Production changes in the Spanish Cod Fishing Industry: Why institutional change is needed in order to survive

Manuel González-López[a]
Alexandre Trigo[a]
Sebastián Villasante[ab]

[a] Universidade de Santiago de Compostela
ICEDE Research Group – Department of Applied Economics
[b] Universidade de Santiago de Compostela – Department of Applied Economics
Karl-Göran Mäler Scholar. The Beijer Institute of Ecological Economics and the Resilience Stockholm

1. INTRODUCTION [1] [2]

This paper approaches the changes occurred in the Spanish cod fishing industry during the last few years. We also aim at understanding the dynamics of industrial change and its relation to institutions, understood here as both formal and informal rules and conventions. Although innovation and change is usually understood as a key factor for economic success for both territories and industries, sometimes to innovate in a *narrow* sense is not enough. In some cases the survival of a given industry entails the alteration of existing institutions and major routines (David, 1993). Although some authors have already analyzed this issue (Gravonetter, 1992; Grabher, 1992; Lindkvist & Sanchez, 2008, etc), more research is needed in order to understand in depth the relationship between innovation and institutions. Our study tries precisely to add to such understanding and, although we focus on a very specific case where a small industry is analyzed, we think the results obtained are worthwhile.

The paper goes as follows: in section one, we discuss the relationship between innovation and institutions under the light of different contributions In order to achieve a better understanding of such relationship, the Innovation System literature will be used as a reference theoretical framework. In section two we briefly present the details of the field research conducted in the Spanish cod fishing industry. In the following section a general description of the Spanish cod fishing industry is presented highlighting not only current features but also historical ones. In section five we present the changes occurred during the last few years in this industry, focusing on different types of innovations. Our findings indicate that rather than incremental changes the Spanish cod fishing industry has suffered a deep restructuring in the last decade. In section six we try to see if the changes at the productive sphere have been accompanied also by changes in the industry innovation system. In section seven we try to bring about the ultimate reasons explaining those changes, we will use here not only our own findings but also other contributions (particularly Lindkvist *et al,* 2008).

[1] This paper has been written thanks to the support given by the Project "Recapturing the Spanish salted fish market" (University of Bergen, Norway)

[2] This paper has strongly benefited from the comments and suggestions made by Professor Knut Lindkvist.

Finally some conclusions are included at the end of the paper that summarize our main results and considerations.

2. Innovation, institutions and change

As pointed out by different authors, during the last 25 years the disciplines of Economic Geography and Regional Development have experienced an important progress (Martin, 1999; Scott, 2000; etc). Part of this resurgence is due to the contribution of a number of schools and authors coming from different traditions. Among these contributions we could mention the Italian School that recovered the Marshallian concept of Industrial Districts (Becattini, 1987), the Californian School and the Flexible Specialization Paradigm that emphasized the breakdown of Fordist production forms towards more flexible ones (Scott, 1988; Piore and Sabel, 1984), the Gremi School based on the concept of "Milieux Innovateurs" (Aydalot, 1986; Crevosier, 2004), etc. According to Scott (2000) these contributions shared a general discontent with the dominant Neoclassical economics. Among other reasons, this is related to the fact that they usually pay attention to the development particularities of regions and territories, instead of aiming at a totalizing theory fitting all. Another common point was the understanding of the process of economic development as a systemic (interactive) process where the behavior of economic agents is shaped by institutions, rules and conventions. Each territory and industry will therefore show a specific pattern of development marked by historical, technological, social and cultural factors.

Innovation Systems

The systemic and institutional perspective is also found in contributions that focused their interest on the study of innovation and particularly in the so-called Innovation System (IS) approach. This approach focuses on the specificities shown by the innovative process across countries, regions and industries (Lundvall, 1992; Cooke et al., 1998; Howells, 1999; Malerba, 2002). The IS literature rests on two major theoretical frameworks. The first one is the post-Schumpeterian stream known as the Evolutionary School (Nelson & Winter, 1982; Dosi, 1982) that emphasize, like Schumpeter did, the dynamic character of the economy in contrast with the Neoclassical focus on equilibrium. Such a dynamic character would be explained by new combinations of the productive factors –innovations-that are path-dependent, i.e. they are determined by previous changes in technologies and –in broad terms- in the economic structure. That would explain why each sector or territory follows different innovation trajectories shaping different innovation systems. The other theoretical source of the IS approach is the so-called "interactive learning theories". These theories understand innovation as a ubiquitous phenomenon that is product of multiple and continuous learning processes where multiple agents participate.

We must take into account that the systematic dimension shared by the IS approach and other perspectives like the *innovative milieus* one (Crevosier, 2004), entails that the dynamics of the territories or industries is affected by multiple factors. Any particular territory or industry will evolve as their components change and such components will be affected by endogenous (e.g. internal learning process) and exogenous factors (e.g. changes in social and cultural demands).

Institutions and innovation

Institutions are usually understood as a key component of an innovation system (Edquist, 2001; Doloreux, 2002; etc). Edquist and Johnson (1997) define institutions as "sets of commons habits, routines, established practices, rules, or laws that regulate the relations and interactions between individuals and groups". Institutions, according to the referred authors, can be formal (such as laws and regulations) or informal (like conventions and habits). Considering this definition, institutions enter into the innovation system approach because they "govern" the relationships among the agents of the system.

