



A demand analysis of the Spanish canned tuna market



Juan José García-del-Hoyo^{a,*}, Ramón Jiménez-Toribio^a, Patrice Guillotreau^b

^a MEMPEA-AEA, Departamento de Economía, Universidad de Huelva, Plaza de la Merced, 11, 21071 Huelva, Spain

^b Institut d'Economie et de Management de Nantes, LEMNA, Université de Nantes, Chemin de la Censive du Tertre, 44322 Nantes Cedex 3, France

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ABSTRACT

The Spanish market for canned fish is one of the biggest in the world. It is still largely supplied by a robust national industry which has survived globalisation when all other European countries failed to preserve their two-century old industry. What is so special about this relationship between Spanish consumers and canned fish? This research analyses the nature of the demand for canned fish, and particularly canned tuna, a rather inexpensive and storable food product, to show how Spanish households are sensitive to price and income changes. The price and expenditure elasticities are estimated through a time-based Almost Ideal Demand System (AIDS) model. A Johansen's multivariate time-series analysis was developed through a vector error correction model, the misspecification tests supporting the use of this model. The empirical analysis found that the Spanish demand for canned fish in Spain is rather price inelastic, whatever the species, but substitutability is found between the different canned fish products. The results also demonstrate that canned tuna over-reacts positively to expenditure changes compared to other fish species, presenting a nature of luxury good compared to other canned fish products.

1. Introduction

Tuna fisheries are considered to be one of the most important in the world. According to a recent valuation, this 5 million tonnes fishery would represent a dock value of US\$10 billion, and an end value of \$42 billion when reaching consumers [1]. Tuna products have become extremely popular all over the world and are traded and priced within a global value chain [2,3]. Spain plays a major role in this global chain. The national fleet of purse-seiners cover the three major oceans. The domestic tuna canneries, with a leading production in Europe (68%) and ranking second worldwide just behind Thailand, still supply a substantial share of the Spanish market and contribute significantly to the global trade of tuna products. When other European countries, hit by globalisation, have forgone most of their fish canning industry after two centuries of existence [4], Spain keeps up its national industry and market well above the water. What is so special about the relationship between Spanish consumers and canned fish?

Canned fish represents a central item of the Spanish diet [5], with an apparent yearly consumption per capita of 5.64 kg in 2013,¹ of which canned tuna represents the lion's share (52%). The long-standing presence of these food products in Spanish homes has led consumers to appreciate its properties of healthy and nutritious protein provider, storability, affordability and ready-to-eat nature. In particular,

according to the Spanish Ministry of Agriculture and Fisheries, Food and Environment statistics, the Spanish per capita consumption is even still growing, reaching 2.31 kg in 2015, which is unexpected for such a mature product. Spain can even be considered one of the main consumers of canned tuna worldwide.

Other countries have developed over time a strong habit of canned fish consumption (USA, France, UK, Italy...), but not to the extent of Spain. For instance, tuna cans produced by the “Big-3 companies”² in the USA is particularly appreciated by the US consumers for its cheap price (less than one US\$), and its long-life preservation to feed historically gold rush miners: “the major canned fish found in international trade, namely tuna, was first canned in 1903 in southern California” [6]. Even false (tuna being processed and traded earlier in Europe in the 1860s according to [7,8], this statement shows how canned tuna has mattered for US consumers for a very long time [9].

Surprisingly, despite its importance, very few economic studies have analysed the canned tuna end market and consumer's behaviour [10,11]. It seems nonetheless important to analyse the economic status of canned tuna products (normal, inferior or superior goods) through the consumers' response to price and income changes. Firstly, if prices are found price inelastic, canneries and retailing companies may enjoy market power and vertical restraints which are detrimental to consumer welfare [12]. Secondly, it would increase entry barriers in this labour-intensive and

* Corresponding author.

E-mail addresses: hoyo@uhu.es (J.J. García-del-Hoyo), toribio@uhu.es (R. Jiménez-Toribio), patrice.guillotreau@univ-nantes.fr (P. Guillotreau).

¹ Estimated by authors from FAO Commodities production and trade statistics, against an average worldwide apparent consumption 0.25 kg per capita.

² The name often given to the three major US companies: Bumble Bee, Starkist and Chicken-of-the-Sea [20].

increasing returns-to-scale industry because potential entrants should reduce substantially their prices to gain market shares and compete with incumbents [13]. Thirdly, an elastic demand usually reveals many opportunities of substitution by consumers, turning to imported goods or domestic substitutes (e.g. other fish or meat products in the diet). Conversely, an inelastic demand may conceal a high degree of differentiation, products being sold on distinct sub-markets which somehow protect the domestic industry against foreign brands [9,14]. A last and important outcome can be derived from demand analysis as far as conservation issues are concerned: an inelastic demand creates an incentive for producers (both canneries and retailers) to reduce their production levels, hence the raw materials based on natural renewable resources which are used to produce canned fish. The catch reduction induced by lower sales of canned fish will be compensated by a price increase, leaving the revenue unchanged with a unitary elasticity [15,16].

Some rare studies about the Japanese market are available, with a demand equation estimated for tuna within a full AIDS (Almost Ideal Demand System) seafood demand model in Japan [17,18]. These two studies conclude to a rather inelastic retail demand for tuna in Japan, although close to unity. [19] state that demand for canned tuna in the USA is highly inelastic, but others, such as [16,20] conclude that the own price elasticity is much higher when looking at local or separate markets (e.g. conventional vs natural food supermarkets). On the same US market, other studies found a lower elasticity of demand for domestic products than for imported commodities [9]. This latter result would tend to prove that consumers are likely to differentiate local brands from more generic imported products [21]. However, most studies looking at tuna products worldwide conclude to the existence a global market, with co-movements of prices in the long-run, demonstrating that markets remain open and competitive [3,22,23].

