

Fish canning industries of France and Portugal

Life histories

JOÃO FERREIRA DIAS E PATRICE GUILLOTREAU

ABSTRACT: The fish canning industry was hit by globalisation a long time ago, prior to other manufactured goods. The parallel developments of fish canning industries in France and Portugal were analysed on the basis of extensive data on landings, foreign trade and industrial organization. The historical look at the life of the industry from the early 1800's to the present emphasizes quite different aspects, from depletion of natural stocks to wars and colonies, which explain the rise and fall of the industry and its current position. The foreign trade and industry pattern show that comparative international advantages in the fish canning industry depend on the relative abundance of fish and not on technology. Even when the value chain is dispersed throughout the world, the location of processing activities follows the raw material, while the level of activity continues to be driven by the behaviour of distant consumer markets.

Key words: Fish Canning Industry, Industrial Dynamics

TÍTULO: As indústrias de conservas de peixe em Portugal e em França: Lições da história cruzada

RESUMO: A indústria de conservas de peixe foi uma das primeiras indústrias transformadoras a globalizar-se. Deu o interesse diário análise comparativa das evoluções das indústrias de conservas de peixe de França e de Portugal, com base em séries longas de dados de capturas, comércio internacional e organização industrial. A história de vida destas indústrias, desde meados do Séc. XIX até ao presente, evidencia a importância decisiva de acontecimentos tão diferentes como a degradação de mananciais e as guerras na dinâmica da indústria e na sua localização. Os comportamentos, quer do comércio internacional, quer dos investimentos produtivos, mostram que as vantagens comparativas na indústria de conservas de peixe têm dependido essencialmente da abundância do peixe - a matéria prima - e não da tecnologia de produto e de processo. Nos casos em que as actividades das cadeias de valor estão dispersas, a localização da actividade primária transformadora segue a matéria-prima, mesmo que o seu nível de funcionamento dependa do comportamento de distantes mercados consumidores.

Palavras-Chave: Indústria de Conservas de Peixe, Dinâmica Industrial

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INTRODUCTION

Industries which go back nearly two centuries and without any major change in the technological process are not commonplace. This is the case of the fish canning industry that continues to use the same technical process invented by Nicolas Appert in 1795¹.

The technical process for sardines was described as follows by Caillo (1855): when the fresh sardines are received, the women clean them and cover the fish with fine white salt; after a few hours, the fish is gutted and its head cut off before washing the fish again; then, the fish is laid out and dried by the wind or the sun in order to obtain a better shine and to avoid deterioration when it is deep fried; the fish is fried in boiling vegetable oil and drained off; fried sardines are then arranged in metal cans and put on tables covered with vegetable oil; the welders seal the tin cans and put them into the autoclave (pressure-cooker) for sterilisation. It is interesting to note how little this process has changed in the course of time. Of course, fish is now usually boiled or *au naturel*² not fried, autoclaves are safer and the containers have been substantially improved (materials, easy opening system), but the production process in itself remains very similar.

The simplicity of the industrial process along with the low opportunity costs of processing low-valued fish species, such as sardine and other pelagic blue fish, explains the success of the industry. Such a simple process has also enabled many newcomers all over the World to enter the industry.

What are the driving factors for the industry's development? To answer this question, we analysed the history of fish canning in both France and Portugal, two pioneers and major players in the industry and their developments observed from the early 1800's to the present. Two different paths emerged due to specific political and economic contexts. Political events, like the colonization process, sometimes affected the industry's evolution more deeply than economic ones, e.g. protectionist regulations. However, we can see that in the medium or long term, the success of both relies on the presence of suitable and abundant fish stocks near to the processing plants.

This paper begins with an overview of the economic theories about industry development and international trade. After that, several sections show the chronological evolution of the canning industry in France and in Portugal. At the end of the XIX Century, the shortage of sardines in the Breton sea caused the international expansion of the industry to Portugal, where stocks were large. The trade protection measures implemented by France are then presented, both to show their limited impact and to shed light on some current debates about trade labelling. In the 1950s, when

the tuna stocks in the Pacific and the Indian Oceans started to be harvested on a large scale, tuna took the comparative advantage over sardine. The strategies followed by the French and the Portuguese industries were very different and explain the current weakness of the Portuguese fish canning industry. Finally, a discussion is proposed about the nature of comparative advantages in this type of industry that depends on a perishable natural resource.

THEORETICAL FRAMEWORK

The methodological approach we use to analyze the dynamics of the sardine canning industries is based on the life history of the two industries.

Life history method has been marginalized from the positivist hegemony in the social sciences. However, social scientists, like Crapanzano³ and others have recently emphasized its importance to capture the product of a particular culture (Linde, 1993). In its most basic understanding, the life history/story addresses the question of the form «what you must know about me to know me» (Linde, 1993, p. 20). The temporal ordering of events in the telling of the story is crucial to the coherence of the narrative but also to identify a particular trend or an emergent strategy.

It is true that life story is «constructed, creatively authored, rhetorical, replete with assumptions, and interpretive» (Lindle, 1993, pp. 4-5), but it is nevertheless useful to get a holistic and free view of the industry dynamics, when more formal theories such as the product life cycle (PLC) theory⁴ seem inadequate. PLC theory claims that there are regularities between the evolution of technologies, on one hand, and the industry's organization and structure on the other. Assuming that the locus of innovation moves progressively from product to process technology, it is possible to identify stages in the technology evolution and foresee the corresponding industrial dynamics.

The extension of the PLC concept to the realm of international trade was later used by Vernon⁵ to explain the Leontief paradox⁶. Analysing the life cycle of manufactured products, where process technology undergoes different stages, Vernon concluded that these products are first produced in the rich countries (L-scarce countries) where the products found their first demand and began to export these L-intensive products. Maturity and decline of demand in the original country, with standardized and increasingly K-intensive production technology, push the production to low-wage countries, using finance and equipment from the originating country. This off-shore production will supply the local market and the exports to the early innovating countries.

