JOURNAL OF MARITIME RESEARCH

Vol XI. No. I (2014) pp 61–72

ISSN: 1697-4040, www.jmr.unican.es

A Seafood Analysis in the Atlantic Area: Contributions from Ireland, Portugal, Scotland and Spain

H. Pinto[1,*], C. Nogueira[2,3] and H.Almeida[3,4]

ARTICLE INFO

Article history:
Received 27 January 2014;
in revised form 06 February 2014;
accepted 05 March 2014.

Keywords:
Economy, Seafood, Human Capital, Innovation.

ABSTRACT

The results of HARVEST Atlantic project highlighted the crucial role that innovation and human capital play in the maritime economy and in the regional development. The goal of the project was to identify good practices and sustainable solutions based on innovation in order to improve the socioeconomic situation of the Atlantic seaside territories of four countries of European Atlantic coast: Portugal, Spain, Scotland and Ireland. The analysis is based on the HARVEST Atlantic survey, applied in the period 2011-2012, with 243 enterprises of maritime sector. By identifying the best practices in the maritime economy sub-sectors it intends to strengthen the sector through increased productivity, competitiveness and job creation. The article is focused in the specific results of companies in the seafood providing policy implications for this sector.

1. Introduction

The definition of the seafood sector is not consensual and it might represent different meanings to different contexts and societies. Its scope can vary from edible fishery products derived solely from the sea to freshwater fish, frozen products or in a broader dimension, other products harvested from the sea to serve nutrition purposes. In general, seafood can be defined as all edible fisheries and aquaculture products harvested from any aquatic environment (Anderson, 2000).

According to FAO - United Nations Food and Agriculture Organization, seafood is perhaps the largest international commodity, with fish trade exceeding 70 billion Euros per year. Almost 200 countries supply fish and seafood products to the global marketplace consisting of more than 800 commercially important species of fish, crustaceans and molluscs (FAO, 2012).

The global seafood industry comprises different activities relating to the culturing, catching, preserving, processing, selling and distribution of fish or fishery products, as well as different and several uses. Most of the seafood harvest is consumed by humans, but a significant proportion is used as fish food to farm other fish or ultimately farm animals. Some seafood (kelp) is used as food for other plants (fertilizer). In this way, seafood is indirectly used to produce further food for human consumption. Products, such as fish oil and spiraling tablets are also extracted from seafood. Some seafood is feed to aquarium fish, or used to feed domestic pets, such as cats, and a small proportion is used in medicine, or is used industrially for non-food purposes (M&A, 2013).

Seafood is a significant contributor to the world's food supply and an important protein-providing food in terms of per capita consumption. Today, the supply of fish has kept up not only with a rapidly increasing population but also with increases in per capita consumption. However, global capture fisheries are at their maximum sustainable yield and besides aquaculture continues to grow, it will have some difficult keeping pace with global demand (FAO, 2012).

This article is part of a broader research developed under HARVEST Atlantic project. It intends to provide a deeper understanding of the seafood sector. To this aim it is organized as

[1]Pos-doctoral researcher. Centro de Estudos Sociais. Universidade de Coimbra. Invited Assistant Professor. Facultade de Economia. Universidade do Algarve. Portugal. E-mail Address: hpinto@ces.uc.pt.

[2]Research Assistant. E-mail Address: cfnogueira@ualg.pt.

[3]Centro de Investigaçao sobre Espaço e Organizações. Universidad do Algarve. Portugal

[4]Assitant Professor. Facultade de Economia. E-mail Address: halmeida@ualg.pt

[*]Corresponding author. E-mail address: hpinto@ces.uc.pt (H. Pinto)

Figure 1: Seafood Value Chain

Source: Own Elaboration

follows. A first part provides a general description of the sector, presenting the value chain, market situation, strategic situation and overview at European Level. A second part presents the main results achieved with HARVEST survey in seafood. The article concludes with some policy implications.

2. Part I- General Description

2.1. Value Chain

The supply chain for seafood products can involve a large number of stakeholders between the fisherman/fish farmer or harvester and the final consumer. There are several factors affecting the demand function of fish and seafood products. Price, income, income distribution, substitutes, tastes and fashion, marketing and expectations of the consumers make the changes along the demand curve and demographic characters lead to change the situation of the demand curve, upward or down ward flowing of the curve (Roheim, 2008).

Due to the diversity of seafood products and seafood demands it is not easy to frame and draw the seafood value chain but in general is possible to identify four possible routes: 1) it may be exported directly after harvest; 2) it may be exported after only primary processing occurs within the foreign harvesting nation; 3) it may be exported after both primary and secondary processing occur within the foreign harvesting nation; or, 4) it may be exported after harvest to a third country processor which will then re-export the product to the consuming nation (Roheim, 2008). Figure 1 show the seafood value chain, although sometimes it might be less linear than it appears in first place.

The value chain begins with the harvest of the products and it involves the collection of seafood species through commercial fishing or aquaculture. This first step is composed by two main actors, artisanal and industrial fishermen. Industrial fishermen are concern more on few economically important species and their scale of production is large compared to artisanal fishermen (Schuurhuizen, 2006). Processing can also operates in two stages that can co-operate together or independently. Primary processing involves the shucking, cleaning, sorting, freezing, filleting and packing of fish and other seafood; secondary processing involves the creation of processed seafood for ready meals or meal components. Processors play a significant role in international seafood value chains and sell their processed product to the stakeholders after certification. This segment includes retailers, wholesalers, and exporters and importers (Dubay, Tokuoka and Gereffi, 2010). Certification and the labelling of certified products aim to identify products that follow certain minimum standards or regulations, such as standards for quality, organic production, fair trade, or sustainability (Greenpeace, 2010). A variety of seafood certification schemes has been developed over the past decade, all claiming that the fish that they certify have been sustainably caught or farmed and that they are sustainable and healthy option for consumers to purchase. Seafood products that are exported to the EU must be accompanied by a health certificate emitted by the Competent Authority of the country of origin (ITD, 2008). External dynamics, such as consolidation in both retailing and distribution in the main markets and Compliance on *Hazard Analysis and Critical Control Point* (HACCP), create division between enterprises upgraded to HACCP system and non HACCP enterprises (Lindhal, 2005). The next stage in the value chain is distribution, which involves the marketing and distribution of fish or processed seafood products. Distributors are those who store products and sell them to retailers, food service and food management companies, and restaurants. Research has identified three types of distributors: specialty seafood distributors, full-line distributors, and environmentally sustainable marketers. Specialty seafood distributors develop regional supply chains; full-line distributor sells a wide range of food products and has national distribution networks and environmentally sustainable marketers are focused on the overexploitation of marine resources and fish stocks (Dubay, Tokuoka and Gereffi, 2010). The consumer typology can vary according to the country or the socio-economic context but it has an interconnected relation with the demand outlines. The major factors driving seafood demand are as follows: diet diversification in industrialized countries due to people becoming more health-conscious; increasing per capita consumption, rising income and changing diet preferences in developing countries and the development of modern distribution channels along with technological improvements in processing, packaging and storage of seafood products (M&A, 2013). Different institutional contexts of end-markets are linked to different forms of coordination and control of global value chains. Economically and socially important species and value chains differ widely across the world (M&A, 2013).

