Economic Consequences of Coronavirus Disease (COVID-19) on Fisheries in the Eastern Mediterranean (Cyprus)

Elias Giannakis, Louis Hadjioannou, Carlos Jimenez, Marios Papageorgiou, Anastasis Karonias and Antonis Petrou

1 The Cyprus Institute, Energy Environment and Water Research Center, 20 Konstantinou Kavafi Street, Nicosia 2121, Cyprus; c.jimenez@cyi.ac.cy
2 Enalia Physis Environmental Research Centre (ENALIA), Acropolis 2, Aglantzia 2101, P.O. Box 26728, Nicosia 1647, Cyprus; l.hadjioannou@enaliaphysis.org.cy (L.H.); c.jimenez@enaliaphysis.org.cy (C.J.); m.papageorgiou@enaliaphysis.org.cy (M.P.); a.karonias@enaliaphysis.org.cy (A.K.); a.petrou@enaliaphysis.org.cy (A.P.)

Abstract: Fisheries are among the sectors hardest-hit by the coronavirus pandemic (COVID-19) crisis due to the sudden decrease in the demand for seafood. This study employs demand-driven and supply-driven input-output models to conduct an economy-wide assessment of the contraction of the fisheries activities in Cyprus, as well as a questionnaire survey to reveal fishermen’s perceptions of COVID-19 crisis impacts. The results at the macroeconomic level reveal that the contraction in the economic output of the fisheries sector does not have any significant impact on the wider economy due to the small size of the sector. However, the COVID-19 crisis has major negative effects on fishermen’s income and the livelihoods of fishers’ households. The average gross margin of the interviewed fishermen for March 2020, i.e., the month where a national quarantine and lockdown was imposed, was four times less the average monthly gross margin for the winter period (December 2019–February 2020) and 2.5 times less compared to the average monthly gross margin of 2019. The recessionary impacts of the COVID-19 crisis in conjunction with the chronic challenges that fisheries are currently facing in Cyprus, negatively affect the viability of the sector.

Keywords: small-scale fisheries; fishermen’s income; fishery value chain; input-output model; economic recovery measures; questionnaire survey; demand-driven multipliers; supply-driven multipliers

1. Introduction

The current coronavirus pandemic (COVID-19) outbreak that initiated during the first months of 2020 caused major disruptions in human societies. COVID-19-related perturbations in the functioning of the economic system, such as business interruptions in many sectors, supply-chain disruptions, and large drops in consumer demand and labor force shortages created significant negative effects on economies across the globe [1]. The fisheries sector is among the hardest-hit sectors of the outbreak of the COVID-19 [2]. The drop in seafood demand and the complexity of the supply chain (i.e., perishable products and labor-intensive activities) have made the operations of the sector loss-making and may lead to a cessation of businesses.

European fisheries, unlike most other economic sectors and despite their small contribution in terms of GDP and employment generation, are regulated at European Union (EU) level through a common policy, that is, the Common Fisheries Policy (CFP). The CFP, which was first introduced in the
1970s and went through successive reviews, sets the rules for managing European fishing fleets and for conserving fish stocks. On March 2020, the European Commission, through the European Maritime and Fisheries Fund (EMFF), proposed several measures to mitigate the impact of the COVID-19 outbreak in the fisheries sector, such as liquidity support for the temporary cessation of fishing activities and support for workers to dampen income losses [3].

The gross value added (GVA) of the fisheries sector in Cyprus (eastern Mediterranean, Levantine Sea) exhibited an annual growth rate of 0.8% (constant prices 2010) during the period between 2000 and 2017, that is significantly lower compared to the annual growth rate of the national economy (5.3%) [4]. Fisheries contributed EUR 32.2 million to the country’s GVA in 2018, that is, a 0.17% share [4]. People working in fisheries accounted for 0.12% of total employment in Cyprus in 2018, corresponding to 500 employees and self-employed persons [5]. Despite its small contribution to GVA and employment generation, the sector is an important economic activity for several coastal areas, mainly for small fishing communities centered around fishing shelters. In these communities, it develops strong links with other sectors of economic activity, such as processing, trade, hotels and restaurants, and transportation, that further increase its direct and indirect contribution to economic output. It is worth mentioning that the aquaculture products in Cyprus, despite the small size of the sector compared to other Mediterranean producer countries, are the third most important agricultural export commodities [6], consisting of a sought-after product around the world.

