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Socio-economic impact of Covid-19 on the fishing sector: A case study of a region highly dependent on fishing in Spain

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ABSTRACT

Galicia is the most important fishing region in Spain. Nearly 50% of the volume of catches and of the national fishing fleet are concentrated in this region. During the Covid-19 pandemic, the fishing sector had the status of an essential sector and was not forced to stop its activity by the national Government. However, its economic performance has deteriorated in 2020. This article aims to analyze the impact of the pandemic on the extractive fishing sector in Galicia. For this purpose, the performance of the main economic and financial variables of the 246 companies that constitute this industry has been studied. The companies pertain to different extractive sectors (the national, offshore and large-scale fleets) and are in 9 different areas (Vigo, Pontevedra, Arousa, Muros, Fisterra, Costa da Morte, A Coruña-Ferrol, Cedeira and A Mariña). The results of the analysis show that the 9 fishing zones share a generalized negative trend but that there is heterogeneity in the results. Among the most determining factors are the predominant fleet extract, the target species caught, or the perception of public subsidies.

1. Introducción

The crisis resulting from the Covid-19 pandemic has created an unprecedented health and social scenario. The geographical extent and intensity with which the Covid-19 outbreaks spread prompted the implementation of restrictive policies that paralyzed, or slowed down, economic activities, and the fisheries sector has been one of them (Sunny et al., 2021; Weible et al., 2020). Globally, fish supply and consumption has declined due to reduced demand for fresh products and species that had their main form of marketing in the HORECA (HOtel, REstaurant and CAtering) channel. As a consequence, aggregate prices and commercial revenues from extractive fishing have decreased with respect to 2019 (FAO, 2020).

Spain is one of the European countries with the highest incidence rates of Covid-19 (Domínguez-Gil et al., 2020). On January 31, 2020, the first case of coronavirus was detected in the country and, following the increasing trend of the disease that made Spain the country with the highest number of active cases after Italy, on March 14, 2020, the national Government declared a state of emergency in Spain. This measure implied the confinement of the population and the paralysis of sectors considered non-essential (Solé et al., 2021). After a period of suppression of mobility restrictions, on October 25, 2020, another confinement was instituted, this time with a regional character, which took place within the second state of emergency in Spain in 2020 (Fernández-González et al., 2021).

The activities declared as essential, and which did not paralyze their activity during the confinement period, were classified within the sectors of food, health services, public transport, citizen security, care for vulnerable people and telecommunications (Real Decreto-ley 10/2020, 2020). Therefore, the fishing extractive industry was not subject to mandatory closure but, given the large marketing flow between this industry and the HORECA channel, the temporary closure of the hospitality industry affected the income of fishing companies (Guerrero-Marrero et al., 2021). In addition, the change in household consumption habits towards processed products, drove the decline in prices in the sector (OECD, 2020).

The fisheries sector in Galicia (a region in northwestern Spain) is one of the most important of its economy. The strategic sector status, granted by the regional Government of Galicia, reflects the importance of an industry that contributes €249.2 millions of gross value added to the...
region (Diario Oficial de Galicia, 2021). In 2019, the extractive fishing sector employed 0.9% of the working population in Galicia and 1.47% of the companies operating in the territory (ARDAN, 2021). These are not as high figures as those presented by other industries. However, their socioeconomic impact is justified for several reasons. First, Galicia is the Spanish region with the highest degree of dependence on fishing, given the high labor linkage and the number of landings presented in a large part of its coastal communities (Garza-Gil et al., 2020; Salz and Macfadyen, 2007). Secondly, in 2020, Galicia accumulated 49.0% of the vessels registered in Spain, which possess 41.3% of the tonnage and 35.6% of the national fishing power (Secretaría general de pesca, 2021). Finally, the extractive fishing industry has created strong synergies with the Galician fish processing and marketing sector, the most important in Spain. In fact, 83% of the extractive fishing catches destined for intermediate demand are acquired by the fish, crustacean, and mollusk processing sector (Cámara and Santero-Sánchez, 2019; IGE, 2015; Sursí-Regueiro and Santiago, 2014).

There are several examples in academia on the analysis of the effects of the Covid-19 pandemic on the Galician fishery sector. Fernández-González et al. (2021) have focused their study on the evolution of catches and income in the fishing and shellfishing sectors in Galicia. Villasante et al. (2021) conducted a rapid assessment of the overall impact of Covid-19 on extractive fishing, aquaculture and canning. However, these two studies do not address the economic-financial impact of companies in the extractive fishing sector, which is the main objective of this article.

This article is structured as follows. Section 2 characterizes the Galician fishing sector through the nine fishing zones stipulated by the regional Government of Galicia. Section 3 describes the methodology applied, characterizing the population sample and specifying the variables studied. Section 4 presents the main results of the analysis, while section 5 presents the conclusions of the study.