2.2. Market Situation

The world seafood industry plays a significant role in the economic and social wellbeing of nations, as well as in the feeding of a major part of the world's population. The global seafood market is undergoing significant change as forces converge from diminishing supply, increasing demand, environmental changes and regulations, and geopolitical events. The seafood demand framework is growing in both the developed and developing countries. It is estimated that the global seafood market reaches around 120 billion Euros per year and the world per capita consumption in 2012 was 19.2 kg, and it is expected to rise to 20.6 kg by 2022. This is a growing market and is estimated that by 2018, the global seafood industry has been forecast to hit a market value of 520 billion Euros, with factors

such as innovation in production, diet, health concerns, and improvements in transportation resulting in a significant upward swing in seafood consumption (M&A, 2013). World fish consumption increases since the 60s, motivated by the increase in per capita consumption (due to health concerns, increased standard of living and immigration) and by the general population growth (FAO, 2012).

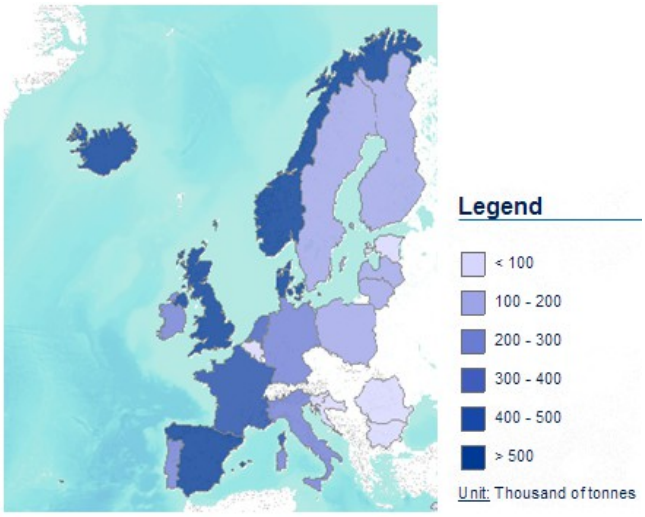
Asia Pacific currently represents the largest region within the global seafood market. Korea and Japan with per capita consumptions of 57.6 kg and 54.8 kg, respectively, are the highest seafood-consuming nations. Brazil, China, India and Australia are forecast to demonstrate the highest growth in per capita consumption of seafood during 2012-2022 (M&A, 2013). Asia is a central agent in the seafood global market, assuming the role of most consuming representative but also of the main seafood producer. Asia is leading the production and exports of wild capture and farmed fish making an important contribution to the food chain of the region along with the mitigation of poverty and generating employment. China in particular has gradually emerged as the single largest producer of aquaculture and capture fisheries products worldwide in the last two decades (M&A, 2013). According to FAO (2012), the global seafood trade is expected to reach 45.1 million tons by 2022, from 37.2 million tons in 2012. China is expected to maintain its leading position as the primary international exporter. The EU and the US are likely to continue being the largest seafood importers based on meeting their growing seafood consumption demands. Sustained demand, development in processing technologies, improved logistics and trade liberalization has all contributed to expanding the international seafood trade (FAO, 2012).

In general, the seafood market usually operate according to four different segments: 1) Aquaculture and fish hatcheries; 2) Commercial fishing; 3) Processing and distribution and 4) Fish feed (M&A, 2013). Taking into account that the seafood demand will increase in the next decade, due to social and economic changes in the society's nutrition patterns and considering the exhaustion of ocean capture fisheries, this increased demand can only be satisfied by aquaculture, and so this segment market will tend to increase.

2.3. *General Description of Seafood at European and Atlantic Area Level*

The European Union is the third largest seafood producer in the world, but Europe is also the biggest importer of seafood products - imports make up 60% of total European consumption. The seafood self-sufficiency of the European Union is estimated to have declined from 53% in 1997 to 36% in 2007 as consumption per capita has increased (EU, 2008) once the sector is faced with many challenges such as: depletion of several fish stocks, outbreaks of invasive species, competition from third countries, conflicts with other coastal activities for space allocation or negative environmental impacts. However, through focused research and innovation, the EU can address these challenges and maximize the potential of their natural resources (ITD, 2008). One of the inputs to the EU fish processing industry is EU catches. Of all the maritime sectors, the fisheries industry is certainly the most emblematic. In 2010, EU catches amounted to 4,943,780 thousand tonnes, of which around 85% were marine fish. Since 2001, EU catches have decreased steadily with the total and marine fish catches following the same trend. Over the last couple of decades, the total engine power and capacity of the EU fleet have decreased regularly by around 2 % per year on average (M&A, 2013). As shown in figure 2 the EU countries with more weigh of catches in the general framework were: Norway with about 2,178,092 thousands of tonnes, Spain with 849686 thousand of tonnes and the UK with about 600,000 thousand of tonnes in catches. According to M&A (2013), nearly 62.5% of all seafood acquisitions in Europe from 2010 onwards took place in one of these three countries.

Figure 2: Catches per EU country (thousands of tonnes) 2011

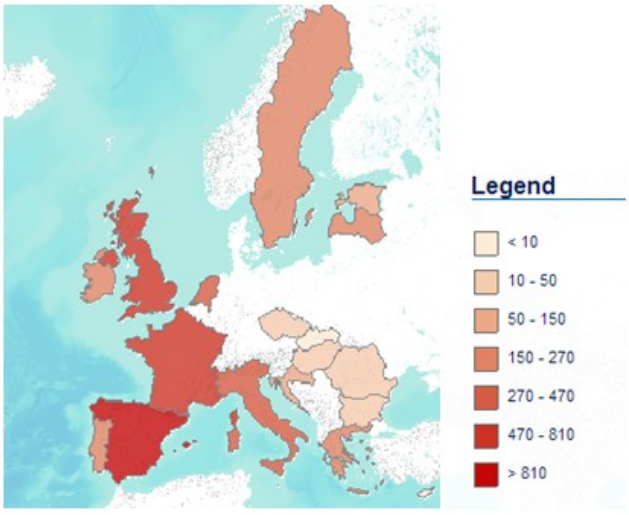


Source: European Atlas of the Seas (European Commission)

Almost one-third of the deals in Europe took place in the aquaculture segment. Norway and the UK are prominent salmon producing countries and, as such, regional and global aquaculture players exhibited a growing interest in acquiring companies in these countries (M&A, 2013). In 2009, output from EU aquaculture was 1,299,635 thousand tons of which 76% was produced in a marine water environment. In 2009, aquaculture produced in a marine water environment in the EU accounted for 993 thousand tonnes, representing around 20% of the EU catch. The largest part of this production came from Spain (25%) followed by France (19%) and the United Kingdom (18%), with Italy and Greece producing 12% each. Since the year 2000, total and marine water aquaculture production followed an irregular trend but largely a similar pattern. However, between 2007 and 2009 marine water aquaculture production went up while total aquaculture production fell in 2008 (MAI, 2013). In 2011, according to figure 3 the highest EU producers of fisheries and aquaculture were: Spain (1134253 thousands of tonnes), UK (79,849 thousands of tonnes) and France (616,173 thousand of tonnes).