The fisheries sector in Cyprus is vulnerable to multiple challenges and pressures, such as overfishing, ecosystem changes, and increase in fuel costs that have made, through the years, the profession unviable [7]. In recent years, the expansion of more economically important sectors in marine areas, such as off-shore oil and gas extraction and tourism and recreation activities [8–11], has been given priority over the fisheries sector and in particular the small-scale fisheries (SSF), thus increasing the pressures on the profession. The expansion of the abovementioned activities has subsequently led to the dispossession of marine space [12], which has become increasingly crowded in the eastern Mediterranean island of Cyprus.

Input-output (IO) models, despite their well-known limitations, such as, fixed prices, constant returns to scale, no supply constraints and the aggregation of input-output data over different products supplied by one industry [13–15], have been incrementally used in the literature to analyze how an exogenous shock propagates in an economy through the interdependence and the links between the production sectors [16,17]. IO techniques have previously been applied in the fisheries sector for economic impact analysis. For example, Lee and Yoo [18] explored the role of the capture fisheries and aquaculture sectors in the Korean national economy for the period 1995–2010 using different specifications of IO models, such as demand-driven, supply-driven, and inter-industry linkage effect models. Garza-Gil et al. [19] and Surís-Regueiro et al. [20] used IO methods to assess the socioeconomic impact of Spanish fishing and aquaculture in Galicia. Grealis et al. [21] assessed the direct and indirect impacts of the expansion of the Irish aquaculture industry. Johansen et al. [22] used a national IO model to analyze the Norwegian seafood value chain and assess the effects of the industry on the remaining economic sectors.

In this study, we aim to assess (a) the COVID-19 pandemic’s impact on fishermen’s incomes and livelihoods in Cyprus and (b) the economy-wide effects of the market disruptions in the fisheries sector to the country’s economy. To do so, we first employed a questionnaire survey to reveal fishers’ perceptions about the impact of the current COVID-19 outbreak on their economic activities. Second, we applied demand-driven and supply-driven IO models to explore how the contraction in the output of the fisheries sector in Cyprus due to the 2020 COVID-19 crisis propagates in the economy through the backward linkages of the supply chain. The combination of micro and macro level data allowed an integrated impact assessment of the pandemic on the fisheries sector.
2. Materials and Methods

2.1. Questionnaire Survey

In this study, a telephone survey was undertaken in May 2020 to reveal fishermen’s perceptions and views about the current COVID-19 impacts on their economic activities. The survey focused on SSF, which is the backbone of the fisheries sector in Cyprus [7]. A total of 51 interviews were conducted which corresponds to 13.5% of the total professional fishermen in Cyprus [23]. The questionnaire was kept short with a total of 19 questions to ensure its completion (see Supplementary Materials). It was designed along three main pillars, namely, the short-term impact of the 2020 COVID-19 outbreak on fisheries, the long-term impact of the pandemic and potential measures for mitigating the adverse effects. Information on the socioeconomic background of the respondents was also provided. A one-way analysis of variance (ANOVA) was conducted to evaluate potential differences between fishermen’s perceptions and explanatory variables such as fishermen’s age, years in profession and annual gross margin.

2.2. Input-Output Analysis

An IO model consists of a system of linear equations that records the financial flows among the economic sectors and describes the distribution of the output of a sector with the remaining sectors of the economy over a stated period of time [24], and it has been widely applied for policy impact analysis, technological change and environmental analysis [15,25]. An important feature of multiplier analysis in an IO context is its ability to disaggregate the effect of a shock or stimulus in the economic system [26,27]. Most of the IO applications in fisheries have applied the demand-driven IO approach, i.e., the demand for seafood either for household consumption or supplying the processing and the service (hotels and restaurants) sectors and the investment demand (e.g., [19,21]). However, the COVID-19 pandemic also influences the fishing activity from the supply side (i.e., supply chain disruptions, lack of workforce). For instance, Leung and Pooley [28] used supply-driven multipliers to assess the economic impact of reducing the operations of longline fisheries in Hawaii. Both approaches are applied in this study to explore the economic impact of the 2020 COVID-19 outbreak.