2. Case study

The Galician fishing fleet, formed in 2021 by 4,266 vessels (total capacity of 127,310.73 GT and total power of 257,583.26 Kw), is the largest regional fleet in Europe. The number of crew members amounts to 10,621 (Ministerio de agricultura, pesca y alimentación, 2021). The classification of the fleet is based on the distance between its home ports and its area of operation, which will determine the characteristics and dimensions of the fishing vessels. Thus, the national or Cantabrian-Northwest fishing fleet operates only in Spanish waters (mainly in waters under the jurisdiction of the region of Galicia) and consists of a total of 4,095 vessels (96% of Galicia’s total), mostly of small dimensions (average capacity of 10.2 GT and average power of 36.4 Kw). The offshore or community fleet operates in the waters of other European Union countries, and also in those of the United Kingdom, by virtue of the EU-UK Trade and Cooperation Agreement. It is composed of 73 vessels (1.7% of Galicia’s total) of intermediate size (average capacity of 283.5 GT and average power of 456.1Kw). Finally, the large-scale or international fleet operates in international waters and in the EEZ of third countries with which the EU signs fishing agreements, and is made up of 98 vessels (2.3% of the total in Galicia) which have the largest dimensions and power of the entire fleet (average capacity of 662.4 GT and average power of 768.2 Kw) (Secretaría general de pesca, 2021).

The Galician fleet is distributed along the Galician coastline in nine areas, ranging from the Miño river estuary to A Marina (Table 1) (de Galicia, 2021a). Zone I (Vigo) has the fishing port of Vigo as its main base of operations. This port accumulates 47.4% of the total tonnage of the Galician fleet and 35.7% of the total power with only 15.4% of the number of vessels, due to the presence of the international fleet, composed of vessels of large dimensions, capacity and power. The activity of this fleet is subject to the participation of the European Union in international fishing organizations and the signing of fishing agreements with third countries with resources of interest in their waters. The estimated employment in zone I is 2,228 people (ARVI, 2021a).

Zone II (Pontevedra) has its main port in Marín. It represents 7.5% of the Galician fleet in number of vessels and 9.7% in tonnage, with a workforce of 722 people. This zone has a large fleet of freezer vessels based in the port of Marín, some of which operate in the NAFO area, and there is also an offshore fleet operating in Portuguese waters. The remaining vessels in zone II work within national waters (de Galicia, 2021a).

Zone III (Arousa) has the largest number of vessels in Galicia, with a total of 1,692. This represents 39% of the Galician fleet in number of vessels, although only 10.4% in tonnage, since they are mostly small vessels dedicated to inshore fishing. The port of Ribeira is the most significant port in Galicia for the fleet of the national fishing grounds, where 99% of the vessels in this area fish. Although the vast majority of the vessels in zone III belong to the artisanal segment, there is also a small offshore fleet, operating in NEAFC, and a large-scale fleet of eight vessels. The estimated employment in this zone is 3,224 people, which represents 30.3% of the fishing employment in Galicia.

Areas IV (Muros), V (Fisterra) and VI (Costa da Morte) together represent a small percentage of the fishing capacity of the Galician fleet, with 8.2% of the total tonnage, although fishing activity is of great social importance for coastal communities. They account for 24% of the Galician vessels (respectively, 14.7%, 2.9% and 6.4%), all of them fishing in the national fishing grounds. More than 90% of the fleet in these areas belongs to the artisanal group, although there is also an important purse seine fleet based in Portosin, Camariñas and Malpica de Bergantínios, a coastal trawling fleet in Muros, and a bottom longline fleet, mainly in Muxía. Total estimated employment in these areas is 2,260 people.

Zone VII (A Coruña-Ferrol) and zone VIII (Cedeira) have A Coruña and Cedeira as their most important ports, respectively. Zone VII has a large-scale fleet (6 longliners) and an offshore fleet (3 trawlers and a bottom longliner) operating in the NEAFC area. The offshore fleet is also present in the Cedeira area with two bottom longliners. In these two areas, most of the vessels operate in the national fishing grounds and

Table 1
Fishing fleet by production zones.

| Zonas      | Número | Variación | Porcentaje | Tono | Potencia | Porcentaje |
|------------|--------|-----------|------------|------|----------|------------|
| Zona I - Vigo | 666 | 2 | 15.42 | 0.11 | 61.968 | 7.36 |
| Zona II - Pontevedra | 324 | –3 | 7.50 | –0.04 | 12.471 | 1.50 |
| Zona III - Arousa | 1,692 |–7 | 39.18 | –0.001 | 14.892 | –0.14 |
| Zona IV - Muros | 633 | 1 | 14.66 | 0.08 | 3.490 | 0.05 |
| Zona V - Fisterra | 123 | –2 | 2.85 | –0.03 | 635 | –3.73 |
| Zona VI - Costa da Morte | 280 | 3 | 6.48 | 0.09 | 3.951 | 3.29 |
| Zona VII - Coruña-Ferrol | 322 | –3 | 7.46 | –0.04 | 6.410 | 4.33 |
| Zona VIII - Cedeira | 112 | –4 | 2.59 | –0.08 | 1.597 | –5.42 |
| Zona IX - A Marina | 166 | –4 | 3.84 | –0.08 | 23.825 | –0.16 |
| Total       | 4,318 | –17 | 100.00 | 0.00 | 129.169 | 3.74 |

2
more than 80% of these are small-scale fishing vessels. However, the A Coruña-Ferrol area almost triples the number of vessels in the national fishing grounds (308 vessels) with respect to the Cedeira area (110 vessels). This difference is evident in the fishing employment figures: while zone VII has 745 workers, zone VIII only reaches 302 fishermen (Ministerio de agricultura, pesca y alimentación, 2021).