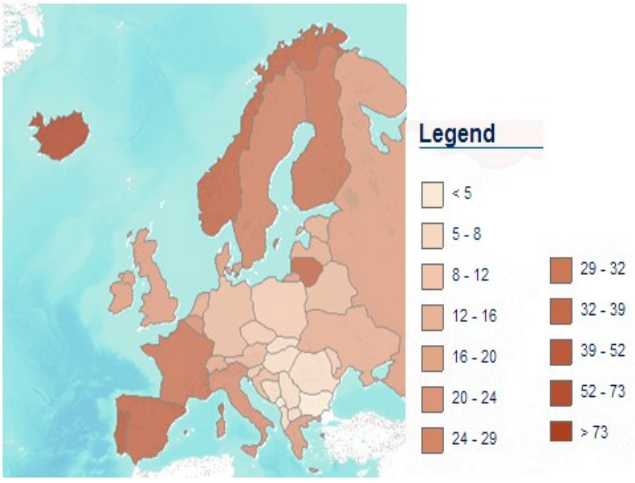
The projections show (Figure 4) an increase in the demand for seafood products to 2030. The average per capita consumption in the UE countries will move from 22 kg per year in 1998

Figure 3: Fisheries and aquaculture production (thousands of tonnes) 2011



Source: European Atlas of the Seas (European Commission)

Figure 4: Fisheries and aquaculture products per capita consumption (kg) 2009



Source: European Atlas of the Seas (European Commission)

to 24 kg per year in 2030. The two additional kilograms per capita signify that the net supply will have to increase by 1.6 million tonnes. Aquaculture growth will not be able to meet the increasing demand; therefore, imports are projected to rise to 11 million tonnes, increasing the dependency of Europe on the rest of the world for its fish and fish products (FAO, 2012).

The UE countries that had the highest consumption rates in 2009 were: Iceland with an average consumption of 88.3 kg per capita; Norway with 50.6 kg per capita; Portugal and Spain, with 43.3 kg and 42.9 kg per capita, respectively.

General consumption trends for the EU countries reflect an increase in consumption of seafood products. This rise is supported by a rise in consumption of convenience products as consumers have less and less time to spare for meal preparation. Frozen products tend to be on a downward trend whilst the consumption of fresh fish stagnates or decreases. The rising share of supermarkets in the retail of seafood products also increases their availability, which leads to increased consumption. Healthy eating, triggered by various food crises is another determinant of the positive trend of seafood consumption (FAO, 2012).

2.4. Strategic Framework

The seafood sector involves several subsectors and stakeholders. In the EU due to the sector's complexity and dimension, does not exist a specific strategic framework for the seafood sector. However, there is a structured and cohesive policy framework for the fisheries and aquaculture subsectors. In the European Union context, regarding seafood, specifically in the fisheries sector a new Common Fisheries Policy (CFP) has been agreed by Council and Parliament and is effective since 1st of January 2014. The new CFP chases to bring fish stocks back to sustainable levels; finish wasteful fishing practices, and generates new opportunities for jobs and growth in coastal areas. The CFP purposes to assurance that fishing and aquaculture are environmentally, economically and socially sustainable. Its goal is to foster a dynamic fishing industry and ensure an impartial standard of living for fishing communities (more information at http://ec.europa.eu/fisheries/). The CFP also includes rules on aquaculture and stakeholder involvement. Currently, too many fish stocks are still exploited at levels in excess of their maximum sustainable yield, in other words the ideal volume of catches that can be taken each year without frightening the future reproductive capacity of a fish stock (EC, 2012). Although it is important to maximize catches, some limits are imperative. The current policy stipulates that between 2015 and 2020 catch limits should be set that are sustainable and maintain fish stocks in the long term. To accomplish this it focuses on banning discards, empowering the sector and decentralizing decision making, prioritizing aquaculture, supporting small scale fisheries, improving the scientific knowledge on the state of stocks, and taking responsibility in foreign waters through the EU's international agreements. The decentralization of decision making is one of the more representative changes in the CFP that provides EU countries with a greater control at national and regional level. The new CFP has 4 main strategic areas, regarding fisheries management, international policy, and market policy and funding. The cornerstone of the CFP for 2014-2020 is the management of fish stocks, to safeguard stock reproduction for high long-term yield, lay the foundations for a profitable industry, share out fishing opportunities fairly, and conserve marine resources. Fisheries management can take the form of input control, output control, or a combination of both. On one hand, input controls include rules on access to waters - to control which vessels have access to which waters and areas, fishing effort controls - to limit fishing capacity and vessel usage and technical measures - to regulate gear usage and where and when fishermen can fish. On the other hand, output controls mainly consist of limiting the amount of fish from a particular fishery, in particular through total allowable catches. The Fisheries man-

agement tool is based on data and scientific advice, and control measures to ensure that rules are applied fairly to and complied with by all fishermen. In order to achieve the strategic goals, the European Union provides a fund to the fishing industry and coastal communities to help them adapt to varying conditions in the sector and become economically resilient and ecologically sustainable - European Fisheries Fund (EFF). The EFF had a budget of 4.3 billion Euros for 2007-2013 and was available for all sectors of the industry - sea and inland fishing, aquaculture (the farming of fish, shellfish and aquatic plants), and processing and marketing of fisheries products (EC, 2012). Projects are funded on the basis of strategic plans and operational programmes drawn up by national authorities in five priority areas: 1) adjustment of the fleet; 2) aquaculture, processing and marketing, and inland fishing; 3) measures of common interest; 4) sustainable development of fisheries areas and 5) technical assistance to finance the administration of the fund (EC, 2012). Once the strategic goals changed, according to the new CFP, the main priorities of funding changed in the same direction. The EMFF is the proposed new fund for the EU's maritime and fisheries policies for 2014-2020. This new fund will help fishermen in the transition to sustainable fishing, support coastal communities in diversifying their economies, finance projects that create new jobs and improve quality of life along European coasts and facilitate the financing access. The new Fund will be used to co-finance projects, along with national funding. Each country will be apportioned a share of the total Fund budget, based on the magnitude of its fishing industry, then each country should draw up an operational programme, presenting their strategic plan to invest the money. The European Commission approves the programme and the national authorities have the authority to decide which projects will be funded, and both will be responsible for the implementation of the programme.