The work of Vernon reinforced the Heckscher-Ohlin theory. Assuming mobile homogeneous products and technology (which is stable and ubiquitous), constant returns to scale and perfect competition of domestic factors⁷, the Heckscher-Ohlin theory says comparative advantage should depend on relative factor availability, and not only on relative opportunity costs of production as proposed by David Ricardo.

The principles of comparative advantage and factor proportions form the basis of the so-called neoclassical theory of international trade which argues that free trade is a condition for development⁸.

At the end of the 20th Century, the role of technology in economic development was emphasized by Solow, Krugman and others. Technology is now seen as an endogenous variable, while an explicit factor of production; its production creates externalities; its use is affected by increasing returns to scale; there is imperfect mobility on the ability to use it; given the specializations of infrastructure, organization, and labour skills that are required. The externalities associated to technology production, on one hand, and the imperfect mobility, on the other, simultaneously encourage convergence by technological diffusion and competitive differentiation by specialized activities. Those factors and others are what Porter (1985)⁹ calls drivers of competitive advantage. The value a firm creates results from its industrial positioning and the way activities, that can be geographically dispersed, work and are linked - the value-chain.

It happens that fish canning uses a very simple technology that has remained almost unchanged over the years. Therefore, the effect of its evolution has not been a determinant of the firms' strategies.

BIRTH OF THE CANNING INDUSTRY (18TH - 19TH CENTURY)

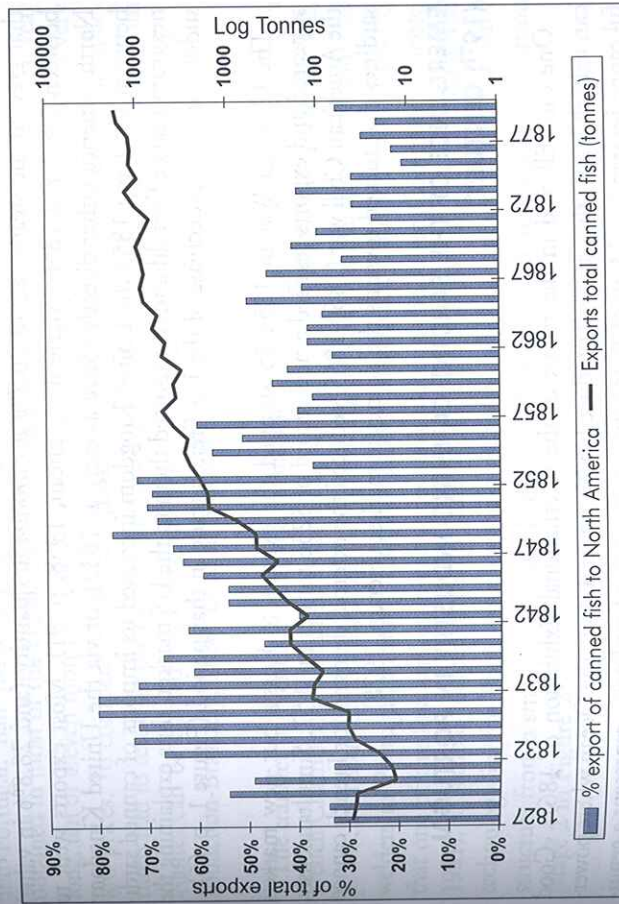
The canning industry began in France in 1795 with the invention of Nicolas Appert, before being established in many other European countries, namely United Kingdom¹⁰ and Portugal.

The first sardines were packed in metal cans before 1822, in Nantes (France) by Joseph Colin¹¹ (*Journal de Nantes et de la Loire Inférieure*, June 8th, 1822). Very little is known about him except that soon after his first attempt to use the Appert's invention, he set up an important canning factory in 1824 in Nantes which went bankrupt fifteen years later. Canned sardines were not the only product coming out of the factory; 30 workmen (*ferblantiers*) worked on the production of metal cans for processing meat, salmon, vegetables and fruits packed by some 300 women in high sea-

son. At its peak, in 1836, this cannery produced some 100 000 tins (36 000 of which were sardines, 250g per tin, i.e., approximately 9 tonnes in all¹²).

International trade of canned fish products represented a logical outlet for such durable goods, but its emergence is reported to have taken place rather late: «the major canned fish found in international trade, namely tuna, was first canned in 1903 in southern California» (Anderson, 2003, p. 9). However, in other books, international trade of canned fish is mentioned at a much earlier date: «by 1860 a substantial market had been created for French sardines in the United States» (Martin and Flick, 1990, p. 8). Indeed, several historical factors had made the French canning industry export a large proportion of its production to North America by the mid 19th Century (Figure 1). From 40 tonnes exported as early as 1827, 400 tonnes were exported in 1844, when Kensett started its oyster canning factory in the USA¹³; French exports of canned fish reached their peak of 17,000 t in 1879.

FIGURE 1
Exports of French canned sardines and North-American share 1827-1879



Source: *Statistiques officielles des Douanes, Ministère du Commerce et de l'Industrie*

According to Libaudière (1910), there are three important factors for the growth of international trade of French canned sardines in the mid 19th Century: London's Great Exhibition in 1851, the discovery of gold mines in California (1848-1853) and

in Australia (1851), and the opening of a new railway between Nantes and Paris (1851).