A contradictory relationship between institutions and innovation exists (Gonzalez, 2010). Thus, institutions, both formal and informal, stimulate innovation because they reduce uncertainties, coordinate the use of knowledge, mediate conflicts, and provide incentives (Carlsson and Jacobson, 1997). Nevertheless, to innovate implies also to alter existing routines, habits and even legal frameworks (Nelson and Winter, 1982, Gavonetter, 1992). The former applies particularly when dealing with radical innovations or important changes occurring in one industry. Douglas North (1994) has argued about the nature of economic change pointing out that whilst most of the time it is a matter of decisions based on existing routines and institutions, some changes might entail the alteration of such routines. These decisions "*involve altering existing "contracts" between individual and organizations. Sometimes that recontracting can be accomplished within the existing structure of property rights and political rules, but sometimes new contracting forms require an alteration in the rules. Equally, norms of behavior that guide exchanges will gradually be modified or wither away. In both instances, institutions are being altered*" (North, 1994, 361). We could interpret from North's words that although some innovations are made within the existing institutional framework, others imply the alteration of such framework.

David (1993) have also referred to the previous issue indicating that sometimes, in order to survive, industries must change their entire institutional framework upon which they are situated. "*Thus, institutional structures, being more rigid and less adept at passively adapting to the pressures of changing environments, create incentives for their members and directors to undertake to alter the external environment. Since there are many circumstances in which the external environment proves intractable, organizations and institutions are subject (in ways that properly designed technologies are not) to pressures and stresses that may cause them to abruptly collapse and dissolve or to be captured, dismembered and ingested by other competing organizations*" (David, 1993, 218).

Similarly, Lindkvist & Sánchez (2008) have also discussed the relationship between innovation and institutions, although referring to "conventions" (non-formal institutions). The authors referred particularly to natural resource based industries and they point out that those industries that have been successful usually show an adaptive behavior of their conventions to new contexts. Nevertheless, other industries show less success precisely because of the rigidity of the existing conventions.

All in all we can conclude that there are situations where an industry needs to break the existing institutional arrangements (formed by rules, conventions, norms, etc.) in order to survive. That could mean an entire revolution on their production and innovation system or just partial changes affecting their components and some of their institutions. As we will try to show in the following paragraphs, there are reasons to think that the Spanish cod fishing industry has been involved during the last few years into a deep structural change. Such changes go further than simple innovations in products or processes and have implied important changes also from the institutional viewpoint.

3. Data collection

In order to collect the information needed for our research, we designed a questionnaire that was used into two subsequent phases. Firstly, it was sent to the five companies of our sample in order to be fulfilled and then we aim at using it as a guideline for the interviews carried out with the companies' managers. The success of the first phase was poor since only one company sent back the questionnaire (just partially accomplished). Therefore, most of the information used in this report was obtained at the interviews. We finally obtained information from four companies since one of them refused to provide any information. Four interviews were carried out at the companies' headquarters, three interviews took place at San Sebastián (Basque country) and one at Vigo (Galicia). They were carried out between the November 23th and December 5th 2009. We followed the questionnaire as a guideline of the interviews and therefore we were able to accomplish it. Besides, we capture relevant opinions and views from the persons interviewed. On top of the interviews, during the processing of information and in order to clarify some aspects and validate the results, a number of phone calls were made to the companies. Finally, since the sector is very small and all companies know about each other, through the interviews we got information not only related to each company but to the whole fleet and industry as well.

4. The Spanish cod fishing industry: presentation and historical review

The Spanish industry of cod fishing is currently composed by five companies that manage a fleet of nine trawlers actively dedicated at cod fishing. At the beginning of 2009, there were six companies but one of them has decided to stop its activities and to transfer the fishing rights of the quote to another Spanish company. Traditionally, the cod fishing industry was located in two regions: Galicia and the Basque Country. Nowadays, two companies locate their headquarters in Vigo (Galicia), while three do it in San Sebastián (Basque Country). Nevertheless, only three vessels are based on San Sebastián (Pasaia port), while the other six have their base in the Port of Vigo.

Total revenues of this industry have varied between 20 and 25 m€ in the last 10 years, where a clear trend (decreasing or increasing) is not observed. Average revenues by firm have varied between 3,3 and 4,5 m€ during that period. Regarding the employment, a much clearer declining trend is observed. Total employment has moved from 158 employees in 1998 to 79 employees in 2007. An increase in productivity (revenue by employee) has been taking place in the period and this is most probably related to production changes and innovations.

