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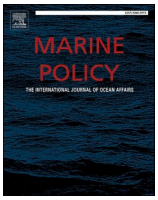

Public health risk management during the Covid-19 pandemic, new amendments in the European Maritime and Fisheries Fund to meet fishers' needs

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ABSTRACT

The recent COVID-19 emergency has shaped economic performance across all sectors, and the fisheries and aquaculture sector did not come out unscathed. The need to protect against risks has always been primary for economic operators, but COVID-19 has accentuated the need to obtain coverage for health risks. In this regard, the European Union has moved quickly with an amendment art. 35 of European Maritime and Fisheries Fund (Regulation [EU] No. 508/2014), including "public health crises" among the causes considered valid for compensation in mutual funds. In this paper, we analyze the evolution of Regulation 508, focusing on Article 35 and its most recent amendments, to understand if the new reform is adherent to the needs of the fisheries sector in Italy, one of the only two States that have documented in their Operational Plans the intention to implement mutual funds. The work involved an empirical analysis through the use of multivariate statistics carried out on 61 Italian stakeholders. Several company profiles were identified and then the likelihood of subscribing to a mutual fund was estimated based on their focus on health crises. The work underlines that the amendments meet the demands of the sector for improved mutual fund clauses, but it's not yet an attractive tool for the Italian market.

1. Introduction

In recent years, the fisheries sector has encountered increasing difficulties in estimating production and in predicting market trends mainly due to climate change, which contribute to shifts in species composition. As well as all the other producers involved in the primary sector, Fishers who share natural resources, are defined as price takers, as they cannot influence product prices and market dynamics. Furthermore, especially in response to adverse environmental conditions, they often tend to respond with overfishing at harvesting time [1] especially when other measures, i.e. risk management tools, are not available [2]. The high degree of uncertainty of operators, referred to as "ambiguity" by Knight [3], which unlike risk is not quantifiable, and the decline in fish biomasses generates a vicious circle that harms the environment and increases the business risk [4]. This situation shows that the long-term sustainability of fisheries could be further compromised if both biological and economic aspects were not taken into account [5–10] especially in a context where information from science struggle to be fully applied by policy-makers [11].

Risk management in fisheries has been explored in several aspects [12] including the need for recommendations to incorporate risk and uncertainty into decision-making [13–16]. The risks mentioned above are related to changes in catch levels and fall within the definition of *Production risk*, which includes variations in production levels and the depletion of fishery stocks.

In addition to *Production risk*, other types of risks are *Market risk*, *Financial risk, Social risk* and *Institutional risk* [17]. *Market risk* is linked to fluctuations in the prices of the harvested product and productive factors, such as the cost of fuel which has the greatest impact on European fishing fleets, but also to the scarcity or lack of information on the market and on the final demand. Seafood prices are commonly subject to large fluctuations during certain periods of the year when their demand skyrockets or when their quantities are particularly abundant just after temporary fishing bans [17]. The high volatility in the prices of caught fish is due not only to the evolution of supply and demand but also to the low concentration of the supplier, the consequent low contractual power

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of fishers, the way fresh fish is commercialized, and the fact that the product is highly perishable [18,19]. This prevents the fisher from having direct control over price formation and thus makes it difficult to pass on increases in input costs to the price of production, as in the case of other agricultural sectors [20]. Besides, fishers are numerous, small in size and often not well organized, therefore, unable to influence the market price by varying the offered quantity. *Financial risk* derives from the management of the company, in particular concerning financial instruments and the evolution of operating costs. *Social risk* is due to the high degree of hazard of the activity, which has the highest rate of accidents [21]. Fishers are also particularly affected by occupational diseases, which however have a significantly lower incidence than accidents. *Institutional risk* includes all the risks associated with administrative measures which directly or indirectly limit the production decisions of fishing enterprises and may affect their profitability. An example of this could be the unequal allocation of fishing quotas between fishers, which could give some players an unfair advantage over others.