The London Exhibition in 1851 was the first universal exhibition in history and was followed by The New York Exhibition 1853 and the Paris Exhibition in 1855. All of them were attended by many industrial fish processors. The gold rush of the mid-century attracted people from all over the world to California and canned sardines were seen as the most convenient food to take and preserve for a long time so far from the cities. By mid-19th Century, canned sardines were still considered as a luxury good¹⁴ but still within the purchasing power of the US diggers who could even afford to pay the extra 40% *ad valorem* tariff duty. In 1851, a similar gold rush in Australia had the same effects on the development of French exports of canned sardines. Finally, in August 1851, the opening of the railway between Angers and Nantes linked Nantes, then the most important canning fish production district, to Paris, the World market reference.

These three combined factors boosted the level of French canned sardine exports that grew at the steady rate of 26,7% *per annum* in quantity (and 28,8% in value) between 1847 and 1856 (Marie d' Avigneau, 1958, p. 91). Most exports went to North America either directly (80% as early as 1832), or via the United Kingdom; between 1852 and 1853 the United Kingdom increased its imports of canned sardines from France fivefold and re-exported them to the US market, thus explaining the sudden and sharp decrease of the US-French trade in that period (Figure 1, p. 65).

The Crimean War in 1854-55 stopped the exports to Russia but new markets appeared and exports reached a new record of 5236 tonnes in 1857. Simultaneously, the American Civil war (1860-1865) reduced the external demand for French canned sardines that turned towards the domestic market (Fiérain, 1978).

EMERGENCE OF THE SARDINE CANNING INDUSTRY IN PORTUGAL (19TH CENTURY)

One can still read in the report of the international Exhibition of 1867: «Good canned fish is rare; they are well produced in Nantes and along the Ocean where powerful canneries stand. (...) Out of all the species, the canned sardines... represent a genuine French speciality. There is nowhere in the World that this good does not reach, for it has become essential to consumers. It has been tried elsewhere, in Brazil, in Spain, in Italy; but these attempts cannot compete with the production from our country» (Michel Chevallier, cited in Marie d'Avigneau, 1958, pp. 109-110). This self-satisfied viewpoint has been denied by the development of a large industry abroad.

Indeed, the canned sardine presented by Feliciano Rocha won several awards at the Paris Exhibition of 1855 in recognition of his high quality products (ADS-FAC¹⁵ 18/1; Serubalense, 2/12/1951). In 1854, Feliciano Rocha and Manuel Neto created a fish cannery using the Appert method in Portugal for the first time (ADS-FAC 18/1, 65/2). Disagreements between the two men caused the split of the firm into two plants the same year. Therefore, the thesis that the cannery set up in Serubal (Portugal) on November 16th 1880 by the French company F. Delory was the first in Portugal (De la Casinière, 2002, p. 54) is not correct. In fact, there were already several sardine canneries in Portugal in 1880 exporting mainly to Brazil and the African colonies (ADS-FAC 18/1, several documents).

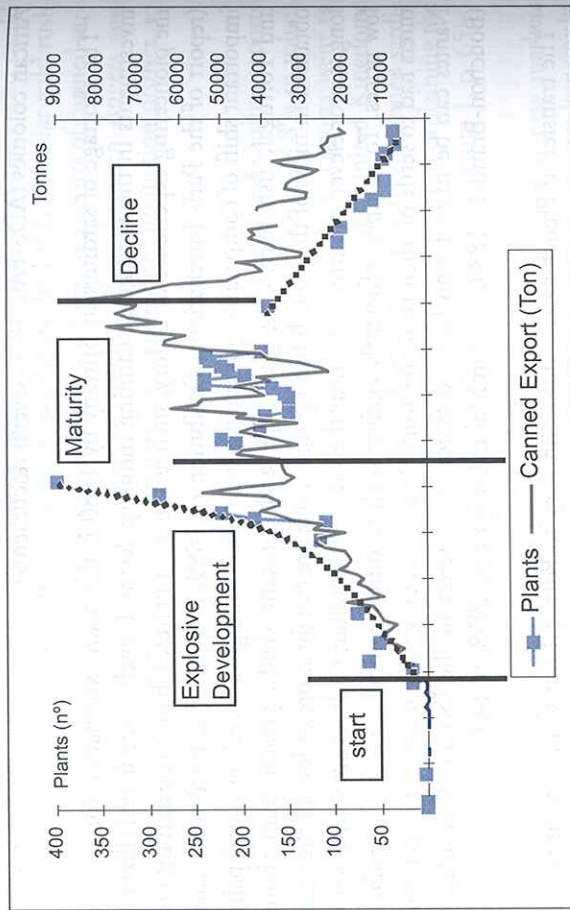
The shortage of sardines in Brittany by 1880 is the main explanation for French investments in the Portuguese canning industry. Many French companies followed the pioneering experience of Delory, such as Ogereau Frères, Chancerelle and others (report of the Paris International Exhibition of 1889, p. 164). The reasons for this important shift of comparative advantages in location were given as follows: «in Spain and Portugal, fish harvesting give large and constant yields, greater than those obtained in most of the French fishing zones; fish are caught more or less all the year long, ten or eleven months a year near the strait of Gibraltar; sardines are sold at very low prices. To compete efficiently against such favoured competitors, our manufacturers had to settle on their rivals' territory. As a result, only three manufacturers from Nantes can be named who have no factory or interest in the Iberian Peninsula...» (Bouchon-Brandely, 1889, cited in Marie d'Avigneau, 1958, p. 143).

The transfer of French capital and technology to Portugal was so important that a French Chamber of Commerce was set up in Lisbon in 1887 (De la Casinière, 2002, p. 54). In 1891, the *Société Métallurgique de Nantes* (tin manufacturer) sent some 50 welders to Portugal, forming a kind of labour aristocracy. Thus it is not surprising that one of the first strikes in canneries took place in the Julien Company (Valente, 1981), a Setubal located firm, in June 1897. The injection of French capital and technology in the Portuguese canning industry led to a change of the industrial structure from a small-scale (stage 1 in Figure 2, p. 68) to an industrial organization (stage 2 in Figure 2).

