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Paper proposal:

"The Spanish backwardness in the participation of rail in globalized intermodal freight traffic: from around 1960 to the present day".

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ABSTRACT:

Historically, the Spanish railway succumbed to the strong competition of the road, since, clearly pointing out immediately before the Spanish Civil War, the lorry overtook it since the 50s of the 20thcentury, with the explosive acceleration of the motorization of the population and the transport of goods by road.

This growing disadvantage of the Spanish railway compared to road transport became more acute when the generalization of freight containers in international maritime traffic made the intermodal organization of transport and its logistics necessary, both worldwide and in the European context, since the last quarter of the last century.

The relative participation of Spanish railways in this intermodal freight transport system is increasingly poor in comparison with the participation of the national railway systems of many European countries.

After comparing the historic available statistics, the paper proposes an interpretation of the causes of this deep divergence and its consequences.

Paper:

"The Spanish backwardness in railway participation in globalised intermodal freight traffic: from c.1960 to the present day."

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1.- Introduction: the containerisation of general cargo transports

If the first wave of globalisation in the 1870s was driven by the telegraph, the railway and maritime transport, the one derived from the Second Industrial Breakthrough in the last quarter of the 20th century, with its key technological changes (the computer, the robot and the comsat), the networked companies and the new flexible organisation of work (Valdaliso & López, 2007, pp. 419-426) was possible thanks to the radical transformation of the globalisation of the transport of goods. 419-426) was made possible by the radical transformation brought about by the explosive generalisation of the use of the standardised container, which will radically affect the traditional modes of freight transport: sea, rail and road.

It is generally acknowledged that "historians' neglect of road transport" stems from the relative paucity of historical evidence in comparison with canals and railways (Barker & Gerhold, 1993, p. 11). Perhaps, too, the still limited attention of historians to the containerisation of global freight traffic has something to do with this neglect, given the majority use of road for the overland transport of global maritime container traffic. This may explain why the master Aldcroft, in 1976, did not name the container among the protagonists of the "Revolution of the 20th century" in the new chapter of the History of Transport (Aldcroft, 1976), although the same author had written, three years earlier, the review of one of the first books on the economics of containerisation, that of Jhonson and Garnett in 1971 (Aldcroft, 1973). A search for the term "container" and "Containerisation" in the JTH summaries yields just one more review, in this case of Matthew Heins' important 2016 work (Harcourt, 2017). A few other articles, especially on port history, refer to this revolutionary phenomenon.

While the use of some form of freight container is much earlier (White, 1988), 1956 is usually considered as the point out year in the history of the modern container. In that year, if not the only, then the pioneering year that reached the largest scale, the owner of the *McLean Trucking company* in North Carolina put an idea into practice: On 23 April 1956, Malcom McLean managed, with some modification to the deck of the oil tanker *Ideal X*, to fit 58 loaded truck trailers, thus becoming the first general cargo containers to travel from the port of Newark in New Jersey to the port of Houston in Texas. After sailing six days on this journey, the 58 trailers were unloaded and hitched to truck tractor cabs that took them to their final land destinations. Having purchased a small shipping

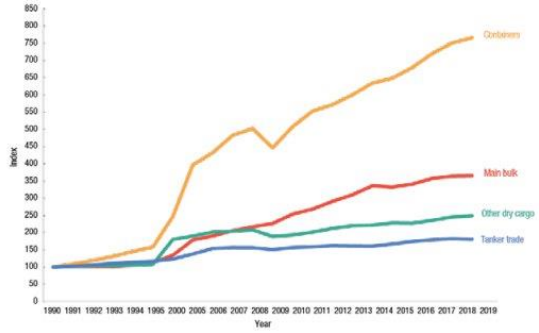
company in 1955, he converted it the following year into the *Pan Atlantic Sea-Land Service*. This company, in 1957, converted a World War II-built C-2 class freighter into the *Gateway City*, making it capable of carrying 226 of the same type of trailer loads in the *Ideal X*, which was soon joined by six other similar ships, expanding the company's operations to Puerto Rico in 1958, and to the West Coast of the United States via the Panama Canal in 1962 and, in 1966, its ship, *Fairland*, also a converted C-2, sailed from New York to the English Channel in Europe. At the end of the same decade and taking advantage of the material needs of American troops in Vietnam, the Pan Atlantic organised a triangular trade, sending military supplies from the West Coast to Vietnam, and from there, sailing to Japan and Hong Kong, returning with commercial cargo from Asia to North America (Cudahy, 2006) (Cudahy, 2006). Soon, and early on, other companies joined in, such as the *U.S. Freight Co*, which in 1960 also began moving containers between the U.S.A. and Japan. (Levinson, 2006, p. 159) (Button, 2001), prior standardisation of containers was necessary. Without such standardisation, each company, like the two mentioned above, behaved as a closed system: its own containers, even if they also travelled by rail or road, were transported exclusively by its own ships. (Heins, 2013, p. 19).

With discussions beginning in 1958, it was in 1961 that the *American Standards Association* (the ASA, later renamed the *American National Standards Institute* or ANSI) announced the first standardisation of containers, with measurements of 8 feett height - 2.4384 m - and 10, 20, 30 and 40 feet long - 3.048 m, 6.096 m, 9.144 m and 12.192 m, respectively). Shortly afterwards, the *International Organization for Standardization* (ISO), with the aim of standardising containers throughout the world, began work in Committee TC-104 and in 1967 established the same measurements as the ASA. From then on, the international majority would be 20 feet and, increasingly, 40 feet, both initially 8 feet high, but which in 1969 was also extended to 8 feet 6 inches (2.5908 m).

The existence of these global ISO standards gave shipping lines, port authorities and infrastructure administrations the confidence to plan and budget investments. Thus, by commissioning ever larger container-only ships, redefining and extending port facilities for the growing volume and movement of containers and intensifying and diversifying their inland access routes to the facilities, the global freight market was revolutionised from the 1980s onwards. The latter was exactly what globalisation - innovations in company organisation and the generalisation of just in time - needed. (Heins, 2013, pp. 20-30).

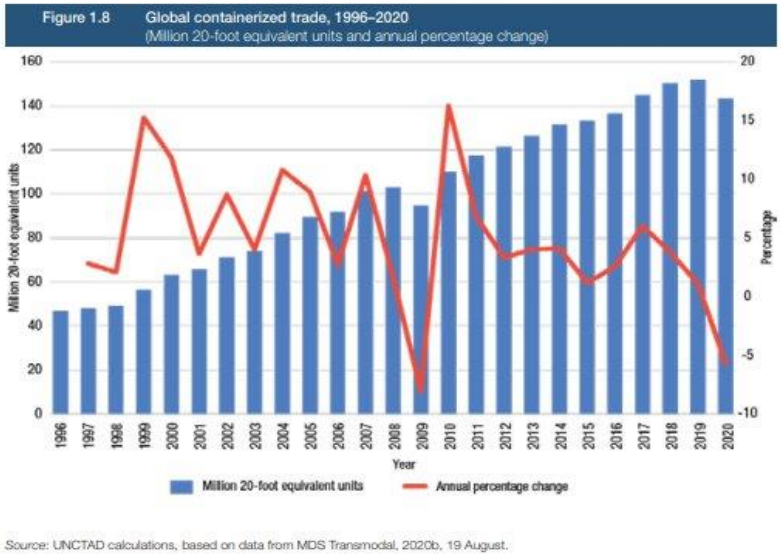
Illustrations 1 and 2 depict this spectacular growth:

Figure 1: Global maritime traffic by type of cargo



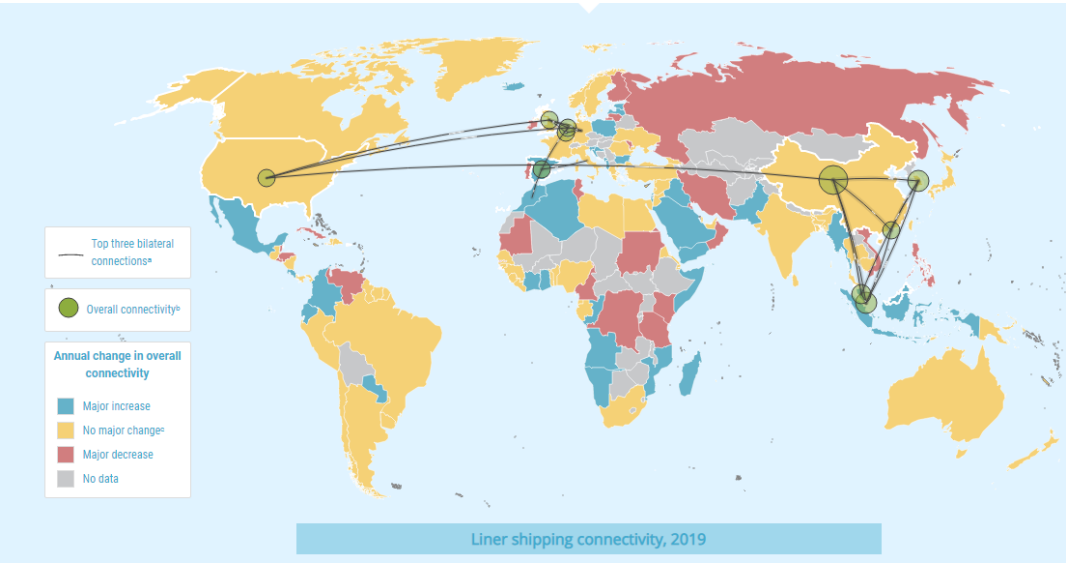
Source: UNCTAD (2020), Review of Maritime Transport, Figure 1.5.

Figure 2:Global Containerised Traffic 1996-2020 (millions of TE's)



The interactive map of the UNTACTD e_Hanbook of Statistics 2020 shows the main global maritime connections. Spanish ports stand out in all parameters, with a global connectivity index of 89.30, slightly below the USA, the Netherlands / Belgium and the United Kingdom (between 89-92) compared to the four major eastern connected hubs of China, Hong Kong, Korea and Singapore all above 100. [1]

Figure 3: Current maritime connectivities



This connectivity is mainly through large superports. Lloyd's lists are often the basis of the data, including for UNCTAD. Table 1 provides information on some of these European ports, ranked in order of importance among the top 100 global ports:

1

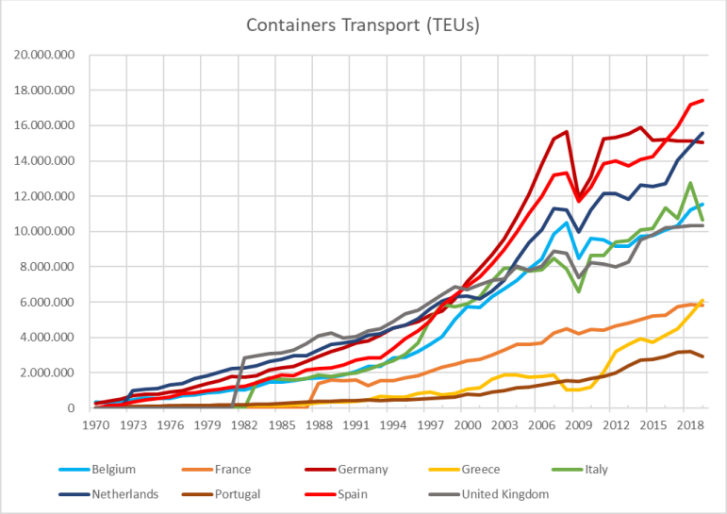
Table 1: Traffic of major European ports in the 2015 ranking of the top 100 global ports in container traffic.

PORT	TOTAL CARGO 2008	TOTAL CARGO 2015	CONTAINER TRAFFIC 2008	CONTAINER TRAFFIC 2015
11-Rotterdam (NL)	421,1	466,4	10,8	12,2
14-Antwerp (B)	189,4	208,4	8,7	9,7
17-Hamburg (D)	140,4	137,8	9,7	8,8
24-Bremen (D)	74,6	73,4	5,5	5,5
28-Valencia (SP)	59,4	69,6	3,6	4,6
29-Algeciras (SP)	69,6	92,0	3,3	4,5
36-Fellxstowe (UK)	n.d	n.d	3,3	3,7
38-Gioia Tauro (I)	34,4	n.d	3,5	3,5
39-Pireus (GR)	n.d.	n.d	0,7	3,4
54 Le Havre (F)	80,5	68,3	2,5	2,6
58-Southampton (UK)	41,0	n.d	1,4	2,3
62-Genoa (I)	54,2	51,3	1,8	2,2
68-Barcelona (SP)	50,54	45,9	2,6	2,0
113-Bilbao (SP)	38,0	n.d.	0,6	0,6

Source: AAPA. Port Industry Statistics. https://www.aapa-ports.org/unifying/content.aspx?ItemNumber=21048 . Except for Bilbao (113th in 2008 in Total Cargo).
Note: Figures in millions of Tons (Total Cargo) and millions of TEUs (Container Traffic). Own elaboration

The evolution of container traffic in the European countries where the above ports are located - substituting Ireland for Portugal in honour of the venue of this Congress - is shown in Illustration 4:

Illustration 4: Containers Sea Transport in some European States

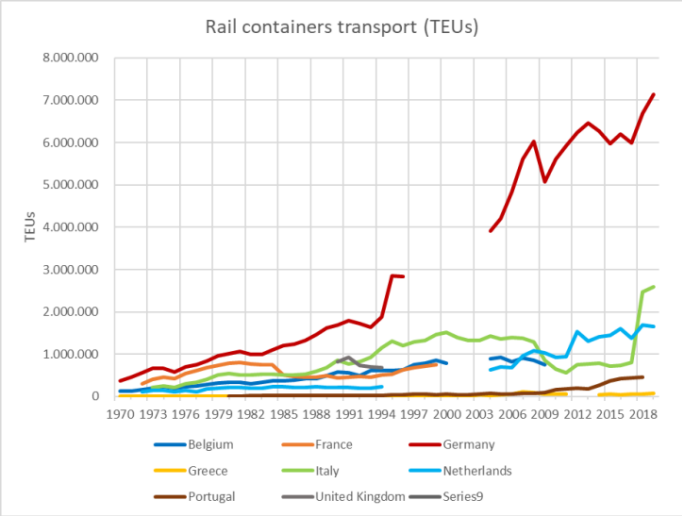


Source: OECD: OECDESTat, Metadata. Own elaboration

Many of these containers arriving from overseas are transferred to other ships, directly or indirectly, and continue to be transported by sea to other destinations. But some of them contain goods for the interior of the country (land transport and coastal shipping) or are moved by land transport and Ro-Ro ships to other European destinations. And with the same means of transport, the goods will arrive at the port to be shipped to

