The Impact of Covid 19 on Fisher and Fish Farmer Terms of Trade

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Abstract. Reflecting the level of welfare of the fishers and fish farmers, terms of trade index (namely NTN/NTP) is believed to have decreased as the result of the Covid 19 outbreak. And recognizing the important role of fisheries in the economy, understanding what have occurred to the index is relevant. This paper aimed to: (i) analyze the impact of the outbreak on NTN/NTP and (ii) identify what changes in variables have significant contribution to the NTN/NTP decrease. The analytical method used is descriptive quantitative. The primary data consisted of: (i) fisher and fish farmer terms of trade as published by the Central Bureau of Statistics, (ii) variables that compose the price index received by fishermen / fish farmers and the index of prices paid by fishermen / fish farmers. The results showed that the decline in NTN and NTP occurred in all provinces in Indonesia. For fishers and fish farmers, variables of received price index that had the most significant effect on the decline is basic need cost such as food, drinks, cloth and transportation while variables of paid price index that had the most significant effect on the decline is capital goods.

1. Introduction
The Covid-19 pandemic is the largest humanitarian disaster in history because of its rapid transmission, massive mortality and extraordinary geographic reach. There is not a single spot on earth that is sterile from this pandemic, both in developed and developing countries. The disaster that started in the city of Wuhan, China, spread in a matter of weeks throughout the world. The increased case of COVID-19 has affected the world economy including Indonesia [1] [2].

The Covid-19 pandemic is perceived by many as hampering the activities of various sectors and so it has caused a decrease in income and reduced job opportunities. Furthermore, this has implications for the weakening of purchasing power and the level of public consumption. The policy of restricting mass mobility (PPKM) following the worsening pandemic has made conditions even more difficult; distribution of food commodities between cities, provinces and islands is disrupted. Although food is excluded from the application of mass mobility restrictions, inspections at monitoring posts clearly affect product and commodity traffic [3] [4] [5].

The challenges faced by business people are not only related to disruptions in the distribution aspect, but also due to time restrictions for marketing their products. Government policies intended to control the pandemic require businesses to adhere to a shortened market operating schedule. Normally,
traders can make market transactions 24 hours a day; during the restricted time, they can only carry out their activities for a maximum of 10 hours per day, from 4 pm to 2 am only. According to [6], this policy hinders and makes it difficult for local fishermen in marketing their catch.

The impact of covid on the fishery sector in several countries was reported. In Turkey, [7] observed that there was a significant decrease in trade volume. In Malaysia, there was a decline in prices and stockpiling of goods due to decreased production of shrimp demand [8] and Peru [9]. Meanwhile, in India, the state suffered a loss in shrimp farming of USD 1.50 billion [10]. Likewise, fisheries business actors in Bangladesh have lost their jobs due to a decline in fishery production activities [11] [12].

Fisheries sector plays an important role in developed countries and developing, employing hundreds of millions of people directly or indirectly directly, provide food, and affirm the cultural identity of many people coast and contribute to survival [13]. The most significant impact felt was the decrease in the price of fish and other seafood up to 50% [14].

The Covid-19 pandemic went on for a long time, so did various related restrictions. Responding to it, the central government and local governments continued to apply social restrictions during this period of time, anticipating uncontrollable conditions. The domino effect of restrictions is increasingly sensed by business players, for example in terms of terms of trade. The terms of trade of fishermen (NTN), fish farmers (NTPi), fishing businesses (NTUN), and aquaculture business (NTUPi) decreased accordingly [15].

Based on the problems presented above, this paper aims to conduct an in-depth analysis of the impact of the Covid-19 pandemic on NTN and NTPi in Indonesia. More specifically, this study answers the question 'how much is the decrease in the value of NTN and NTPi and how much is the decrease in the value of NTUN and NTUPi due to the Covid-19 pandemic?'