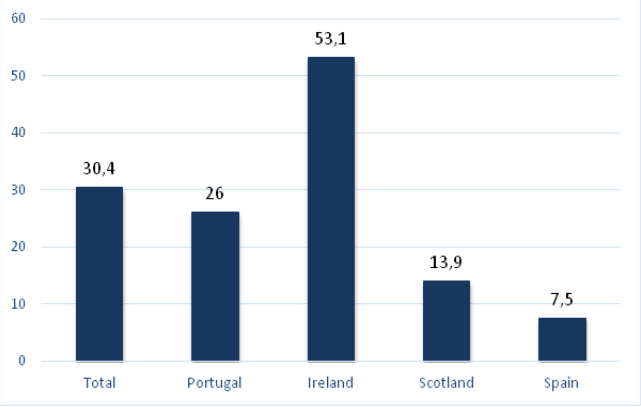
3. Part II - The Sector Within The Harvest Regions

3.1. Description of the Sector in the Harvest Regions

This paper is a result of one of the major outputs of the project, a statistical report, focused on four subsectors of the maritime economy, under study, namely the green maritime energy, the biotechnology, the repair and shipbuilding and the seafood sector. The study was applied through an online survey, which inquired companies operating in the sectors underlined in the four countries where the HARVEST was implemented: Portugal, Spain, Ireland and Scotland. The survey resulted in a sample of 243 enterprises of maritime sector and the step of processing and analysis of data was made with the SPSS - Statistical Package for the Social Sciences (version 21.0), and using descriptive statistics allowed to present the differences between the four analyzed countries (Portugal, Scotland, Ireland and Spain) in relation to all the questions.

According to the survey implemented in the HARVEST regions - Portugal, Spain, Ireland and Scotland - 30.4% of the companies inquired develop their economic activities in the seafood sector. Ireland is the region with the most representative percentage of seafood companies (53.1%), followed by Portugal with a 26% weigh in the companies inquired (Figure 5). The regions with a lower seafood weight in the HARVEST area are Scotland and Spain, with 13.9% and 7.5% respectively. In general, all the companies inquired, in the seafood sector are SMEs - about 52.6% have a turnover less than 2 million Euros and only around 10% stressed to have a turnover greater than 50 million Euros.

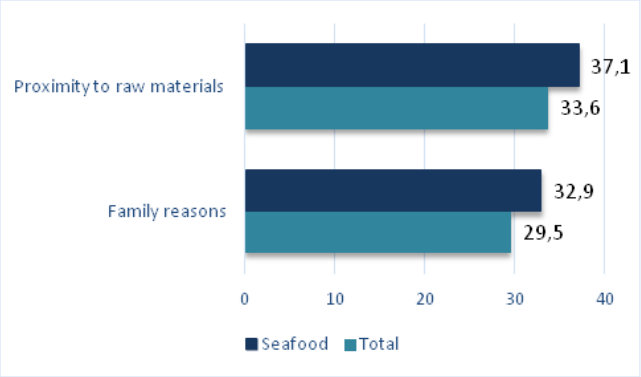
Figure 5: Seafood in HARVEST regions (% from total number of entities interviewed)



Source: Own Elaboration

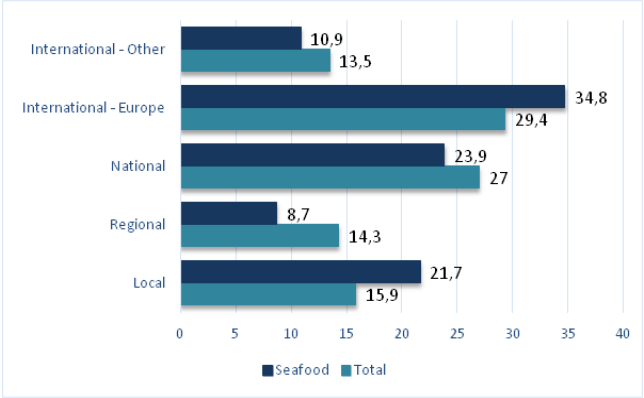
The seafood sector is a traditional sector in Portugal. The activities related to seafood production had represented, along the years, one of the major economic activities with a historical and identity relation within the Portuguese society. Portugal has followed the global mobilization for the ocean and for its promotion as a strategic vector of development. The first steps on this path, nationally, were given in 2006 by the creation of the National Strategy for the Sea. This strategy has now been renovated to the new strategic period 2014-2020, allowing Portugal to meet the challenges for the promotion, growth and competitiveness of the maritime economy, in particular, taking into account the significant changes in the political and strategic framework at European and global level. Portugal has one of the largest maritime Economic Exclusive Zones (EEZ) in the European Union and thus numerous possibilities in the seafood sector. In 2006, fisheries and agriculture accounted for about 4% of the GDP, down from approximately 25% in the 1960s, while still employing 13% of the labour force. In 2012 the contribution of fishing and aquaculture economic activities dropped to less than 2% of the country's GDP. This was seen as a result of the structural adjustment of the economy produced by technological improvements in the first sector, and the subsequent diversification of the economic activity towards the industry and service sectors. According to the results of the Census, only 13,156 individuals worked in the fishing sector in 2011, representing 0.3% of the total employed population (Maritime affairs and fisheries, 2013). In return, an accelerated increase of aquaculture activities has been observed, meeting a GVA of 5.3% in 2011 and constituting around 5% of the total fish production (INE, 2012).

Figure 6: Reasons for Companies Location HARVEST regions (% from total number of entities interviewed and seafood sector)



Source: Own Elaboration

Figure 7: Largest Markets HARVEST regions (% from total number of entities interviewed and seafood sector)



Source: Own Elaboration

4. Location

In the seafood sector the location is highly important due to the geographical and climatic characteristics that some subsectors in seafood, like salt production or fisheries, need to its production. The figure 6 shows the two main reasons for the location choose by the companies.

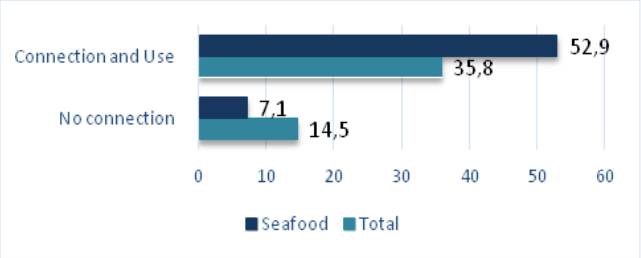
About 37,1% of the seafood companies highlighted the proximity to raw materials as the main factor taking into account when choosing the company´s location followed by 32.9% that give relevance to the family reasons. There are other identified reasons that are close to this two: The proximity to markets (11.6%) and the opportunity to exploit an existing need (10%). The key factors identified as the less important, for seafood companies, regarding the location of their businesses were the proximity to specialized human resources (7.1%) and the availability of/access to higher education resources (1.4%). However, the two reasons highlighted on figure 6 were the only where the seafood percentages were higher than the total average. The availability of access to higher education resources was identified as one of the main features, when choosing a location, for the total of the companies inquired with about 21%, against 1.4% of seafood companies. This gap with respect to this variable may be due to the fact that the seafood sector is still a mainly traditional sector that requires the conjugation of scientific knowledge with traditional and tacit knowledge - Know-how - present in the traditional knowledge of the key actors of the sector, accumulated over the years.

Although the total average of the companies inquired had identifies this two reasons as the more important when choosing a company´s location, the seafood sector has a higher percentage, than the total average on the same reasons, mainly due to the need of specific geographical conditions for the products development and the type of knowledge it requires can only be find in particular geographic areas where the sector had constructed a traditional network of agents. Figure 7 shows the largest markets for the HARVEST regions regarding the total average of the companies inquired in the sectors under the study and the seafood sector.