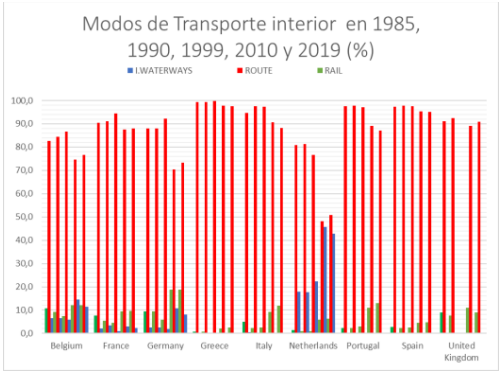
other ports. For this transport, both road and rail, the available statistics are relatively scarce. One of the few available series is Figure 5, which does not include Spain. Somewhat more abundant are those on the distribution by mode of inland freight traffic in the EU, as shown in Figure 6, where the predominance of road is overwhelming, only tempered in the Netherlands and Belgium by the importance of their inland waterways, with some incidence also in Germany and France. Rail, as opposed to lorries, is very much in the minority. In the last decades of the 20th century, the share of rail has declined steadily in all the countries listed, even among the few that accounted for around 10% (Belgium, Germany, the UK and, to a lesser extent, France). However, in the last two decades, and with the rise of container and lorry transport by rail, as shown in Figure 5, Germany has approached 20% and Belgium, France and the UK are around 10%, with Italy and Portugal also joining the club. Spain, which did not reach 3% in the early periods, although also growing in the 21st century, still does not reach 5%. We will analyse the latter and its causes more in the following sections.

Illustration 5: Rail containers transport (TEUs) in some Eueropean States



Source: Eustat. Own elaboration

Illustration 6: Inland Transport Modes %



Source: European Commission, Panorama of Transport, 2003, for 20th century cuts and Eustat, Modal split of freight transport [T2020_RK320]. Own elaboration

2.- The Spanish port system and the container revolution.

Spain has 7,661 km of coastline. For the purposes of this work, although the previous figure is reduced by not considering the Balearic and Canary Islands or Ceuta and Melilla, peninsular Spain still has 4,830 km of maritime coastline. The port network is therefore very extensive, although of very unequal significance, both in historical and current terms. In fact, as shown in Table 1, only two Spanish ports are among the 50 largest in the world in terms of container traffic.

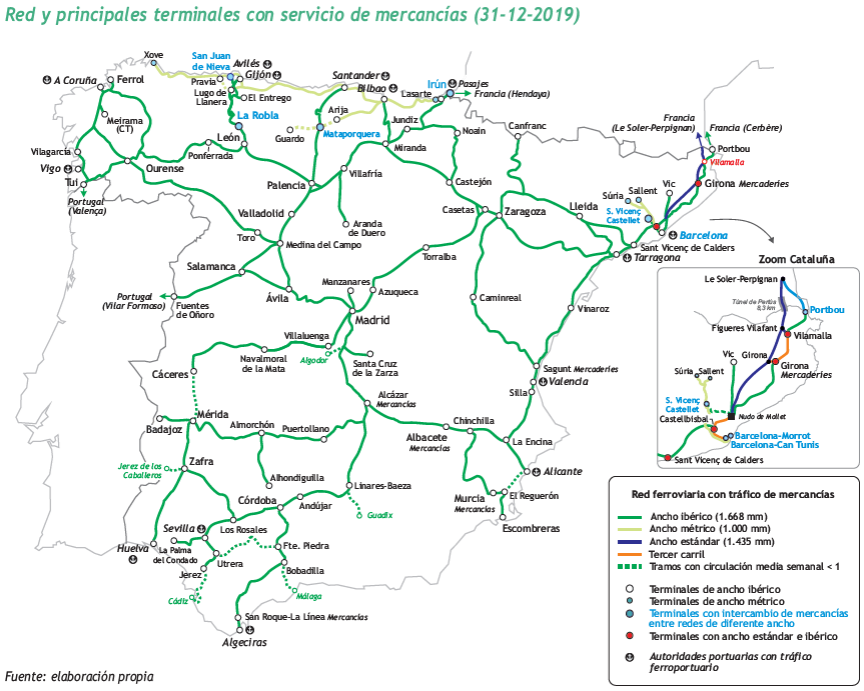
The development of commercial activities since the Middle Ages and especially since the 16th century with the overseas expansion, a handful of Mediterranean and Atlantic ports, managed by consulates and local government boards, already stood out above the rest. From 1851, with the transfer to "Fomento", the "ports of general interest" began to be distinguished from the others - local, refuge, fishing, etc. -. The First Industrialisation, the irruption of the railway in the 19th century and the radial characteristic of the Spanish network would provoke the growth of the majority of the previous ones and the emergence of some other large ports in Peninsular Spain, with the administrative structure of the "Juntas de Obras del Puerto" which would be sanctioned by the Ports Law of 1860 was in force, with modifications, until Law 27/1992, of 24 November on State Ports and the Merchant Navy, later modified by Law 62/1997, of 26 December. (Hernández Marco, 1997), (Hernández Marco, 1999), (Rueda, Sazatornil, & Delgado, 2008), (Ruiz Romero de la Cruz, 2004). Subsequent modifications with the laws 48/2003, of 26th November, on the economic regime and the provision of services of ports of general interest and 33/2010, of 5th August, made the approval of the R.D. Legislative 2/2011, of 5th September, with the Revised Text of the Law on State Ports and the Merchant Navy, absolutely necessary.

With this latest Spanish legislation, consolidated as of 31 December 2020, two main categories of ports are distinguished: a) commercial ports and b) non-commercial ports, such as fishing ports, sheltered ports and recreational or sporting ports. The former are those of "General Interest". Annex 1 of the consolidated legislation defines the Ports of General Interest,[2] grouped into 28 Port Authorities. Illustration 7 shows the current Spanish rail network and the existing port connections. Illustration 8 shows the current importance, in terms of volume of freight traffic per port authority.

In the time of strong growth and opening of the Spanish economy covered by this work, it is not surprising the significant increase of all maritime traffics of the Spanish ports in the periods in which it is usually subdivided, as shown in table 2, and shown annually in Illustrations 9 and 10..

[2] 1. Pasaia y Bilbao (País Vasco). 2. Santander (Cantabria). 3. Gijón-Musel y Avilés (Asturias). 4. San Cibrao, Ferrol y su ría, A Coruña, Vilagarcía de Arousa y su ría, Marín y ría de Pontevedra y Vigo y su ría, (Galicia). 5. Huelva, Sevilla y su ría, Cádiz y su bahía (with Puerto de Santa María zona franca de Cádiz, Puerto Real, Bajo de la Cabezuela y Puerto Sherry), Tarifa, Bahía de Algeciras, Málaga, Motril, Almería y Carboneras (Andalucía). 6. Ceuta y Melilla. 7. Cartagena (with Escombreras) (Murcia). 8. Alicante, Gandía, Valencia, Sagunto y Castellón (Comunidad Valenciana). 9. Tarragona y Barcelona (Cataluña). 10. Palma, Alcúdia, Maó, Eivissa y la Savina (Illes Balears). 11. Arrecife, Puerto Rosario, La Hondura, Las Palmas (with Salinetas and Arinaga), Santa Cruz de Tenerife (whit Granadilla), Los Cristianos, San Sebastián de la Gomera, Santa Cruz de la Palma y la Estaca (Canarias)

Illustration 7: Spanish ports and rail connections at the present time



Source: FFE. *Observatorio del Ferrocarril*, 2019

Illustration 8: Total Traffic registered in 2019 by the Spanish Port Authorities.