In 1884, Portugal had 18 canneries and Spain around 40; two years later, 66 factories were operating in Portugal (Dupouy, 1920). Portugal had started to supply Spain and Brazil, the nearest countries geographically and culturally, respectively, and its influence was gradually extended in the European markets, selling canned sardines to England, France and Germany and tuna to Italy and Spain. This specialisation remains today more than a century later.

The emergent Portuguese industry seemed little affected by the sardine shortage that hit Europe, mainly France, at the turn of the 20th Century; at least, statistics do not reveal any effects (though data on fish catches were scarce and unreliable until 1927 because the attention was focused on values for tax reasons). By 1912, Portugal was the first World producer and exporter of canned fish, composed essentially by canned sardines.

FIGURE 2
Portuguese exports of canned sardines



Source: *Ministério da Marinha, Ministério das Finanças, INE, DGPA, IPCR, FAO*

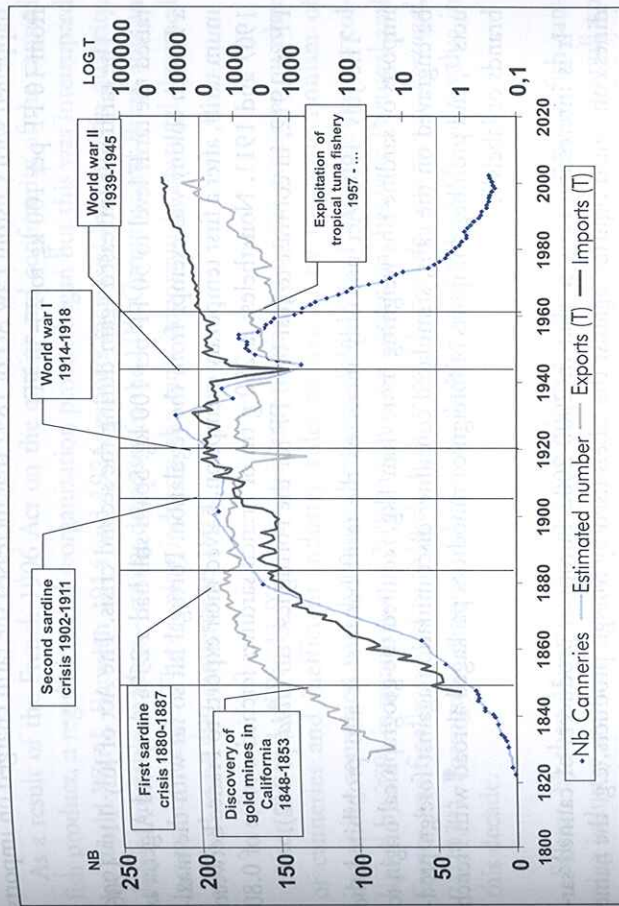
SARDINE SHORTAGE IN FRANCE AND PROTECTION RULES (19TH - 20TH CENTURY)

In France, the major changes in the foreign trade of canned fish occurred after two severe depletions of sardine stocks at the turn of the 20th Century.

The first sardine crisis began in 1880 and ended in 1887. All the ports with fish canneries saw sardines catches declining sharply during this period¹⁶. Figure 3 (p. 69) shows the impact on the imports of foreign canned sardines which grew by 159% in the period. In 1887, half of the canned sardines imported by France came from Portugal.

The second crisis was more severe and took place between 1902 and 1908 and between 1911 and 1914. The average tonnage caught dropped from 32,300 t per

FIGURE 3
Number of canneries in France and foreign trade of canned fish



Source: *National customs, FAO, Eurostat, FIAC*

year in the period 1894-1901 to 12,900 t per year in the period 1902-1913. As a result, the average cost of sardines doubled during this period.

The first crisis moved the industry to the south (in the Basque region) and boosted the Spanish and Portuguese exports to France. French imports of canned fish increased from 2,000 t per year in the period 1894-1901 to 8,900 t in the period 1902-1913. With the second crisis, France clearly positioned itself as a net importing country of canned fish.

Curiously, the first sardine crisis and the resulting growth of imports did not make the government increase tariff duties, at least at first. On the contrary, despite domestic complaints, in 1881 the tariff on French imports was reduced from 31.20 FF per 100 kg to 10 FF. As a comparison, French exports were charged an extra duty of 60-95 FF to the USA (replacing the 40% duty of the mid-19th Century), 75 FF to Germany and 73.25 FF to Russia (+10% after January 1st 1881) (Marie d'Avigneau, 1958, p. 163).

Why was this tariff reduction implemented in a context of European protectionism? The explanation is probably that there was no previous experience of stock

depletion and it was necessary to supply the national market. In fact, the French manufacturers asked for a change of this policy soon after the end of the crisis; this happened with Custom Law Act of 1892 that increased the tariff charged on imports from 10 FF per 100 kg to 25-30 FF.

The tariff was increased again during the second crisis. The Act of July 11th 1906 raised the tariff level to 50 FF per 100 kg. Spain still had a 25% duty and Algeria as a French colony was exempt from the regulation. Portugal hit so far with the maximum tariff, after a first temporary exemption, halved their exports to France between 1907 and 1911. Nonetheless, a 250 g tin of French sardines fetched a price of 0.80 FF in 1912, in contrast to just 0.50 FF for the Portuguese tin (*Ibid.*, p. 242).

The July 1906 Act not only increased the tariff barriers; it also prohibited the imports of sardine tins weighing more than 1kg, required the geographical origin to be engraved on the cans, stimulated consumer discrimination against foreign products¹⁷, and prohibited imports of foreign commodities packaged abroad with French brands or labels¹⁸.