Zone IX (A Mariña), has Celeiro and Burela as its most representative ports, which house one of the most important fleets in Galicia, the offshore fleet operating in the waters of the Grand Sole (mainly in the Celtic Sea) with bottom longline as the main fishing modality and hake as the most important target species. There is also a large-scale fleet of 11 surface longliners. In addition, the area also has a national fishing fleet of 114 vessels. The most numerous national segment (65.7%) is that of small-scale fishing, followed by surface longliners and trawlers. The estimated fishing employment in this area is 1,165 people (Cofradía de pescadores de Burela, 2021; Cofradía de pescadores de Celeiro, 2021).

3. Methodology

The database used in this analysis is SABI (2021). This financial platform, belonging to Moody’s Analytics group, allows customized searches on the more than 2.5 million Spanish companies contained in this platform (Akimova et al., 2020). In order to define the sample of extractive fishing companies operating in Galicia, the following Boolean criteria were used: (1) The location of the company’s head office must be located in Galicia; (2) The company must be active in at least one of the years between the period 2017–2020; (3) The primary 2009 CNAE code is 0311 - Marine fishing.

As a result of the application of the above search criteria, the population sample of the study is composed of 246 companies. In order to perform a more detailed analysis, the companies have been grouped according to their location within the nine zones into which the Ministry of Fisheries of the Regional Government of Galicia divides the Galician coast (de Galicia, 2021b) (Fig. 1).

Regarding the indicators, there is a wide range of variables that characterize the economic performance of the sector. The choice of the variables selected for the analysis of the study sample is based on criteria such as their relevance, appropriateness to the sector and availability. Considering the above reasons, the variables that best define the efficiency of the sector’s production, its profitability and its resilience to external conditions are: Operating income variation (%), Gross value added variation (%), Asset turnover ratio (%), Personnel expenses variation (%), Number of employees, Profit margin (%), Economic Profitability (%), Financial Profitability (%), Indebtedness (%), and Financial leverage (%). Given the annual variability in the number of companies in the sample, the median is the value calculated for these variables, with the exception of the number of employees, which is expressed as the mean value.

4. Results

Regarding the overall evolution of all fishing areas in Garza-Gil et al., 2020) production exceeded 2019 in volume in five months (March, April, August, September, and November) remaining below the rest of the year. However, from March onwards, once the pandemic started, 2020 turnover is always (except for a small increase in November) lower than that of 2019. This is a consequence of the behavior of prices and the decline of the tons caught in all areas except for zones VI and IX. These began to fall significantly after the declaration of the state of alarm, and the sharpest drops (€0.70 on average) corresponded to the months of March, April, and May. From June onwards, prices rose again and remained stable in the months of July, August, and September. From October onwards, prices fell again, this time with a sharper drop (€0.56 on average) in November.
March, April, and May, coinciding with the confinement of the population and the closure of the hospitality industry. Subsequently, prices recovered, but only slightly exceeded those of the previous year in July, October, and December.

Zone I-Vigo is one of the areas that has been most affected by the effects of the Covid-19 pandemic. Both the variation in operating income, assets and profit margins show a high economic and financial erosion of the companies located in this area (Table 2). As specified in section 2, Vigo is the Galician fishing area with the largest number of vessels engaged in large-scale fishing and with the second largest number of vessels operating in offshore fishing. Regarding the freezer surface longliners fleet, which is responsible for a significant part of the volume of landings, it has had a 13% decrease in its turnover compared to the average of the previous three years between February 1, 2020 and August 31, 2020 (DOG, 2020a).

This decrease in the turnover of the surface longline fleet, which is authorized for the first sale of frozen products (i.e., without attending the fish market auction) is mainly due to the closure of its main marketing channels. On the one hand, the closure of the HORECA channel, that became effective during the periods of confinement as it was not considered an essential sector by the national Government, damaged this fleet. On the other hand, given that a large part of its production is destined for export, the closure of the borders of two of its main markets, Italy and Asia, greatly reduced the volume of turnover (ARVI, 2021b).

In view of this scenario, and after repeated complaints from the sector’s representatives, the Ministry of Fisheries of the regional Government of Galicia published an announcement of public subsidies in November 2020 in order to alleviate the poor financial results of the companies. However, as this call was resolved in February 2021, no considerable improvement in the variables studied can be seen, since these subsidies have not been included in the 2020 fiscal year (DOG, 2020a).