In this sector, the compliance with the rules by fishers is essential for their effective enforcement in a territory where large and fragmented fleets would make any control activity by the authorities challenging. Fishers with a higher "perception of risk of change" in the institutional environment, for example on rules, may appear more vulnerable to accept the transition and this could lead them to ignore those Community Regulations that are considered too restrictive [22]. In implementing new strategies to develop the sector in a sustainable way, therefore, it should be taken into account that the distribution of risks and premiums among the beneficiaries is as fair as possible, adapting the plan to the working environment to avoid a misallocation of risks. The various aspects of risk outline a scenario of complexity marked by the strong link between the production performance of the operators and the climatic circumstances. For this condition, studies have highlighted the exceptionality of the primary sector compared to other economic ones [23,24] which has represented in fishing and agriculture the justification for public intervention to support the income of economic operators and cover part of their risks. Although the two sectors share this issue, the fishery has some peculiarities such as the diversity of risk sources and greater difficulty in their prevention and management [25]. Moreover, the exploitation of fish stocks accentuates the systemic nature of risk to which fishers are exposed and the possibilities for their long-term characterization [26]. These factors make it more difficult to obtain risk data compared to agriculture. This has contributed to making the transfer of risk to the market less explored, given the difficulty in identifying sources and intensity of losses and also limiting the number of experiences of public support to risk management tools. The absence of specific regulation marks a further difference with the agricultural policy system, which, instead has a focus on risk management within the World Trade Organization (WTO). The limits of the public contribution, the area of losses that can be compensated for, and the rules for calculating losses set in this domain for the agricultural sector are not present in the fisheries sector. In Europe, this issue was initially addressed with the 2007 Reform of the Common Market Organization (CMO), which introduced specific risk management resources into the Common Agricultural Policy (CAP) and was confirmed by subsequent reforms up to the latest indications in the European New Green Deal. The measures of the 2007 Reform defined sector-specific resources for risk management and introduced the possibility for Member States (MS) to use up to 10% of the "direct payments" ceiling to support the creation of insurance contracts against natural disasters and the functioning of mutual funds. Among risk management tools applied in the agricultural context, insurance and mutual funds, have also been confirmed within the policies of the fishing sector. Technically, a *Mutual fund* is a system recognized by the MS which allows participants to receive compensatory payments in the event of economic losses resulting from events such as those mentioned above. In particular, mutual funds can be set up and managed by fishers' associations in any legal form. In the agricultural field, these instruments have already been integrated in the design of the 2013 CAP Reform and even extended to the *Income stabilization tool* (IST), an instrument for stabilizing income that can be activated through mutualistic formulas [27]. The IST, through its mechanisms allowing the sharing of risks, enables to cover a part of the negative fluctuations in corporate income, coping well with individual and systemic purposes In this second instrument, differently from the mutual funds, the income loss is a sufficient element for the eligibility of the beneficiary, without the need to demonstrate the cause-effect relationship between the sources of risk and the damage experienced. The absolute innovation of mutuality for the income stabilization was also supported by the Omnibus Regulation (Regulation (EU) 2017/2393), which implemented substantial changes to the system of subsidies concerning risk management for farmers in the European Union (EU), allowing the possibility of financing a part of the initial costs of the constitution of the fund with public capital.

Initially, since its inception, the CAP also includes interventions for the fisheries sector. In fact, the Common Fisheries Policy (CFP) was established by the Treaty of Rome in 1957 and is provided for in Article 38 of the Treaty establishing the European Communities that underline "*The common market includes agriculture and trade in agricultural products. Agricultural products are understood to be the products of the soil, of agriculture and fisheries, as well as products of primary processing directly related to these products*". Only later, after several years of negotiations, it was adopted Regulation (EEC) No 170/83 in 1983, establishing the new generation CFP. In 2009, the Commission launched a public consultation on the reform of the CFP and after a long discussion in the Council and, for the first time, in the Parliament, an agreement was reached on 1 May 2013 on a new fisheries regime based on three fundamental dimensions corresponding to three regulations:

- Regulation (EU) No 1380/2013 on the new CFP;
- Regulation (EU) No 1379/2013 on the CMO in fishery and aquaculture products;
- Regulation 508/2014 on the European Maritime and Fisheries Fund (EMFF).

