

# Data Analytics on Indonesia Industries Economic Resilience Based on Poverty Rate Growth During Covid-19 Pandemic

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**Abstract**—Covid-19 pandemic is one of the biggest challenges that each country around the world has to overcome. This pandemic has affected a lot of countries in many sectors including Indonesia. During the year 2020 when Covid-19 cases rise in Indonesia, the poverty rate has also increased by 0.97% meaning almost 270.000 people went poor. Understanding the impact and the resilience especially on the primary industry during the Covid-19 situation is important to decrease the poverty rate as well as create new alternative strategies for the government to overcome. However, the economic resilience of primary industries such as fishing and plantation is still less to explore. In this study, the economic resilience of four major industries in Indonesia when facing the Covid-19 pandemic is presented namely tourism, fishery, plantation, and micro and small business. Bivariate correlation analysis is applied to calculate the statistical correlation between the growth of poverty rate during the Covid-19 pandemic with four major industries in 34 provinces. Based on the result, it can be concluded that plantation industries are the most resilient industries while facing the Covid-19 pandemic, so the provinces with plantation industries as their main industry are less likely to have major growth in poverty rate compared to other provinces with fewer plantation industries. The second most resilient industry is fishing. Meanwhile, the tourism industry is the most vulnerable during the pandemic situation. In this study, the qualitative analysis especially in Riau and Bali provinces is also presented.

**Keywords**—Covid-19, Indonesia, Industries, Poverty.

## I. INTRODUCTION

According to the UN secretary-general, Covid 19 pandemic is the biggest challenge after world war 2 that humanity has to overcome. Covid-19 is caused by a virus named SARS-COV2, and this virus is transmitted by using a water droplet or bodily fluid from the patients [1][2]. When the SARS-COV2 virus is inside the human body, there are no serious symptoms until one week later. As time goes by, the virus also went some various mutations making it more dangerous and infectious [3][4]. Because of this characteristic, the SARS-COV2 virus is highly contagious and almost affects all people around the world.

In Indonesia itself, covid 19 has infected more than 1.8 million people, resulting in 50.000 thousand deaths [5] and it still has no sign of reaching an end. The Indonesian government has created a new policy [6] to limit the spread of the SARS-COV2 virus. The policy includes changing the learning method to be online schooling, closing recreational

areas, and doing Large Scale Social Restrictions in several places. Although the policy is helping and considered effective in decreasing the spread of the SARS-COV2 virus [7], the percentage of poor people in Indonesia during the Covid-19 pandemic keeps increasing. In September 2020, based on the data taken by Badan Pusat Statistik Indonesia (*Central Agency on Statistics of Indonesia*) the percentage of poor people reached 10.19%, increasing 0.97 % from the previous year [8]. This means almost 270.000 new people become poor and live below the poverty line.

The Covid-19 pandemic also has an effect on the various sector of industries. One of the most highlighted industries is the tourism and hospitality industry. Because of the SARS-COV2 virus characteristic that is easily transmitted, most areas are doing lockdown and closing the place where it might be crowded and full of people, including recreational areas. While there are fewer travelers and tourists, the industry still has to maintain operational costs. This makes the tourism industry become the most vulnerable [9]. Another industry that got affected badly is the real estate industry where the number of house sales has dropped greatly [10].

However, studies that are related to other industries such as the plantation industry and fishing industry that is one of the primary industries in Indonesia are still rarely carried out. So far, studies about Covid-19 effect on industries are still focused on tourism and hospitality industries. Therefore, the studies about the resilience of various industries in Indonesia will be needed to obtain new insight to help the government on how to decrease poverty due to the Covid-19 pandemic situation and how to be more resilient in case a similar situation might happen in the future.

This study is conducted with the goal to obtain new knowledge regarding which industry in Indonesia is the most resilient based on the lowest growth of poverty rate and which are not while facing the Covid-19 pandemic. The result obtained from this study not only could help in deciding which industries heavily need recovery programs after the Covid-19 pandemic, but also determining which industries should be developed as those industries showed some resilience.