Source: Puertos del Estado: Puertos del Estado. Annual report. 2019

Table 2 Annual averages of Spanish port freight traffic (Millions of mt) and % average annual log increase

2.a	(1)	(2)	(1)+(2)	(3)	(4)	(5)	(4)+(5)	(6)	(7)
1962-1974	59,3	1,0	60,3	32,6	0,6	19,4	19,9	112,9	
1975-1984	96,0	8,5	104,5	55,2	9,8	27,2	37,0	196,6	
1985-1992	102,2	14,7	117,0	63,0	21,9	26,1	48,0	228,0	
1993-2007	105,3	24,0	129,2	90,7	74,0	42,0	116,0	335,9	
2008-2013	117,8	32,7	150,5	84,6	147,8	55,1	202,9	437,9	
2014-2019	141,7	30,5	172,2	94,6	175,1	70,0	245,2	511,9	
2.b	%	%	%	%	%	%	%	%	*GDP*
1962-1974	*0,64*	*0,89*	*0,66*	*0,26*	*1,64*	*0,26*	*0,34*	*0,44*	*6,5*
1975-1984	*0,03*	*0,72*	*0,08*	*0,22*	*0,85*	*0,09*	*0,25*	*0,10*	*2,2*
1985-1992	*0,05*	*0,47*	*0,09*	*0,08*	*0,38*	*-0,01*	*0,15*	*0,09*	*4,5*
1993-2007	*-0,14*	*-0,32*	*-0,16*	*-0,01*	*0,40*	*0,16*	*0,30*	*0,23*	*3,3*
2008-2013	*0,06*	*-0,09*	*0,04*	*-0,65*	*-0,01*	*-0,07*	*-0,03*	*-0,13*	*-1,4*
2014-2019	*0,23*	*0,17*	*0,21*	*-0,46*	*-0,06*	*0,20*	*0,00*	*-0,01*	*2,4*

Source: Pueros del Estado. Annual reports.(1) Oil products;(2) Other liquids;(3) Bulk solids;(4) Containerised general cargo;(5) Other general cargo; (6) Total cargo. Millions of mt. The Spanish GDP in (Prados de la Escosura, 2017, p. 24)

Illustration 9

Source: Pueros del Estado. Annual reports. Own elaboration

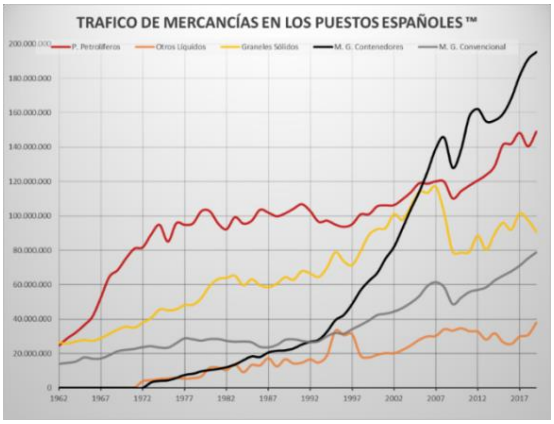
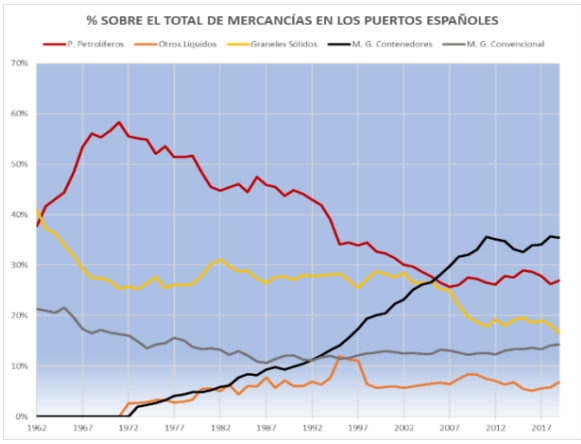


Illustration 10



Source: Puertos del Estado. Annual reports. Prepared by the authors.

A question which also measures the much higher degree of openness of the Spanish economy is the evolution of the volume of traffic by type of shipping (cabotage and foreign), which we have carried out in several significant cuts, as shown in Table 3, where, from equivalent traffic between cabotage and foreign before Spain's entry into the EEC and globalisation, it is well over 80% in foreign traffic both in tonnes and TEUs, since the last decade of the 20th century:

Table 3: Goods by type of navigation (%)

Tipo Navegación	1974	1983	1999	2008	2019
Overseas (t)	50,0	57,4	78,0	88,3	82,4
Cabotage (t)	50,0	42,6	22,0	11,7	17,6
TOTAL (t)	**4,054**	**13,528**	**62,177**	**145,403**	**551,635**
Overseasr (TEUs)	43,8	58,6	72,4	83,5	86,1
Cabotage (TEUs)	56,2	41,4	27,6	16,5	13,9
TOTAL (TEUs)	**0,364**	**1,458**	**6,455**	**13,335**	**17,509**

Source: Puertos del Estado. Annual reports. Prepared by the authors. Fishing, provisioning and local traffic not included. In TOTAL, millions of tonnes and TEUs.

Comparing the average annual increases of the last seven rows of Table 2, with the corresponding most recent published estimates of Spanish GDP, a first observation to be highlighted is the much more moderate growth of maritime trade with respect to GDP. Also with respect to the volume indices of exports and imports, although the difference is now much more moderate. It is worth noting, in the period of Franco's Developmentalism, the growth of Large Liquids traffic, at 0.66% per year, especially due to the development of the network of oil and gas pipelines as shown in Figure 11 after the inauguration of the arrival of Algerian gas in 1970, the policy of creating refineries on the peninsula[3], the boom in motorisation (HERNÁNDEZ MARCO, 1996; HERNÁNDEZ MARCO, 2002) and the development of thermoelectric production in Spain (Carreras, 2005)[4].

Illustration 11: Oil and gas pipeline network in Spain and Portugal

[3] The firsts milestones in Spanish refining are as follows: 1930, CEPSA builds the first Spanish refinery in Tenerife.1964, The Coruña refinery comes into operation.1965, Inauguration of the Puertollano refinery. 1967, The Huelva and Castellón refineries come into operation. 1968, The ASESA refinery in Tarragona comes into operation. 1969, CEPSA builds its second refinery in Spain in Algeciras. 1970, The Somorrostro refinery comes into operation. 1974, The Tarragona refinery (Repsol) comes into operation. Source: Spanish refinery capacity | CAMPSA (cnmc.es).