The EMFF ranks among the priorities that have guided the fishing regime within the EU as it aimed to "*promote the sustainable management of fisheries and aquaculture activities while encouraging competitiveness and the related capacity to generate development, employment and territorial cohesion*" (Regulation 508/2014, p.2). Also, the literature shows the need for these funds both to increase the efficiency of the sector, so that it is less dependent on the quantities produced, but also to promote goods with low environmental impact and high quality that could be useful to differentiate EU products [28,29]. The EMFF has an overall budget of € 8.6 billion, with an EU contribution of € 6.4 billion and the remaining € 2.2 billion from the national contributions; 62.6% of the 2014–2020 program financial resources are concentrated in six MS, with Italy ranking third (9.3%) after France (10.2%) and Spain (20.2%).

Italy, on which this study is focused, is the only member state together with France in Europe that has documented in their Operational Plans (OP) the intention to implement mutual funds. The budget dedicated to risk management in the Italian fisheries and aquaculture sector foresees a total commitment of €5 million for the period 2014–2020, of which 2 million is dedicated to mutual funds in the fisheries sector and 3 to the insurance of aquaculture stocks. The sustainable development mentioned by Regulation 508/2014 is based on the paradigm of participatory local development (art. 32 of Regulation EU 1303/2013) implemented through the definition of development strategies consistent with the needs and potential of the territorial context. The central actors of this mode of action are the Fisheries Local Action Groups (FLAGs), i.e. aggregations of representatives of territorial socio-economic interests, public and private, who have the role of developing and executing local development strategies. This approach is supported by other cases in the literature that evidence how the

government-led initiatives are less likely to suffer the problems of sustainability and short-term funding that often burden stakeholder groups [30]. With art. 35 of the Regulation 508/2014, the European policies for the fisheries sector started to develop mechanisms for the transfer and sharing of business risks, using the same mutualistic formulas as agricultural policies that combine risk-sharing mechanisms with the leverage of public support, which can be defined without any limits by the single Member State. The mutual fund creates a bridge above the existing gap between public and private contributions to the fund and organizes the latter to optimize risk-sharing procedures.

Over the years, similar risk management mechanisms have been applied by countries such as Finland, the United States and Japan. In Finland, coverage of fishery risks is mainly managed through mutual insurance associations of fishers, with financial support provided by the government. The distinctive feature of this model is the mutualistic management of coverage aimed at mitigating the *free-riding* problem, which occurs when an individual benefits from resources, goods, or services without contributing to their payment while the community bears the cost. This phenomenon is typical of insurance schemes [31]. The United States, on the other hand, has developed a program to use the experience of agricultural insurances to consolidate some unresolved weaknesses in fisheries catch insurances [25,32,33]. This experience shows that in the fisheries sector the identification of risk sources is more complex [12], the possibility that the insured can avoid being diligent in operations and lastly the potential advantage of the insured over insurers when the former has a better knowledge and perception of the current situation. Japan [34] operates a mutual insurance scheme that identifies the association of fishers' cooperatives as the contracting entity that buys the policy on behalf of the participating fishers, while the conditions for sharing the cost of the premium and for the distribution of the compensatory payments are defined within the cooperative. The two macro objectives of this experience are the coverage of production costs in cases of reduction of catches linked to unforeseen natural events and the protection of production assets to reduce some of the risks associated with fishing activities. In Europe, risk management is gaining attention in the operational strategies of fishing and aquaculture companies, given the reconfiguration of public support and the recurring emergencies resulting from adverse climatic events. To date, the only two MS that have documented in their OPs an intention to implement mutual funds are France and Italy. Both experiences have demonstrated the necessity to have complete information about fishers to improve the chances of activating the fund. It is also described as among all the risks encountered by fishers that climate risks are the most difficult to control [35].

The recent COVID-19 emergency has added uncertainty to the starting difficulties and made it necessary to include all the consequences deriving from public health crises in these strategies. About that, Regulation (EU) 2020/460 of the European Parliament and of the Council of 30 March 2020 amended Regulations (EU) No 1301/2013, (EU) No 1303/2013 and (EU) No 508/2014 with new measures to stimulate investments by MS and react to the pandemic. Regulation 2020/460 with Art. 3 has made amendments to Art. 35 of Regulation (EU) n. 508/2014, including "*public health crises*" among the causes considered valid for compensation in mutual funds to prevent shortages of liquidity and public funds of MS that would delay the investments needed to fight the epidemic.

