Deutsches Schiffahrtsarchiv 30, 2007, S. 357–372

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Making Cans for the Fish Canning Industry

An Experience in Galicia (1880-1936)

Traditionally, Galicia was an important region producing salted sardines throughout the nineteenth century. Although in 1836 Francisco Zuloaga established the first cannery in Oza, in the North Atlantic province of Coruña, the canning sector really took off in 1880, for the following reasons: Galician canners had the best olive oil, supplied by the Andalucian olive-growing companies; canning companies could count on relatively cheap tinplate – partly imported, partly produced in Spain – and, finally, Galician canners benefited from the Brittany fishing crisis in the 1880s. The absence of sardines in coastal France forced the French entrepreneurs to seek the raw material in Portugal and Galicia.[1]

Some French canners established factories on the Galician coast; others linked up with Galician salted fish entrepreneurs and formed mixed companies with qualified workers, technology, capital and a market for the canned products. The growth in the sector can be gauged by the number of factories and the export figures. The number of factories grew from six in 1880 to over a hundred in 1907.[2] In parallel with this, in the first decade of the twentieth century Galician canning exports attained a significant position, ahead of France, in the international market.[3] Galician canned products were exported to Europe, especially France, and to South America. At the same time, the canning industry drove forward technical changes in the fishing of sardines, the principal canned species. Furthermore, the canning industry adopted new techniques and greater mechanisation in the manufacturing in order to reduce costs and increase production. During this period Galicia became the principal canning region and Vigo one of the most important European canning cities, with a larger number of factories than Setúbal in Portugal, Douarnenez in France or even Stavanger in Norway.[4] The canning industry stimulated the growth of fishing, ice production, mechanical construction, commercial services, insurance services, etc. The demand for lithographic cans even gave rise to a new and hitherto unknown industry in Galicia: the metal graphic industry.

1. Metal graphic companies, technology and the labour market before the First World War

1.1. The first steps

Before 1890 the tinplate required by the Galician canning industry was either imported from England and France or bought from the domestic factories in Vizcaya. The lithographed tinplate arrived at the factories ready to be transformed into cans in the canning workshops called "de vacío". The biggest canneries would sell part of their can production to the smaller canneries. However, from the 1880s onwards two companies located on the Cantabrian Coast, the *Société de Cirages* in Santander and *Rochelt y Cia* in Bilbao, supplied lithographed tinplate to Galician canners.[5]

This activity started in Galicia in 1890 when the brothers José and Germán Suárez Pumarie-

ga, who had experience in the graphic arts, set up their first establishment, named *La Artística*, in La Coruña.[6] Later, the need for capital caused Germán Suárez to team up with Manuel Salgado Rosendo (1853-1910), a former emigrant who had returned from Cuba. In 1899, they formed the general partnership *Germán Suárez y Salgado*, a chromolithographic factory for stamping tinplate and paper and producing metal containers for all kinds of industries. The fish-canning industry was its principal market, and Vigo, as a great canning centre, stimulated can manufacturing companies.[7]

In 1900 José Suárez Pumariega went to Vigo to instigate the formation of a major canning group which in August of that year founded *La Metalúrgica* S.A.[8] This company produced lithographed tinplate and cans for the fish-canning industry, paper printed with the canneries' designs, etc. However, serious disagreements between the main shareholders prompted José Suárez Pumariega to start up his own company in 1903.[9]

Lithography was very important to the canning industry. Lithographed cans incorporated precise information about the product, such as origin, quality, and who the manufacturer was. All this information enabled the consumer to identify the product name and brand, elements that were intangible but essential to differentiate the product from those of competitors. Although canned products could also be wrapped in paper with a label or presented in a labelled cardboard box, the brand printed on the tinplate and, consequently, on the can was good marketing for the canner. As we mentioned before, from 1880 onwards French entrepreneurs were involved in the development of canneries. Galician canning companies imported French technology, labour, capital and marketing techniques, so that by the end of the nineteenth century brand and product name were very important elements if one was to be competitive in the international market.[10] The importance of those elements increased at the beginning of the twentieth century, when Galician canned products were more competitive than the French ones. Galician canners tried to boost the quality and marketing of their products through various public health measures such as the use of better raw materials for making cans.[11]

The rapid growth of the canning industry increased the demand for lithography, and so, in 1906, Germán Suárez, Salgado and Fadrique, the directors of *La Artística* at La Coruña, decided to establish a branch in Vigo. The competition between *La Artística* and *La Metalúrgica* held down the prices of lithographic products. In addition, the metal graphic companies had to contend with the following factors: firstly, from 1909 onwards, canners benefited from the extension of the *law permitting the temporary admission of imported tinplate*, and they demanded more stamped tinplate and used it in their own canning workshops instead of buying cans from the metal graphic companies. Secondly, the neighbouring country, Portugal, also had an extensive regime of temporary admission of imported tinplate, and its canning industry proved to be highly competitive in the international market. Thirdly, the sardine crisis began in 1909 and lasted up to 1913, leading to a considerable reduction in the demand for lithographic products and can manufacture. The crisis in the canning sector had a detrimental effect on the metal graphic sector.

Against this background, in 1910 the Suárez Pumariega brothers founded a lithographic factory in Oporto and decided to merge their Vigo companies. On the one hand, they tried to introduce their products into the Portuguese market and to prevent Portuguese competition in Galicia. On the other hand, they tried to increase their market power in Galicia, taking advantage of the difficulties being experienced by *La Metalúrgica*. This company tried to maintain its profits by reducing its workforce (from 64 in 1907 to 43 in 1910).[12]

By the end of 1910 the brothers *Hermanos Suárez, Salgado and Fadrique* had founded *La Artística. Manufacturas de hoja de lata* (tinplate). Table 1, based on the inventories of this company, shows that José Suárez Pumariega's company had a lithographic section and a canning workshop, while that of *Germán Suárez, Salgado y Fadrique* focused exclusively on lithogra-

phy. The new company had too much fixed capital investment in the lithographic section, and had to transfer some of the machinery to the new factory in Oporto (Portugal).