Table1.GeneralinformationoftheSpanishCodFishTrawlerFleetFirms

Company	Headquarter localization	Cod fish quote share	Number of vessels actively dedicated at cod fishing
Pesquera LaurakBat S.A.	*Pasaia – San Sebastián (Basque Country)*	*9.0%*	*1*
Velaspex S.L.	*Pasaia – San Sebastián (Basque Country)*	*14.8%*	*2*
Pesquera Rodríguez S.A. (Pescafria)	*San Sebastián (Basque Country)*	*27.4%*	*2*
Pesquera Ancora S.L. (FormerTranspesca S.A.).	*Vigo (Galicia)*	*24.1%*	*2*
Valiela S.A.	*Vigo (Galicia)*	*24.4% (*)*	*2*

(*) Valiela has recently bought the quote share of León Marco S.A, the company that has stopped its activities in 2009.

The industry of cod fishing counts with a long tradition in Spain which is narrowly linked with the Spanish long-distance fishing history. In 1924, a Galician trawler based in Vigo initiates its activities of cod fishing in the grounds of Newfoundland. Five years before, in 1919, the Basque company PYSBE (*Pesquerías y Secaderos de Bacalao en España S.A.*[3]) had been established; nevertheless this company did not start its fishing activities until 1927. In 1929 fishing in Icelandic and Northern Europe grounds took place for the first time. It must be pointed out that at the beginning the Spanish fleet used a single trawler system since the incorporation of the traditional "pair trawling" system does not take place until 1949 (Oya, 1974).[4]

At the world level, the Spanish fishing fleet became the third largest one at the end of the 60s with 15 single and 64 pairs trawlers. Catches reached 300,000 Tn at that time, basically from the Northwest Atlantic fisheries. As it is widely known, both changes in International Law of the Sea and stock declines due to fisheries overexploitation forced the reduction of captures (Zeller and Pauly, 2004). Since the establishment in 1977 of the Economic Exclusive Zones (EEZs) in the European Community, Canada, United States and Norway, the Spanish cod fish quotes were progressively decreasing; and at the end of that decade catches had declined to less than 30,000 Tn.

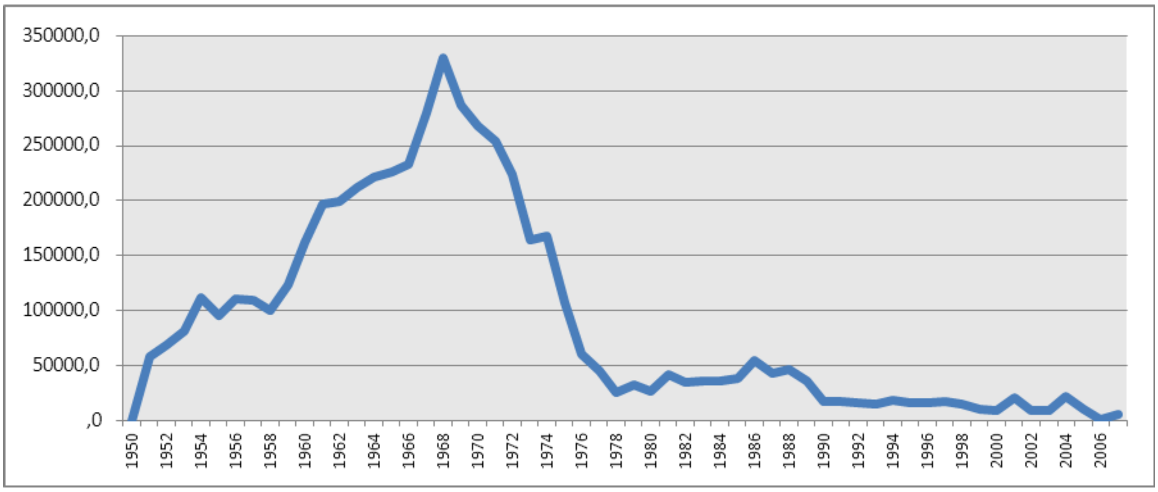
The entrance of Spain in the European Community (EC) in 1986 marks another relevant point in the recent history of the cod fishing fleet. The EC established important limitations to cod fishing which in practice meant the closing of all community fishing grounds (Baltic Sea, North Sea, Kattegat and Skagerrak) to the Spanish fleet. Meanwhile, the NAFO fisheries suffered a strong crisis at the beginning of 90s what derived in the ban of cod fishing in those fisheries (Hilborn and Walters, 1992). Since then, the Spanish fleet develops its activity at the Norwegian EEZ (based

[3] PYSBE: Cod Fisheries and Dryers of Spain.

[4] At the moment three companies use the traditional "pair trawling" system while the other two have recently changed to a single trawler system ("bou" in Spanish).

on the agreements between this country and the EC) and at the Svalbard fishing ground. The Spanish quote reached around 12,000 Tn in 2008 and it was distributed among 6 companies that, as we mentioned, became 5 at the end of 2009.[5]

Figure.1. Volume of production, Cod fish, Spain (Tn). 1950-2006



Source: Own elaboration based on FAOSTAT. Global Production Statistics 1950-2007.