In zone II-Pontevedra, inshore fishing has a much greater relative importance than in zone I-Vigo. The Bueu fish market, the most important in the area in terms of volume and turnover in inshore fishing, has obtained extremely poor economic data, given that its most important species, octopus, recorded a very low level of catches as a result of a mixture of factors, such as environmental changes in the estuary, pollution and overfishing (Pita et al., 2021). In addition, the closure of the hotel and catering industry caused the demand for octopus to fall and prices to remain low. As for the offshore fleet, there were several cases of forced mooring of vessels. An example of this is the trawler Sanamedio, which returned to the port of Marín after reporting a case of Covid-19 among its crew. This situation caused the vessel to be moored in the port for a month, paralyzing its activity (Autoridad Portuaria de Marín y Ría de Pontevedra 2020). Regarding inshore fishing, this has also had a negative performance.

For its part, the performance of zone III-Arousa in 2020 has been negative. During the first two months of the pandemic, the artisanal fleet in this zone faced a huge drop in turnover. The drop in aggregate auction prices, close to 30%, due to the closure of the HORECA channel, caused part of the fleet to stop fishing on a daily basis or cease their activity, even without taking advantage of any Temporary Employment Adjustment Plan (ERTE). The trend observed in Galicia, especially pronounced in this area, is that the species with the highest average price and whose main marketing channel is the hospitality industry have suffered the greatest decline. In the ports of Arousa, bivalves, sea urchin (Paracentrotus lividus), Patagonian toothfish (Dissostichus eleginoides), octopus (Octopus vulgaris) or tuna (Thunnus spp) are landed, species of high economic value that suffered a strong depreciation during the pandemic for this reason (Fernández-González et al., 2021). In the case of octopus, the port of Ribeira was the most affected. The coastal fleet dedicated to its fishing suffered significant losses due to the low price and scarcity of octopus, whose average price was 7.96 €/kg. This value is far from the octopus’ prices in 2019 (9.77 €/kg) and 2018 (12.88 €/kg). Concerning tuna, a target species of the offshore fleet operating in NEAFC, in the

| Table 2 | Evolution of economic variables. |
|---------|---------------------------------|
|         | 2017  | 2018  | 2019  | 2020  | % Var. 2020-2019 (2017-2019) |
| Zone I - Vigo |       |       |       |       |                               |
| Operating income variation (€) | -1.1  | 2.53  | -2.76 | -19.78 | -4361.7 |
| Gross value added variation (€) | -6.01 | 0.46  | -4.37 | -24.64 | -645.2 |
| Asset turnover ratio (%) | 0.81  | 0.91  | 0.86  | 0.63  | 26.7 |
| Personnel expenses variation (€) | 0  | 2  | 1.16  | -9.96 | -1045.6 |
| Number of employees | 14  | 14  | 15  | 12  | -16.3 |
| Zone II - Pontevedra |       |       |       |       |                               |
| Operating income variation (€) | 3.14  | 0.58  | -0.71 | -3.56 | -454.8 |
| Gross value added variation (€) | 1.63  | -2.73 | 3.88  | -10.77 | -1262.2 |
| Asset turnover ratio (%) | 1.21  | 1.27  | 1.18  | 0.84  | -31.1 |
| Personnel expenses variation (€) | 6.77  | 4.12  | -0.6  | -0.89 | -125.9 |
| Number of employees | 17  | 17  | 17  | 14  | -17.6 |
| Zone III - Arousa |       |       |       |       |                               |
| Operating income variation (€) | -2.91 | -0.98 | -2.04 | -10.93 | -453.0 |
| Gross value added variation (€) | -15.51 | -4.23 | -6.18 | -8.88 | -2.8 |
| Asset turnover ratio (%) | 0.9  | 0.85  | 0.82  | 0.67  | -21.8 |
| Personnel expenses variation (€) | 3.67  | 1.28  | 4.28  | -5.7  | -285.3 |
| Number of employees | 10  | 11  | 10  | 9  | -12.9 |
| Zone IV - Muros |       |       |       |       |                               |
| Operating income variation (€) | 32.11 | -11.97 | 1.99  | -13.61 | -284.5 |
| Gross value added variation (€) | 14.71 | -18.32 | -0.42 | -9.66 | -619.1 |
| Asset turnover ratio (%) | 0.94  | 0.78  | 0.85  | 0.59  | -31.1 |
| Personnel expenses variation (€) | 26  | -8.86 | -1.97 | -17.98 | -455.6 |
| Number of employees | 15  | 14  | 14  | 10  | -30.2 |
| Zone V - Fisterra |       |       |       |       |                               |
| Operating income variation (€) | 33.81 | -7  | -11.92 | 17.03 | 243.1 |
| Gross value added variation (€) | 34.75 | -11.27 | -4.98 | 8.04  | 30.4 |
| Asset turnover ratio (%) | 1.09  | 0.98  | 0.62  | 0.72  | -19.7 |
| Personnel expenses | 28.4  | -5.13 | -15.66 | 18.8  | 641.1 |

(continued on next page)
central months of the summer not a single ton of this fish was landed in the ports of Ribeira and Pobra do Caramiñal, when 11,250 tons had been landed in the same period of 2019. The causes are to be found, on the one hand, in the inactivity derived from the Covid-19 outbreaks in the crews of this fleet and, on the other hand, in the increased competition in North Atlantic Ocean (de Galicia, 2021). Despite the sharp decline in sales revenue, the financial results of the companies in this area have not been as damaged. This is due to the transfer of public funds, through subsidies from the national and regional Governments, which have benefited the companies in the area (DOG, 2020b).