It is interesting to note that in 2000-2002 European producers of canned sardines continued fighting against the labels used by foreign products, e.g. the name of sardines used by the Peruvian *Sardinops sargax* or the Venezuelan *Sardinella aurita* exported to Europe. The European producers want to maintain CEE Reg.2136/1989 that restricts the use of 'sardine' solely to *Sardina pilchardus Walbaum*. The Peruvian producers obtained authorisation from the World Trade Organisation to sell the *Sardinops sargax* as "sardines", in line with the Codex Alimentarius which encompasses herrings, anchovies, sprats, sardinops and sardinas in this category.

In spite of all these protectionist measures at the turn of the 19th Century, Figure 3 shows how much the trade deficit had grown in France. Many canneries closed down and the overall number of factories started to decrease at this time. It seems clear that the protection of a national industry by tariff and other legal barriers can rarely stop the decline of this industry in the long run.

WORLD WARS AND THE PORTUGUESE APOGEE (MIDDLE 20TH CENTURY)

As the leading World exporter, Portugal saw the problem from the opposite perspective. Between 1854 and 1927 there was a steady increase of canned fish exports with an explosion of small plants. Many of the small Portuguese canneries produced

either very low quality products or high quality products many of which with French brands (including those of French owners settled in Portugal¹⁹).

As a result of the French 1906 Act on the quality and conformity of the canned fish product, a regulation and reorganization process began but this was interrupted by World War I. Between 1914 and 1924, exports increased by 190% in quantity, despite unstable markets - strong decreases in the UK, Germany and Brazil and an increase in France. The canning industry, the most important in Portugal, boomed and had some 400 canneries in 1925.

After the end of World War I, a crisis erupted caused by the excessive number of canneries and inefficient industry rules as well as by the protectionism of importing countries, namely France. Between 1924-1934, Portuguese exports collapsed by 23% in quantity and 30% in value. An agreement between Portugal and France was finally signed on March 30th 1934 (*Diário do Governo de Portugal*, 74/1934). Portuguese exports collapsed by 23% in quantity and 30% in value in this decade.

Salazar, by then Minister of Finance, conducted a study on the national fish canning industry and foreign trade. His idea was to support exports in order to pull up domestic industry: «if we want to stabilise or to increase exports of canned fish (...), we cannot go from domestic fish consumption to develop fishing, from fishing to develop the canning industry and from the canning industry to develop exports. It must be the other way around» (Salazar, 1931, p. 8).

Salazar himself played a decisive role in the structuring and development of the Portuguese fish canning industry that was subsequently implemented by his Ministers of Industry and the Sea, Sebastião Ramirez and Henrique Tenreiro, respectively. The New State policy of Salazar was based on a strong government, a corporatist industrial organisation and protectionist rules, but without the direct presence of the State as producer or trader. Portuguese laws 21621/1932 and 21622/1932 created the institutional framework whereby the producers' association - Consórcio Português de Conservas de Sardinha - was entitled to regulate, monitor and control the quality and conformity of production and exports of canned fish. Until 1940, the focus was on the organisation and control of the industry (stage 3 in Figure 2). Exports and production remained more or less stable in quantity but with better prices, in particular during the Civil War in Spain (1936-1938). Portugal's neutrality during World War II benefited the industry not so much in quantity (greater volatility and a peak of 61,000 tonnes in 1941), due to problems of logistics, but more in average prices (140% higher).

The end of World War II caused a sharp drop in fish canning as well as in fishing, but less than ten years later it had fully recovered. Between 1954 and 1965 exports increased by more than 30% in quantity reaching 82,000 tonnes in 1965.

During this period, Salazar took two important and contradictory political measures: internal restrictions for the creation of new industrial plants (Portuguese laws L 2052 of November 1952 and DL 39634 of May 1954) and external adhesion (with restrictions) to the European Free Trade Association in 1960...

The shortage of sardines and the recruitment of fishermen to fight in the colonial war caused a sudden 20% cut in the production and export level at the end of the sixties. In April 1974, the fall of the political regime resulted in huge economic and social changes in the canning industry, first with state interventionism and later opening to foreign investors, e.g. Heinz and Ebro. Portugal's integration in the EEC in 1986 had both positive and negative consequences for the canneries. Access to European funding to modernise the industry was the main advantage; on the other hand, Portugal was faced with the low level of tariff duties applied to Moroccan canned sardines²⁰ and the increased bargaining power of fishing activity supported by EEC regulations.

After a peak of production in 1967 with 74,000 t, the output of canned sardines has dropped to an average 50,000 t in the last 25 years. This product still represents one third of the Portuguese seafood exports in value.

PRODUCT DIVERSIFICATION AND THE GLOBALIZATION OF THE FRENCH INDUSTRY (END OF 20TH CENTURY)

Between the World Wars, the French canning industry experienced new growth due to diversification towards new species, essentially tuna. The canning of North Atlantic tuna or Albacore (*Thunnus alalunga*) went back to the first sardine crisis. «Then a linkage of substitution appeared between tuna and sardines processed by the canning industry: in a period of shortage of sardines or whenever they become more difficult to sell, tuna can be substituted to a certain amount. That was observed in L'Île d'Yeu in 1867» (Odin, 1894, p. 185). Tuna at that time was canned in vegetable oil and was consumed as a luxury good (the price was double that of canned sardines in 1868).