5. Cod fish production: traditional systems and recent changes

5.1. The traditional method of salting fish on-board and its associated production system

The traditional method of cod fish production of the Spanish trawler fleet was to salt it on-board. This method for salting cod is also known as dry salting or kench curing where solid salt is rubbed into the fish meat, the fish is then pile-stacked in the trawler with alternate layers of fish and salt. The pile salting method results in the dehydration of much of the salted fish because of the increasing pressure from the overburden on the fish in the lowest part of the batch. The salted fish was then landed in the Basque or Galician ports and usually dried again at inner Spanish regions with appropriate dry climate.[6] Lindkvist *et al*, (2008) has suggested that this method arose in order to optimize the vessels stock capacity since the space onboard schooners is limited. This aspect is indeed crucial when dealing with long-distance fishing, as it is the case of the Spanish cod fishing fleet.

The technological process described above could be considered a part of a whole production system that encompassed also specific market relationships and conventions. There were for instance specific commercializing channels since the

[5] NAFO fisheries have been recently re-opened although the quote given to the Spanish fleet is not large enough to initiate a fishing campaign there.

[6] The landing of on-board salted fish takes currently place only at one Spanish port situated nearby Vigo (Cangas) because this is the only port where the needed infrastructure and labor for salt fish unloading is available. The salted fish is usually bought by intermediaries who use Vigo (Cangas) as a temporary stock point previous to send it to driers situated in other parts of Spain.

Spanish fleet use to sell their “bacalao verde” to Spanish dealers or industrial processers that were in charge of distributing the product to retailers (supermarkets, restaurants, etc). The links between the companies and their clients were in most cases based on long term and well established relationships founded on mutual trust. In many cases the fishing companies get purchase commitments in advance (previously to be fished). Moreover, this product achieved a dominant position in the Spanish market during the boom of the Spanish cod fishing industry. It showed a particular appearance (split or butterfly), color (yellow-green) and taste. It also required a specific procedure previously to be cooked consisting in desalting and dehydrating the salted fish during a couple of days. As pointed by Lindkvist *et al*, (2008) these conventions and rules were followed also by foreign producers that exported salted fish to the Spanish market.

5.2. Recent changes in the production system of the Spanish trawler fleet

The traditional process of on-board salting is still in use, although it is being progressively abandoned and substituted by the freezing system. At the moment three companies still maintain the traditional system even though the three of them combine it with the new one. All in all, in 2009 around 68% of the catches were frozen and only 32% used the traditional onboard salting system. The substituting of the traditional method by the freezing one does not mean that the cod is sold to the final customer as frozen fish since a relevant part of the frozen fish is eventually salted by the processers. This happens particularly with catches landed in Norway (at least 2 -out of 5- companies land part of their catches in Norway).

Changes in the conservation system were accompanied by other changes related to product characteristics. The Spanish companies of cod fishing sell at the moment three basic types of products that combine two conservation systems, frozen and salted:

- Split Cod or "Butterfly". It is sold as the traditional salted fish but in some cases is also landed as frozen cod.
- HG (headed and gutted). It is sold mainly as frozen (but part of it is later salted by processers).
- Fillets. They are sold by the fishing firms mainly as frozen.

Apart from the previous basic products at least one company has launched other product innovations and it is trying to sell little cod loins, “kokotxas” (cod cheeks), etc. Besides, most of the companies have implemented little changes in fillets affecting its appearance (and other aspects) in order to attend the market requirements.

Both product and process innovations have required the incorporation of new technologies. Thus one company built a new trawler and other undertook a deep transformation in their fleet during the last decades. In both cases important changes were made in the processing plants. Innovations here regard the design of more efficient plants, the incorporation of new industrial cold systems, new conservation systems or new packing systems. Related to the previous point we must call attention here to an important issue. Thus, when we asked to the company managers about the technologies used in their production process the interviewed indicated that in most cases they have been in use in the fishing sector for a long time. It is just in the last decade that the Spanish fleet is incorporating this already available technology. That means that innovation in our industry did not find technology barriers and therefore the main force for innovation is, very likely, "the market pull" (instead of the "technology push").

5.3. Other changes at the Spanish cod fishing industry in the market sphere

Joseph Schumpeter (1942) used to include among the types of innovation the opening of new markets. Relevant changes have been occurring during the last years in the Spanish cod fish industry also in this field. As mentioned above, the Spanish fleet traditionally used to sell their "bacalao verde" to Spanish dealers or industrial processers that were in charge of selling the product to retailers. To some extent the traditional method of commercializing and the associated rules and conventions are still in use. Nevertheless, as in the production sphere, important changes have occurred during the last years.

Firstly, an internationalization process of sales has been going on. At least two companies are selling now to clients situated in other countries different from Spain and one of them (the largest of the industry) sells the majority of its captures abroad. All in all and according to the information obtained from the companies, in 2009 around 59% of total sales took place at the Spanish market, while 41% took place at international markets. An important part of foreign clients are located at Norwegian ports. The cod landed in Norway is usually frozen cod product that is later salted (and probably a good part of it exported to Spain).

Secondly, some companies have tried to move to other clients apart from dealers and processers. We refer basically to retail chains located not only in Spain but also in countries like UK or France. The products sold in these markets are usually fillets (particularly in Britain where they are commercialized under the famous recipe of "fish and chips").