Annex 1 presents an overview of the regulations mentioned above.

The purpose of this article is to represent the evolution of Regulation 508, focusing on Article 35 and its most recent amendments, and understand if the new regulation meets the demands of the sector, and in which way.

Based on a direct survey carried out in 2018 aimed at Italian fishing companies, an attempt was made to analyze and highlight the needs expressed by the sector at the time and understand if the new European Regulation responds to these needs. The work involved a three-phase exploratory analysis. First of all, a descriptive analysis was performed to have a picture of the sector. In the second part of the work, a cluster analysis was carried out to identify homogeneous groups of companies based on their socio-economic dimensions to verify whether or not these factors influenced their willingness to adopt risk management tools and to quantify their willingness to invest part of their turnover in the creation of a mutual fund. Subsequently, in the third step, based on the results of the cluster, a logit model was performed to estimate the probability of subscribing to a mutual fund based on their preferences, to verify whether there were needs or attitudes that positively (or negatively) influenced the probability of subscribing to the risk diversification tool. Finally, the needs were analyzed in light of the contents of the new regulation.

2. Material and Method

2.1. Sample

The questionnaire was developed through the study of secondary sources, such as ISTAT, AIDA[1] and the European Market Observatory for Fishery and Aquaculture products (EUMOFA), improved and perfected through a focus group composed of 12 of industry, institution, experts and researchers [36,37]. The data that emerged from the focus group were recorded and transcribed to identify the main flaws of the questionnaire and include their points in the survey. Subsequently, the sections of the questionnaire and related questions were improved. Questionnaire validation was carried out through a pre-test to eliminate issues that may affect the quality of the data, such as the question ambiguity, incorrectly presented questions and potential bias effects. The final version of the questionnaire was obtained after a pilot test. The survey was administered to a convenience sample, in fact, the Producers' organizations (Pos) were contacted and 61 of their representatives were interviewed in a face to face manner.

The questionnaire consists of 11 questions, divided into two sections:

- the first section is dedicated to general company information, which aims to define the type of company in terms of economic, employment and instrumental dimensions; the questions were open-ended and were as follows:

  - o *Role in the company*
  - o *Year of birth of the company*
  - o *Location: Region*
  - o *Turnover*
  - o *Number of employees*
  - o *Three most important cost items*

- the second section is dedicated to understand the company and risk system relationship, and also deepen the interviewee's perception of risks. The questions were administered through the use of a 5-point Likert scale:

  - o *Are you interested in instruments such as microcredit?*
  - o *Are you interested in instruments such as guarantees?*
  - o *Importance of risk factors: adverse weather conditions*
  - o *Importance of risk factors: personal risk (illness and accidents)*

Then, they were asked whether or not they would like to join a mutual fund (from 1 not very interested, to 5 very interested) and to quantify a percentage of their income (less than 2%, between 2% and 7% or +7%−10%) that could be invested in a mutual fund.

2.2. Model

To build entrepreneurial profiles the interviewees have been

[1] https://aida.bvdinfo.com/

grouped following a segmentation framework [38] considering business characteristics [39]. The first analysis that has been carried out is a Cluster analysis.

Multivariate analysis has been carried out, with the purpose of aggregating homogeneous groups and then the "Two-Step Cluster Analysis" was run. We used the Log-likelihood distance measures [40] and the Akaike Information Criterion (AIC) [41]. The last one is an algorithm to quantify the deviation of the model based on the probability distribution *f* from the true distribution g. The formula is the following:

$$AIC=2k-2ln(L)$$

where k is the number of the parameters of the model and L is the maximum of the likelihood function.