2. Research Methods

This study adopted a descriptive research methodological approach with data collected through a literature review which involved exploring and examining data and information available at various sources. These sources were documented files of Central Agency of Statistics [16] [17] and the Ministry of Maritime Affairs and Fisheries [18].

The study placed more emphasis on NTN and NTPi. The NTN and NTPi are the ratio of the price index of all goods sold (fishery business products) to the price index of all purchased goods (consumer goods and fishery business inputs) belonging to the households of fishermen and fish farmers. Meanwhile, NTUN and NTUPi are the ratio of the price index of all goods sold (fishery business products) to the index of production factor prices paid by fishery business actors, in this case fishermen and fish farmers. The base year used for calculating the values of these terms of trade is 2018.

In this study, the interpretation of NTP and NTUP values is as follows. If the values of NTN, NTPi, NTUN, and NTUPi are greater than 100, it means that NTN and NTPi are getting better. The price received increases more rapidly than the price paid against the base year or when the price received decreases more slowly than the price paid against the base year. Meanwhile, NTUN and NTUPi show higher incentives to engage in fishing business.

If the values of NTN, NTPi, NTUN, NTUPi = 100, it means that NTN and NTPi have not changed, the ratio of the price received by fishermen and fish cultivators is the same as the price paid by fishermen and fish cultivators for the base year. But after that it doesn't happen again, in month to month, year to year NTN and NTPi = 100. So, if NTN and NTPi = 100, it rarely happens, then the definition of NTN and NTPi will be better if we compare months and/or years certain compared to the previous month and/or year. NTUN and NTUPi do not provide incentives to fishermen and fish cultivators in conducting fishing business. It could be that NTN and NTPi = 100 if the previous month or year NTN and NTPi < 100. So, whether or not NTN and NTPi are good, it depends on the comparison of the previous month or year.

If the values of NTN, NTPi, NTUN, NTUPi are less than 100, it means that NTN and NTPi are getting worse. The price paid increases more rapidly than the price received against the base year or
when the price paid decreases more slowly than the price received over the base year. Meanwhile, NTUN and NTUPi did not show any incentive to do business or even made a loss.

Qualitative Comparative Analysis (QCA) has been implemented in this study which developed by [19] [20] [21]. This method uses small to intermediate samples and allows generalization (external validity) relying on a strong case orientation [22] [23]. To ensure generalization, the selected cases should be specifically chosen and in-depth case knowledge is needed to ensure internal validity [24]. Although the present study could have been developed using traditional methodologies, QCA has advantages that encourage its use in organizational studies [25]. The main advantage of QCA is that it permits conjunctural causation and multiple causation [26]. QCA was developed as a tool to analyze causal relationships between a set of conditions and an outcome [27]. According to [28] QCA allows comparisons to be made systematically across regions and analyze complex combinations of factors which have implications for the outcome.

In this paper, NTN, NTPi, and fisheries production is thought to be able to explain the impact of covid 19 in fsQCA model. In fsQCA analysis, the form of data used to study set-theoretic relationship is a fuzzy data set. Preliminary data from outcomes and four conditions which are still in the form of interval and ratio scale data are transformed first go through the calibration process into the form of membership score data (membership scores) fuzzy set with values between 0 to 1 so that it becomes continuous fuzzy set [29] [28], and it shows the degree membership of each province in the fuzzy dataset [21].

3. Result and Discussion

3.1 Fisher’s terms of trade (NTN)

The NTN values decreased in February to start increasing again in May 2020. Extremely low values, below 100, were recorded in the months of April, May, June. This, undoubtedly, was associated to COVID-19 outbreak, which impacted almost all economic activities. In the three months of the second quarter, the demand for fish products had decreased greatly in various regions. This then caused prices at the producer level fell relatively deeper than other products consumed by fishery business actors. Figure 1 shows that the lowest NTN value occured in April 2020 = 98.49. It means the purchasing power of fishermen decreased at the beginning of the determination Covid-19 pandemic in Indonesia. This means that small fishermen are very vulnerable to non-natural disasters such as pandemics this Covid-19. Therefore, the government needs to do protection of small-scale fishing communities from non-natural disasters.