However, the can manufacturing section of *La Artística* was smaller than that of *La Metalúrgica* and could not compete with the canning workshops of the big canneries like that of José Curbera, which in 1912 employed eighty workers. *La Artística* expanded its activities and opened a new section to produce rubber for hermetically sealing cans. This, together with the purchase of new machinery, shows that the company was aware of the adoption of new techniques in can manufacture, such as the sanitary can.

Workshop	Value of assets	
	José Suárez Pumariega	Germán Suárez, Salgado and Fadrique S.R.C.
Lithographic workshop	63,250	128,401
Canning workshop	30,300	

Table 1 Value of assets provided by Suarez Pumariega and Suarez, Salgado and Fadrique to La Artística. *Manufacturas de hojalata* in 1910 (pesetas). (Source: AHLA – Historical Archive of La Artística, Inventories and Balance sheet, Book 1)

1.2. Technological change in metal graphic companies

In the period before the First World War, metal companies had similar characteristics to those established in other countries such as France or Portugal. They supplied canneries with the various raw materials for making cans, such as tinplate, lead, tin, bodies, can bottoms and tops or finished cans. The Galician fish-canning industry took up a great part of the can manufacturers' production, but they also produced different types of containers for biscuits, coffee, oil, pharmaceutical products, and so on.

While in North America can making moved from a craft to the 'American System of Manufacture' by the mid-nineteenth century, in southern Europe technological change became widespread during the first decades of the twentieth century. As a result, cans were no longer the product of a single individual responsible for their production from the sheet of tin-plated iron to the completed containers.

Labour was organised in two sections: lithography and can manufacture. Tinplate decoration took place in the lithographic workshops. In this section, workers designed, drew and printed the designs required by the canners and other customers. In the early days the lithographic printing was done by means of lithographic stones and aluminium or zinc plates used in lithographic machines such as Voirin or Koch presses, which were flat. The company *Suarez, Salgado y Fadrique* in Vigo adopted the 'Mann rotary press', which was far more productive.[13]

The production of cans took place either in the canning workshops or in the factories of can manufacturers. In both places the labour process was manual up to the end of the nineteenth century. Basically, cans were manufactured as follows: each part of the can was laboriously hand-cut from sheets of tin- plated iron. The body was shaped around a form, lapped and secured with lead solder. Tops, bottoms and caps were also cut with hand shears, and then skilfully soldered to the body to prevent air from entering the can.[14] Once bottoms and body were bonded, cans were ready to be used in the food processing plants.[15] This process relied on the dexterity of adult males. Therefore, in the first canning workshops there were no women and few teenage apprentices.[16] The adult male can makers were sometimes called 'iron knights' on account of their high wages and high bargaining power. They were the labor aristocracy, the 'aristocracy among the workers' in the canning and metal graphic industries.

Workshop	Value of assets
Lithographic workshop	51,489
Canning workshop	67,530

Table 2 Value of assets in *La Metalúrgica* S.A. in 1910 (pesetas). (Source: Inventories and Balance Sheet of La Metalúrgica, Book 1)

From the beginning of the twentieth century in Galicia, as in other southern European canning regions, trade unions existed in all canning towns and labour disputes were common. Strikes to improve labour conditions – working hours and wages – often occurred at the busiest time of the season.[17] Mechanisation was therefore welcomed by entrepreneurs in order to increase productivity and prevent strikes among can makers. For instance, the major Galician canners introduced presses, sealing and soldering machines.[18] The daily output of a welder was about six hundred cans per working day. This low productivity led to a bottleneck in the cannery production line, and had to be solved by technical change.[19]

Productivity increased greatly with the installation of new devices during the first years of the twentieth century, following the wave of technological change that took place in the USA in the last decades of the nineteenth century.[20] The major Galician canning companies imported the new technology from the USA and also from the principal European canning countries such as France and Norway. For instance, Curbera's company introduced American Bliss presses in 1900 and Massó's firm adopted the Norwegian sealing machines, Reinerts, when they began to be marketed around 1903.[21] Two years before, another important canner from Vigo, Barreras, accompanied the owner of the Société Générale Métallurgique on a business trip to Setúbal, an important Portuguese canning centre, to sell 'Asche soldering machines'.[22] The spread of technological change was gradual in Galicia, as in other canning regions. Workers' productivity increased relatively slowly at the beginning of the century, but grew rapidly between 1915 and 1920 due to the wider use of increasingly modern machines (Table 3).[23]

The canning sector has a dual structure: a first sector that concentrated a few large and modern companies which adopted new technologies from the beginning of the twentieth century, and a second sector made up of a great number of small canneries with short life expectancy and an inability to keep up with technological change.[24]

Year	1900	1904	1912	1920
Cans per day by worker	600	800/850	1,100	8,800

Table 3 Soldered cans by worker per working day in the canning workshop of Curbera's company in Vigo. (Sources: AHUSC, Curbera Collection, Curbera's Letters, nos. 124, 17-19, 1900; nos. 152, 289, 1903/4; Curbera's Daily production control book by worker and day, 1912; Curbera's Daily Book from can workshop, 1920)

1.3. The labour market under new technologies

Technological change in can manufacture led to the employment of women as a means of increasing the pace of work. Entrepreneurs pressed ahead with mechanisation in order to reduce the craftsmen's power, using female and child labour which was not unionised and was not under the protection of male adult trade unions.[25] Mechanisation in canning workshops did not imply a completely automated process. The first semi-mechanical machines were imported at the beginning of the twentieth century. They employed male adult labour. For instance, presses for printing and cutting tinplate were operated by a skilled worker called an 'oficial de máquina', helped by a child whose job it was to pass tinplate to the adult.[26] In this way, canning work-

shops started to employ females and children who worked with stamping presses which made can bottoms and tops that would be soldered by adult workers.[27] There was a skilled operator working with each machine and a teenager and a woman who performed service tasks – taking away the welded cans, bringing different parts of the cans to the machine – in order to speed up the work.