For the second step of the analysis, we had to estimate the probability to join a mutual fund and determine the existence of discriminating factors in the choice of joining or not joining the risk management instrument. A binomial logistical regression [42] was then conducted to identify the factors leading to increased financial exposure for entry into a mutual fund. A logit model is structured in three equations: predictive, stochastic, and systematic. The predictive one doesn't change, while the other components do. The parameter to estimate is η_i, where i corresponds to the N cases counted. It is determined through a linear expression of K variables X, as illustrated in the following formula:

$$\eta_i = \beta_0 + \sum_{j=1}^{k} x_{ij}\beta_j$$

β_0 is the value of η_i when all the regressors are 0, whereas βj measures the change of η_i for each unit increasing with the corresponding regressor x_j. The stochastic part varies in the model. The dependent variable y imposes different assumptions on the random variable Y. This analysis correlates the binary independent variable (y_i) with a random variable Y_i, which has a Bernoullian distribution, which is represented by the following formula: $y_i \in Y_i \sim$ Bernoulli (π_i). We used the Wald statistics to shows the significant relationship and we used the maximum likelihood (ML) algorithm to estimate the parameters. The systematic component underlines the logistic function, which binds the probability distribution of Y_i to independent variables and allows for the linking of the parameter to estimate π_i to the predictive Equation.

$$\pi_i = \exp(\eta_i)/(1+\exp(\eta_i))$$

The β coefficient, which produces a variation of π_i between 0 and 1, represents the parameter to estimate and describes the effects of the independent variables on the dependent one.

In this study, the software used for data processing is SPSS v.27.

3. Results

The following table shows the most relevant data of the sample under examination. (Table 1).

The surveyed companies are mostly located in Puglia (54.1%) and Lazio (23%) (Fig. 1) and the majority of survey respondents are shipowners (63.9%), followed by cooperative managers (22.9%).

The companies surveyed are diversified according to their year of establishment, in fact there are about 50% young companies (between 2 and 20 years old) and 50% more historical companies (between 20 and 40 years old).

Given the limited number of interviews, the variability of the results is very large, but interesting indications are nevertheless extracted.

The average size of the company turnover is about 130,000 euros per year, but when analysed in detail, 43% have a turnover of less than 50,000 euros, while only 10% have a turnover of more than 200,000. Thus, the sample is mostly represented by small and medium-sized enterprises, in line with the average of the Italian companies [43]. The small size is also confirmed by the number of employees working in the company, on average 4 people, but 72.1% of the companies have between no employees and a maximum of 3. This is confirmed by the fact that 40% of the companies have only 2 employees.

Table 1
Descriptive sample statistics.

		Mean	Median	Mode
Average revenue		132,078.8	90,3000	150,000
Life of the companies		18.85	20	26
Number of employees [except the owner]		4.2	3	2
			Frequency	**Percentage**
Role of the respondent in the organisation	*Shipowner*		39	63.9
	Legal representative		4	6,6
	Cooperative manager		14	22.9
	Principal		4	6.5
Region of location	*Basilicata*		1	1.6
	Friuli-Venezia Giulia		2	3.3
	Lazio		14	23
	Liguria		3	4.9
	Marche		2	3.3
	Puglia		33	54.1
	Sardegna		1	1.6
	Sicilia		3	4.9
	Veneto		2	3.3
Main costs incurred by the company	*Fishing equipment*		43	24.9
	Fuel		60	34.6
	Taxes		13	7.5
	Maintenance		14	8.1
	Staff		40	23.1
	Land based services		3	1.7

The second part of the questionnaire revealed the propensity to adopt or not to adopt risk-sharing instruments. The percentage of those who would be willing to invest less than 2% is slightly higher (+ 4.1%) than those who would be willing to invest between 2% and 7%. None of the respondents would be willing to spend between 7% – 10% (Table 2).

To ascertain their attitudes towards certain risk management tools and towards certain risk factors, a Likert scale was used. It turned out that microcredit was the preferred instrument, with more than half of the participants considering it very interesting, while more than half gave low marks to insurance instruments such as guarantees. The high importance given to climatic events also emerged, with over 50% of the sample assigning high marks (4 and 5). Finally, the sample was divided into two blocks for health illnesses, with one group not very interested (marks 1 and 2) and one group very interested (marks 3–5) (Table 3).

These results highlight the variety of the sample, which seems to be composed of different structural and behavioral profiles. In the light of the insights from the descriptive analysis, we turned to cluster analysis to identify possible homogeneous groups of entrepreneurs based on their socio-economic characteristics and risk protection needs.