Zone IV-Muros is more dependent than zone III-Arousa with respect to its inshore fleet. In this zone, the degree of affection by the closure of the HORECA channel was very high. Sole (Solea solea), turbot (Scophthalmus maximus), sea bass (Dicentrarchus labrax) and the different types of shellfish from this zone, all of them species of high commercial value, saw a large part of their demand reduced. As a consequence, the shellfishing afloat, the artisanal fleet and the coastal trawling fleet, decreased or paralyzed their activity until the end of the first confinement in Spain in June 2020 (Conselleria do mar, 2020). Octopus, one of the most important target species in the area, deserves special mention. In two of its main ports, Muros and Porto do Son, the sale of octopus in two of its main ports, Muros and Porto do Son, the sale of octopus represents an important source of income. In 2020, the closure of the hospitality industry caused the average price of the species to fall. Even the scarcity of the catches of this cephalopod did not increase the average selling price, since the HORECA channel did not demand this product and neither did the freezing companies in the area (the alternative way of commercialization) because they were at full capacity and did not sell the stock they had in their facilities. Therefore, the average price of octopus at first sale decreased by 1–2 €/kg (Villasante et al., 2021).

Zone V-Fisterra and zone VI-Costa da Morte do not register such an acute effect on the pandemic as other areas. The last fishing seasons in the area, in the period 2017–2019, had derived in poor economic results due to the scarcity of pelagic species caught by the purse seine fleet, which has a considerable relative importance in these areas (29 vessels). In 2020, there was a considerable increase in catches of species such as sardine (Sardina pilchardus), Atlantic mackerel (Scomber scombrus) or anchovy (Engraulis encrasicolus) due to the increase in quotas and the availability of these species in Galician waters (ICES, 2021). However, their abundance did not reduce the price of these species in the pandemic situation. The increase in the consumption of canned, semi-preserved and salted fish products in Spain meant that a large part of the pelagic catches was used as raw material for the fish processing industry and prices reduced their negative trend (Table 4) (Anfaco-Ceopesca, 2021).

Table 2 (continued)

| Table 2 (continued) | 2017 | 2018 | 2019 | 2020 | % Var. 2020–2019 |
|----------------------|------|------|------|------|------------------|
| variation (%) EUR    |      |      |      |      |                  |
| Number of employees  |      |      |      |      |                  |
| Zona VI - Costa da Morte |      |      |      |      |                  |
| Operating income variation (%) EUR |      |      |      |      |                  |
| Gross value added variation (%) EUR | -3.51 | -5.51 | -8.89 | 4.96 | 183.1% |
| Asset turnover ratio (%) |      |      |      |      |                  |
| Personnel expenses variation (%) EUR | -2.23 | 2.92 | -7.51 | -7.06 | -210.6% |
| Number of employees  |      |      |      |      |                  |
| Zona VII - A Coruña-Ferrol |      |      |      |      |                  |
| Operating income variation (%) EUR | -2.89 | -3.26 | -4.83 | -6.3 | -72.1% |
| Gross value added variation (%) EUR | -7.88 | 7.22 | -6.4 | -6.43 | -173.2% |
| Asset turnover ratio (%) |      |      |      |      |                  |
| Personnel expenses variation (%) EUR | 1 | 0.86 | 0.91 | 0.71 | -23.1% |
| Number of employees  |      |      |      |      |                  |
| Zona VIII - Cedeira |      |      |      |      |                  |
| Operating income variation (%) EUR | -4.53 | 4.72 | -7.11 | 5.97 | 358.8% |
| Gross value added variation (%) EUR | -11.53 | -5.04 | -5.33 | 10.87 | 248.9% |
| Asset turnover ratio (%) |      |      |      |      |                  |
| Personnel expenses variation (%) EUR | 0.86 | 0.8 | 0.95 | 0.77 | -11.5% |
| Number of employees  |      |      |      |      |                  |
| Zona IX - A Marina |      |      |      |      |                  |
| Operating income variation (%) EUR | -3.15 | -13.03 | -6.61 | -12.17 | -60.2% |
| Gross value added variation (%) EUR | -3.17 | -18.03 | -11.6 | -10.64 | 2.7% |
| Asset turnover ratio (%) | 0.92 | 0.83 | 0.73 | 0.66 | -20.2% |
| Personnel expenses variation (%) EUR | 4.7 | -1.26 | 0.14 | -3.73 | -412.6% |
| Number of employees  |      |      |      |      |                  |
| Total Galicia |      |      |      |      |                  |
| Operating income variation (%) EUR | -0.44 | -3.08 | -4.13 | -12.43 | -387.5% |
| Gross value added variation (%) EUR | -3.24 | -4.74 | -5.25 | -12.81 | -190.5% |