Metal graphic companies in Vigo adopted technological change as well as a new workforce. In fact, from the beginning of the twentieth century in La Metalúrgica, one of the main can manufacturers in Vigo, women, adolescents and children worked with various machines: presses for cutting and stamping, and mechanical scissors. The same trend in employment was also found in the canning workshops. In 1901, one factory inspector clearly described the employment of women and children: *'hay en ella mujeres y niños, estos en número de doce a trece de ambos sexos, cuyas edades varían de ocho a catorce años. A estas mujeres y niños se los dedica a servir las máquinas cortadoras y estampadoras.'* (There are women and children in the factory. The children, male and female, number thirteen and they are helpers. They help adults working on various machines, especially cutting and stamping presses; authors' translation).[28] Table 4 shows the division of labour in metal graphic factories. Male occupations were related to administration, mechanical work, lithography (designer, lithographer, printer, truck driver, stove controllers. Female occupations were related to can manufacture and the cleaning of cans. In the canning workshop, female work represented almost half of the total work. If we add child and adolescent labour it is possible to confirm that can production was no longer an activity performed by well-paid adult males.

Occupation	1905		1910	
	Workers	Wage (pesetas)	Workers	Wage (pesetas)
Office Work (M)	4	4.3	2	4.3
Watchman (M)	1	3.3	1	3.3
Warehouse (F)	2	3.25	2	3.4
Engine maintenance (M)	4	4.75	4	4.3
Drawing (M)	4	3.9	9	3.3
Lithography	8	3.7		
Carriers (M)	6	2.5	3	2.5
Stamping Tinplate (M)	5	5.6	4	6.5
Marking cans (F)	6	1.7	4	1.75
Collecting cans (F)	3	1.1	3	1.5
Stove controllers (M)	1	2.5	2	3.4
Carpenters (M)	3	3.1	2	3.12
Transport (M)	2	2.5		
Cleaning cans (M)	2	1.4		
Cleaning cans (F)	4	1.2		
Can manufacture (M)	6	2.3	3	4.0
Welder (M)	1	5.0	1	5.0
Welder (F)	1	1.6		
Can manufacture (F)	5	1.3	3	1.75
Total Male Workers	47		31	
Total Female Workers	21		12	
Total Workers	68		43	

Table 4 Workers and wages at *La Metalúrgica*. (Source: Historical Archive of Pontevedra, Balance sheet of *La Metalúrgica*)

Without any doubt, the founding of *La Metalúrgica* in Vigo was a consequence of the canners' decision to adopt and spread technological change. This decision was confirmed by the Spanish government in one fish-canning industry report: 'por fin en 1900 se instaló en Vigo, por iniciativa de varios industriales de aquella localidad, la primera fábrica con maquinaria adecuada para efectuar el cierre mecánico'. (In Vigo in 1900 a number of canners founded the first modern can manufacture with automatic soldering machines; authors' translation).[29] The inventory book of La Metalúrgica for the year 1903 did not list manual soldering devices, whereas it did include new machines for cutting, stamping, tin-plating, drifting, soldering, sealing, etc. These machines were imported from European and American machinery companies: Ewers, Soudage, Kargess, Bliss, Asche. The spread of technical change made it possible to introduce a division of labour and increase the employment of women and children in can-manufacturing plants. In the first years of the twentieth century Galicia, like other canning areas, adopted the sanitary can. This new can consisted of a tin cylinder with the ends rolled on by a seaming machine rather than being soldered in place. While rolled seams were not new, the key to the success of using them in can manufacturing included the application of a sealing compound which created a container that provided several advantages over earlier designs: sanitary cans were leakproof, they could be made, filled and sealed by machine, and they could be sealed and coated with a special paste to prevent the metal from leaving an unpleasant taste on the foodstuffs.

Many factors slowed down the spread of technological change: the multiplicity of containers and the labour disputes. Those factors were common in other Spanish canning areas such as Andalucia and also in the neighbouring countries, Portugal and France.[30] Firstly, workers' resistance to technological change slowed down mechanisation. Craftsmen did not want to lose privileges. Secondly, the different can shapes and sizes made it impossible to use only one type of machine.[31] On the one hand, the use of different-sized containers was a basic element of competition in the international market, since the demand for canned products was diverse and the use of different containers contributed to satisfying the demand from different types of customers. This fact has been pointed out by Martínez Carrión in relation to the vegetable canning industry.[32] On the other hand, this lack of standardisation made the mechanisation of can manufacture and the sealing of cans once they were filled with fish more difficult. Thus, canning companies had to keep a semiskilled workforce, the welders. But this group of organised workers were progressively replaced by machines operated by women and children in many phases of production and in the manufacture of certain formats.