3.1. Cluster analysis

Once the general framework was defined, a cluster-type analysis was carried out to determine the profiles of the interviewed companies. To do this a two-step cluster analysis was performed, using the auto clustering algorithm of the Akaike criterion. Based on this analysis 3 groups of owners were extracted. Graph 1 shows the percentage relevance of each group, the first cluster is marked by 15 companies that absorb 25.4% of the total sample. The second cluster, the largest, represents 29 companies or 49.2% of the sample, while the third group is determined by 15 companies, which are 25.4% of the total.

Table 4 presents the characteristics of each cluster with reference to the socio-economic variables.

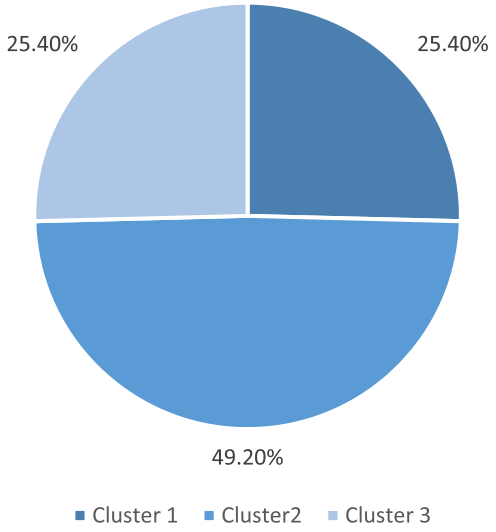
Fig. 1. Distribution of the Companies investigated.

Table 2
Can you choose the share of your turnover that you would invest in a mutual fund?.

	Frequency	Percent
Less than 2%	33	54.1
beetwen 2% and 7%	28	45.9
Beetween + 7%– 10%	0	0.00
Total	61	100.0

Table 3
Liker scale, 1 (nothing), 5 (very).

	1	2	3	4	5
Are you interested in instruments such as microcredit?	4.92	11.48	3.28	24.59	55.74
Are you interested in instruments such as guarantees?	26.23	36.07	18.03	13.11	6.56
Importance of risk factors: adverse weather conditions	0,00	14.75	31.15	32.79	21.31
Importance of risk factors: personal risk [illness and accidents]	0,00	45.90	14.75	9.84	29.51



Graph 1. Chart of cluster size.

3.1.1. First cluster

The group is made up of 25.4% of the companies and is characterized by the largest and most long-lived companies since they are the only ones founded before 2000. They have a heterogeneous territorial distribution, although in 22% of cases the companies are based in Liguria. The territorial dispersion also characterizes the type of business management that in this cluster is not concentrated around a single typology, even if the presence of cooperative managers is notable. The companies in this cluster are the largest both in terms of the number of employees (9 on average) and the size of average revenue in the last 3 years (on average € 262,163.47) and declare to produce a balance sheet. Microcredit is among the preferred credit instruments, while individuals indicate the risk of illness and injury among the most important sources of risk. The impact of the adverse weather conditions in recent years has

Table 4
Socio-economic dimensions of clusters.

Cluster	**1**	**2**	**3**
Dimension	25.4% (15)	49.2% (29)	25.4% (15)
Region	Heterogeneous	Puglia (100%)	Lazio (86.7%)
Year of foundation [average]	1993	2002	2004
Number of employees [average]	9	2	3
Revenue [average]	262,163.47 €	58,558,51 €	144,133.33 €
Role in the company	Cooperative manager (20%)	Shipowner (72.4%)	Shipowner (100%)

been very high, in fact in 90% of cases it has significantly affected and even reduced revenues by more than 20%, putting at risk the possibility of continuing the business activity. This is due to companies located in areas that have suffered severe weather conditions in the last 5 years, such as Liguria. The economic challenges of these farms are mainly due to high fuel and manpower costs. This group is indifferent to the possibility of participating in the creation of a mutual fund.

3.1.2. Second cluster

The second cluster is composed of 49.2% of the companies and is characterized by companies located in Puglia, and that were founded after 2000. Most of the respondents of this cluster are shipowners (72,4%). The companies of this cluster are the smallest, both in terms of the number of employees (2) and in the size of the average revenue (€ 58,558.51) and they declare that they do not compile any balance sheet having other documents to reconstruct the company's accountancy. Their fishing activity is divided into trawling and local coastal fishing. Their preferred credit instrument is microcredit and they identify the variation of prices of the sold product among the main sources of risk. This fact is related to the structural and economic dimensions of the companies, which are smaller than the others and therefore more exposed to the risk of price volatility. The cost of fuel, the purchase and maintenance of fishing equipment and taxes are significant for this group. The situations of companies were significantly affected by weather conditions, but without undermining their stability. This group sees the presence of companies hesitant in the possibility of participating in a mutual fund since 40% of them would be willing to pay between 2% and 7% of the revenue to subscribe.