2.2.1. Demand-Driven Input-Output Model

The traditional equations of the standard demand-side IO model can be formulated as follows:

\[ X = AX + F \]  
\[ (I - A)X = F \]  
\[ X = (I - A)^{-1}F \]

where the supply \( X \) is a \( n \times 1 \) vector of output in each sector, \( A \) is an \( n \times n \) matrix of technical coefficients that determine the needs for intermediate inputs of a sector; \( I \) is an \( n \times n \) identity matrix; \( F \) is a \( n \times 1 \) vector of exogenous final demand for each sector’s product. Final demand is the demand for goods, which are not used to produce other goods, and is typically disaggregated into consumption, investment, government expenditure, and exports.

The \((I - A)^{-1}\) matrix is known as the total requirements or Leontief inverse, comprised of the interdependency coefficients \((l_{ij})\). The Leontief matrix quantifies the round-by-round direct and indirect effects exerted by a change in the final demand of a sector \((\Delta F)\) on the economic output of each sector \((\Delta X)\). The demand-driven output multiplier of a sector \(j\) equals to the column sums of the \((I - A)^{-1}\) matrix, i.e., \(\sum_{i=1}^{n} l_{ij} \) [24].
2.2.2. Mixed Endogenous-Exogenous Input-Output Model

In the previous section, the final demand shocks ($\Delta F$) were exogenously determined and the effects of these changes on sectoral economic output ($\Delta X$) were endogenously determined. There are however certain exogenous shocks or policies that induce changes in the output of the production sectors ($\Delta X$) [28,29]. In such special circumstances, the outputs of the sectors of interest are exogenously specified so that the outputs of the remaining sectors to be quantified endogenously [29,30].

Using subscript 1 to denote the sectors whose economic outputs are exogenous and subscript 2 for those sectors whose outputs are endogenously determined, the Equation (2) can be expressed in a system of two matrix equations as follows:

$$
\begin{align*}
(1 - a_{11})X_1 - a_{12}X_2 &= F_1 \\
-a_{21}X_1 + (1 - a_{22})X_2 &= F_2
\end{align*}
$$

(4)

Rearranging Equation (4) in order to have the endogenous variables ($X_2, F_1$) on the left-hand side and the exogenously determined variables ($X_1, F_2$) on the right, we have:

$$
\begin{bmatrix}
-a_{12} \\
(1 - a_{22})
\end{bmatrix}
\begin{bmatrix}
X_2 \\
F_1
\end{bmatrix}
- 
\begin{bmatrix}
-1 \\
0
\end{bmatrix}
\begin{bmatrix}
X_1 \\
F_2
\end{bmatrix}
= 
\begin{bmatrix}
-(1 - a_{11}) \\
0
\end{bmatrix}
\begin{bmatrix}
X_1 \\
F_2
\end{bmatrix}
$$

(5)

We denote $M = \begin{bmatrix}
-a_{12} \\
(1 - a_{22})
\end{bmatrix} - 1$ and $N = \begin{bmatrix}
-1 \\
0
\end{bmatrix}$, then Equation (5) can become:

$$
\begin{bmatrix}
X_2 \\
F_1
\end{bmatrix}
= 
M^{-1}N
\begin{bmatrix}
X_1 \\
F_2
\end{bmatrix}
$$

(6)

The study focus on the impact of exogenous changes of the economic output of a given sector, namely fisheries, on the output of the remaining sectors; thus, we can assume zero changes in the exogenously-defined final demands ($\Delta F_2 = 0$) [29,31]. The multiplier matrix $(I - A_{22})^{-1}A_{21}$ denotes the changes in the endogenous outputs ($X_2$) that are derived from a unitary change in the exogenous output ($X_1$).

2.2.3. Data and Application

The structure of the Cypriot economy is assessed on the basis of the latest available national symmetric IO table for the year 2016 [32]. The initial scheme of 65 sectors of economic activity was aggregated into 24 sectors (see Table A1, Appendix A). In the absence of more recent information, we assume that the industrial structure and the state of technology remains unchanged between 2016 and 2020.

The lockdown measures to contain spread of the pandemic led to a serious economic downturn in Cyprus, with GDP contracting by 12.2% in the second quarter of 2020 [33]. According to the European Commission’s forecasts, the gross domestic product (GDP) in Cyprus will shrink by 7.4% in 2020 due to the current COVID-19 crisis [34]. Here, we explore two scenarios, namely, a reduction of the economic output of the fisheries sector by 10% (COVID10 scenario) based on the abovementioned data and projections and a reduction of the economic output of the sector by 50% (COVID50 scenario) based on the perceptions of the surveyed fishermen (Section 3.3). The economy-wide effects of the contraction in the economic output of the remaining production sectors due to the COVID-19 crisis are beyond the scope of this paper.
3. Results

3.1. Questionnaire Survey Results

A telephone survey on a sample of 51 fishermen was conducted. Forty-nine interviewees completed the survey (96%); the remaining two fishermen were either unwilling or not able to participate in the survey. Most of the respondents are in the range of 45–54 years old (29%), followed by the age range of 35–44 (22%), 55–64 (20%), and older than 65 (20%) years old. Around 24% of the respondents work as professional fishermen the past 6–10 years, 20% the past 11–15 years, and 14% the past 1–5 years.