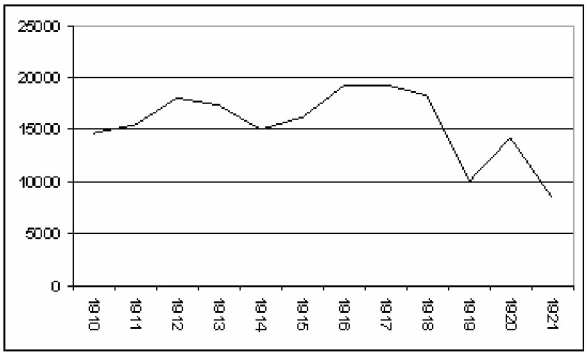
Although some writers have pointed out the active steps taken by the metal graphic companies to eliminate unionised labour, especially in France and Portugal, we think that in the Galician case *La Metalúrgica* and *La Artística* had only a limited role in spreading technical change, at least before the First World War. In fact, Galician canneries partially outsourced can manufacture. The great majority kept their canning workshops and bought containers either from the biggest fish-canning companies or from the metal graphic firms. In this way smaller and medium-sized canning companies avoided investing in machinery, that is to say, fixed capital and minimised their labour costs. At the same time, metal graphic companies benefited from the increase in the demand for cans.[33]

In any case, metal graphic companies produced cans not only for the fish-canning industry but also for any other products (olive oil, coffee, cakes, sweets, paprika, paint, etc.), in different shapes and sizes. This variety made it necessary to retain manual soldering. This is why all the inventory books of *La Metalúrgica* and *La Artística* showed semiautomatic machines and manual devices being used concurrently by men, women and children.

2. Making cans in the interwar years: From the First World War to the Spanish Civil War

2.1. The industrial difficulties in the First World War and the Twenties

The problems that adversely affected the metal graphic companies were similar to those of the canning sector: a rise in raw material prices (coal, tin, fish) and a scarcity of some materials such as tin and tinplate.[34] Up to 1916 metal graphic companies imported tinplate from England at high prices, which were translated into higher product prices. By the end of 1917, however, the situation had improved owing to the imposition of import quotas for tinplate from England and the United States.[35]



Spanish production of tinplate (tons). (Source: F. Mota, 'Historia de la industria española. La Fabricación de hojalata,' *Industria Conservera*, 1951: 167-168)

Altogether, the availability of tinplate was not a big problem, either for the canning industry or for the metal graphic industry. The two companies, *La Artística* and *La Metalúrgica* increased both production and employment. *La Metalúrgica* increased the number of its workers from 73 in 1916 to 109 in 1918. However, difficulties in the markets made it hard to get good quality tinplate and other materials such as ink, shellac, etc. All of that reduced the quality of the lithography, and in 1917 the company *La Metalúrgica* recognised that 'this gave rise to serious customer complaints that we had to sort out'.[36] Furthermore, the loss of quality affected the production costs and led to steep price rises. However, the main problem was to obtain tinplate: its origin and quality took second place.

Table 5 shows how tinplate prices increased during the First World War, reaching their peak in 1917. In this year two factors contributed to the rise in prices: First, good catches of sardines and the high demand for cans from the fish-canning industry; second, enormous difficulties in obtaining English tinplate when domestic production was insufficient. Throughout the following year, 1918, a better supply situation was reflected in a slowdown in prices.

Year	*La Artística*		*La Metalúrgica*	
	Pesetas	Boxes	Pesetas	Boxes
1914	44	100	43	100
1915	55	145	67	155
1916	85	193	68	158
1917	199	452		
1918	151	343		

Table 5 Price per box of tinplate in Vigo.[37] (Source: AHPP, Inventories and Balance sheets of *La Artística* and *La Metalúrgica*)

But this increase in the price of tinplate was not a big problem for the fish-canning industry because of the high demand for canned products on the international market and the good profits that the Spanish and Galician canning sector was making during the First World War.[38] In the context of the war, metal graphic companies benefited from the high demand for lithography and containers for the fish-canning industry. As can be seen in Table 6, metal graphic companies made large profits during the First World War.[39]

These profits were invested in the companies themselves, and there was a notable increase in assets as well as in productive capacity, as can be seen in Table 6. Which activities received the investment? Firstly, in *La Artística* all sections increased in size, but can manufacture was the biggest due to the use of new technology: cans were closed automatically using rubber instead of tin because the tin prices were high. In 1918, *La Artística*'s 'rubber factory' produced 35 tons of rubber for sealing cans.[40] The profits achieved by this company quadrupled between 1916 and 1918, and increased substantially in the following years (Table 7).

Secondly, the profits of both the metal graphic companies and the canneries were invested in the production of machinery in their own workshops. For instance, in 1916, *La Artística* started the production of semiautomatic and manual machines: scissors to cut rubber for hermetically sealing cans, can glueing machines, soldering and sealing machines, etc.

The mid-Twenties were difficult years for fishing and fishing-related activities. The fish canning industry and metal graphic industry suffered a crisis due to a shortage of sardines. The scarcity of sardines started in 1923, worsening in the following years when they almost disappeared from the Galician Coast. The catches of sardines recovered in 1927. This second sardine crisis forced the canning companies to process other fish such as tuna, anchovies, mackerel, and so on.[41] However, the fish canning companies' need of raw materials did not decline. In fact, there was an increase in the amount of tinplate brought into the port of Vigo.[42]

Metal graphic companies expanded their can manufacturing sections and diversified production to include corks for drink bottles, stoppers and boxes for pharmaceutical products. Also, the 'rubber factory' of *La Artística* sold its products to all Spanish and Portuguese canning regions and made a substantial profit of 600,000 pesetas between 1924 and 1926.