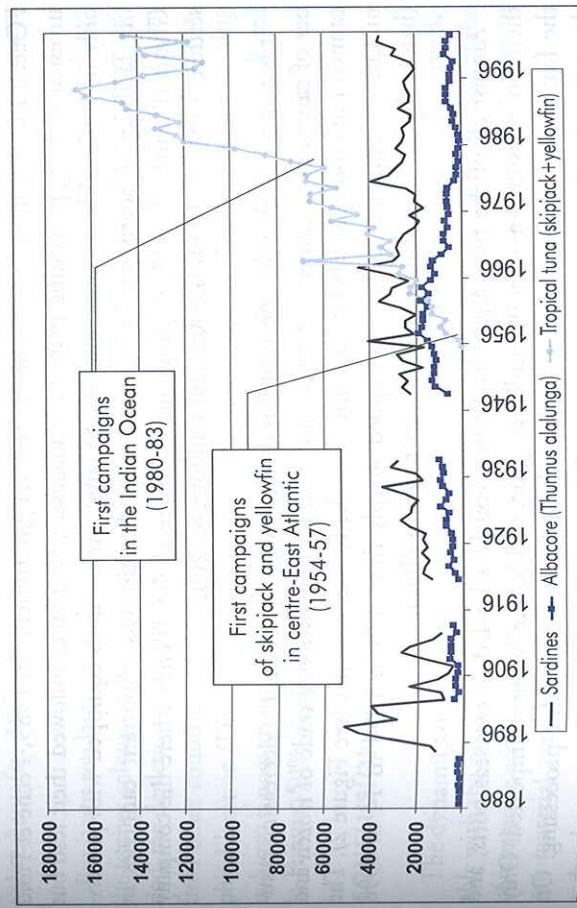
Tuna canning developed fast during the second sardine crisis of 1902 and after World War I. Between 1920 and 1930, canned sardines still represented 60% of the output of the French canning industry, falling to 37% in 1937. The economic crisis

of the 1930s and World War II saw the dramatic decline of the French canning industry (Figure 3). It was only in the fifties that the canning industry recovered with the discovery of important tropical tuna stocks, mainly Yellowfin (*Thunnus albacares*) and skipjack (*Katsuwonus pelamis*), in the Senegal and Ivory Coast seas (Figure 4).

After a few exploratory fishing campaigns between 1948 and 1954, the Breton and Basque fishermen, followed by the Spanish fleet, moved en masse to West Africa for fishing. In 1956-57, some 87 long-liners were fishing in this area, catching 13,000 tonnes of tropical tuna. In 1964, more productive purse-seiners increased the level of catches substantially: 21,000 t in 1965, 33,000 t in 1970, 48,500 t in 1975 (Figure 4).

After West Africa and the East Atlantic Ocean, fishing moved to East Africa and the West Indian Ocean. The first fishing campaign in 1983 reached 16,000 t. There was soon a transfer to the fishing grounds of the Indian Ocean where catches rapidly went up to 65,000 t in 1984, while those in West Africa dropped from 57,000 t to 20,000 t during that period.

FIGURE 4
Catches of sardines and tuna by French* vessels, 1886-2002



Sources: Bulletin statistique des pêches maritimes; Orthongel.

* Landings of sardines and albacore in France; catches of tropical tuna by the French-owned vessels (including those fresh and frozen tuna landed in African ports)

A relationship can now be established between the number of canneries and the level of foreign trade for canned fish across the whole period from the very beginning of the French industry to its latest development (Figure 2).

COLLAPSE OF THE PORTUGUESE EMPIRE AND ITS INDUSTRY (END OF 20TH CENTURY)

One might wonder why this important geographical re-allocation process did not occur in Portugal. Nonetheless, the first Portuguese cannery in Africa was set up as long ago as 1914 in Moçamedes (Angola); *Fábrica Africana* belonged to Miguel Almeida (Carneiro and Baptista, 1934). The cannery exported various canned products - fish, meat and vegetables - to other Portuguese colonies and to neighbouring Belgian Congo, as well as canned tuna to Italy (the largest client with 482 tonnes in 1932) and France (127 tonnes in 1933).

The main reason is political as the New State policy of Salazar took a paternalistic approach to industry. Organisational and technological innovations that could cause social troubles were restrained or not favoured, including investments abroad and migration of people to the colonies²². Mainly concerned with the survival of the Portuguese Empire, Salazar tried to plan an international division of labour within this empire. The decision to make large investments, including new canneries, was only taken after 1961 when the war of independence began in the African colonies.

But it was too late! The dictatorship remained until the Revolution of April 1974 and the former colonies plunged into destructive civil wars. Consequently for the recent period, the depletion of sardine stocks (Figure 5, p. 76), along with the fierce competition from other countries, could not be compensated by diversifying products and geographical location (Dias *et al.*, 2000). Once the world leader, the Portuguese fish canning industry is now an industry in decline. In 1997, 271,000 t of canned fish were produced in Europe, 50% in Spain, 28% in Italy, 14% in France and only 8% in Portugal.

CONCLUSION

The dynamics of trade and investments in the sardine canning industry fit remarkably with the neoclassical theory. It should be noted however that in this industry the comparative advantage has not shifted because of technology, but due to changes in raw material availability.

For the sardine canning industry, the comparative advantage is mainly dependent on the abundance and dynamics of sardines, a perishable natural resource. The first

The French fleet have recently had some experimental fishing campaigns in the Pacific Ocean where the skipjack and yellowfin tuna stocks are still under-exploited.

After the emergence of the African tuna fishery and before the independence of the former colonies, the major European canneries set up processing units overseas, close to the fishing grounds. Between 1955 and 1957, four French companies (Pêcheurs de France, Guyader et Guichard, Cassegrain, Saupiquet) and some Basque (Spain) canneries invested in new subsidiaries in Senegal. The leader Saupiquet, also present in Morocco, systematically took over all these companies except Pêcheurs de France. In 1971, Saupiquet opened a new factory in Abidjan (Côte d'Ivoire). In addition to Saupiquet and Pêcheurs de France, another French group - Pêche et Froid - built its own units in Senegal in 1966, and in the Ivory Coast in 1978 (Charneau, 1989).