The average gross margin of the respondents in 2019 was around EUR 7084 ranging from EUR 0 to EUR 20,000. Two respondents were largely disappointed by the profession and reported no profit, having been largely affected by damages to their nets, depredation and/or minimal catches. Similarly, the average monthly gross margin in 2019 was around EUR 744, ranging from EUR 100 to EUR 2000. Around 53% of the fishermen have a complementary source of income to support their livelihoods. Next, fishermen were asked about the average monthly gross margin for the months December 2019, January 2020 and February 2020, i.e., the months prior the COVID-19 global outbreak. Forty-four out of the 49 interviewed fishermen reported an average monthly gross margin of EUR 1112, which ranges between EUR 0 (due to large-scale damages in their nets and very low catches) and EUR 3000. During this period, the average monthly number of fishing trips was 8.4 ranging from 0 to 25 trips.

We then asked fishermen their average gross margin for March 2020, i.e., the month where a national quarantine and lockdown were imposed restricting the movement of the population and reducing economic activity. During this month, more than half of the respondents reported no income. Specifically, the average gross margin dropped to EUR 297, that is, about four times less the average monthly gross margin for the winter period (December 2019–February 2020) and 2.5 times less compared to the average monthly gross margin of 2019. Similarly, the average number of fishing trips was 7.9, i.e., slightly reduced compared to the previous three months; about 20% of the respondents did not carry out any fishing trips during March 2020.

Thirty-five out of the 49 respondents (i.e., 71%) reported that they received financial aid from the government and the EU after application to the Department of Fisheries and Marine Research (EUR 1000 per month for two months); the remaining 14 fishermen either did not apply for financial aid or their application was rejected. The majority of the respondents (62%) believe that the current financial compensation tools implemented by the Cyprus government and the EU are not enough to cushion the economic fallout of the sector from the current COVID-19 pandemic and long-term recovery programs are required.

Almost all fishermen describe the negative impact of the COVID-19 outbreak on their income as very high (70%) or high (18%). About half of the interviewees believe that the demand for seafood will continue to drop after the end of the COVID-19 pandemic, while 31% of the respondents believe that the fish demand will increase (Figure 1a). The main reasons behind the reduction in the demand for fresh seafood are financial reasons (43%), followed by the collapse of the tourism industry (19%) (Figure 1b). Interestingly, consumers’ perceptions, e.g., not trusting or believing that fish is safe to consume, is also named among the reasons (19%; Figure 1b). Regarding the effect of the COVID-19 crisis on the price of the fresh fish, around 30% of the respondents believe that the prices will continue to drop after the end of the pandemic, mainly due to the overall drop in the consumer demand. On the contrary, around 57% of fishermen believe that the fresh fish selling prices will not decrease because fish stocks are relatively low, thus the supply will balance the reduced demand. The results of the ANOVA tests showed that there were not any statistically significant differences in fishermen’s perceptions about the demand for fresh fish after the COVID-19 crisis and variables such as fishermen’s age ($p = 0.4$), years in profession ($p = 0.1$) and annual gross margin ($p = 0.8$) (see Table A2).
Thirty-five percent of the respondents are concerned that the consumers will turn to packed and frozen seafood products after the COVID-19 pandemic. Half of the respondents believe that the consumers’ behavior will not alter, while the remaining fishermen could not predict consumers’ response. The main reasons behind consumers’ shift to frozen fish are financial ones (60%), that is, the lower price of frozen fish, and the low quantities of fresh fish in the market (13%); around 7% of the respondents believe that consumers cannot understand the difference between fresh and frozen fish (Figure 2).