Year	*La Artística*		*La Metalúrgica*	
	Assets	Profits	Assets	Profit
1913	905,956	50,000	638,633	25,000
1914	1,060,622	0	614,403	25,000
1915	1,070,270	20,000	686,291	30,000
1916	1,162,429	80,000	747,519	107,783
1917	1,144,156	100,000	809,297	128,558
1918	1,473,245	200,000	788,277	166,276
1919	1,978,870	200,000	1,128,788	381,563

Table 6 Value of assets and profits of metal graphic companies in Vigo (pesetas). (Source: AHA – Historical Archive of the company *La Artística*, Books 1-3 Inventories and Balance Sheets; AHPP, Public Treasury Papers, Company Balance Sheets

Year	Profits (Pesetas)
1916	10,358
1917	32,076
1918	41,007
1919	25,206
1920	73,051

Table 7 Profits of La Artística's 'rubber factory.' (Source: AHA, Inventories and Balance Sheets, L-2)

Year	Tinplate in Vigo Port
1923	4,392
1924	7,065
1925	7,128
1926	5,929
1927	5,074

Table 8 Imports of tinplate in Vigo (tons). (Source: Unión de Entidades Viguesas, Los puertos nacionales de pesca en España. Aportación de Vigo al estudio del problema, Vigo, 1928: 26)

2.2. The acceleration and consolidation of technological change

The workforce of the metal graphic companies was modified as a consequence of the technological change that took place during the First World War and in the 1920s. In this way, by 1918 the workforce of *La Metalúrgica* changed from the way it was at the beginning of the twentieth century, as can be seen in Table 9.

Occupation	1905		1918	
	Workers	Wage (pesetas)	Workers	Wage (pesetas)
Office work (M)	4	4.3		
Watchman (M)	1	3.3		
Warehouse (F)	2	3.25		
Motor (M)	4	4.75	6	2,3
Drawing (M)	4	3.9	4	6.1
Lithography	8	3.7	3	3.3
Carriers (M)	6	2.5	4	3.25
Stamping tinplate (M)	5	5.6		
Marking cans (F)	6	1.7	7	2.0
Collecting cans (F)	3	1.1	5	1.5
Stove controllers (M)	1	2.5	4	4.0
Carpenters (M)	3	3.1	9	4.0
Transport (M)	2	2.5		
Cleaning cans (M)	2	1.4		
Cleaning cans (F)	4	1.2		
Can body makers (M)			5	1.0
Can body makers (F)			8	1.6
Welder (M)	1	5.0		
Welder (F)	1	1.6		
Mechanical scissors (M)			3	4.0
Mechanical scissors (F)			2	2.0
Presses (F)			4	1.75
Can glueing (F)			3	1.5
Can packing (M)			6	2.2
Can packing (F)			2	1.5
Can manufacture (M)	6	2.3	4	2.75
Can manufacture (F)	5	1.3	10	1.0
Total male workers	47		48	
Total female workers	21		41	
Total workers	68		89	

Table 9 Workers and wages at *La Metalúrgica*. (Source: Historical Archive of Pontevedra, Balance sheet of *La Metalúrgica*)

The proportion of women increased from thirty per cent in 1905 to fifty-one per cent in 1918. Some indications of mechanisation were the presses operated by women, the body-making machines worked by women and adolescents, the can glueing machines attended by women and the soldering machines operated by women and by teenagers of both sexes. Even in the skilled occupations such as lithographers, the company replaced skilled and adult workers with apprentices on a low wage. The lithographers who earned more in 1905 were no longer working for *La Metalúrgica*. Instead, the three lithographers in 1918 earned less than half of what the workers at the beginning of the century had earned. Furthermore, and most importantly, the number of craftsmen, unionised workers with great bargaining power, sharply declined. Thus entrepreneurs were relieved of an expensive and militant group of workers, and reduced their labour costs.

Furthermore, the composition of the workforce in the other metal graphic company studied, *La Artística*, underwent the same changes. In fact, the labour contracts made by *La Artística* in those years are not only an indicator of the excellent behaviour of this company but also of the changes in the labour market.

If more women were taken on by the company between 1910 and 1920, during the Twenties the number of women was practically three times the number of men (Table 10). Furthermore, adolescents made up 35 per cent in the first period, while in the second period they represented 50 per cent. The women were single and young, under twenty years old.[43] However, the company did employ a few married women – women who had experience from working for other companies, especially in canning workshops. There was not a clear gender and age structure either in canning workshops or in metal graphic companies. In fact, canneries recruited female and child labour according to the labour available, wages and dexterity. The main categories are indicated in Table 11.

Contracts	1910-1920		1920-1930	
	Number	Percentage	Number	Percentage
Men	37	45%	100	27%
Women	45	55%	272	73%
Total	82	100%	372	100%

Table 10 Labour contracts issued by the company *La Artística*. (Source: AHA, Workforce payrolls, 1920-1930)

Machines	Gender of Workers
Presses	Adult Male and Female
Can glueing machines	Adult Female
Machines for soldering bodies	Adult Female and Male Teenagers
Machines for making can edges	Adult Female and Male Teenagers
Welding machines	Adult Female
Automatic sealing machines	Adult Female

Table 11 Gender and machines in can manufacture *La Artística*. (Source: AHA, Workforce payrolls)

During the 1920s, in metal graphic companies as well as in canning workshops, female and adolescents became the main workforce and the skilled can makers almost disappeared. With the spread of new technologies, women could operate different kind of machines after an inexpensive and short period of informal 'on-the-job training' and craftsmen lost their control of the

production process and of their bargaining power.[44] Entrepreneurs were interested in reducing labour costs and retained wage differentials by gender, as shown in Table 12.

