The Spanish Mediterranean Hake Market: an application for the upgrade of bio-economic models

by Jordi Guillén

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The PhD. Thesis is directed by Dr. Ramon Franquesa and is related to the work we are developing at the Gabinete de Economía del Mar of the University of Barcelona with the BEMMFISH project (Bio-Economic Modelling of Mediterranean Fisheries) inside the European Commission Research Program, FAIR program of the European Commission (project Q5RS200101533), as well as from previous research projects.

PhD Thesis

Hake has been very important for the Spanish fishing sector, being for many years the demersal fish most captured. Nowadays, when the European stocks are overexploited, and with lower captures, its high level of consumption and value still plays an important role. As Spain holds about the 50 % of the European hake consumption and hake is about 1/3 of the total fish consumed in Spain.

The Spanish Mediterranean zone can only supply around the 25% of its own hake demand. Due to this high demand, the Spanish Mediterranean hake market needs to be supplied from the Spanish Atlantic coast and from other countries.

External trade has grown really fast in last decades, principally due to the improvements in technology, transport and communications, as well as an existent demand.

This has made that several fish species are commercialised as hake, so, the definition of hake from a commercial point of view has become less strict. This allows that not all the species commercialised under the name of hake (or "merluza" in Spanish) belong to the *Merluccius* genus.

In 1998 were traded nearly the 35% of the *Merluccius* genus captures. Spain was the main importer of fresh hake, receiving in 1999 the 79% of the total fresh hake imports.

Imports have increased market segmentation, as to the traditional segmentations due to size, gear used (long-line or trawl) and presentation form (fresh, frozen and frozen fillets), a new segmentation can be performed regarding the different hake species.

The main objective of the thesis is to found and quantify the principal variables that affect the hake price variations in the Spanish Mediterranean. This should help to better characterise the market model inside the bio-economic models.

In order to do that, I consider that the thesis should deal with the next topics:

- Theory and state of arts in biological, economic, and bio-economic models.
- Analysis and context of the fishery (species, captures, fleets).
- Market Analysis (consumption, commercial structure, external trade).
- Application to the hake fishery of the economic model.

Bio-economic models are used to reproduce the bio-economic conditions in which the fisheries occur and simulate alternative management strategies. Are composed by:

- Biological (or stock) model: includes the dynamics of the resource population(s) and their interaction with human activity in the form of fishing mortality.
- Economic (fleet, market and fishermen) model: should account for the dynamics of fleets and markets, and consider the fishermen's behaviour.

The biological model that is going to be used to characterise the hake fishery is the age structured model of Beverton-Holt where recruitment is density dependent. The standard equations of the resource dynamics allow to obtaining a fishing mortality / catch in function of the age-class / length generated by every fishing gear, at a time.

The economic model part can be divided into:

- Market model, where occurs the price formation.
- Fleet model, which simulates the fleet dynamics and the fishermen behaviour.

This research is mainly going to focus on the market model. Aspects of this model are:

- Before studying the relations between products is necessary to determine the market of a product.
- (Stigler & Sherwin 1985) define market as the area in which price is determined; giving price the principal role in defining market boundaries (Clay and Fofana, 1999).
- Two products are considered part of the same market if they are close substitutes and their relative prices maintain a stable ratio (Stigler and Sherwin, 1985).
- So, the product prices must have the same behaviour in the long term.
- Cointegration analysis allows finding long term relations between non-stationary variables.
- Variations in prices due to other variables like offer, size, gear used, etc. can be estimated by econometric models.

Along the thesis there is going to be the need of:

- Characterize the market structure.
- Test the size of the hake market (local, national, European, global).
- Characterize hake market demand functions.
- Test for product differentiation due to:
  - Hake species
  - Size.
  - Presentation (fresh, frozen, etc.).
  - Fishing gear used.
  - Etc.
- Test the market model obtained in a bio-economic model

The Spanish Mediterranean zone: Main markets characteristics

- There is a high demand for fish consumption.
- Very dependent on imports, more than 75%.
- There is misidentification of some species, fishing gears, product’s origin, etc.
- Price is related to size, fishing gear and freshness, presentation, etc.
- The commercial structure is complex and dynamic. Especially due to imports.

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