![Figure 1. Fish demand after COVID-19 (a) and reasons for the reduced demand for fresh fish. (b) Other includes changes in people’s dining habits and low fish supply.](image)

![Figure 2. Reasons behind consumers’ preferences to seafood products.](image)

Lastly, fishermen were asked to propose measures to mitigate the effects of the COVID-19 current pandemic on their livelihoods. The application of control/management measures for the protection of fish population is the most popular measure (25%) followed by more support mechanisms from EU and national government (12%) and the re-opening of restaurants and hotels (4%); one fourth of the fishermen did not provide any suggestions.

### 3.2. Demand-Driven Input-Output Multiplier Analysis

The demand-driven multiplier analysis identifies the most important sectors of economic activity with regards to their capacity to generate economic output (Table 1). Fisheries create relatively medium-scale direct and indirect effects on the output of the Cyprus economy (11th in rank), that is, for an EUR 1 million decrease for the products of the fisheries sector, the total output of the Cyprus economy will be decreased by EUR 1.63 million. The water transport sector creates the highest backward linkages (2.47) followed by the warehousing, postal, and courier activities (2.20) and the construction (2.19) sectors.

### 3.3. Supply-Driven Input-Output Multiplier Analysis

The supply-driven output multipliers of the fisheries sector derived from the exogenization of the sector’s output in the mixed endogenous-exogenous IO model are presented in Table 2. Each sectoral
multiplier shows the output change of sector $i$ due to the exogenous change of the output of the fisheries sector, while the sum of the multipliers indicates the total indirect impact generated on the output of the remaining economic sectors. In other words, a contraction in the output of the fisheries sector by 1-million-euro will decrease the output of the remaining sectors by EUR 0.598 million. The highest negative effects are observed for the construction (0.147), banking-financing (0.066), and metal and non-metal products (0.065) sectors. The assumed 10% contraction in the output of the fisheries sector (COVID10 scenario), that is EUR 5.9 million, will result in a direct and indirect shrinkage of the total output of the economy by EUR 9.5 million (i.e., $-0.02\%$). Similarly, the COVID50 scenario that corresponds to an EUR 29.7 million contraction of the fisheries sector output will lead to a total shrinkage of the output of the economy by EUR 47.5 million (i.e., $-0.10\%$).

Table 1. Demand-driven output multipliers.

| n/n | Economic Sectors                                      | Demand-Driven Output Multipliers |
|-----|-------------------------------------------------------|---------------------------------|
| 1   | Water transport                                       | 2.47                            |
| 2   | Warehousing, postal and courier activities            | 2.20                            |
| 3   | Construction                                          | 2.19                            |
| 4   | Mining                                                | 1.80                            |
| 5   | Accommodation and Food services                       | 1.74                            |
| 6   | Banking-Financing                                    | 1.73                            |
| 7   | Electricity, gas and water                            | 1.71                            |
| 8   | Land transport                                        | 1.70                            |
| 9   | Food manufacturing                                    | 1.68                            |
| 10  | Trade                                                 | 1.65                            |
| 11  | Fisheries                                             | 1.65                            |
| 12  | Agriculture                                           | 1.62                            |
| 13  | Metal and non-metal products                          | 1.59                            |
| 14  | Other services                                        | 1.58                            |
| 15  | Wood and paper                                        | 1.56                            |
| 16  | Health                                                | 1.51                            |
| 17  | Real Estate                                           | 1.35                            |
| 18  | Public administration                                 | 1.28                            |
| 19  | Education                                             | 1.27                            |
| 20  | Chemical and plastic products                         | 1.13                            |
| 21  | Air transport                                         | 1.12                            |
| 22  | Forestry                                              | 1.12                            |
| 23  | Machinery and equipment                               | 1.08                            |
| 24  | Textile                                               | 1.07                            |

Table 2. Fisheries’ supply-driven output multipliers.