## II. INDONESIA OVERVIEW

This study uses secondary data from Central Agency on Statistics of Indonesia. The data taken for this study include

the number of small and micro industries, the area of the plantation, the number of guests that stay in a hotel, and a number of fish produced by all 34 provinces in Indonesia. The area of plantation data is used to show the amount of plantation industry in one province, while the number of guests that stay in a hotel is used to show the amount of tourism industry. The same thing goes for the number of fish produced by each province. The amount of fish produced is used to show the proportion of the fishing industry in that provinces.

The research starts by collecting all the available data from Central Agency on Statistics of Indonesia. The data is then normalized to show the basic characteristic of each province regarding their industries. Afterward, the normalized data will be analysed using bivariate correlation to determine which industries are more affected by the Covid-19 pandemic in terms of the growth of the poverty rate. The result will be shown by a correlation between the increasing poverty percentage in 2020 with the number of industries in 2019.

#### A. Indonesia Provinces Poverty Percentage

Indonesia has 34 provinces where ten provinces are situated in Sumatera Island, six provinces in Java Island, three provinces in Bali and the Lesser Sunda Islands, five provinces in Kalimantan Island, six provinces in Sulawesi Island, and four provinces in Maluku and Papua Islands. Each provinces have a different percentage of poor people, where people that are considered poor in 2019 are people whose income is less than 29.36 US dollar, while people that are considered poor in 2020 are people whose income is less than 31.69 US dollar per month. [11,12].

#### B. Small and Micro Businesses

Small and micro businesses in Indonesia is a business that sells a service or goods with less than 20 labours. In 2019, there are more than 4.3 million small and micro-businesses where 1.7 million of the businesses mainly focus on food production and processing and 62% of the businesses are in Java Island. From the data that we acquired more than 50% of the small and micro businesses owner doesn't graduate from middle school, and only 3.53 % is university graduate. The business owner that has low education mostly works in the food and wood industries, while the owner that has high education mainly works in the fashion and drink industry [13].

#### C. Tourism Industry

In 2019, the contribution of travel and tourism for Indonesia's GDP was 6.1 % with 69.8 billion US dollars of income [14]. This is a great increment from the previous year which is only 62.6 billion US dollars. This makes the tourism industry one of the most important aspects of Indonesia's GDP. One of the parameters to show the amount of tourism industry in one area is the number of guests that stay in a hotel. Therefore, we use the data about the number of guests that stays in a hotel to represent the tourism industry.

#### D. Plantation Industry

The plantation industry in Indonesia is commonly found in Kalimantan and Sumatra. In 2019, there is more than 2.500 [15] industry that is focused on the plantation industry

with more than 10 million hectares of plantation area. Most of the plantation industries are focusing on palm oil and rubber. In this study, we use the area of plantation by each industry to represent the plantation industry.

#### E. Fishing Industry

Indonesia is the biggest archipelago country, with 62 % of its area being water. This makes the fishing industry flourish. In the last 5 years, more than 10 million tons of fish are produced every year by Indonesia, where the biggest producer is South Sulawesi Province with more than 3 million tons of fish produced annually [16]. In 2019, this industry contributes 2.65 percent to Indonesia's GDP [17].

### III. METHODS

This research uses Bivariate Pearson Correlation methods to find a correlation between the number of industries with the poverty growth rate, the lower poverty growth rate in one area shows that it is more resilience than the others. Before applying Bivariate Pearson Correlation, data normalization using min-max data normalization is needed so all features will have the exact same scale.

#### A. Min-Max Data Normalization

Min-max data normalization is a technique to normalize data where the minimum value is transformed to 0 and the maximum value is transformed to 1, and every other data gets transformed into a value between 0 and 1. The min-max equation is shown in (1).

$$X_{normalized} = \frac{x - \min(x)}{\max(x) - \min(x)} \quad (1)$$

#### B. Bivariate Pearson Correlation

Bivariate Pearson Correlation is a method to measure the strength and direction of the linear relationship between the two variables and to decide whether they are related to each other or not. The strength of the relation between two variables is determined by the correlation coefficient. The equation for the correlation coefficient is shown in (2).

$$r = \frac{\sum x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n}}{\sqrt{\left(\sum x_i^2 - \frac{(\sum x_i)^2}{n}\right)\left(\sum y_i^2 - \frac{(\sum y_i)^2}{n}\right)}} \quad (2)$$

Where:  $r$  = correlation coefficient

$x_i$  = independent variable

$y_i$  = dependent variable

$n$  = population size

The correlation coefficient is also known as r-value ( $r$ ) will have a value between negative one and one. If the r-value is negative, then there is an inverse relationship between the independent variable and the dependent variable. Meanwhile, if the r-value is positive, there is a direct relationship between the dependent and independent variables. And if the r-value is near 0, it means there is almost no correlation no relation between the dependent and independent variables. The interpretation of the correlation coefficient value is defined in Table I.