With supermarket scanner data, [11] analysed the demand for canned tuna at the retail level in the UK and considered three types of product that should be distinguished, that is, canned tuna in brine, canned tuna in oil and canned tuna in sauce. They concluded that the demand was own-price inelastic for all goods. Additionally, tuna in oil is depicted as a luxury good, for which consumption increases faster than expenditure, whereas tuna in brine and sauce are rather normal goods (positive relationship between consumption and income, but the expenditure elasticity is smaller than unity). Tuna in oil and tuna in sauce were finally found substitutes on this market.

The main goal of this article is to expand the strand of research described above with an accurate and thorough econometric analysis of the demand for canned tuna in Spain, one of the major markets in the world, which has never been done before. Such an analysis can only be envisaged within a complete bundle of related commodities, i.e. the canned fish products (sardine, tuna and other fish). Because of the peculiar characteristics of these products (fish-based, inexpensive, ready-to-eat, long-term storage), it is assumed that these products are likely to be substitutable among themselves, but not so much with other food commodities. To estimate demand elasticities, a linear approximation of an Almost Ideal Demand System (AIDS) model has been used. The Johansen's approach was used for this purpose and the own price, cross price and expenditure elasticities were obtained [24,25].

The paper is organized as follows. Section 2 positions the Spanish market in the global market of canned tuna. Section 3 introduces the data used in this study. Section 4 presents the methodology adopted, that is the Almost Ideal Demand System model and the way it was estimated. Section 5 displays the empirical results about the elasticity coefficients estimated, which are discussed in Section 6. Finally, Section 7 provides some concluding remarks.

2. The Spanish market within the global market of canned tuna

Canned fish and shellfish production is highly concentrated globally [2,26]. The top five producing countries concentrate half of the world canned fish and shellfish production: Thailand is the leader, just

Table 1
Production of canned tuna by country (in Metric Tonnes) (year 2013). Source: FAO Commodities Production and Trade database.

Country	Production	Percentage of production
Thailand	551,000	27%
Spain	257,880	13%
Ecuador	215,894	10%
USA	173,352	8%
The Philippines	137,000	7%
Mauritius	113,750	6%
Mexico	108,270	5%
Indonesia	74,000	4%
Iran	73,969	4%
Italy	67,150	3%
Others	271,391	13%
Total	2,043,656	100%

followed by Spain, [27]. In Europe, Spain is the most significant country, accounting for 68% of the EU-28's production in 2015, against 58% in 2005. In 2015, according to the National Canning Industry Association (ANFACO), the Spanish cannery production reached 345,920 t (of which 2/3 are filled with tuna) for an approximate value of 1503.3 million euros (of which half concerns tuna products). These figures have increased by 11.2% in weight and 36.7% in value since 2005. This dynamic trend contrasts with the rest of Europe where this industry has nearly disappeared, most EU countries now importing canned tuna from third countries (from south-East Asia in particular), mostly because the canneries are too far away from the fishing grounds and because of higher labour costs [28].

In Table 1, worldwide production of canned tuna by country is displayed for 2013. In 2013, according to the FAO Commodities Production and Trade database, global production of canned tuna was 2,043,656 Metric Tonnes. Thailand (27%), Spain (13%) and Ecuador (10%) account for 50% of the world production. Interestingly, several important Ecuadorian canneries exporting loins or canned fish are also owned by Spanish multinational companies (Garavilla, Jealsa, Salica). As [26] point out, production used to be dominated by the United States for decades in the past. Nowadays, Asian companies (Thai Union, Dongwon...), Spanish and other multinational companies dominate the global market, and Thailand has become the first producer in the late 1990s because the USA were no longer able to compete with lower production costs in these countries. The five main producing countries have changed notably over the past few decades and more countries are currently taking part in the global production of canned tuna [26].

It is true that there is an almost direct relationship between the size of the canning sector and the capacity of the tuna fleet, although this relationship decreases as the share of imports in the total supply increases. Regardless of the artisanal catches of small tunas in the Cantabrian Sea or Canary Islands or the Bluefin tuna in the Strait of Gibraltar or the Mediterranean Sea, a powerful freezer tuna fleet has been developing since 1969. Initially it developed in the Gulf of Guinea and the eastern Atlantic, and then extended its operations to the Indian Ocean in the early 1980s and, more recently, to the Pacific Ocean. This fleet was mostly driven by shipowners from the Basque Country and, to a lesser extent, Galicians and Andalusians. The number of vessels grew rapidly from the first freezer purse seiner (PS) launched in 1963, which only had 263 GRT, to the two vessels in 1969, and it reached the figure of 56 units with 65,839 GRT in 1991. At present it is composed of 30 boats and 54,934 GRT because a significant part of the fleet has been transferred to companies registered in south-America (Ecuador, Belize, El Salvador, etc.). In 2015, the standard PS vessel had a large dimension with about 1800 GRT and an average power of 5000 HP. In the last thirty years, it has experienced an increase of more than 60% in its average size. In Fig. 1, the evolution of the number and carrying capacity (GRT) of the Spanish high-seas tuna purse seine fleet show the increasing individual size of vessels, the tonnage (right axis) being

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