Section	Occupation	Daily wage
Lithographic workshop	Female occupations	
	Lithographer	5.0
	Marking tinplate	3.0
	Male occupations	
	Lithographer	6.0
	Machinist	5.0
	Apprentice	2.0
Can workshop	Female occupations	
	Welder	3.0
	Stamping press	2.75
	Apprentice	1.65
	Drifting machine	2.5
	Can glueing	2.5
	Can checking	2.5
	Assistant	1.75
	Male occupations	
	Welder	4.5
	Stamping press	3.0
	Apprentice	2.0
	Tinsmith	9.0
	Mechanic	10.0

Female wage as a percentage of male wage: 30%

Table 12 Daily wages in the can manufactures of *La Artística*, 1920. (Source: AHA, Workforce payrolls of *La Artística*, 1920-1950)

Can manufacturers maintained wage discrimination by gender in order to have a cheap, skilful and disciplined female labour force. Although men and women worked with the same types of machines – presses, stamping presses, welding machines – and had the same occupation, men were better paid than women (Table 12). It is not possible to know the rates of productivity per worker, but interviews with workers show that women produced the same number of cans as men did, but received lower wages. One female worker said: *'la mujer siempre ganaba menos aún haciendo lo mismo. Siempre había alguna protesta, pero esto estaba así y no había nada que hacer.'* (Women earned less than men doing the same task. Women always protested about it, but there was no solution to this problem; authors' translation).[45] One man said: *'en las prensas troquelando había algunos hombres y en este caso ganaban más que las mujeres.'* (If men worked with the stamping presses, they earned more than women; authors' translation).[46] Women learned to make can bodies quickly and skilfully.

The best-paid male occupations were those of the tinsmith, who remedied faulty cans, and the mechanic, the person who repaired the machines in the workshop. There used to be one or two tinsmiths and mechanics.[47] The other male occupations – operating presses and stamping presses – were semiskilled, but in any case men were better paid than women for no reason other than pure gender discrimination. There was gender discrimination with regard to the adolescents, too, with male apprentices earning more than female ones.

To sum up, the introduction of new technology generated female semiskilled positions linked to the new machinery indicated in Table 12 (stamping presses, drifting machines, soldering machines, etc.), and the new workforce did not have control over the production process, nor the bargaining power that the craftsmen had had in the past. Thus this docile, cheap and non-unionised labour contributed to the growth of the can manufacturing sector throughout the nineteen-twenties.[48]

3. Conclusions

From the 1880s onwards the growth of the fish canning industry in Galicia gave rise to various other activities, among them the metal graphic industry. This activity was located in Vigo, the main Spanish industrial canning centre. During the early stages, from 1880 to the First World War, this industry focused on lithography to meet the demand of the canning companies. Each canner needed to identify its products and to differentiate them from those of its competitors by using its own brand. Can manufacture became largely an activity of the canning companies themselves. The spread of open-top can production was relatively slow in this period. However, the new technology caused changes in the labour market: the craftsmen started to be replaced by women and children who operated some of the new machines (presses, deep drawing machines, soldering and sealing machines).

During the First World War, despite all the problems arising from the scarcity and high prices of raw materials, both the canning and the metal graphic companies achieved substantial profits. They invested within the companies that expanded their can manufacturing sections and started to produce machinery for the fish-canning industry. Technological change intensified during the war years and throughout the 1920s with the rapid spread of the open-top can. At the same time, the number of manual welders declined, substantially increasing the number of women and children, a cheap and non-unionised labour force.

The technological change that had started by the beginning of the twentieth century, had accelerated in the 1910s and was consolidated in the 1920s, brought about the formation of a workforce structure that was very different from that which had existed when can manufacturing began. In the years before the Spanish Civil War the process of mechanisation was completed, as was the feminisation of the labour market. The metal graphic companies became the main suppliers to the fish-canning firms that outsourced the production of cans. In this way, Galician canners reduced their production costs by eliminating their canning workshops, except for the biggest firms, which kept them. The metal graphic companies not only produced tin for the fish canning industry, but also provided the canneries with lithography, rubber rings for hermetically sealing cans, tin for solder, etc. To sum up, during the first third of the twentieth century metal graphic firms became a key factor in the development of, and competition within, the fish-canning industry.

Notes:

1 André Marie D'Avigneau, *L´industrie des conserves de poissons en France métropolitaine,* Ph.D. dissertation, (Rennes, 1958).

2 Xan Carmona Badía, *Producción textil rural y actividades marítimo-pesqueiras en Galiza, 1750-1905,* Ph.D. dissertation (Santiago de Compostela, 1983).

3 France monopolised the international market in the last decade of the nineteenth century. Carmona, *Producción textil rural y actividades marítimo-pesqueiras.*

4 Xan Carmona Badía and Jordi Nadal, *El empeño industrial de Galicia. 250 años de historia, 1750-2000* (A Coruña, 2005): 134.

5 On the development of metal graphic companies see Concepción Lidón Martínez, *La litografía industrial en el norte de España de 1800 a 1950. Aspectos históricos, estéticos y técnicos* (Gijón, 2005); José Ignacio Homobono, 'Las con-

servas de pescado en el País Vasco,' in José Ignacio Homobono (ed.), *Conservas de pescado y Litografía en el Litoral Cantábrico* (Madrid, 1992): 11-61.

6 Ana Romero Masiá and Carlos Pereira Andrés, *O orballo da igualdade. Asociacionismo femenino progresista na cidade da Coruña* (A Coruña, 2005): 64-68; Lidón, *La litografía industrial:* 121.

7 Registro de Sociedades de La Coruña, Libro 11, fol. 287.

8 *Revista de Pesca Marítima* (Madrid, 1900): 332-334; Carmona and Nadal, *El empeño industrial:* 152.

9 Archivo Historico Provincial de Pontevedra (hereafter AHPP), Matricula Industrial de Vigo, 1903.

10 Carmona, *Producción textil rural.*

11 Xavier Dubois, *La revolution sardinière. Pêcheurs et conserveurs en Bretagne Sud au XIXe siècle* (Rennes, 2005): 283.

12 AHPP, Hacienda, Balances de Sociedades, Leg. G-8671 and G-8672; Registro de Sociedades de La Coruña, Libro 2, fol. 36.

13 Lidón, *La litografía industrial* 121; Romero and Pereira, *O orballo da igualdade:* 66-67.

14 William McCauly, *The History of the canning industry in Delaware,* Ph.D. dissertation (Delaware, 1961); Luisa Muñoz, *Los mercados de trabajo en las industrias marítimas de Galicia. Una perspectiva histórica, 1870-1936,* Ph.D. dissertation (Barcelona, 2002).