Generally speaking we can affirm that the launch of new products by the Spanish cod fishing industry has been associated to changes in the market sphere. Thus whilst the traditional "bacalao verde" is sold exclusively to Spanish dealers or industrial processers, the new products are sold mainly to foreign clients, some of them retail branches. The whole production system of the Spanish cod fishing industry seems that has been altered.

6. Changes in innovation system of the Spanish cod fishing industry

We have seen how the Spanish cod fishing industry has innovated in different fields but we still do not know if these innovations have been accompanied by changes in the way the industry incorporates knowledge. For this reason we asked the companies about the channels of knowledge incorporation and innovation. The results indicate that the companies are rarely involved in explicit innovation activities. Thus, none of the companies undertake internal R&D activities neither have specific departments or personnel involved in innovation. The lack of involvement regards also absence of collaboration for innovation with other companies, universities or other institutions.

Channels for innovation are in general not explicit or formal ones and show a rather passive innovative role of companies. Thus, all companies use contacts with clients, providers and personnel of other firms to incorporate knowledge. Although the questionnaire did not distinguish between formal and informal contacts, the persons interviewed pointed that the informal ones are the most used. All companies use internal learning process as an innovation channel as well as the attendance of sector fairs or conferences and specialized publications. Finally, the acquisition of machinery is used by all firms as well. Other means used, in this case not by all companies, refer to the hiring of specialized personnel or to training activities. The personnel in charge of technological or innovation issues is also employed as a channel for knowledge incorporation although we must indicate here that none company has specific personnel for these tasks but persons who are dedicated just occasionally to this field.

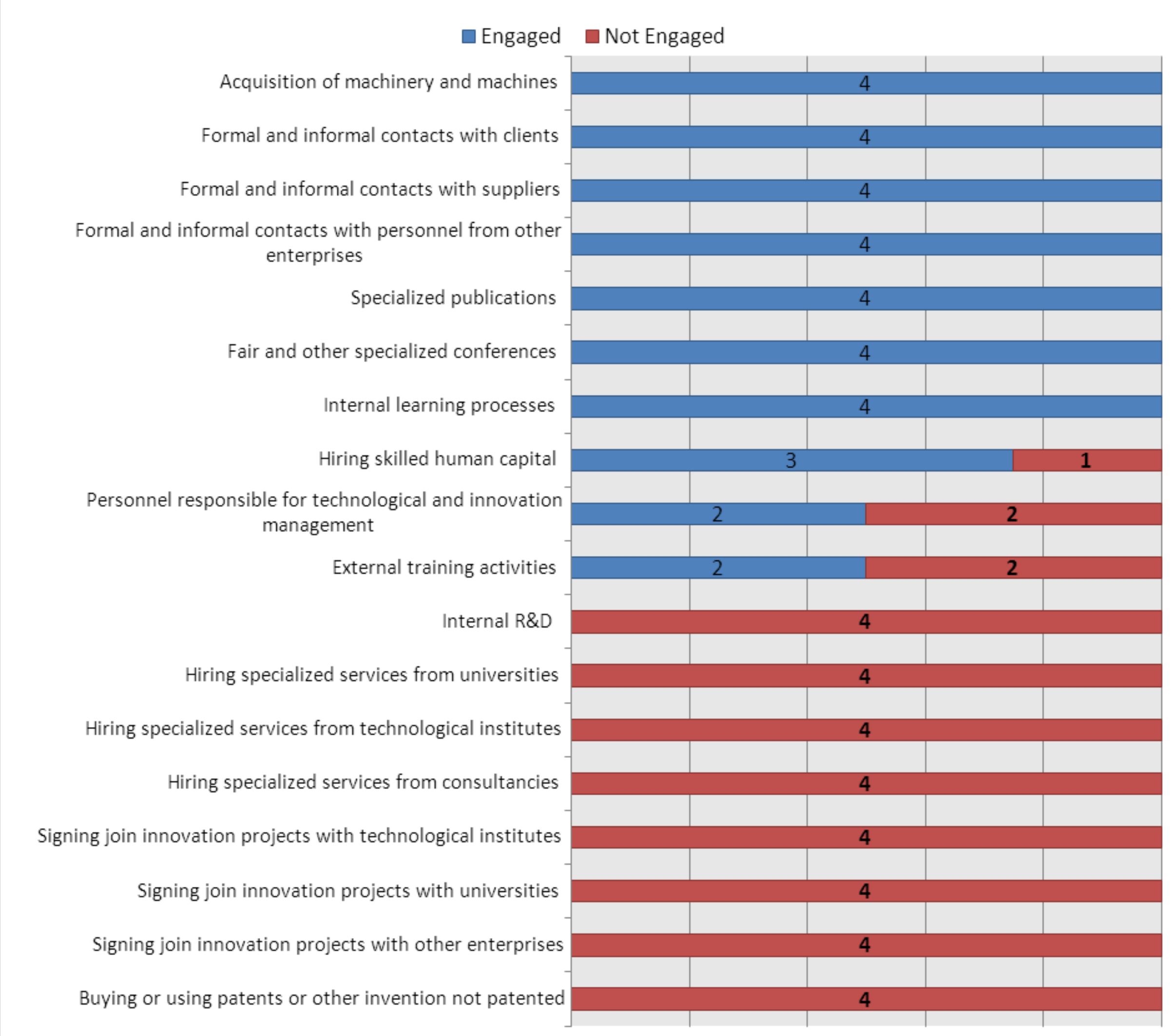
Regarding the importance given to each of the channels used to innovate or incorporate knowledge, the results reinforce the previous ones. Thus, formal and informal contacts together with internal learning processes and the acquisition of machinery and equipment are considered as the most important channels to innovate. The rest of channels demonstrate a medium importance, while specialized publications are considered of little importance.