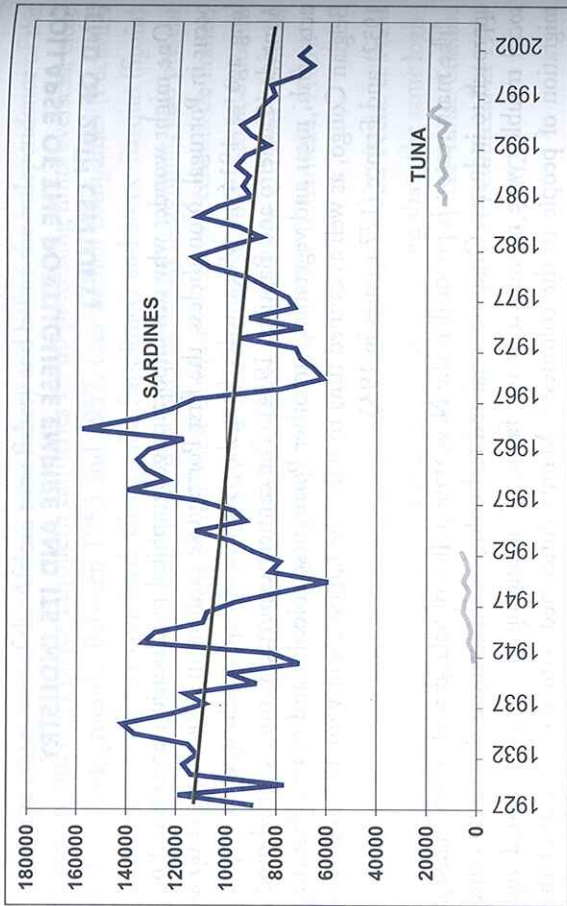
These three major French groups - Saupiquet, Pêcheurs de France, Pêche et Froid - work as an oligopoly on the French market of canned tuna and share the same logistic supplier Cobrecaf-Sovetco for the transport of frozen tropical tuna. Starkist (Heinz group) joined the French oligopoly after purchasing 36% of Cobrecaf in 1978 and the Paul Paulet cannery in 1987²¹ (Le Roy and Guillotreau, 2002).

These companies followed a similar strategy in the Indian Ocean. In 1987, Pêcheurs de France set up a new factory in the Seychelles Islands (Conserverie de l'Océan Indien), in partnership with the local government. In 1989, Pêche et Froid invested in a big processing plant in Madagascar. Saupiquet followed their lead but only in 1996, with the launching of two large purse-seiners equipped with processing facilities onboard producing tuna loins. Starkist has important canneries in Ghana (Pionner Food Company) and in the Seychelles Islands where the company settled in the late 1990s (Le Roy and Guillotreau, 2002).

It is easy to imagine the effects of this direct foreign investment: a decreasing number of canneries remained in France and an important two-way trade of frozen and canned tuna took place between France and the former colonies (see Figure 2). The number of canneries in France dropped sharply from 175 in 1954 to 14 in 1998 (before slightly increasing in recent years to 18 in 2002).

Almost all of the fish caught by French vessels is landed in overseas ports, and therefore registered as exports, and then processed before being re-imported. Only the frozen cooked tuna loins are imported for further high-value processing. On the other hand, most of that canned fish is marketed into France and other European countries mainly with brands owned by French firms (Guillotreau and Le Roy, 2000).

FIGURE 5
Catches of sardines and tuna in Portugal 1927-2002



Sources: IFCP, DGPA

sardine crisis, in the 1880s, pushed the French investment to Portugal; the second crisis, at the turn of the 19th Century decisively positioned France as an importer of canned sardines. Portugal remained an attractive location while labour productivity was low and sardine was abundant and cheaper than other species.

The French industry was only able to recover by the mid-20th Century when new tuna began to be intensively exploited in the former African colonies shortly before independence. French firms invested directly in those coastal countries near the tuna stocks, in order to compete efficiently, thereby creating an important two-way trade in this globalization process. Like France, the US industry did this in Puerto Rico and Samoa Islands. Meanwhile, the Portuguese canning industry was blocked for political reasons - industrial protectionism rules, African wars of independence, Portuguese revolution, etc..

However, a national and autonomous canning industry has not (yet?) emerged in Africa. The reasons are based on both economic factors and strategic decisions. Firstly, tuna is not as perishable as sardine and the scale effect of processing is greater. For instance, in France, productivity increased from less than 1000 t per firm in the early 1970s to more than 5,000 t in 2000. The scale effect favours concentration

leading to high entry barriers that makes ownership by locals difficult. Another reason is the type of investment made in Africa, since activities in the value chain have different strategic importance. In the tuna canning industry, the critical downstream activities related to the branding, distribution and marketing remain under tight control of the French and other OECD firms, while the upstream activities related with fishing (although the headquarters of international commissions, e.g. International Commission for the Conservation of Atlantic Tuna, are in the OECD countries) and standard industrial processing are located abroad.