All the companies inquired in Portugal, Spain, Ireland and Scotland, in the seafood sector identified Europe as their main market (34.8%). This percentage is in agreement with the overall trend of all sectors surveyed, where 29.4% also choose the European market, followed by the national both in the total average and in the seafood sector, 27% and 24% respectively; the local representing the biggest market for 15.9% of the total companies inquired and 21.7% for the seafood sector. In the international and regional markets the seafood sector does not follow the trend of the average of all the sectors: 10.9% of seafood companies identified the international market as the biggest against 8.7% which identified the regional market. Regarding the total average there is an inversion of this values, while 14.3% of the companies highlighted the regional as the largest market for their business, 13.5% underlined the international. The total average represents higher values than the seafood sector for all the markets under study, except for the European and local market. Europe is the biggest importer of seafood in the world, in 2012 imported 7.6 million tonnes while produced 6.5 million tonnes, so it was expected that the European market was stressed as the main market in the seafood business. The local market has a higher percentage for the seafood sector than for the total average. As figure 8 showed, seafood companies tend to localize according to the proximity of raw materials. It is expected that the communities that live near the raw material tend to privilege that resource and is in this sense that there is a local market for the seafood companies rather than for the other sectors, which is confirmed by the 11.6% that choose the location of the company based on the proximity to markets. Figure 8 justify and strengthens the conclusions of the figures above. The majority of the surveyed companies, both in total average (35.8%) and in the seafood sector (52.9%) stressed that there is a strict connection between the location of the company in Atlantic Area and the use of the coastal atlantics natural resources or products.

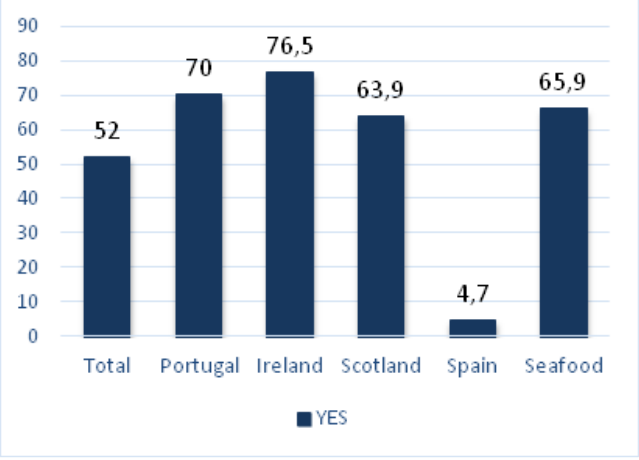
The concept of innovation has had, over the last years, a greater emphasis, penetrating not only in the scientific and political discourse but also become one of the companies chal-

Figure 8: Connection between location and the use of Coastal Atlantic resources (% from total number of entities interviewed and seafood sector)



Source: Own Elaboration

Figure 9: Engage in Innovation Activities 2012 (% from total number of entities interviewed)



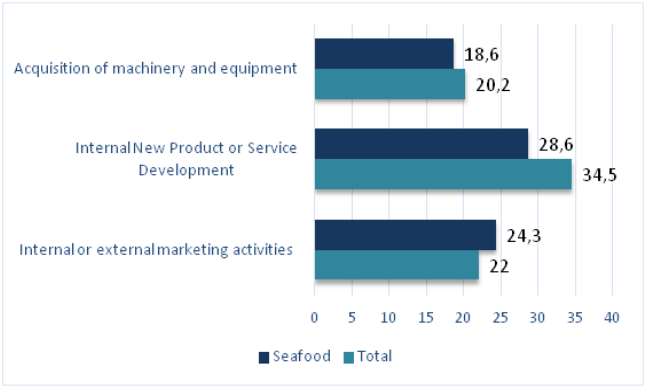
Source: Own Elaboration

lenge in the competitive markets. In the HARVEST regions, in general, as it is possible to see in figure 9, the companies surveyed were highly engaged in innovation activities in 2012, except the Spanish companies. Specifically in the seafood sector almost 70% of the companies inquired promoted activities related with innovation.

Between the seven variables proposed in the survey as innovation related activities, figure 10 shows the main activities which companies were engaged at.

The innovation activity most choose, both in total average and seafood is related with the internal new product or service development, with 34.5% and 28.6% respectively. This variable is followed by the activities related with internal and external marketing, with 22% of the companies surveyed underlining this feature and 24.3% of the seafood companies; and the acquisition of machinery and equipment for the total average, about 20% and for seafood sector with 18.6%. This main features are followed by: all design functions (including industrial, product, process and service design and specifications for production or delivery) with a relevance of about 15% for the totality of the companies and for the seafood sector; the internal or external training for the personnel directly related to innovation activity, representing the innovation engagement activity for nearly 14%

Figure 10: Innovation Activities (% from total number of entities interviewed and seafood sector)



Source: Own Elaboration

of the all the companies and the seafood sector; the acquisition of external R&D services or products, where around 13% of the companies were engaged at.

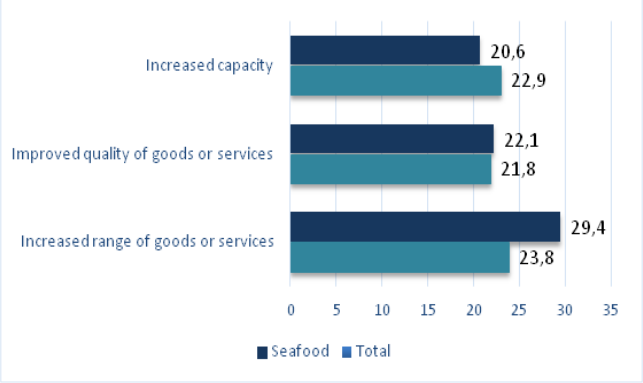
All of the variables have close percentages regarding the totality of the firms surveyed and the seafood sector, however for the acquisition of other external knowledge (such as licenses to use intellectual property e.g. patents, know-how; or specialized services e.g. consultants, universities), the numbers vary. While this variable is a key dimension for the totality of the companies under study (16%), only 8% of the seafood firms inquired was engaged in this activity in 2012.

The acquisition and promotion of innovation brings together several impacts for the companies. According to the implemented survey in the HARVEST regions and sectors there are three main impacts when innovation activities are applied.

Conferring figure 11 about 24% of the companies and almost 30% of the firms in seafood sector, suggested that the implementation of innovation activities had result in the increment of the range of goods and services, followed by the improvement of the quality of goods and services for 22% both, the totality and the seafood companies and an increment in capacity for 23% of the companies in all the sectors and 20% specifically in the seafood area.