Table 2 (continued)

| Table 2 (continued) | 2017 | 2018 | 2019 | 2020 | % Var. 2020–2019 |
|----------------------|------|------|------|------|------------------|
| Asset turnover ratio (%) | 0.93 | 0.9 | 0.85 | 0.69 | -22.8% |
| Personnel expenses variation (%) EUR | 2.16 | 0.89 | 0.91 | 5.59 | -523.5% |
| Number of employees  |      |      |      |      |                  |
| Zona VII-A Coruña-Ferrol |      |      |      |      |                  |
| Operating income variation (%) EUR |      |      |      |      |                  |
| Gross value added variation (%) EUR |      |      |      |      |                  |
| Asset turnover ratio (%) |      |      |      |      |                  |
| Personnel expenses variation (%) EUR |      |      |      |      |                  |
| Number of employees  |      |      |      |      |                  |
| Zona VIII - Cedeira |      |      |      |      |                  |
| Operating income variation (%) EUR |      |      |      |      |                  |
| Gross value added variation (%) EUR |      |      |      |      |                  |
| Asset turnover ratio (%) |      |      |      |      |                  |
| Personnel expenses variation (%) EUR |      |      |      |      |                  |
| Number of employees  |      |      |      |      |                  |
| Total Galicia |      |      |      |      |                  |
| Operating income variation (%) EUR |      |      |      |      |                  |
| Gross value added variation (%) EUR |      |      |      |      |                  |
| Asset turnover ratio (%) |      |      |      |      |                  |
| Personnel expenses variation (%) EUR |      |      |      |      |                  |
| Number of employees  |      |      |      |      |                  |
Table 3
Evolution of financial variables.

| Zone | 2017 | 2018 | 2019 | 2020 | % Var. 2020-2019 |
|------|------|------|------|------|------------------|
| Zone I - Vigo | | | | | |
| Profit margin (%) | 6.48 | 7.03 | 3.64 | 1.23 | −78.5 |
| Economic | 4.61 | 6.62 | 3.4 | 1.92 | −60.6 |
| Financial profitability (%) | 8.6 | 11.07 | 6.51 | 0.36 | −95.9 |
| Indebtedness (%) | 22.86 | 29.27 | 32.9 | 31.85 | 12.4 |
| Financial leverage (%) | 2.86 | 4.53 | 3.56 | 4.15 | −13.7 |

Zone II - Pontevedra

| Profit margin (%) | 6.41 | 1 | 2.27 | 1.11 | −65.6 |
| Economic | 7.34 | 1.76 | 2.53 | 2.32 | −40.2 |
| Financial profitability (%) | 20.03 | 12.06 | 8.94 | 3.87 | −71.7 |
| Indebtedness (%) | 42.95 | 45.88 | 39.01 | 40.01 | −6.1 |
| Financial leverage (%) | 0.84 | 0.39 | 1.13 | 0.08 | −89.8 |

Zone III - Arousa

| Profit margin (%) | 6.69 | 4.77 | 2.44 | 3.53 | −23.8 |
| Economic | 6.73 | 5.89 | 2.85 | 3.89 | −24.6 |
| Financial profitability (%) | 12.55 | 10.21 | 9.88 | 10.65 | −2.1 |
| Indebtedness (%) | 35.89 | 38.54 | 37 | 34.87 | −6.1 |
| Financial leverage (%) | 21.93 | 24.77 | 15.93 | 21.31 | 2.1 |

Zone IV - Muros

| Profit margin (%) | 4.53 | −0.023 | 0.674 | 0.491 | −71.6 |
| Economic | 2.7 | −0.02 | 0.57 | 0.42 | −61.2 |
| Financial profitability (%) | 11.04 | 0.39 | 1.6 | 1.29 | −70.3 |
| Indebtedness (%) | 56.97 | 55.53 | 49.16 | 29.05 | −46.1 |
| Financial leverage (%) | 85.58 | 78.442 | 56.501 | 28.024 | −61.9 |

Zone V - Fisterra

| Profit margin (%) | 10.38 | 8.24 | 12.39 | 5.64 | −45.4 |
| Economic | 13.11 | 10.49 | 7.64 | 4.54 | −56.4 |
| Financial profitability (%) | 25.48 | 16.86 | 15.97 | 8.1 | −58.3 |
| Indebtedness (%) | 50.26 | 43.15 | 48.94 | 47.41 | −0.1 |
| Financial leverage (%) | 69.27 | 58.84 | 83.59 | 79.44 | 12.6 |

Zone VI - Costa da Morte

| Profit margin (%) | 3.4 | 2.17 | −1.92 | 2.02 | 66.0 |
| Economic | 4.11 | 1.28 | −1.24 | 2.91 | 110.4 |
| Financial profitability (%) | 8.72 | 2.54 | −2.3 | 6.72 | 125.0 |
| Indebtedness (%) | 52.88 | 49.5 | 51.72 | 42.53 | −17.2 |
| Financial leverage (%) | 45.23 | 53.67 | 82.12 | 65.58 | 8.7 |