| n/n | Economic Sectors                                      | Supply-Driven Output Multipliers |
|-----|-------------------------------------------------------|---------------------------------|
| 1   | Construction                                          | 0.1466                          |
| 2   | Banking-Financing                                    | 0.0659                          |
| 3   | Metal and non-metal products                          | 0.0648                          |
| 4   | Chemical and plastic products                         | 0.0638                          |
| 5   | Trade                                                 | 0.0509                          |
| 6   | Electricity, gas and water                            | 0.0508                          |
| 7   | Other services                                        | 0.0496                          |
| 8   | Wood and paper                                        | 0.0473                          |
| 9   | Machinery and equipment                               | 0.0212                          |
| 10  | Land transport                                        | 0.0109                          |
| 11  | Real Estate                                           | 0.0084                          |
| 12  | Warehousing, postal and courier activities            | 0.0068                          |
| 13  | Food manufacturing                                    | 0.0033                          |
| 14  | Mining                                                | 0.0023                          |
| 15  | Accommodation and Food services                       | 0.0020                          |
| 16  | Air transport                                         | 0.0016                          |
| 17  | Agriculture                                           | 0.0007                          |
| 18  | Textile                                               | 0.0006                          |
| 19  | Education                                             | 0.0004                          |
| 20  | Water transport                                       | 0.0004                          |
| 21  | Public administration                                 | 0.0003                          |
| 22  | Health                                                | 0.0000                          |
| 23  | Forestry                                              | 0.0000                          |
|     | Total                                                 | 0.5985                          |
4. Discussion and Conclusions

In this study, we empirically explored the economic impact of the current COVID-19 crisis on the fisheries sector in Cyprus at the macro (IO) and micro (questionnaire survey) level. The results of the demand-driven multiplier analysis revealed medium-scale direct and indirect effects of the fisheries sector on the output of the Cypriot economy. The backward linkages of the sector are ranked around the middle of the sectoral linkage rankings (11th out of 24). The results of the supply-driven multiplier analysis indicated that the assumed reduction of the fisheries’ output by 10% (COVID10) and 50% (COVID50) will result in a scant contraction in the total output of the economy by 0.02% and 0.10%, respectively, which is mainly attributed to the small size of the sector. Construction, banking-financing, and metal and non-metal products sectors would suffer the most serious losses. This is mainly due to the high direct backward linkages of the fisheries industry with these sectors. In particular, about 30% of the intermediate inputs of the fisheries industry are purchased from the construction sector, while significant direct purchases are made from the banking-financing (9%) and metal and non-metal products (8%) sectors.

The demand-driven multiplier analysis results can guide policy makers and fisheries investment planning for evaluating the economy-wide effects of investments in the sector after the COVID-19 crisis. On the other hand, the supply-driven multiplier analysis can provide insights to policy makers about the economy-wide impacts of negative exogenous shocks on the output of the fisheries sectors, e.g., from natural disasters to depletion of fish stocks or stricter fishery regulations, for developing disaster management strategies.

The findings of the questionnaire survey indicate that the COVID-19 outbreak had significant negative impact on fishermen’s income. An on-line survey for the commercial fishing industry in the Northeastern US revealed also similar disruptions for the sector [35]. More than 40% of fishers reported that between mid-March and mid-May they had not been fishing due to social distancing restrictions, while all of them reported a significant decline in their income. White et al. [36] reported a substantial decline in fresh seafood catches (~40%), imports (~37%) and exports (~43%) for the US relative to the previous year (2019), while frozen seafood products were generally less affected. Severe negative effects are also reported for the fisheries sector of the Southeast Asian countries [37].

The surveyed fishermen reported that the current financial compensation mechanisms of the government and the EU are not enough to ameliorate the impact of the pandemic and stressed the need for long-term economic recovery plans and programs. Fishing operators, being mostly micro-enterprises, often lack the financial reserves to cover on-going costs; thus the support of the state, such as liquidity facilities, is crucial for avoiding bankruptcies and loss of jobs. Additional measures are required to secure the viability of fisheries towards potential long-term negative economic impact of the pandemic, such as large drops in the demand for fresh fish and the shift of consumers to frozen seafood products as well as control measures for the preservation of fish stocks.

Nevertheless, the results of our analysis show that the contraction of the fisheries sector does not have a significant impact on the wider economy though it has major negative effects on fishermen’s income and the livelihoods of the households depending on fishing activities. Even with the claims from some fishermen, who have benefited from the government’s allowance, that their activities have not been much affected by the COVID-19 crisis, there is still evidence that the recent crisis along with past/current challenges such as the growing number of maritime activities/users, the increasing international competition, and the decline in marine resources, will negatively affect the viability of the sector in Cyprus.

The COVID-19 pandemic has negatively affected the fishery value chain including retailers, restaurants and hotels. The post-effects of COVID-19 outbreak could result in the complete shutdown of the tuna and swordfish fisheries (considered as longline fisheries or large-scale fisheries) since the significant price drops can make fisheries no longer viable. The average tuna price per kilo in Cyprus during the tuna fishing season in 2020 was EUR 1.80 whereas the average price for 2019 was EUR 2.30. The falling prices have negatively affected both retailers and export-oriented fishermen, while SSF are
affected from the reduced demand of fresh fish in the local market especially from restaurants and hotels as the tourism industry is currently not fully operational.