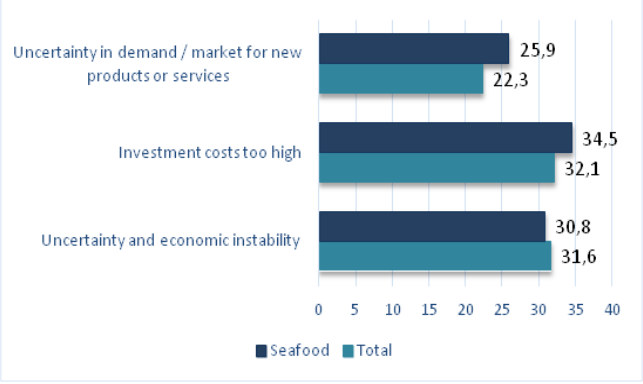
However there are some factors that may be responsible to inhibit the innovative capacity of the companies. Between the dimensions proposed in the HARVEST survey, the high value of the investment costs was the variable stressed for both, total (32.1%) and seafood (34.5%) companies, as the major inhibitor of innovation. In the contemporaneous scenario of economic crisis was expected that the features more representative were related with the costs and the economic uncertainty. Figure 12 proves this expectation and shows that the uncertainty and economic instability is a determinant factor concerning innovation, because 31.6% of the totality of companies surveyed and 30.8% of the seafood sector, underlines this feature as the more determinant innovation inhibitor, followed by uncertainty in demand and uncertainty in the market for new products or services, evidenced by almost 30% of the seafood companies and 25.9% of the companies in all the sectors.

Figure 11: activities impacts (% from total number of entities interviewed and seafood sector)



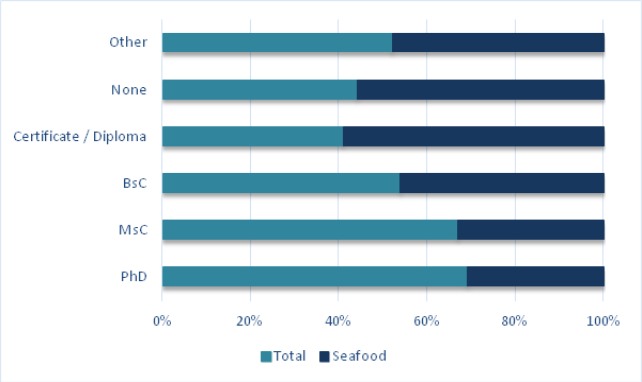
Source: Own Elaboration

Figure 12: Innovation Inhibitors (% from total number of entities interviewed and seafood sector)



Source: Own Elaboration

Figure 13: Staff Qualifications (% from total number of entities interviewed and seafood sector)



Source: Own Elaboration

Regarding the remaining variables of the survey 11% of the seafood companies identified the following dimensions as the major innovation inhibitors: the impact of regulations or standards and the domination of the market by established enterprises. Eight percent of the enterprises stress the difficulty in finding partners for cooperation in product/service development and the lack of defined Innovation strategy or culture within the organization as the main features in this domain. The values for the totality of the organizations surveyed are according to the seafood sector percentages.

4.1. Human Capital

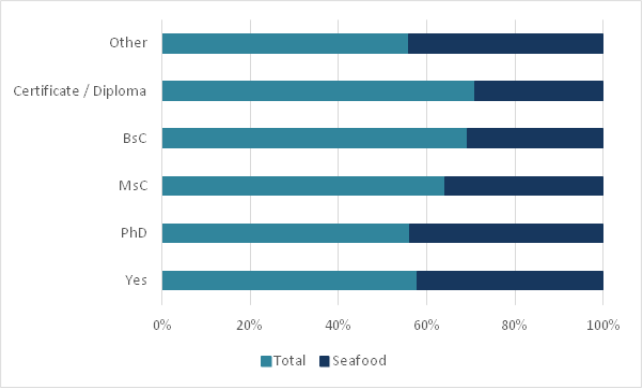
In European societies characterized by knowledge, companies make a continuous effort to improve and generate new forms of knowledge, skills and experience in an attempt to make an effective management of their intellectual capital, in order to succeed and thrive in the competitive environment of the markets.

According to the survey implemented in the HARVEST regions, taking into account the total average the companies inquired, have work teams highly qualified: more than 60% of staff holds an MSc and/or a PhD; less than 50% holds a certificate/diploma or none qualification and about 55% of the collaborators of the firms surveyed holds a BSc or other type of qualification. Figure 13 opposes the results of all enterprises with specific results for the seafood sector. Despite the fact that the values are very close to each other in some dimensions, in the seafood sector companies reported that only about 20% of their staff holds a higher degree like a MSc or a PhD, contradicting the general tendency.

In the seafood sector, about 60% of the companies' staff holds a certificate/diploma or doesn't hold any qualification and nearly 50% holds a BSc or other type of qualification.

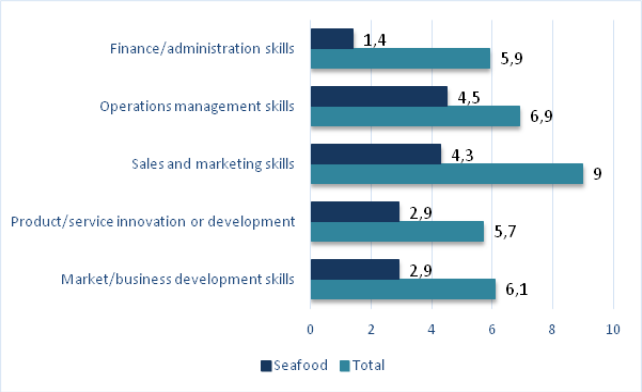
Before identifying the qualifications of the companies' collaborators, the organizations surveyed were asked about their qualifications shortages that could be met by third level institutions. In average, about 60% of the companies surveyed stressed that they have qualification shortages. Figure 14 shows that the majority of the companies operating in the sectors under study

Figure 14: Qualification shortages that third level institution could meet (% from total number of entities interviewed and seafood sector)



Source: Own Elaboration

Figure 15: Areas of staff shortages (% from total number of entities interviewed and seafood sector)



Source: Own Elaboration

in the HARVEST project do have qualification shortages that third level institutions could meet.

These shortages are more evident in the dimensions of BSc and certificate or diplomas, where almost 80% is reported. Almost 60% of the totality of the companies inquired underline that their staffs have qualification shortages regarding MSc and other qualifications. The area where the qualification shortages are less evident is PhD.

Regarding the seafood sector, the qualification shortages that could be diminished by the third level institutions, are not as evident as the total average of the organizations surveyed. Around 40% of the seafood companies under study admit to have qualification lacks. This shortages are more apparent both for PhD and other type of qualifications (about 40%), followed by MSc qualification (around 30%) and BSc and certificates or diplomas (nearly 25%). The seafood sector tends to combine skills involving advanced level of technological education with more traditional forms of knowledge. Concerning to the traditional knowledge it is fundamental to enhance this kind of knowledge, once there is an accentuated ageing of the fleet and of fishermen and an absence of incentives for the recruitment of young people for this activity, that puts in risk not only the fisheries sector, but also the reduction of human capital, traditional based, in this sector.