15 Muñoz, *Los mercados de trabajo.*

16 Muñoz, *Los mercados de trabajo.*

17 Archivo Histórico de Galicia, (hereafter ARG), Serie Gobierno Civil. Asociaciones profesionales, sindicatos y partidos políticos, Diversos expedientes; Exp.4, Leg. 1801. On welders in Norway see J. Jorg Hviding, *The Race for Seaming Machine* (Stavanger, 1994); for France Hubert Ouizille, *Les conditions économiques actuelles des industries sardinières française et portugaise,* Ph.D. dissertation (Paris, 1926); for Portugal Vasco Pulido Valente, 'Os conserveiros de Setúbal (1881-1901)', *Análise Social,* 18:3-4 (1981): 615-678; for the United States Martin Brown and Peter Phillips, 'The Historical Origin of Job Ladders in the US Canning Industry and their Effects on the Gender Division of Labour,' *Cambridge Journal of Economics* 10 (1986): 129-145; for Canada, Cicely Lyons, Salmon: *Our Heritage, the Story of a Province and an Industry* (Vancouver, 1969).

18 Xan Carmona, 'Recursos, organización y tecnología en el crecimiento de la industria española de conservas de pescado, 1900-1936' in Jordi Nadal and Jordi Catalá, *La Cara oculta de la industrialización en España. La modernización de los sectores no líderes* (Madrid, 1994): 127-162.

19 Archivo Histórico de Curbera (hereafter AHC), Copiador de cartas de Curbera, nº 124, Año 1900, Fol. 17-19, 12/5/1900.

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21 Carmona, 'Recursos, organización y tecnología:' 127-162; Luisa Muñoz, 'Labour Market in the Spanish Fish-Canning Industry, 1880-1977: Labour Contracts and Work Organization,' *International Journal of Maritime History,* 17:2 (2005): 211-230.

22 Pulido Valente, Os conserveiros de Setúbal: 615-678.

23 Muñoz, *Los mercados de trabajo;* Muñoz, 'Labour Market:' 211-230.

24 Muñoz, *Los mercados de trabajo;* Muñoz, 'Labour Market:' 211-230.

25 Muñoz, *Los mercados de trabajo,* Muñoz, 'Labour Market:' 211-230. On the American canning industry see Brown and Phillips, 'The historical origin of job ladders in the US canning industry:' 129-145; for France Martin Saint-León et Léon de Seilhac, *La crise sardinière.*

26 Muñoz, *Los mercados de trabajo.*

27 Muñoz, *Los mercados de trabajo.*

28 Archivo Histórico de Vigo (hereafter AMV), Reformas Sociales, Trab. 2, 'Expediente formado para comprobar las denuncias publicadas acerca de como se trata a niños menores de 14 años en las fábricas de conserva'. Expediente 'Resultado de las visitas de Inspección giradas a las fábricas y los talleres abajo expresados', 1901.

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32 Jose Miguel Martínez Carrión, 'Formación y desarrollo de la industria de conservas vegetales en España, 1850-1935' *Revista de Historia Económica* 7:3 (1989): 619-649.
33 Carmona, 'Recursos, organización y tecnología:' 127-162.
34 *Gaceta de Madrid*, 6-VI-1918; 9-VIII-1918 and 26-IX-1918.
35 Carmona, 'Recursos, organización y tecnología:' 127-162.
36 AHPP, Fondos de Hacienda, Balances de Sociedades, Leg. G-8676.
37 It is necessary to point out that in 1914 the boxes contained 112 tinplate leaves that measured 710 x 515 mm and that each box weighed 170 pounds. From 1915 to 1917 the tinplates leaves measured 710 x 508 mm. However, the price in 1918 refers to a box with a weight of 136 pounds.
38 Carmona, 'Recursos, organización y tecnología:' 127-162.
39 Jesús Mirás, 'El impacto de la Primera Guerra Mundial en la industria de A Coruña', *Revista de Historia Industrial*, 29 (2005): 143-165.
40 Instituto de Reformas Sociales, *Informes de los inspectores de trabajo sobre la influencia de la guerra europea en las industrias españolas (1917-1918)*, (Madrid, 1919), Vol. 2.
41 Jesús Giráldez, *Crecimiento y transformación del sector pesquero gallego (1880-1936)* (Madrid, 1996).
42 Carmona, 'Recursos, organización y tecnología:' 127-162.
43 Luisa Muñoz, 'Hombres, mujeres y latas: La segmentación laboral en la industria de conservas de pescado,' in Carmen Sarasúa and Lina Gálvez (eds.), *Mujeres y hombres en los mercados de trabajo ¿Privilegios o eficiencia?* (Alicante, 2003): 279-307.
44 Brown and Phillips, 'The historical origin of job ladders in the US canning industry:' 129-145.
45 Interviews with *La Artística* workers, August 2003.
46 Interviews with *La Artística* workers, August 2003.
47 Interviews with *La Artística* workers, August 2003.
48 Muñoz, 'Hombres, mujeres y latas:' 279-307.

Acknowledgement:
This article was fiancially supported by the research project SEJ 2004/07130 'Economic Growth in Galicia during the Twentieth Century,' Secretaría de Estado de Universidades e Investigación, Ministerio de Educación y Ciencia.