NOTES

1. The invention was rewarded with a cash prize of 12 000 Francs in 1809 after a call for offers launched by Napoleon's French government. The objective was to preserve food for military campaigns. Ironically, the Appert's plant built in 1804, in Massy near Paris, was destroyed ten years later by the war (Barbosa, 1941).
2. The recipe *au naturel* was introduced in 1936 by M. Tristan, a manufacturer in the Island of Groix, Morbihan. The raw fish is put into the tin can and covered with brine before sealing and cooking directly inside the autoclave.
3. CRAPANZANO, Vincent (1984), **Life Histories: A Review Essay**. American Anthropologist, 86, pp. 953-960.
4. A fundamental work on the product life cycle theory is ABERNATHY, W. and UTTERBACK, J. (1978), «Patterns of industrial innovations». *Technology Review*, 80(7), pp. 40-47.
5. VERNON, R. (1966), «International investment and international trade in the product cycle». *Quarterly Journal of Economics*, pp. 190-207.
6. LEONTIEF, W. (1933), «The Use of Indifference Curves in the Analysis of Foreign Trade». *Quarterly Journal of Economics*, 57, May, pp. 493-503.
Using data series from the input-output model of the US economy, Leontief calculated the K (capital) and L (labour) intensities of several US industries and trade flows. He found a paradox: US exported goods while they were L-intensive and imported when they were K-intensive. The paradox was also found in Japan. These empirical results contradicted the Heckscher-Ohlin theory.
7. Relaxing constant returns to scale and perfect domestic competition assumptions, the Heckscher-Ohlin Model leads to new trade theories that explain the intra-industry trade based on increasing returns to scale and on product differentiation.
8. Jagdish Baghwati (International Trade, Selected Readings, MIT Press, 1987) discovered some circumstances where free trade may not lead to increased wealth and living standards. One, "immiserating trade", when a country's imports depend on its export of basic, raw commodities, because of greater elasticity on raising prices than on lowering prices. The other is related to over-abundance of potential labour that results in persistent low wages, leaving little incentive to increase labour productivity. The two conditions may relate in a vicious cycle thus impoverishing poor countries, while trade in quantity increases.
9. PORTER, M. (1980). **Competitive Strategy**. Free Press, New York, 1985.
10. In the United Kingdom (Bermondsey), John Hall and Bryan Donkin had already preserved meat in tin containers in 1811. After that Peter Durand imported the Appert's process in 1810 and ordered them to use tin cans. As early as 1813, they became important suppliers of the Royal Navy (De la Casinière, 2002, p. 16).
11. In fact, his name was Pierre-Joseph Colin, son of Joseph Colin who was the first man who applied the Appert's process to sardines and died in 1815. His son shortened his name to maintain the confusion with his father's name (De la Casinière, 2002, p. 13).
12. By 1850, more than 3 million tins (app. 750 tonnes) were produced in France (Caillio 1855, p. 69).
13. Anderson exaggerates the importance of the USA in the fish canning process: «In 1844, Kensett started the first large-scale oyster canning operation in Baltimore, MD. Canned oysters are considered to be the first canned seafood to receive broad distribution» (Anderson, 2003, p. 9). This opinion is shared by other authors (Martin and Flick, 1990, p. 3). It is acknowledged that oysters were being processed by the same Thomas Kensett and Ezra Daggert since 1812, but these experiences were not developed to the level of a large-scale industry. Indeed, Martin and Flick (1990, p. 3) reports that «tin containers for packaging processed food were first used [at USA] in the

1840s». In the USA, sardines were first canned in Maine about 1850. The important Californian sardine industry, which used the abundant Monterey Bay stock, was only launched in 1900, by Booth (Martin and Flick, 1990).

14. Salted-pressed sardines produced by the curing industry had a wholesale price of 0.40 FF per kg in 1837 and a retail price of approximately 0.90-1.00 FF/kg. The same year, the price of canned sardines reached 2.72 - 3.04 FF/kg in net weight, depending on the tin size. It proves that the two products belonged to separate markets.

15. ADS-FAC is the abbreviation of Almeida Carvalho Files (FAC) sited at the Distrital Archives of Setúbal (ADS) in Portugal.

16. This kind of depletion is typical of migratory species like sardines. Every year, the warm equatorial waters push away the colder and polar waters, fostering the migratory transgressions of the scombrid and clupeid stocks. The shoals may disappear for a while by diving deeply into the sea in order to lay, requiring for that a temperature between +10 and +17°C (Le Danois, 1951). Other explanations why sardine stocks can disappear for several years in some areas are suggested. The wind may push the eggs away from the sea shore. It was mainly coming from the west in the abundant years of 1978-79, but turned to East for the two next years of scarcity (Lachèvre, 1994, p. 52). The temperature also appears to play a role, as shown above, and sardines often disappear after a hard winter. The fishermen believe that cetaceans like belugas may represent efficient predators competing with them for the fish. Experts have other hypotheses: sardines would be very sensitive to electricity and volcano eruptions, or even to orientation changes of marine streams (*Ibid.*, p. 51). None of these is thoroughly confirmed and the chaotic dynamics of the sardine stocks keeps its part of mystery.

17. Only the French canned fish is served as starters in first and second classes of the boats; the foreign canned fish is for third class passengers only (in Portugal Exportador, 1932, n° 1).

18. In 1896, the Syndicat des fabricants de conserves de Nantes took several smugglers from New York to a US court because they were re-selling small herrings under the name of sardines and using French origin labels such as Douarnenez or Nantes (Chambre de Commerce de Nantes, exposé des travaux, 1896, p. 83).

19. In its bulletin of 31/1/1912, the Setúbal Industrial and Commercial Association emphasised the importance of the French legislation of 11/7/1906 that imposed the engraving of the originating country on the cans. Many of the best Setúbal made canned fish products like those produced by Delory were traded as French. Delory was sentenced by a commercial court in 13/2/1901 to pay a fine after a complaint of F. Jullien, another French firm established in Setúbal.

20. When Portugal entered the EEC in 1986, Morocco enjoyed a free quota for their exports of canned sardines up to 14,000 tonnes, a 10% duty between 10 and 20,000 tonnes and 25% above, and a duty-free rate for tuna; as compared to Portugal who faced a duty-free quota of 5,000 tonnes for canned sardines, a 8.18% rate beyond and a free quota for tuna until 1,000 tonnes with a 7.2% rate beyond. These specific tariff duties applied to Portuguese by the EU have gradually disappeared.

21. After a severe legal and financial fight in the mid-1990s, Startisk finally obtained full control of Cobrecaf-Soverco in 1995, thus becoming leader of the industry (Guillorreau and Le Roy, 2000).

22. Until mid 20th Century, a Portuguese worker had to receive a job offer ("carta de chamada") from a firm in the Portuguese colonies to go there.

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