The areas where staff shortages are more manifest vary from market related dimensions to finance skills. In a general way, as it possible to understand in figure 15, the seafood sector has lower values, in every item, than the whole companies investigated. But the item where this discrepancy is more evident is on finance and administration skills: In the total average this dimension is one of the third more representatives while in the seafood sector is the less descriptive one. For both, total and seafood the areas with a higher staff shortage volume is sales and marketing and operations management skills.

Areas related with the product/service innovation or development and market and business development skills are less representative comparing with the previous two dimensions.

Regarding the human capital factor, the economy of the sea, in general, and the seafood sector in particular, presents complex problems of technological basis in most of its vectors of development, which require the involvement of a highly qualified workforce. The recognition, maintenance and enhancement of professional qualifications, for current and future generations, are fundamental to maintaining and securing specialized frames across the range of sea-related activities. However, at present, are not ensured the necessary conditions for the education and training of the workforce, particularly those that allow the qualification of an increasing number of technicians in sea-related disciplines, in all its aspects.

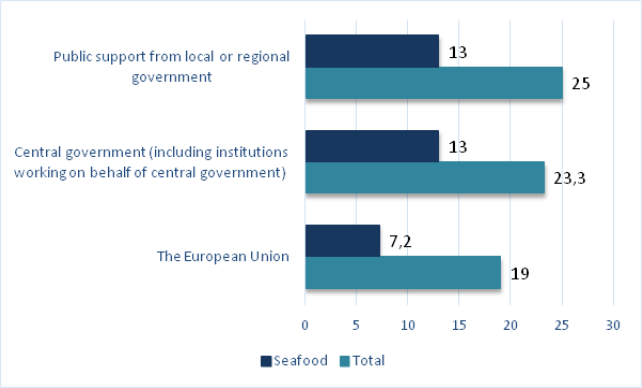
4.2. *Policy Making*

The seafood sector is a vast and interconnected sector which cannot obey to a common directory and needs to be understood taking into account all of its dimensions. Thus the seafood sector relies on and interacts with a variety of EU policies: from the common fisheries policy to the integrated maritime policy, from quality and safety of seafood products to fresh and marine water quality. Fisheries and aquaculture research also covers seafood safety and quality, feeds, fish health and welfare, which are dealt with by the Commission's Health and Consumers Directorate as well as the European Food and Safety Authority. Besides European Union, the policy support can be achieved by the central government of each country and by local or regional government of each region.

Within this generic framework, figure 16 enhances the source of the public supports received for the overall companies under study and for the seafood sector.

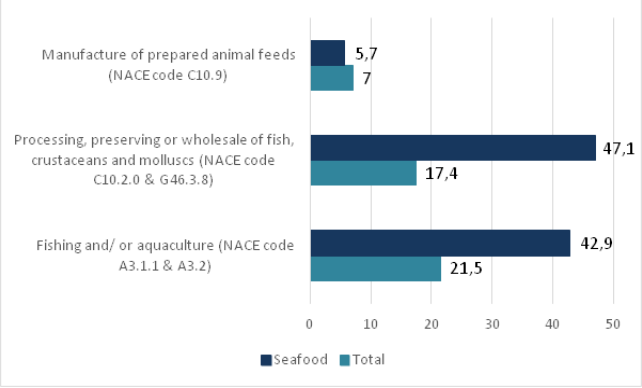
The public support with higher percentages, for the entirety of the firms and for the seafood sector, are those who came from local or regional government, 25% for the overall framework and 13% for the seafood companies; Then about 23% of the companies operating in the subsectors being studied by HARVEST, affirm to receive public supports from the central government, including institutions working on behalf of central government. For this same dimension, about 13% of the seafood organizations have received, or receive some support. Regarding the supports promoted through the European Union,

Figure 16: HARVEST regions public supports (% from total number of entities interviewed and seafood sector)



Source: Own Elaboration

Figure 17: Categories (NACE codes) that best define the companies' activity (% from total number of entities interviewed and seafood sector)



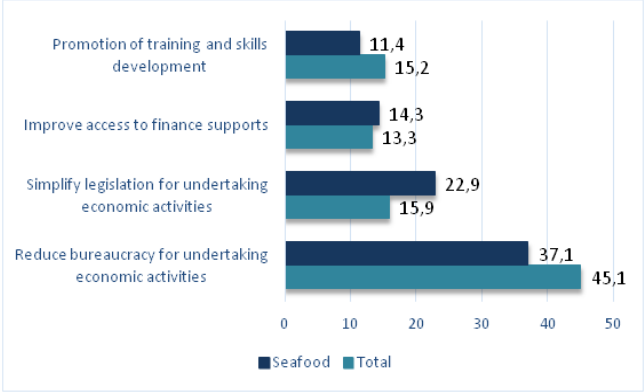
Source: Own Elaboration

about 20% of the overall companies and 7% of seafood sector, reported to receive some kind of support.

As already mentioned in the first part of this report, the seafood sector can operate in a broad scope which can be divided into various activities. In order to contextualize the areas where the policy support is high-priority, figure 17 shows, within the companies surveyed in the HARVEST project, the top three categories that best defines them, according to NACE codes. Fishing and/ or aquaculture (NACE code A3.1.1 & A3.2) and Processing, preserving or wholesale of fish, crustaceans and molluscs (NACE code C10.2.0 & G46.3.8) where enhanced as the classes that best state not only the seafood companies activities, but also of all the companies queried in the study. More than 50% of the seafood firms develop their activity in the processing, preserving or wholesale of fish, crustaceans and molluscs, what makes this subsector as the most representative in the seafood sector, followed by fishing and/or aquaculture (42.9%) and the manufacture of prepared animal feeds (5.7%).

Comparing the overall framework with the seafood sector, there is a divergence in what regard the third most selected category. While the seafood sector placed the manufacture of prepared animal feeds in third, the average of the companies regarding all the sectors under study, choose the building, repair and maintenance of ships, boats or floating structures (NACE code C33.1.5) as the third category that best define their business/organization (11.6%).

Figure 18: Priority Supports (% from total number of entities interviewed and seafood sector)



Source: Own Elaboration

The proportion of the policy supports they enhanced (total and seafood) as more priority are similar, due to the excessive bureaucracy and legislation for the maritime economy activities. Figure 18 shows the supports that the companies under study identifies as the most priority ones. The dimension which achieves higher percentages, both for total and seafood sector, is the need to reduce the bureaucracy for undertaking economic activities, with around 45% for the total and 37% for the seafood sector.

The simplification of legislation for undertaking economic activities is also a critical dimension which needs to be achieved through policy support. Almost 20% of the companies surveyed and of the seafood sector underline this feature as the most impeditive one when trying to develop or increase a business. Factors like improve the access to finance supports are stressed for around 14% of companies in all the sectors (also in seafood) and the promotion of training and skills development is a priority support for 15% of the totality of the companies being studied in HARVEST and for 11% of the companies operating in the seafood sector in the HARVEST regions.

5. Conclusion

5.1. Summary

Seafood is a relevant sector in the regions under study on the HARVEST project, representing among all the sectors studied, almost 30% of the companies surveyed. Ireland is the region where the sector is more determinant with an overall weigh of near 50%, followed by Portugal where the companies developing activities related with seafood reaches almost 30%. Scotland and Spain are the regions where the sector has less weigh and range between 15% and 10% respectively.