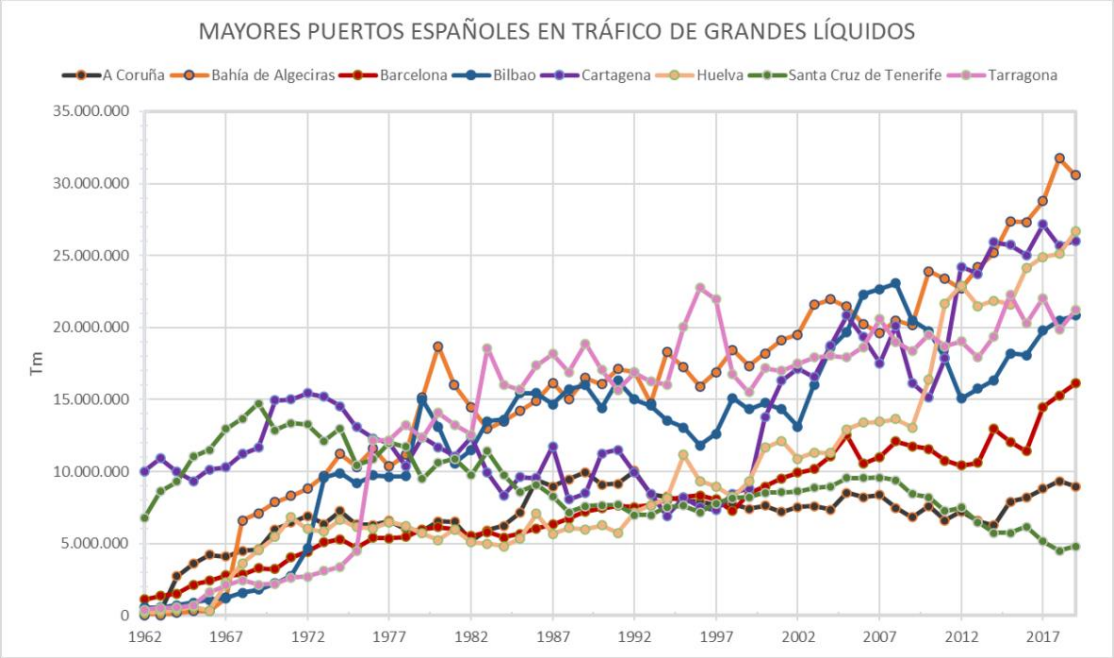
[4] Tables 5.16 and 5.17 show how, while 5.4 million tonnes of oil were imported in 1957, they exceeded 10 million t in 1963, 20 million t in 1967, 30 million to in 1970, 40 million t in 1974 and 50 million t in 1989. Similarly, more than 10 billion therms of natural gas have been imported since 1973, 22 billion in 1981, 53 billion in 1991 and more than 130 billion since 1989. For its part, the production of conventional thermoelectricity (coal, oil and gas) exceeded 10 million Mgw/h in 1965, 60 million in 1976 and 118 million in 1999.

Source: https://geografiainfo.es/tuberias/mapa_tuberias_espana_portugal.html

Illustration 12 therefore highlights the historical evolution of the most important Spanish ports in the arrival of Large Liquids and the rise of those of the Bay of Algeciras. Huelva, Cartagena, Tarragona and Bilbao as the major Spanish oil and gas ports of the 21st century.

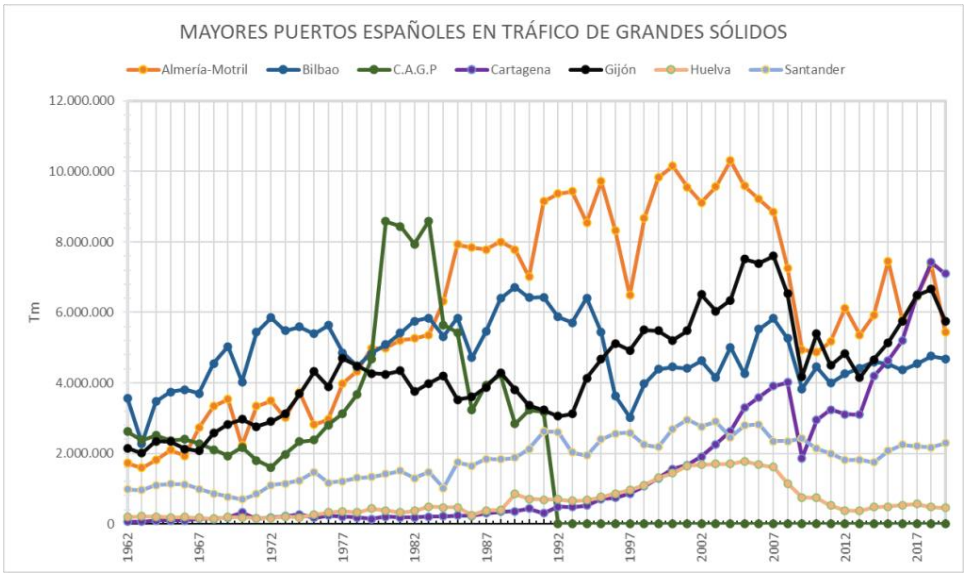
Large solids, normally transported by sea by bulk carriers, are made up of unpackaged or unpackaged goods, where the ship itself acts as a container, similar to those specialising in large liquids: cereals and seeds, minerals and salts, fertilisers and other chemical products, cements, sands and wood are the usual large solids. Although the golden age of Spanish mineral exports in the 19th century ended well before the Civil War, the protection of coal imports until the beginning of the current century and its increasing use in thermoelectric power stations until the first decade of the 21st century, together with the greater use in Spain of its other mineral resources, the growth of the chemical sector and basic materials for construction are related to the growth of these bulk traffics, especially until 1984, with their traffics stagnating or decreasing in the remaining periods. Illustration 13 shows the special importance of these traffics in the Bay of Algeciras, Almería-Motril, Cartagena, Gijón and the traditional importance of Bilbao.

Illustration 12: Largest Spanish ports in Large Liquids traffic



Source: Puertos del Estado. Annual reports. Own elaboration.

Illustration 13: Largest Spanish ports in Large Solids traffic



Source: Puertos del Estado. Annual reports. Prepared by the authors.

And we end this section with the evolution of maritime traffic of general cargo and, especially, containerised cargo, the main object of our analysis, which in Spain, as shown in Table 2, is the presentation of goods that has grown the most, surpassing the rest: non-containerised general cargo since 1992 and since 2006, including oil products and large solids, as shown in Illustration 10. Appendix 1 transfers all the information available in each of the Spanish port authorities, from 37,000 TEUs in the first year of registration in 1969, to the milestones of more than one million in 1979, 10 million in 2004 and the peak of 17.5 million in 2019. The 314 million TEUs moved in all Spanish ports in the last half century, however, are mostly concentrated in a few ports: Bahía de Algeciras (27.6% of the total), Valencia (25.5%) which since 2008 has overtaken the hitherto leader Algeciras, Barcelona (17.1%) and Bilbao (5%) on the Peninsula - between the four of them accounting for 75% of all Spanish container traffic - and the island ports of Las Palmas (8.3%) and Santa Cruz de Tenerife (3.8%) in the Canaries and the Balearic Islands (2%) which account for another 14%. In the rest, only those of Alicante, Bahía de Cádiz, Málaga, Seville and Vigo exceed 1%, without reaching 2%.