Therefore, we are dealing here with an industry that is poorly involved in explicit innovative activities like R&D or formal collaborations for innovation. For this reason, to optimize fishing and processing task firms incorporate technology embedded in machinery and equipment bought to world leader manufacturers. Nevertheless, the Spanish cod fish companies have important advantages that draw on implicit knowledge, most of it coming from informal contacts and internal processes. These advantages draw on the accumulated “know-how” related for instance to the Galician and Basque rich tradition on distant water fishing fleet. In this regard, even when dealing with the incorporation of new machines and equipment, it is very important to count nearby with world leaders shipyards. Another advantage regards the established linkages with the Spanish market where “knowing who” (knows the market) and “knowing what” (wants the market) becomes very important. Finally, internal learning processes are also very relevant and, according to some opinions, they draw highly on the role of the captain and the technical inspector who own precise information about all processes happening on-board.

We can conclude that not important changes have happened in the way the companies incorporate knowledge and finally innovate. While other companies and industries, in order to change their productive system, have been forced to undertake an explicit innovative effort and therefore to change the way they articulate their system of innovation, this does not seem to be the case of the Spanish cod fishing industry. On the contrary the companies rely upon factors that have been “always there” like providers, internal knowledge and so on. For this reason we can affirm that not relevant changes have happened in the innovation system of this industry. [7]

[7] The fact that the companies do not seem to have changed their innovation channels does not mean that not changes have happened at this level, it only means that the way how the industry organizes its innovation activity has not suffered particular changes. Nevertheless it is obvious that the “accumulated” internal knowledge have continued to “accumulate” or that machinery providers do not supply the same than before.

Figure 2. Use of channels for innovation and introduction of new knowledge into the company



Source: Own elaboration.

7. Why are things changing for the Spanish cod fishing industry?

We have seen that the Spanish cod fishing industry is introducing deep changes in its production and commercializing system. The result is the progressive abandoning of the traditional on-board salted fish, the production system that characterized this industry since the beginning of the last century. The reasons has to do with a strong restructuring occurred in the Spanish market of salted fish during the last decades, a process that has been described in depth by Lindkvist *et al*, (2008). Next we point some factors related to that restructuring:

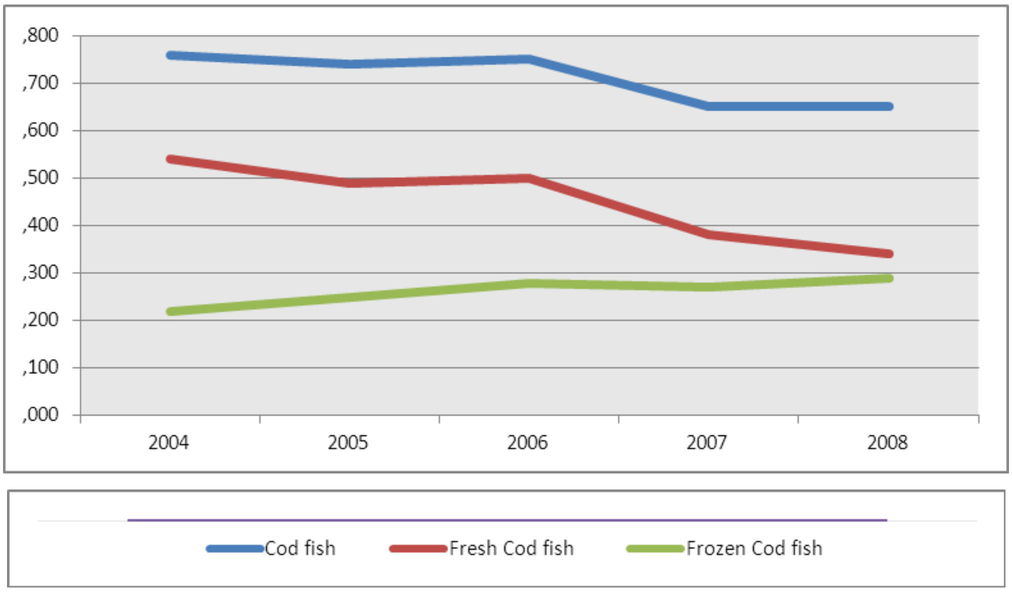
- Social and cultural changes occurring in modern societies have led to a general trend of introducing frozen products into the consumer diets. The incorporation of women to the labor market has reduced the time for typical home tasks like daily shopping or cooking in such a way that already made food and frozen products have becoming very popular. Thus, cod fish is increasingly consumed by final consumers in a frozen basis with presentations and tastes that may differ from the traditional salted one. In Figure 2 we can observe how frozen cod fish is increasing its relative weight in the Spanish market while the salted cod fish (included into the category of fresh cod fish) has reduced its quote.[8]