Despite the minor role of the fisheries sector in terms of GDP and employment generation, efforts should be put to preserve as much as possible the fishermen’s profession, the disappearance of which threatens the cultural heritage of the region. It is worth mentioning that during the COVID-19 pandemic, there were numerous examples of food sharing between SSF and coastal communities, i.e., exchanging fish and seafood products for vegetables, fruits and meat that forge stronger relationships among people in small local communities.

It would be expected that the impact from the contraction would be more evident in the coastal areas, thus a future regionalization of the IO model could better quantify the relative importance of the fisheries sector in these areas. Another important limitation of this analysis is that it only considers the macroeconomic impact of the simulated reduction in the output of the fisheries sector and does not capture any trade-offs with the economy-wide effects of the contraction in the output of the remaining sectors of economic activity. Future research could analyze the economic effects of the COVID-19 crisis on the fisheries sector and on the wider economy through the application of a computable general equilibrium (CGE) model that allows for relative price changes and input substitution.

Supplementary Materials: The following are available online at http://www.mdpi.com/2071-1050/12/22/9406/s1, Title: Questionnaire on the impact of COVID-19 outbreak on fisheries.

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Appendix A

Table A1. NACE (Statistical classification of economic activities in the European Union) codes of the sectors of economic activity that make up the 24 sectors for the input-output analysis for Cyprus (2016) and sectors’ contribution to Cyprus’ GVA and employment.

| n/n | Sector Description | NACE | GVA Share (%) | Employment Share (%) |
|-----|-------------------|------|---------------|----------------------|
| 1   | Agriculture       | A01  | 2.2           | 3.7                  |
| 2   | Forestry          | A02  | 0.1           | 0.1                  |
| 3   | Fisheries         | A03  | 0.2           | 0.1                  |
| 4   | Mining            | A04  | 0.1           | 0.1                  |
| 5   | Food manufacturing| C10-C12 | 1.8  | 3.2                  |
| 6   | Textile           | C13, C15 | 0.1  | 0.2                  |
| 7   | Wood and paper    | C16, C17, C18 | 0.5   | 0.9                  |
| 8   | Chemical and plastic products | C19, C20, C21, C22 | 0.9 | 0.8                  |
| 9   | Metal and non-metal products | C23, C24, C25 | 1.1 | 1.5                  |
| 10  | Machinery and equipment | C26-C33 | 0.8  | 1.3                  |
| 11  | Electricity, gas and water | D, E36, E37-39 | 2.5  | 1.2                  |
| 12  | Construction      | F    | 4.6           | 6.8                  |
| 13  | Trade             | G45, G46, G47 | 10.6 | 16.7                 |
| 14  | Accommodation and Food services | I | 7.1  | 11.4                 |
| 15  | Land transport    | H49  | 1.1           | 1.3                  |
| 16  | Water transport   | H50  | 3.1           | 0.1                  |
| 17  | Air transport     | H51  | 0.0           | 0.1                  |
| 18  | Warehousing, postal and courier activities | H52-H53 | 3.2 | 2.6                  |
| 19  | Banking-Financing | K64-K65-K66 | 11.3 | 5.1             |
| 20  | Real Estate       | L68  | 9.5           | 0.6                  |
| 21  | Public administration | O   | 8.9           | 8.8                  |
| 22  | Education         | P    | 6.2           | 7.2                  |
| 23  | Health            | Q    | 3.9           | 4.7                  |
| 24  | Other services    | J58, J59, J60, J61, J62-63, M69-70, M71, M72, M73, M74-75, N, R, S, T, U | 20.2 | 21.4 |
Table A2. One-way ANOVA for fishermen’s perceptions about the demand for fresh fish after the COVID-19 crisis to fishermen’s age, years in profession and annual gross margin.

|                          | Sum of Squares | DF | Mean Square | F       | Sig.  |
|--------------------------|----------------|----|-------------|---------|-------|
| Fishermen’s age          | 342            | 2  | 170.9       | 1.029   | 0.372 |
| Years in profession      | 1464           | 2  | 731.8       | 2.164   | 0.136 |
| Annual gross margin      | 6,576,022      | 2  | 3,288,011   | 0.192   | 0.827 |

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