Zone VII - Coruña-Ferrol

| Profit margin (%) | 3.82 | 3.66 | 5.62 | 3.25 | −25.6 |
| Economic | 2.45 | 3.27 | 3.41 | 1.87 | −38.6 |
| Financial profitability (%) | 12.95 | 12.58 | 14.19 | 5.47 | −58.7 |
| Indebtedness (%) | 64.21 | 36.45 | 38.43 | 27.81 | −40.0 |
| Financial leverage (%) | 0.56 | 11.21 | 12.05 | 0.04 | −99.5 |

Zone VIII - Cedeira

| Profit margin (%) | 1.73 | −0.93 | −7.28 | −9.25 | −328.2 |
| Economic | 1.97 | 0.75 | −4.65 | −5.18 | −353.1 |
| Financial profitability (%) | 5.41 | 8.93 | −2.73 | 7.19 | 85.8 |

Table 3 (continued)

| Zone | 2017 | 2018 | 2019 | 2020 | % Var. 2020-2019 |
|------|------|------|------|------|------------------|
| Zona VIII - Cedeira | | | | | |
| Profit margin (%) | 1.73 | −0.93 | −7.28 | −9.25 | −328.2 |
| Economic | 1.97 | 0.75 | −4.65 | −5.18 | −353.1 |
| Financial profitability (%) | 5.41 | 8.93 | −2.73 | 7.19 | 85.8 |
| Zona I - Vigo | | | | | |
| Profit margin (%) | 6.48 | 7.03 | 3.64 | 1.23 | −78.5 |
| Economic | 4.61 | 6.62 | 3.4 | 1.92 | −60.6 |
| Financial profitability (%) | 8.6 | 11.07 | 6.51 | 0.36 | −95.9 |
| Indebtedness (%) | 22.86 | 29.27 | 32.9 | 31.85 | 12.4 |
| Financial leverage (%) | 2.86 | 4.53 | 3.56 | 4.15 | −13.7 |

prices in target species such as horse mackerel (Trachurus trachurus) and Atlantic mackerel, for the purse seine fleet, and hake (Merluccius merluccius), for the offshore fleet (de Galicia, 2021b).

On the other hand, zone VIII-Cedeira is dedicated, in more than 90%, to artisanal fishing. A large part of this fleet focuses its activity on hake fishing using gillnets. The volatility of the catches of this species is reflected in the variability of the results of the companies in the area in the last five years. In 2020, the hake gillnet season was particularly unprofitable. The turnover of the shipping companies, between May and June 2020, was 80% lower than in previous years. The closure of the HORECA channel resulted in the marketing of large-sized fish, such as hake and monkfish (Lophius budgessa, L. piscatorius) over 3 kg, not having a commercial outlet (de Pescadores de Cedeira, 2020). Faced with this scenario, the gillnet fleet joined the albacore (Thunnus alalunga) campaign in the Cantabrian Sea. This was a wise decision as the fleet experienced a strong increase in its income, attributable to the exceptionally abundant sale of albacore (from €318,099 in 2019 to €580,773 in 2020). However, the process of adapting the vessels to albacore fishing entails costs that decreased the profitability of the fishing companies (Table 3) (Confraría Pescadores Cedeira, 2021).

Another of the most important fishing areas of Galicia, zone IX-A Marín, has been able to improve its aggregate economic results for 2020 through the transfer of public funds. This area has been the main beneficiary of the announcement of subsidies published in July 2020 by the regional Government of Galicia. This was the first call for applications made at regional level to alleviate the effects of Covid-19 on fisheries. To qualify for these subsidies, it was necessary to present a decrease in turnover, with respect to the previous year, of more than 25%. In the case of A Marín, the fleet of the national fishing grounds dedicated to fishing albacore in the Cantabrian Sea suffered losses, as the price of this species fell by around 40% during the 2020 campaign (May–August). In the case of the offshore fleet fishing in the Celtic Sea, the low prices of hake (−42%), monkfish (−15%) and megrim (Lepidorhombus whiffiagonis) (−15%) reduced the profit margin of the extractive companies in the area (de Galicia, 2021b). Therefore, a large percentage of the extractive fishing companies in zone IX met the requirements to be beneficiaries of the first call for aid approved by the regional Government of Galicia.

The performance of labor variables shows a similar trend in all study areas. While the number of employees has suffered a slight decrease, personnel costs have decreased. This fact is due to the adoption of ERTEs in the extractive fishing sector in Galicia. Despite the fact that Galicia
has been one of the Spanish regions with the fewest ERTEs, only 4%, 1,078 ones have been approved (BOE, 2020). Vigo area has had the highest number of ERTEs (383), followed by A Coruña-Ferrol (360), Arousa (310) and A Mariña (25) (Ministerio de inclusión, seguridad social y migraciones, 2021). The adoption of ERTEs has meant that, despite the crisis in the sector, the number of layoffs was limited. In addition, the companies whose workers were under ERTE were exempted from social security contributions, so that their personnel costs have decreased by around 111,000 € (Instituto Social de la Marina, 2021).