- Moreover, in the market segment of salted fish (still predominant in countries like Spain and Portugal), the traditional onboard salted fish shows some comparative disadvantages. According to the views of Spanish producers this is largely due to the irruption of foreign producers in the Spanish market happening since the 80s. This opinion fits reasonably well with the results of the study made by Lindkvist *et al*, (2008), who highlighted the influence of Icelandic producers strategies on the dynamics of the Spanish salted fish market. As a result, salted fish produced by means of alternative salting methods is now dominant at the Spanish market. We refer to methods like direct brining that are more flexible in terms of production time and make not necessary for the consumers the desalting and dehydrating process (since it is made by the producers). Moreover, a wide variety of salted fish products like light salted fillets have been introduced in the market. These products have better acceptance by consumers also because of appearance reasons. Thus, on-board salting usually gives a yellow appearance to cod fish that does not like to consumers who associate white color to freshness and quality. Meanwhile, other methods are able to salt fish maintaining the white appearance. Although the Spanish producers insist in the higher quality of their product and maintain that the traditional salted fish do not show cost disadvantages they are aware of the market changes. One of the interviewed persons agreed with by pointing out that "*it is too late to launch any strategy to maintain the traditional salted fish"*. [9]
- Finally, social, cultural and economic changes have also altered the traditional distribution channels of the Spanish cod fish. Large supermarket and retail chains have become the key stakeholder in the Spanish food market displacing, in the salted fish case, the traditional dealers and processers that were dominant in the market. According to Lindkvist *et al*, (2008), this process has been also influenced by the Icelandic producers strategies that, established their own sales network avoiding the traditional Spanish one *"They* (the Icelandic producers) *have been able to change Spanish production institutions and distribution systems. With their light salted frozen fillets, they have established innovative and new products that have required a new distribution system and that meet the demands of modern customers in the markets".* (Lindkvist*et al,* 2008, 119).

[8]We are aware that part of the frozen cod fish has previously been subject to a salting process, as it is the case of the light salted frozen fillets. In any case it seems clear that frozen cod fish is increasingly present in the Spanish market regardless if it has been salted or not.

[9] In this regard, during the last years a new product has entered into the Spanish market. We refer to light salted fillets mostly coming from China and other Asian countries. They are produced based on frozen HG exported from Europe that is then filleted and exposed to a process of salt solution injection. According to the opinions of the interviewees the quality of this product is quite poor and its success lies both on its low prices and the lack of adequate labeling.

Figure 3. Cod fish consumption per capita (Kgs/population)



Source: Own elaboration based on the *Base de datos de consumo en hogares* of *Ministerio de Medio Ambiente y Medio Rural y Marino.*

8. Conclusions

In this paper we have analyzed the changes occurred in the Spanish cod fishing industry during the last few years. In order to understand such changes we conducted a field research to investigate the recent innovative patterns of this industry. Innovations are understood here from a systemic viewpoint, i.e. as the response of a particular industry not only to changes in technologies but also to social or cultural factors. Our results indicate that innovations implemented by the Spanish cod fishing industry go further than simple incremental innovations in products or process but are accompanied by a deep institutional change. The main driver of such deep changes is the restructuring happened at the Spanish salted fish market, the traditional market of the Spanish cod fishing industry. As mentioned, social and cultural changes occurred in Spain during the last decades together with the irruption of the strategies followed by strong foreign competitors have changed the rules of the game at that market.

As a result of the restructuring of the Spanish salted fish market, the tiny Spanish cod fishing industry has been obliged to restructure itself in order to survive. They have done it by different means: a) incorporating the freezing conservation system and progressively abandoning the on-board salting system (process innovation); b) diversifying its product offer incorporating new products like salted/frozen fillets and others (product innovation) and, c) diversifying their market strategies both internationalizing their sales and selling directly to retailer and supermarket chains.

Nevertheless, in this case changes in the productive system do not seem to have been accompanied by changes in the innovation system. The way and channels through which the Spanish cod fishing companies innovate and incorporate knowledge have not changed recently. In order to innovate the companies rely basically on machinery purchases, internal know-how and informal contacts with clients, providers and other firms of similar industries. Not relevant changes are observed in the actors and institutions shaping the industry innovation system.

We can therefore conclude that in some situations and industries, in order to maintain their competitive position, do not only need to implement incremental changes in their products or in the technologies that they use. Like the Spanish cod fishing industry, major changes are needed affecting the institutional set-up of their productive system. Nevertheless, even when major changes happen at the production sphere this does not mean that relevant alteration happen in the way companies innovate, i.e. in their innovation system.