One of the key determinants in the sector is the location of the companies, once this is a type of business that benefits from

the geographical proximity to the natural resources needed, in order to decrease the costs and often this proximity is a mandatory feature to develop the business, for example in subsectors like fisheries, aquaculture or salt extraction, otherwise it won´t be possible, or much more difficult and expensive to develop the business. Almost 40% of the companies admit to choose the location of the business based on the proximity to raw materials and that exists a strictly and direct connection between the location and the use of coastal Atlantic natural resources.

The seafood is a sector highly engaged in innovation, where 60% of the companies inquired stressed that was involved in innovation activities in 2012. The majority of these activities were directly related with the development of internal new products or services. Seafood sector is still a mainly traditional sector which needs to constantly reinvent itself in a competitive way. Regarding its human capital contours and tendencies, seafood is a sector that privileges the specialized technical capacities based on traditional and tacit knowledge, the know-how held by the local agents and accumulated over the years, namely in activities like fishing and/ or aquaculture (NACE code A3.1.1 & A3.2) and salt extraction. Only 20% of the seafood companies inquired report PhD and MSc as qualifications hold by their collaborators. However, as in the innovation domain, the sector has the need to reinvent itself and innovate their products, processes and marketing, and thus 40% of the surveyed stakeholders affirm to have qualification shortages that could be meet to third level institutions, specifically in the PhD and MSc degrees. It is important to promote and value the knowledge that emerges from the existing traditional relationships and a new logic of supply and demand in the markets. This leads to the creation of new knowledge that is generated through the encounter between tradition and the new opportunities that innovation can provide.

In general, seafood is a sector highly injured by the excessive bureaucracy programmes and legislation which ultimately proves to be an inhibitor to the development of new businesses and also to the increment of the economic and innovative capability of the companies already in the market, and this result in a limitation to the growth of the seafood sector. Around 50% of the seafood companies inquired highlights the necessity to promote supports in order to reduce the bureaucracy and simplify legislation in order to undertake economic activities.

5.2. Policy Implications

A central dimension in the discussion about the policy implications in the seafood sector is the urgent need to reduce the excessive bureaucracy of the current strategy programs where several levels of decision making instead of being oriented for the region and level, are concentrated at the central level. The reduction of the bureaucratic programmes could increase the opportunity to undertake economic activities and to foster a more dynamic and integrated sector, with a constant and balanced growth that could on one hand, improve the economic and social condition and on the other hand, promote the regions development in a sustainable way.

Related with this central dimension is the rearrangement of the legislation framework. A more coherent, cohesive and integrated framework will also increase the opportunity to undertake economic activities and consequently work as a lever for the sector growth. The lack of sustainability of public policies difficult the companies vision when designing a long term strategy because it the uncertainty related to legislations becomes time consuming and expensive and makes it very difficult to chronological project profitability.

More control over the value chain is required to address the increasing need for seafood traceability. A presence in harvesting, processing and distribution activities allows companies to address traceability, legality and sustainability concerns with respect to seafood. Industry players need to meet the changing demands of customers/retailers because there is a growing need for industry players to adapt to the changing demand for different seafood products. It is then need to promote and support qualifications and capabilities in both processing and distribution activities which allows companies to introduce differentiated products, mostly under their own brands, improving their innovative capacity and consequently expand their economic capacity and growth. This control and support could ensure the sustainability of the seafood across all the value chain.

Regarding the human capital characteristics of the sector it would be interesting to promote a linkage between the sector necessities and the offers of the third level institutions in order to diminish the gap between universities and R&D centres and the real necessities and characteristics of the market. On the other hand the human capital contours of the sector are crucial in this discussion because the seafood management is immensely complex involving disputed allocation rights over a global resource, issues of national sovereignty, private and public sector interests, economic development, employment and basic food security. This is then further complicated by scientific uncertainties over the number and distribution of fish in the sea. Promote the supports and incentives for young people to join the sector would be a cornerstone to the emergence of more innovative practices and products and a determinant step to guarantee the long term sustainability of the seafood sector.

In general, the strategy needs to be more horizontal and vertical articulated between the different sectors that regard the sea's economy. The sea's economy sector has to be analyzed in an integrated way, regarding every sub-sector in a unique strategy that must be coherent and integrative.

Aknowledgements

This article was stimulated by HARVEST Atlantic - *Harnessing all resources valuable to economies of seaside territories on the Atlantic*, project developed between 2011 and 2014 and co-financed by the European cooperation program INTERREG Atlantic Area through the European Regional Development Fund.

References

Anderson, J.G. (2000) Seafood quality: issue for consumer research. *The journal of consumer Affairs* 25 (1), 144-163.

Asche, F. and Smith, M.D. (2010) *Trade and Fisheries: Key Issues for the World Trade Organization, World Trade Report 2010* [Online]. Available from: http:// www. wto. org/ french/ res _f/publications _f/wtr10 _ forum _f/wtr10_ asche_ smith_f. htm [Accessed at 15th February 2014]

Dubay, K.; Tokuoka S. and Gereffi, G. (2010) *A Value Chain Analysis of the Sinaloa. Mexico Shrimp Fishery. Center on Globalization. Governance and Competitiveness*. Durham: Duke University.

European Union (2008) *Seafood industry report* - Glitnir seafood research.

European Commission (2012) *Facts and figures on the Common Fisheries Policy - Basic statistical data*. ISSN 1830-9119.

Fishery survey (2012) *Statistics Portugal*. (INE).

Food and agriculture organization of the UN (2012) *The State of World Fisheries and Aquaculture*. Rome: FAO.

Greenpeace USA (2010) *Sustainable seafood* [Online]. Green peace International. Available from: *www. greenpeace. org/ usa/ en/ campaigns/ oceans/ seafood/ certification*. [Accessed 10th February 2014] ITD - International Trade Centre (2008) Exportating seafood to the UE, Bulletin No. 84/ 2008/ Rev.1.

Lindahl, J. (2005) Vietnam's seafood industry: A socially embedded division of state owned and local Chinese owned enterprises in regional value chains? *International Development Studies*, Roskilde University.

M&A International Inc. (2013) *The Seafood Industry: A Sea of Buyers Fishing for M&A Opportunities Across the Entire Value Chain* [Online]. Available from: http: //mergers. net/ fileadmin /MAI/public _documents /MAI_Food. And. Beverage _Seafood .Industry. Report _2013 _Email. v2. pdf. [Accessed at 14th February 2014].

Maritime Affairs and Fisheries. (2013) *Study on deepening understanding of potential blue growth in the EU member states on Europe's Atlantic arc*. Maritime Affairs and Fisheries.

Roheim, C.A. (2008) *Seafood Supply Chain Management: Methods to Prevent Illegally- Caught Product Entry into the Marketplace* [Online]. Department of Environmental and Natural resource Economics University of Rhode Island Kingston. Available: *http:// cmsdata. iucn. org/ downloads/ supply _chain _management _roheim. pdf.* [Accessed at 15th of February 2014]