3.1.3. Third cluster

the third cluster is composed of 25.4% of the companies, which are also the youngest having been founded around 2004, and 86.4% of them are based in Lazio. The group is exclusively composed of shipowners. The companies in this cluster have an average of 3 employees, the annual average revenue is € 144,133.33 and they declare to draw up the balance sheet. In their fishing activity, more than 75% of the companies declare to practice trawling. They prefer micro-credit as a financing instrument and do not identify a particular source of risk, but the risk of illness and injury are the most important for more than half of the group. This is linked to their concern about labor costs, and another cost that weighs on the business is the cost of fuel. In this group, there is a strong presence of companies that declare that climate conditions have had little impact on their revenues in the last 5 years. The 90% of the companies are strongly interested in the possibility of setting up and participating in a mutual fund but declaring that they would be willing to pay a share of the revenues assigned to the fund to have total coverage of drastic losses of less than 2%.

3.2. The logistic model

The cluster analysis has highlighted a fragmented picture on the possibility of joining a mutual fund, therefore a binary logistic model has been carried out to identify which perceptions determine the willingness to join such instruments. The independent variable is represented by the following dichotomous question "How much of your revenue would you be willing to give to the fund to have total coverage of drastic losses? Table 5 shows the results.

The importance attributed to climate risk does not affect the willingness to pay less than 2% or between 2% and 7%. Likewise, the usefulness attributed to guarantee instruments has no significant relationship with the willingness to invest less than 2% or between 2% and 7% in a mutual fund.

On the other hand, among factors described above, those that have a significant statistical significance, a p-value of less than 0.05, are worth mentioning.

Consistent with the willingness to invest less than 2% of turnover in a mutual fund, the participants that have a lower probability to join this instrument indicate a marked preference for microcredit solutions (Exp (B) less than 1, p-value 0.049). On the other hand, the group willing to invest between 2% and 7% of turnover indicates a higher risk perception for illness and injury (Exp(B) 1.862, p. value 0.017).

Table 5
Results of logit model.

	B	S.E.	Wald	Sign.	Exp (B)
Preference of financial instruments Microcredits	-0.52	0.275	3.579	0.049	0.594
Preference of financial instruments Warranties	0.198	0.256	0.595	0.441	1.218
Importance of risk sources Atmospheric events	0.378	0.318	1.413	0.235	1.459
Importance of risk sources Risk (illness and injury)	0.622	0.26	5.701	0.017	1.862
Constant	-0.887	1.861	0.227	0.634	0.412

4. Discussion

Our analysis of the 61 Italian companies interviewed shows that the need of fish farmers to have health-related risks included in the specifications of mutual funds was important. In fact, the probability of increasing the share of turnover (2–7%) compared to invest less (less than 2%) to join a mutual fund doubles when the possibility of using such instruments for human health crises is included. In view of this, we can still say that the cooperative nature of the fund is not yet strongly rooted among the actors as there is a very low demand for the activation of such instruments. Through the use of cluster analysis, an exploratory analysis was conducted to explore this situation and to understand the existence of business types oriented to adopt such instruments. The output of the analysis highlights how there are 3 types of companies that are driven by their socio-economic characteristics and their perception in the identification of costs and business risks. The results present the following situation: 1) the first cluster is composed of companies that are not interested in joining a mutual fund. These are the largest companies both structurally and economically and they are also the longest-lived; 2) The second cluster is made up of companies that are uncertain but willing to invest a very high percentage to join a fund, mostly small companies in Southern Italy; 3) The third cluster is the group of those companies that are strongly inclined to join, even if with a low membership fee (less than 2%), located in Central Italy and medium-sized companies.