References

AYDALOT, P. (1986); *Milieux innovateurs en Europe.* Paris: GREMI

BECATTINI, G. (1987); *Mercato e forze locali: il distretto industrial*. Il Mulino: Bologna

CARLSSON, B. & JACOBSSON, S. (1997); "Diversity creation and technological systems: a technology policy perspective" in EDQUIST , C. (1997); Systems of innovation: technologies, institutions, and organizations. London: Pinter Publisher

CETMAR & OPTI (2005); *El futuro de la tecnología de la pesca.* Centro Tecnolóxico do Mar e Fundación OPTI.

COOKE, P. et al. (1998); Regional Innovation Systems: The role of governances in a globalization world. London: UCL Press.

DAVID, P. A. (1993); "Why are institutions the "Carriers of History"?: Path Dependence and the Evolution of Conventions, Organizations and Institutions" Structural Change and Economic Dyanamics. Vol. 5 N. 2. 205-220

DOLOREUX, D. (2002); "What we should know about regional systems of innovation" Technology in society. 24 (2002) 243-263

DOSI, G. (1982); "Technological paradigms and technological trajectories", Research Policy, 11, pp. 147-162.

EDQUIST, C. & JOHNSON, B (1997); "Institutions and Organizations in Systems of Innovation" en EDQUIST , C. (1997); Systems of innovation. Technologies, Institutions and Organizations. Oxon: Pinter

EDQUIST, C. (2001); "The system of innovation approach and innovation policy: an account of the art of the state of the art". Paper presented at the DRUID Conference, Aalborg, June 12-15, 2001

EDQUIST, C. (ed.) (1997)Systems of Innovations. London: Pinter Publishers.

FAO (2009) Fish and fishery products: world apparent consumption statistics.

FAOSTAT (2009) Global Production Statistics 1950-2007.

GRABHER, G. (1992); "The weakness of strong ties.The lock-in of regional development in the Rurh area". The embedded firm. On the socioeconomics of industrial networks. Routledge: New York

GONZÁLEZ, M. (2010); "The institutions-innovation dilemma: the case of coastal fisheries" *Working Paper of the Department of Applied Economics* (to be published).

GRAVONETTER, M. (1992); "The impact of social structure on Economic outcomes". *Journal of Economic Outcomes*. 19, 1, 35-50

HILBORN, R. & WALTERS, C. (1992); *Quantitative Fisheries Stock Assessment: Choice, dynamics and uncertainty* Chapman and Hall, New York.

HOWELLS, J. (1999) “Regional systems of innovation?” in Archibugi, D. et al (1999); Innovation policy in a global economy. Cambridge University Press.

LINDKVIST K. B., GALLART-JORNET, L. & STABELL, M.C. (2008) “The restructuring of the Spanish salted fish market”, The Canadian Geographer / Le Géographe canadien 52, 1,pp. 105-120.

LINDVIST, K.B. & SANCHEZ, J.L. (2008); “Conventions and innovation: a comparison of two localized natural resource-based industries” Regional Studies. Vol. 42, 3, 343-354

LUNDVALL, B.-Å. (1988) “Innovation as an interactive process: from user–producer interaction to the national system of innovation” in Dosi, G. Freeman, C., Nelson, R., Silverberg, G. &Soete, L. (eds.), Technical Change and Economic Theory. London: Pinter Publishers, pp. 349.369.

LUNDVALL, B.-Å. (ed.) (1992)National System of Innovation: Towards a Theory of Innovation and Interactive Learning. London: Pinter Publishers.

MALERBA, F. (2002) “Sectoral Systems of Innovation and Production”, Research Policy, 31, 2, pp. 247-264.

MARTIN, R. (1999); “The New 'Geographical Turn' in Economics: Some Critical Reflections”, *Cambridge Journal of Economics*, 23, pp 63-91.

MINISTERIO DE MEDIO AMBIENTE Y MEDIO MARINO (2009) Bases de datos de consumo de hogares. Available at http://www.mapa.es/es/alimentacion/pags/consumo/BD/consulta.asp

NELSON, R. R. (ed.) (1993)National innovation systems: a comparative analysis. New York: Oxford University Press.

NELSON, R. R., & WINTER, S. G. (1982) An evolutionary theory of Economic Change. Cambridge: Harvard University Press.

NORTH, D. (1994); “Economic performance through time” The American Economic Review. Vol. 84, No. 3 (Jun., 1994), pp. 359-368

OYA, J. (1974) “Las pesquerías españolas en onda larga: la "gran pesca” del bacalao en los bancos del Atlántico noroccidental”, Revista de Geografía, 10, pp. 48-78.

PIORE, M.J. AND. SABEL. C.F. (1984); *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books

SABI: Iberian Balance-sheets Analysis System.

SCHUMPETER, J. A. (1942) Capitalism, socialism and democracy. New York: Haper & Brothers.

SCOTT, A.J. (1988); *New industrial spaces: flexible production organization and regional development in North America and Western Europe,* London, Pion.

SCOTT, A.J. (2000); “Economic geography: the great half century” *Cambridge Journal of Economics*, 24:483-504

ZELLER, D. & PAULY,D. (2004) “The future of fisheries: from 'exclusive' resource policy to 'inclusive' public policy : Perspectives on eco-system-based approaches to the management of marine resources” *Marine ecology. Progress series*, vol. 274, pp. 295-303