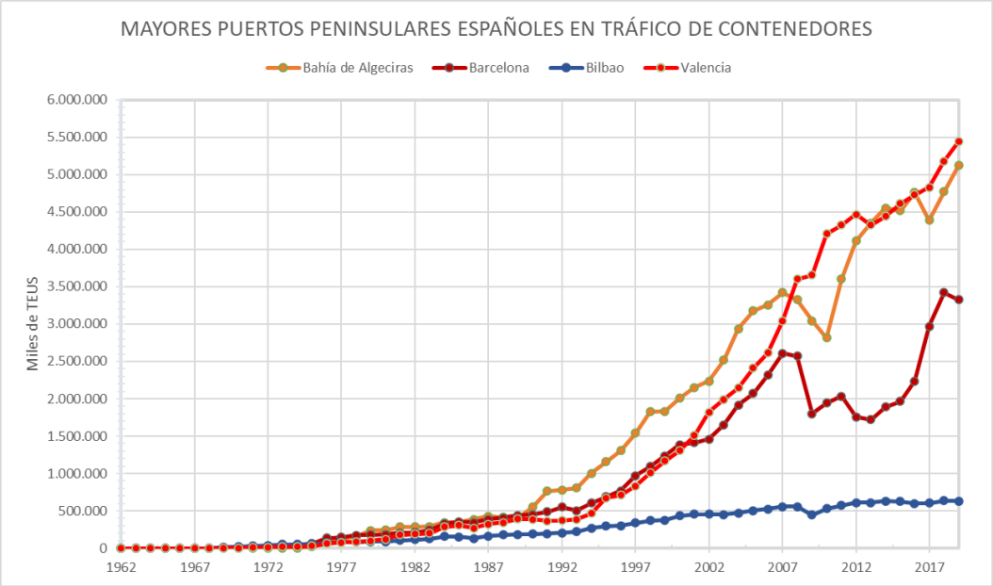
How all these goods enter the port to be loaded and, after unloading, leave the port precincts, thus bringing us closer to a first intermodality, will be dealt with in the next section.

3.- Intermodality in Spanish port traffic through the means of arrival and departure of goods to and from the ports.

In 1974, the first year in which the Report of the General Directorate of Ports and Maritime Signals of the Ministry of Public Works detailed the means of transport used in goods traffic to or from the Spanish port "zones", these had very limited infrastructures,

both for the future exponential increase in container traffic and even for the storage and handling of containers on land. Table 3 shows the evolution of the main facilities and those not dedicated to the perching and repair of ships.

Illustration 14: Largest Spanish ports in container traffic:



Source: Puertos del Estado. Annual reports. Own elaboration.

Table 4: Port facilities in 1974 and 2019:

Facility	**1974**	**%**	**2019**	**%**	**X 19/74**
Uncovered warehouses (ha)	34.971	79,0	331.683	88,0	9,5
Id. Covered and open (ha)	1.486	3,3	5.618	1,5	3,8
Id. Closed (ha)	7.961	6,0	39.562	10,5	5,0
Warehouses Total (ha)	44.418	42,4	376.863	38,6	8,5
Road and Rail ways (ha)	36.016	34,8	133.427	13,7	3,7
Rest (ha)	24.337	23,3	464.777	47,7	19,1
TOTAL LAND AREA (ha)	104.771	100,0	975.067	100,0	9,3
TOTAL CRANES (nº)	1.407	100	643	100	0,5
Portainers	0	0,0	141	21,9	****
Gantry cranes	882	62,7	183		0.2
>13t	28	3,2	106		3,8
Rest t	854	96,8	77		0,1
Automobile cranes	399	28,4	297		0,7
Other cranes	126	8,9	22		0,2

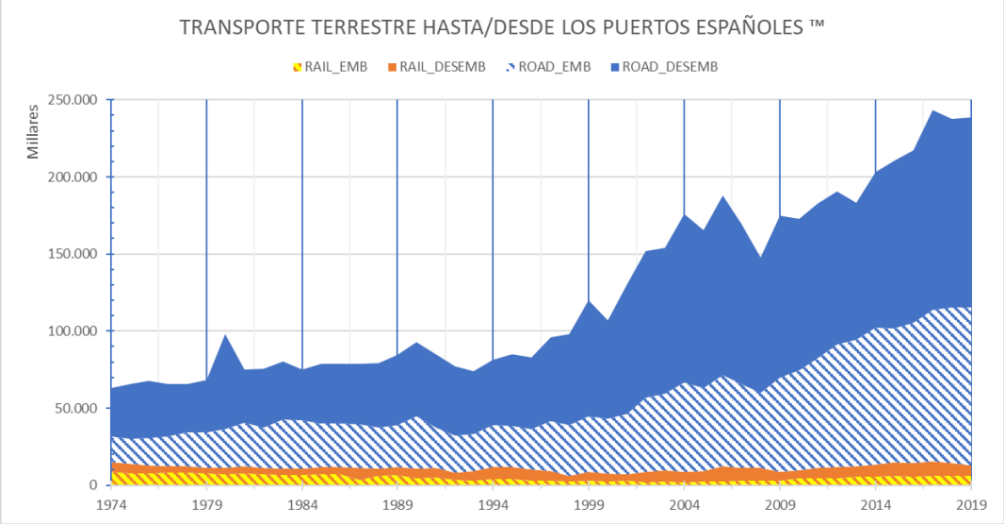
Source: Puertos del Estado. Annual reports 1974 and 2019. Own elaboration

In 28 detailed ports, in the latest available year, 2019, the total land area of the ports had increased by a factor of 9.3 and warehouses by 8.5 compared to 1974. Although cranes were half as many, while there were still no large container handling installations, 140 large container handling installations were counted in 1919, and large cranes of more than 13 t had increased almost fourfold, with less capable mechanical means decreasing. As for the tugboats available, if in 1974 there were 215, without specifying their power, in 2019 there were 158, but 100 of them with more than 3,000 hp. In 2019, we have no information for other means that were available in 1974: 676 "buckets and 307 loading shovels; and just over 2,000 forklift trucks or transporters. As for the railway resources belonging to the port facilities or to private individuals, 12 ports had 46 locomotives - 14 of them in Gijón and 11 in Melilla - and 544 wagons. This scarce land mobile infrastructure was completed by 293 tractors and 575 trailers.

As in successive annual reports, distinguishing the goods loaded or unloaded, details are given of the tonnes transported by rail, road, pipeline, "direct" and other means. Illustration 15 shows the annual information for the Spanish port system as a whole for inbound (loaded) and outbound (unloaded) traffic in the two land modes of interest in this work: rail and truck.

Between 1975 and 2019, while goods arriving at port by rail, to be loaded, fell at an average annual rate of 0.04%, those arriving by road increased at an average rate of 0.23%. And while those loaded on rail wagons from ships only grew at an average annual rate of 0.02€, those loaded on lorries grew at an average annual rate of 0.17%. As a result, if in 1974, 76.% of the 63 million tonnes arriving or leaving the ports were by road and 23.7% by rail, in 2019, road increased to 94.6% and rail fell to a paltry 5.4%, in the 226 million tonnes moved by these modes in Spanish ports. The only notable aspect of rail traffic in ports is the growth in its use in certain periods: in those transported after unloading by sea in 1993-2007 (+0.26%), but which fell at almost the same rate in the following period (-0.22%), and the strong increase in rail arrivals in 2008-2013, coinciding with the inflexion of road transport. Meanwhile, lorry transport only shows decreases in arrivals for loading in 1985-92 (-0.19%) and in departures from port in the "Great Recession" of 2008-13 (-0.14%).