5. Conclusions

The Covid-19 pandemic has had important consequences for Galician fisheries. The volume of fresh fish production during 2020 (150,256 tons) was the lowest in 15 years, and turnover (€412.96 million) also fell to levels of 14 years ago. The average price (€2.75 per kilogram) also fell compared to previous years, although to a lesser extent than the rest of the variables, which prevented even greater economic losses. The decrease in production volume is largely due to the closure of the hospitality industry, which had a negative impact on fish and especially shellfish catches. The drop in demand had a strong negative impact on prices, especially between March and May.

Detailed analysis of production in the nine coastal areas of Galicia shows that turnover has decreased in all of them with respect to the 2017–2019 period. Profit margin and economic and financial profitability also fall across the board, although unevenly, in the different zones. There is a generalized trend whereby the zones whose catches are marketed in the HORECA channel have been more affected by the pandemic. Zone III-Arousa and zone IV-Muros focus their fishing efforts on high-value species such as spider crab (Maja brachydactyla), velvet crab (Necora puber), octopus, different types of clams or sea urchin, caught through floating shellfishing; and turbot, sea bass or sole, the result of the activity of the coastal fishing fleet. These species are mainly marketed through the HORECA channel, so the closure of this activity has led to a decrease in the demand for these products.

On the other hand, the confinement of the population has redirected the demand for fresh fish products towards frozen or canned fish, sectors that have been affected to a much lesser extent by the health crisis. In this way, the fish processing sector has been strengthened during the periods of intermittent confinement in Spain. In turn, the areas whose fleet catches species such as sardines, Atlantic mackerel and anchovies, which are the raw material for frozen, salted or canned products, have been able to provide a commercial outlet for their products. This is the case of zone V-Fisterra and zone VI-Costa da Morte, which supplied the region’s canning companies with small pelagic species for their production.

As for the areas with an important offshore fishing fleet, such as zone I-Vigo, zone VII-A Coruña or zone IX-A Mariña, they also present a negative evolution of their economic performance, but to different degrees. Although the closure of the HORECA channel has also affected these fleet segments, it has had a lesser impact as it rivals in importance with other marketing channels. The partial closure of international borders, the increase in rivalry in the waters in which the fleets fish, or the paralysis of the activity of some of these vessels due to the Covid-19 infection among their crew members, have been some of the factors that have reduced both the number of catches and their sales.

Faced with this situation, the Spanish Government and the Galician Government created an institutional framework to alleviate the losses derived from the decrease in income of the extractive fishing sector in Galicia. Following the recommendations of the European Union, the national and regional fisheries ministries approved several calls for public aid. In addition, the adoption of Temporary Employment Adjustment Plans, a labor flexibility measure, allowed companies to make significant savings in social security contributions, which avoided the need for layoffs. Thus, the level of fishing employment in Galicia has not been substantially affected.

The analysis carried out in this article exposes the heterogeneity of the variables and the features that have characterized the economic evolution of the extractive fishing sector in each of the maritime areas of Galicia during the Covid-19 crisis. Although it is true that this study has an academic profile, the conclusions reached through the analysis are of great importance for policy-makers and stakeholders in the fishing sector. External disturbances, in a globalized economic scenario, are increasingly frequent, so studies of an applied nature are necessary to improve resource governance.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Table 4

| Table 4 | Evolution of catches in Galicia. |
|----------|---------------------------------|
|          | 2020 | 2019 | Var. 2020–2019 | % Var. 2020–2019 |
| Zona I - Vigo | 31,516,880 | 108,438,728 | 34,991,602 | 120,031,062 | -3,474,723 | -11,592,334 | 0.10 | -0.10 |
| Zona II - Pontevedra | 2,856,498 | 11,896,544 | 4,528,268 | 15,351,151 | -1,671,770 | -3,454,607 | -0.37 | -0.23 |
| Zona III - Arousa | 32,249,429 | 82,422,361 | 33,736,957 | 93,141,587 | -1,487,528 | -10,719,226 | -0.04 | -0.12 |
| Zona IV - Muros | 8,041,696 | 20,942,479 | 10,140,802 | 30,684,018 | -2,099,286 | -9,741,540 | -0.21 | -0.32 |
| Zona V - Fisterra | 813,915 | 4,490,312 | 844,806 | 5,336,927 | -80,892 | -848,285 | 0.09 | 0.16 |
| Zona VI - Costa da Morte | 7,087,004 | 9,993,215 | 3,439,654 | 10,310,697 | 737,350 | 317,481 | 0.12 | 0.03 |
| Zona VII - Coruña-Ferrol | 31,891,319 | 63,403,111 | 34,619,145 | 72,666,042 | 2,727,826 | 9,262,932 | -0.08 | -0.13 |
| Zona VIII - Cedeira | 1,488,254 | 6,201,048 | 2,131,900 | 8,471,719 | 642,746 | 2,270,672 | -0.30 | -0.27 |
| Zona IX - Mariña | 34,311,148 | 105,172,547 | 30,774,899 | 108,893,374 | 5,356,248 | 3,720,628 | 0.11 | 0.03 |
| Total | 150,256,142 | 412,960,344 | 158,167,314 | 464,888,248 | 7,911,171 | 51,927,904 | -0.05 | -0.11 |
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