![Figure 1. Changes in the terms of trade of Fishers and Fishery businessesYear 2019-2020 (2018 = 100)](image-url)
3.2 Terms of trade of fish farmers
During 2020, the highest NTPi was in January at 101.62 and the lowest was in April at 99.02. Fish farmers’ expenditure are greater than their income. At the beginning of the pandemic, a policy of limiting people mobilities was implemented so that it had implications for decreasing demand for fishery products. The purchasing power of fish farmers decreased at the beginning of the determination Covid-19 pandemic in Indonesia. This is reflected in the Value of NTPi which is worth below 100. This means that small fish farmers are very vulnerable to non-natural disasters such as pandemics this Covid-19 [15]. Therefore, the government needs to do protection of small-scale fishing communities from non-natural disasters.

![Changes in terms of trade of fish farmers and fish aquaculture business Tahun 2019-2020 (2018 = 100)](image)

3.3 QCA Analysis
Table 1 visualises the results of QCA for the 34 province under analysis, while Table 2 display the results in a tabular format.

**Table 1.** Truth table analysis for complex solutions covid-19 impact to fisheries sector in Indonesia

| No | Province                                                                 | NTN | NTPi | Capture Production | Aquaculture Production | Covid Case |
|----|--------------------------------------------------------------------------|-----|------|--------------------|------------------------|------------|
| 1  | Aceh, North Sumatera, West Sumatera, Banten, West Sulawesi               | 0   | 0    | 0                  | 0                      | 1          |
| 2  | East Nusa Tenggara                                                      | 0   | 0    | 0                  | 1                      | 1          |
| 3  | Riau, South East Sulawesi, Gorontalo, West Papua                        | 0   | 0    | 1                  | 0                      | 1          |
| 4  | East Jawa, South Sulawesi                                               | 0   | 0    | 1                  | 1                      | 1          |
| 5  | Bengkulu, Jakarta, Bali                                                 | 0   | 1    | 0                  | 0                      | 1          |
| 6  | West Java, Central Sulawesi                                              | 0   | 1    | 0                  | 1                      | 1          |
| 7  | South Kalimantan, North Maluku                                          | 0   | 1    | 1                  | 0                      | 1          |
| 8  | Jambi, South Sumatera, Yogyakarta, Central Kalimantan, North Sulawesi   | 1   | 0    | 0                  | 0                      | 1          |
| 9  | Bangka Belitung, Maluku                                                 | 1   | 0    | 1                  | 0                      | 1          |
| 10 | West Nusa Tenggara                                                      | 1   | 0    | 1                  | 1                      | 1          |
The fsQCA analysis showed there are seven pathway that could produce a successful quality performance. It can be seen in Table 2 that pathways 1 is passed by 11 provinces, pathway 2 is passed by 12 provinces, pathway 3 is passed by 9 provinces, pathway 4 is passed by 8 provinces, pathway 5 and pathway 6 are passed by 7 provinces and pathway 7 is passed by 26 provinces.