Illustration 15: inland transport to/from the Spanish ports:



Source: Puertos del Estado. Annual reports. (Except for the port of Melilla between 1974 and 1984, rail traffic is limited to mainland Spain).

Table 5: Shipments and landings by rail and lorry in Spanish ports. % average annual log increase.

	RAIL-SHIP	SIHP -RAIL	RAIL TOTAL	ROAD-SHIP	SHIP - ROAD	ROAD TOTAL
1975-1984	-0,18	-0,22	-0,19	0,36	0,05	0,17
1985-1992	-0,46	0,08	-0,21	-0,19	0,22	0,05
1993-2007	-0,06	0,26	0,14	0,31	0,31	0,30
2008-2013	0,63	-0,22	0,07	0,39	-0,14	0,07
2014-2019	0,12	-0,02	0,4	0,20	0,29	0,24
1975-2019	**-0,04**	**0,02**	**-0,02**	**0,23**	**0,17**	**0,19**

Source: Puertos del Estado. Annual reports. Own elaboration

4.- Conclusion The modest role of the Spanish railway in intermodality

The Railway Sector Act 39/2003, dated 17th November, transferred the European directives on railway competition to the Spanish railway legislation. This meant the elimination of the public monopoly that had existed until then. In 2005, seven companies had already submitted applications for a railway company licence for freight transport, and three of them (Renfe Operadora, Comsa Rail Transport S.A. and Continental Rail S.A.) were granted. Likewise, 3 companies applied for authorisation for the allocation of railway infrastructure capacity as an operator other than railway companies, having been granted to one of them, Transfesa. Law 38/2015, went further along this path. In this way, some private companies began to operate in 2007. As of 31 December 2019, in addition to Renfe Mercancías S.A.U., 18 other companies had an Operator's Licence and Safety Certificate for rail freight transport. However, of these, only the following 12 were actually operational in 2019:

- Renfe Mercancías
- Continental Rail
- Acciona Rail Service
- Tracción Rail
- Captrain España (until 2018 Comsa Rail Transport)
- Transfesa Logistics
- Logitren
- Transitia Rail
- Ferrovial Railways
- Low Cost Rail
- Medway Mercadorias
- Go Transport Services 2018

As Table 6 and Illustration 17 show, although Renfe Mercancías remains in the majority, private companies are growing significantly:

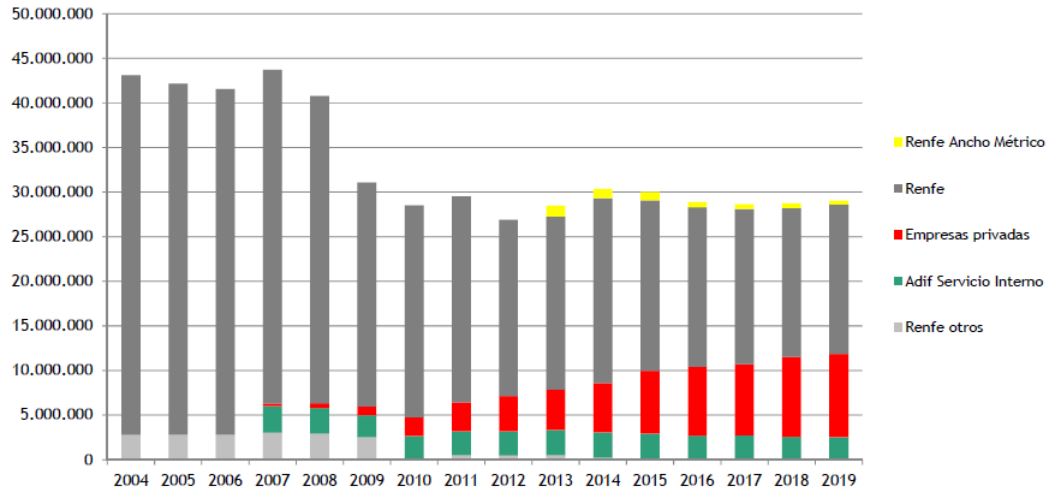
Table 6: Relevance of private companies in the production of services in the RFIG (General Interest Railway Network).

Relevancia de las empresas privadas en la producción de servicios sobre la RFIG (2014-2016)

Indicadores	2014				2015				2016			
	Renfe mercancías		Empresas privadas		Renfe mercancías		Empresas privadas		Renfe mercancías		Empresas privadas	
	Valor	*%*	*Valor*	*%*	*Valor*	*%*	*Valor*	*%*	*Valor*	*%*	*Valor*	*%*
Número de trenes	121.518	86,7	18.636	13,3	110.347	83,6	21.698	16,4	97.316	79,3	25.380	20,7
Kilómetros recorridos	21.763.706	79,8	5.523.422	20,2	20.005.300	74,5	6.836.450	25,5	18.456.957	70,5	7.711.980	29,5
Horas realizadas	417.100	80,5	101.059	19,5	389.563	75,4	126.949	24,6	353.486	71,2	143.255	28,8
Kilómetros / tren	179,1		296,4		181,3		315,1		189,7		303,9	
Horas / tren	3,4		5,4		3,5		5,9		3,6		5,6	
Velocidad comercial (km/h)	52,2		54,7		51,4		53,9		52,2		53,8	

Source: FFE, Railway Observatory, 2019

Illustration 17: Annual freight train journeys (km) (2004-2019):



Source: FFE, Railway Observatory, 2019

Taking into account private competition since 2007, and therefore until that date, Renfe will be a public monopoly operator, the evolution of net freight tonnage transported is shown in Table 6:

Table 6: RENFE freight traffic (Thousands of net t)

	Total Commercial	Full Wagon	Total Intermodal	Sea Intermodal
1962-1974	**27.998**	**24.903**	**1.525**	
1975-1984	32.151	29.374	2.777	
1985-1992	27.012	22.463	4.358	
1993-2007	24.732	17.787	5.857	2.194
2008-2013	18.040	12.280	5.290	2.480
2014-2019	19.233	11.950	5.886	2.336

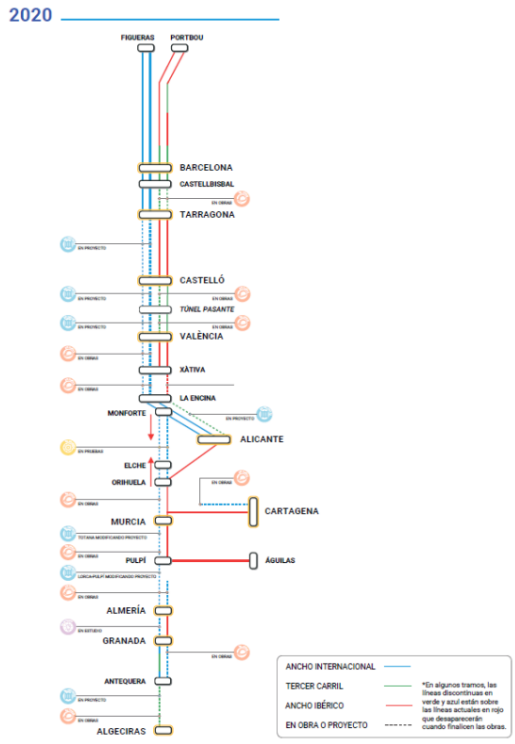
Source Renfe - Historical Railway Statistics - Docutren ,1962-1999. Renfe, Annual Reports 2007-2019.