The results of the cluster analysis show that the socio-structural dimensions of companies do not influence the willingness to adopt these instruments, in fact, both large and small companies, in economic and structural terms, show uncertainty or even no interest in joining a mutual fund. In light of these results, we attempted to understand how the entrepreneurs' perception can influence access to the fund, regardless of their business type. The results that emerged from the probabilistic model indicate two macro indications: 1) companies interested in micro-financing, such as micro-credit, tend to be less keen on participating in risk-sharing instruments; 2) the companies most interested in investing part of their capital in a sharing instrument are those that mostly afraid of systemic risks, such as health crisis.

The results of the model therefore confirm the need for policymakers to take proactive action to promote the dissemination of risk management tools, even if critical issues related to the type of tools and their characteristics emerged.

Furthermore, despite the efforts made by the European Union since the introduction of risk management in 2007, there is still much to be done. Since 2008, Member States have been able to use up to 10% of the "direct payments" ceiling to support the conclusion of insurance contracts against natural disasters and to favor the functioning of mutual

funds. These were confirmed in the 2013 Reform with the introduction of the *Income Stabilization Tool* (IST), an instrument for income stabilization that can be activated through mutualistic formulas, but which unfortunately only records two experiences in France and Italy. Moreover, this last instrument, which is currently foreseen for the CAP, has not yet been implemented in the fisheries regulation. For the fisheries sector, only France and Italy have planned to implement the measure drawn by Article 35 of Regulation 508/2014.

5. Conclusion

This paper aimed to analyze the issue of risk management for the fisheries sector. In particular, we analyze the evolution of Regulation 508, focusing on Article 35 and its most recent amendments trying to understand whether the inclusion of health crisis management among the tools of risk management met a need of the fisheries sector. The study focused on the Italian case study, being one of the two countries that have documented in their Operational Plans (OP) the intention to implement mutual funds.

The year 2020, with the pandemic caused by the Sars-CoV-2 virus, brought crises in all production areas of the primary sector, including aquaculture. The most concrete response of the European Union is represented by Regulation 2020/460, Art. 3, which has finally included the cause "public health crises" among those valid for the activation of mutual funds.

Our study allowed some important evaluations, which could provide insights for the policymakers. As highlighted by the probabilistic model, the attention of operators to health risks plays a crucial role, especially in the choice of a health insurance instrument. The Covid-19 emergency proved how important the management and protection of risks deriving from human epidemics was since the related economic causes were difficult to sustain.

This first evidence suggests the need to promote experimental initiatives to encourage information and knowledge on risk management tools in the Italian fisheries sector. These should be identified on the basis of specific sectoral and/or territorial conditions that could be consistent with the need to adopt simplified accounting models and to be able to associate with sufficient precision the harmful event, as well as health crises, and the quantification of economic damage. The change of course of the European Union, with the modification of Article 35 of the EMFF, should not be a point of arrival but should push the legislator to reflect on the issue and imagine structural reforms that were already required by producers long ago.

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Annex 1

Regulation	Name and focus
Regulation (EU) 2020/460	Regulation of the European Parliament and of the Council of 30 March 2020 amending Regulations (EU) No 1301/2013, (EU) No 1303/2013 and (EU) No 508/2014 as regards specific measures to mobilise investments in the healthcare systems of Member States and in other sectors of their economies in response to the COVID-19 outbreak (Coronavirus Response Investment Initiative)
Regulations (EU) No 1301/2013	Regulation of the European Parliament and of the Council of 17 December 2013 on the European Regional Development Fund and on specific provisions concerning the Investment for growth and jobs goal and repealing Regulation (EC) No 1080/2006. It sets up the European Regional Development Fund for the period 2014–2020.
Regulations (EU) No 1303/2013	REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006
Regulation (EU) n. 508/2014	REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 May 2014 on the European Maritime and Fisheries Fund and repealing Council Regulations (EC) No 2328/2003, (EC) No 861/2006, (EC) No 1198/2006 and (EC) No 791/2007 and Regulation (EU) No 1255/2011 of the European Parliament and of the Council. This Regulation defines Union financial measures for the implementation of: (a) the Common Fisheries Policy; (b) relevant measures relating to the Law of the Sea; (c) the sustainable development of fisheries and aquaculture areas and inland fishing; and (d)the Integrated Maritime Policy.

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