Table 2. Pathway to covid-19 impact in fisheries sector

| Pathway | Causal Condition Combination | Province |
|---------|------------------------------|----------|
| 1       | ntn*prodtangkap              | Aceh, South Sumatera, West Sumatera, Banten, West Barat, East Nusa Tenggara, Bengkulu, DKI Jakarta, Bali, West Java, Central Sulawesi (11) |
|         |                              | Aceh, North Sumatera, West Sumatera, Banten, West Sulawesi, |
| 2       | ntn*ntpi                     | East Nusa Tenggara, Riau, Sulawesi Tenggara, Gorontalo, West Papua, East Java, South Sulawesi (12) |
| 3       | ntpi*prodtangkap             | Riau, Sulawesi Tenggara, Gorontalo, West Papua, East Java, |
| 4       | NTPI*prodtangkap             | South Sulawesi, Bangka Belitung Island, Maluku, West Nusa Tenggara (9) |
| 5       | NTN*prodtangkap              | Bengkulu, DKI Jakarta, Bali, West Jawa, Central Sulawesi, West Barat, Papua, North Kalimantan (8) |
| 6       | NTN*NTPI                     | Bangka Belitung Island, Maluku, West Nusa Tenggara, Lampung, Riau Island, East Kalimantan, Central Java (7) |
| 7       | prodbudidaya                 | Kalimantan Barat, Papua, Kalimantan Utara, Lampung, Kepulauan Riau, Kalimantan Timur, Jawa Tengah (7) |
|         |                              | Aceh, North Sumatera, West Sumatera, Banten, West Sulawesi, Riau, Sulawesi Tenggara, Gorontalo, West Barat, Bengkulu, |
|         |                              | DKI Jakarta, Bali, South Kalimantan, North Maluku, Jambi, South Sumatera, DI Yogyakarta, Central Kalimantan, North Sulawesi, Bangka Belitung Island, Maluku, West Barat, Papua, Lampung, Riau Island, East Kalimantan (26) |

Remarks:
- NTN = fishers’ terms of trade
- NTPi = fish farmers’ terms of trade
- prodtangkap = capture fishery production
- prodbudidaya = aquaculture production

Table 3 shows the parameters of fit based on the intermediate solution which is the most recommended solution to interpret the fsQCA result.
Table 3. Parameters of Fit

| Solutions | Consistency | Coverage | Unique Cov. |
|-----------|-------------|----------|-------------|
| ntn*prodtangkap + ntpi*PRODTANGKAP + NTN*NTPI + prodbudidaya | 1 | 1 | ** |
| ntn*prodtangkap | 1 | 0.323529 | ** |
| ntpi*PRODTANGKAP | 1 | 0.264706 | ** |
| NTN*NTPI | 1 | 0.205882 | ** |
| Prodbudidaya | 1 | 0.764706 | ** |
| ntn*ntpi + NTPI*prodtangkap + NTN*PRODTANGKAP + prodbudidaya | 1 | 1 | ** |
| ntn*ntpi | 1 | 0.352941 | ** |
| NTPI*prodtangkap | 1 | 0.235294 | ** |
| NTN*PRODTANGKAP | 1 | 0.205882 | ** |
| Prodbudidaya | 1 | 0.764706 | ** |

Remarks:
- NTN = fishers’ terms of trade
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The impact of covid-19 is make household consumption or purchasing power decrease [30]. Even though household consumption is relatively large economic support [31]. The other impact second impact is that the pandemic causes there is a prolonged uncertainty so that investment also weakens and has implications for the cessation of business.

Same fishermen do expansion of alternative livelihoods carried out both in the fisheries sector and in the non-fishing sector. Affected fishermen become laborers to repair ships, sell fish in the market, become a construction worker and some become motorcycle taxi drivers [32]. Improvement of facilities and infrastructure carried out through government programs. This is needed to equal opportunities and reduce the gap between large fishermen and small fishermen. Improvements can be started from replacing fishing tools that still use manual methods, as well as equitable distribution of fuel so that fishermen easily do their work without being burdened by the difficulty of getting fuel [33] and provide ease of logistics distribution for fisheries products [34].

4. Conclusion

This paper ends up with following findings: (1) The QCA analysis shows that 14 variations exists in the classification of the relationship between the impact of Covid-19 and the NTN, NTPi and fish production, and (2) the lowest NTN and NTPi and fish production occured in Aceh, North Sumatra, West Sumatra, Banten and West Sulawesi.

Following these findings, there at least two policy implications, namely: (1) the necessary of an effective policy on encourage fishermen and fish farmers to maintain fish quality, and (2) the relevance of an effective policy on trasportation system to facilitate distribution of both input and output of fish production.

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