Die Konservenherstellung in der Fischkonservenindustrie. Ein Erfahrungsbericht aus Galizien (1880-1936)

Zusammenfassung

Galizien galt im 19. Jahrhundert traditionsgemäß als eine wichtige Region für die Produktion von gesalzenen Sardinen. Obwohl Francisco Zuloaga bereits 1836 die erste Konservenfabrik in Oza gründete, gehen die offiziellen Anfänge der Konservenfabrikation auf das Jahr 1880 in die Nordatlantische Provinz Coruña zurück. Dies lässt sich folgendermaßen erklären: Die galizischen Konservenfabrikateure besaßen nicht nur das beste Olivenöl, das direkt von den andalusischen Olivenanbau-Betrieben angeliefert wurde, sondern es wurde außerdem in den Konservenfabriken relativ günstiges Weißblech verarbeitet – teils importiert, teils in Spanien produziert –, und letztlich profitierten die galizischen Konservenfabrikanten von der Fischereikrise der Bretagne im Jahr 1880. Der Mangel an Sardinen in Frankreichs Küstengewässern

zwang die französischen Unternehmer dazu, den Rohstoff aus Portugal und Galizien zu beschaffen.

Einige französische Fabrikanten errichteten Fabriken an der galizischen Küste; andere fusionierten mit galizischen Unternehmen, die sich auf gesalzenen Fisch spezialisiert hatten, und so entstanden Mischunternehmen mit qualifizierten Arbeitskräften, der entsprechenden Technologie, Kapital und einem Markt für die Produkte aus der Konservenfabrikation. Das Wachstum in diesem Sektor lässt sich an der Anzahl der Fabriken und Exporte festmachen. Die Zahl der Fabriken stieg von sechs im Jahre 1880 auf mehr als einhundert im Jahr 1907 an. Ähnlich erfolgreich entwickelten sich die Exportzahlen. In der ersten Dekade des 20. Jahrhunderts nahmen die galizischen Konservenexporte einen bemerkenswerten Stellenwert im internationalen Markt ein, der sogar den Frankreichs überstieg. Die galizische Konservenproduktion wurde nach Europa exportiert, im Besonderen nach Frankreich und Südamerika. Zur gleichen Zeit trieb die Konservenindustrie den technischen Fortschritt in der Sardinenfischerei an, der Fischspezies, die von allen am häufigsten in Dosen konserviert wurde. Außerdem führte die Konservenindustrie neue technische und maschinelle Verfahren für die Dosenfabrikation ein, um die Kosten reduzieren und die Produktionserzeugnisse steigern zu können. In jenen Tagen wurde Galizien die wichtigste Region für die Konservenfabrikation, und Vigo wurde mit einer größeren Anzahl an Fabriken als Setúbal in Portugal, Douarnenez in Frankreich oder sogar Stavanger in Norwegen eine der bedeutendsten europäischen Städte der Konservenfabrikation. Die Konservenindustrie trieb nicht nur das Wachstum der Fischerei, die Eisproduktion oder die Entwicklung mechanischer Anlagen an, sondern sie unterstützte auch den Dienstleistungssektor, Versicherungen etc., die unter dem Druck der Konservenindustrie entstanden waren. Es ist gerade die Nachfrage nach lithographisch bedruckten Dosen, die eine neue und unbekannte Industrie in Galizien hervorbrachte: die des Gravierens von Metall.

La fabrication des conserves dans l'industrie poissonnière. Un témoignage de Galice (1880-1936)

Résumé

La Galice, traditionnellement, passait au XIX^{e} siècle pour une région importante de production de sardines salées. Bien que la première conserverie à Oza ait déjà été fondée en 1836 par Francisco Zuloaga, les débuts officiels de la fabrication des conserves remontent à 1880, dans la province de Corogne au nord-ouest de l'Espagne. Ceci peut s'expliquer de la façon suivante: les fabricants de conserves galiciens possédaient non seulement la meilleure huile d'olive, livrée directement depuis les plantations et huileries andalouses, mais le fer-blanc employé dans les conserveries était aussi relativement bon marché – en partie importé, en partie produit en Espagne, et pour finir, les producteurs de conserves galiciens profitaient de la crise poissonnière sévissant en Bretagne en 1880. La pénurie de sardines dans les eaux côtières françaises forçait les entreprises françaises à se procurer de la matière première au Portugal et en Galice.

Quelques fabricants français érigèrent des usines sur la côte de la Galice; d'autres fusionnèrent avec des entreprises galiciennes qui s'étaient spécialisées dans le poisson salé et on vit ainsi apparaître des entreprises mixtes avec des ouvriers qualifiés, une technologie correspondante, un capital et un marché pour les produits de la fabrication des conserves. Grâce au nombre des usines et aux chiffres de l'exportation, la croissance dans ce secteur peut être déterminé. Le

nombre des usines grimpa de six en 1880 à plus de cent en 1907, les chiffres de l'exportation se développant de la même manière. Au cours de la première décennie du vingtième siècle, les exportations de conserves galiciennes occupèrent une place remarquable sur le marché international, qui dépassa même celle de la France. La production de conserves en provenance de Galice était exportée en Europe, en particulier vers la France et l'Amérique du Sud. À la même époque, l'industrie des conserves fit avancer le progrès technique dans la pêche à la sardine, de toutes les espèces de poissons, celle qui était le plus souvent mise en boîte. L'industrie des conserves introduisit en outre de nouveaux procédés techniques et mécaniques dans la fabrication des conserves afin de réduire les frais et d'augmenter la production. La Galice devint à cette époque la plus importante région de fabrication des conserves et Vigo, avec un nombre d'usines plus élevé qu'à Setúbal au Portugal, Douarnenez en France ou même Stavanger en Norvège, devint l'une des plus importantes villes d'Europe pour la fabrication des conserves. Non seulement l'industrie de la conserve entraînait la croissance de la pêche, de la production de glace ou le développement d'installations mécaniques, mais elle soutenait également le secteur des prestations de services, des assurances, etc., qui avait vu le jour sous la pression de l'industrie des conserves. C'est justement la demande de boîtes gravées qui développa une nouvelle industrie, jusqu'alors inconnue en Galice, celle de la gravure sur métal.