TABLE I. CORRELATION INTERPRETATION

Value of $ r $	Interpretation
0.9 – 1.00	Very high correlation
0.70 – 1.89	High Correlation
0.50 – 0.69	Moderate Correlation
0.30 – 0.49	Low Correlation
0.00 – 0.29	Little if any correlation

IV. RESULTS AND DISCUSSION

A. The Growing of Poverty Level

One of the key points in this data is, before the Covid-19 pandemic (2016-2019), Indonesia’s poverty rate is steadily decreasing. On table II, the growth of poverty rate from 34 provinces of Indonesia are collected and is divided based on the year. From the table we could know that the growth of poverty rate in 2016, have a maximum value of 0.67%, median value of -0.385% and the minimum value of -1.15%. where the negative value means that the poverty rate is decreasing and the amount of poor people is minimized. From the data we could also know that the maximum value of poverty growth rate is always below 0.3 % in 2017 until 2019 and the average of poverty growth rate shows that the poverty rate is decreasing and the amount of poor people is also decreasing. However, in 2020 there is a massive spike in Covid-19 cases, the poverty rate is increasing by 0.57% with a 0.45% standard deviation and maximum value of 1.69%.

TABLE II. POVERTY GROWTH RATE

Metrics	2016	2017	2018	2019	2020
Mean	-0.34 %	-0.41 %	-0.34 %	-0.37 %	0.57 %
Standar deviation	0.45 %	0.51 %	0.29 %	0.27 %	0.45 %
Min	-1.15 %	-1.76 %	-1.31 %	-1.15 %	-0.12 %
Median	-0.41 %	-0.35 %	-0.32 %	-0.31 %	0.71%
Max	0.67 %	0.29 %	0.18 %	0.29%	1.69%

In 2020, the percentage of poor people in each province is increasing, except in Central Sulawesi province where the percentage of poor people goes down from 13.18% to 13.06%, meaning there are -0.12% growth on poverty rate. However, there are some provinces that have more than 1% of poverty rate increasing, the provinces are West Java with 1.61%, Central Java with 1.26%, DI Yogyakarta with 1.36%, Banten with 1.69%, and lastly DKI Jakarta which is the capital of Indonesia with 1.27%.

B. Industries Data on Each Province

After we collected data about industries in each province, we normalized it with min-max normalization. The result for each province is as follows: In Sumatra Islands, the poverty growth is not that high and Riau has the highest plantation industries but also the lowest poverty growth rate in Sumatra Islands. This data is shown at Figure 1.