To conclude, we would like to highlight that the relative weakness and stagnation of Renfe's intermodal traffic, especially in maritime intermodal traffic and its rail connection with Europe, is the great pending task of Spanish rail infrastructures. For this freight train traffic by Renfe and private operators is carried out with the network characteristics shown in the map in Illustration 7 of Section 1. Even at the end of 2019, the persistence, almost unchanged since the end of the 19th century, of the radial characteristic of the Spanish rail network, with its centre in Madrid, is the main cause of the scarce operability of the railway between Spanish ports.

The Cantabrian ports in the north, only interconnected by the narrow-gauge network, from Santander to Pasajes. Only in the Mediterranean, from Alicante to Barcelona, almost in its entirety and only on the Iberian gauge network, is there a railway interconnection. The wasteland from Murcia to Algeciras is still desolate. A goods train from the port of Algeciras, as we have seen, the largest in Spain in terms of total traffic and second after Valencia in terms of container traffic, in order to send freight by land to the north-east of Spain and the French border, must at least pass through Alcázar de San Juan in the centre of Spain.

If we take into account, as we have seen throughout this work, the importance of the ports of Algeciras, Valencia and Barcelona, only by properly linking these ports with inland and, especially, international rail traffic, will it be possible in the future to substantially increase intermodal rail transport. Therefore, it is essential to increase investments and plans for the completion of the so-called standard gauge Mediterranean Corridor and port connections. The most recent report of the lobby for this infrastructure shows the challenges to be overcome.

Illustration 19: The future Mediterranean Corridor and its current situation



Source: https://elcorredormediterraneo.com/wp-content/uploads/2020/11/Dosier_2CHEQ_NOV-ok.pdf

SOURCES:

REFERENCES:

Aldcroft, D. H. (1973). "Review: THE ECONOMICS OF CONTAINERISATION, by K.M. Johnson and H.C. Garnett. (Allen & Urwin, 1971. 216 p. Diagrams. 3.75 Pounds". *The Journal of Transport History, ss-2*(1), 63.

Aldcroft, D. H. (1976). " A New Chapter in Transport History: The Twentieth-Century Revolution". *The Journal of Transport Histort, ss 3*(3), 217-239.

Barker, T., & Gerhold, D. (1993). *The Rise and Rise of Road Transport, 1700-1900.* London: McMillan Oress.

Beth, H., Hader, A., & Kappel, R. (1984). *25 Years of World Shipping.* London: Fair-play Publications.

Bonacich, E., & Wilson, J. B. (2008). *Getting the Goods: Ports, Labor, and the Logistics Revolution.* . Ithaca: Cornell University Press.

Broeze, F. (2002). *The globalisation of the oceans : containerisation from the 1950s to the present.* St. Johns': International Maritime Economic History Association. Research in Maritime History Series, 23.

Button, K. J. (2001). "Economics of Transport Networks". En K. J. Button, & D. A. Hensher, *Handbook of Transpor Systems and Traffic Control* (págs. 61-75). Amsterda -London - New York: Pergamon. Elsevier Science.

Carreras, A. (2005). Industria. En A. Carreras, & X. (. Tafunell (Edits.), *Estadísticas Históricas de España, siglo XIX y XX*.

Corlett, E. (1981). *The Ship. The Revolution in Merchant Shipping 1950-1980.* London: Mational Maritime Museum.

Cudahy, B. J. (September-October de 2006). "The Containership Revolution. Malcom McLean’s 1956 Innovation Goes Global. *TR. News*(246), 5-9.

Economides, N. (1996). "The economics of networks". *International Journal of Industrial Organinisation, 14*(6), 676-699.

Harcourt, K. (2017). "Book Reviews: "Matthiew Heins, The Globalization of American Infrastructure. The Shippin Container and Freight Transportation (New York, Roudtledge, 2016; 221 pp. Pounds 90.00 ISBN 978-1138188563". *The Journal of Transport History, 38*(2), 313-314.

Heins, M. W. (2013). *The Shipping Container and the Globalization of American Infrastructure.* Recuperado el Junio de 2021, de Dissertation for the degree of Doctor of Philosophy (Architecture) in the University of MIchigan: https://deepblue.lib.umich.edu/bitstream/handle/2027.42/102480/mheins_1.pdf

HERNÁNDEZ MARCO, J. L. (1996). La oferta automovilística en España antes del "Seat-600": 1956-1957. *Economía Industrial. Ministerio de Industria y Energía*(307), 131-148.

Hernández Marco, J. L. (1997). *Trenes, Estaciones y Puertos: El Tráfico de Mercancías de la Cía. del Norte (1876-1930)*. Bilbao: Gobierno Vasco. Departamento de Transportes y Obras Públicas.

Hernández Marco, J. L. (1999). "El ferrocarril como ampliador de los espacios económicos portuarios: La Cía. del Norte y algunos puertos septentrionales españoles entre 1878 y 1930". En M. Muñoz Rubio, J. Sanz Fernández, & J. Vidal Olivares (Edits.), *Siglo y medio del ferrocarril en España, 1848-1998* (págs. 597-618). Madrid: Fundación de los Ferrocarriles Españoles.

HERNÁNDEZ MARCO, J. L. (2002). Las primeras reacciones de las compañís ferroviarias españoles al inicio de la cometencia automovilística antes de la Guerra Civil. *Revista de Historia Económica, XX*(Primavera-Verano, 2), 335-363.

Hernández Muñiz, M. (1999). "Cambio espacial en la economía española y cambio en la demanda del transporte de mercancías". En *Siglo y Medio del ferrocarril e Espña, 1848-1998* (págs. 355-378). Madrid: Fundación de los Ferrocarriles Españoles.

Levinson, M. (2006). *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger.* Princeton: Princeton University Press.

Prados de la Escosura, L. (2017). *Spanish Economic Growth, 1850–2015.* Cham: Palgrave Macmillan.

Rueda, G., Sazatornil, L., & Delgado, C. (2008). "Las principales ciudades portuarias en la España del siglo XIX". *IX Congreso AEHE. Murcio 2008.* http://www.aehe.es/wp-content/uploads/2008/09/Las-principales.pdf.

Ruiz Romero de la Cruz, E. M. (2004). *Historia de la navegación comercial española* (Vol. I). Madrid: Ente Público de Puertos del Estado.

Tena Junguito, A. (October de 2017). *New Series of The Spanish Foreingsector, 1850-2000.* Obtenido de Universidad Carlos III de Madrid. Working Papersin Economic History. WP 07-14: https://www.researchgate.net/publication/4764962_New_series_of_the_spanish_foreign_sector_1850-2000

Valdaliso, J. M., & López, S. (2007). *Historia Económica de la Empresa.* Barcelona: Crítica.

White, J. H. (1988). "The Magic Box: Genesis of the Container". *Railroad History*(158), 72-93.