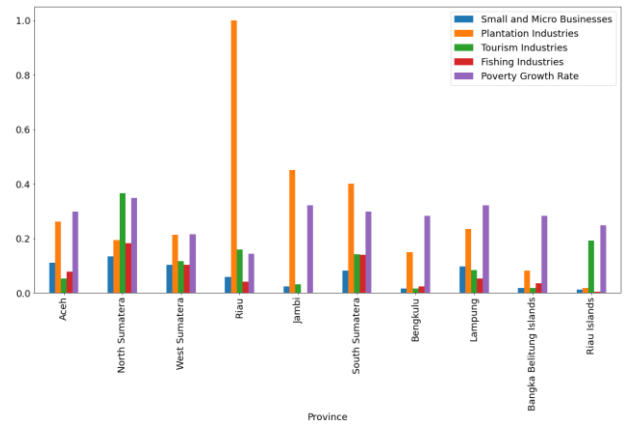


Fig. 1. Industrial Data in Sumatra Island

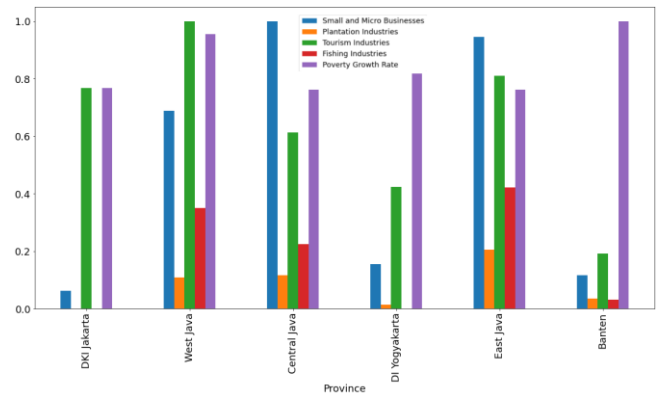


Fig. 2. Industrial Data in Java Islands

In Java Islands, the poverty growth is really high, as well as the number of industries, especially in West Java where the tourism industries are really high and also has a significant amount small-micro business.

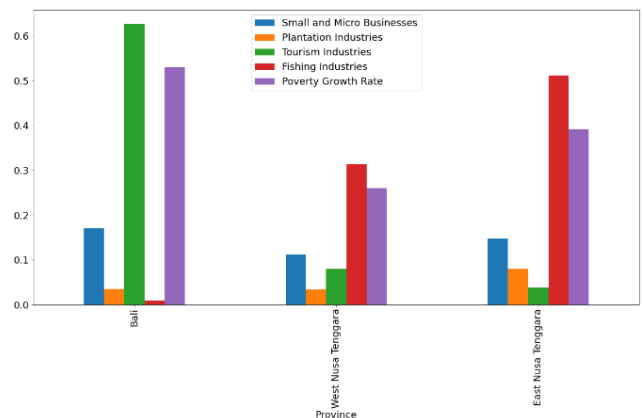


Fig. 3. The Growth of Bali and Lesser Sunda Islands

Meanwhile in Bali and Lesser Sunda Islands, the biggest poverty growth rate happens in Bali and also has the highest tourism industry between all other provinces in Bali and Lesser Sunda Islands.

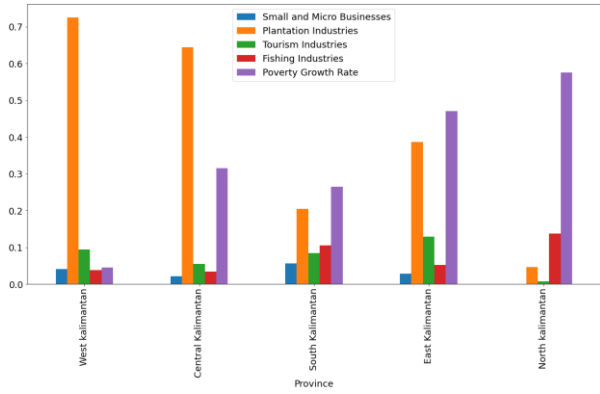


Fig. 4. Industrial data in Kalimantan Island

In Kalimantan, West Kalimantan and Central Kalimantan has a significant amount of plantation industries. While North Kalimantan has the highest poverty growth rate but also the lowest plantation and tourism industry.

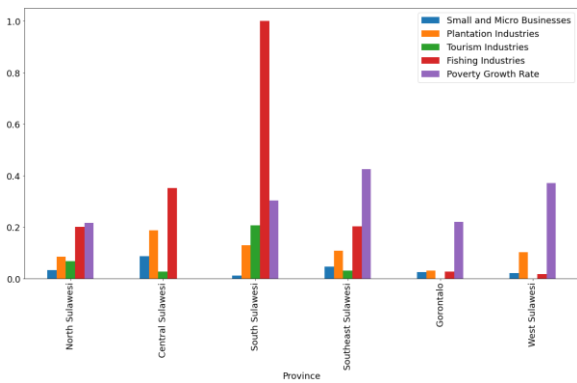


Fig. 5. Industrial Data in Sulawesi Island

In Sulawesi Island, South Sulawesi has the highest fishing industries among all provinces in Indonesia. While Central Sulawesi's poverty growth rate is the lowest. Overall, provinces in Sulawesi Island have a low poverty growth rate.

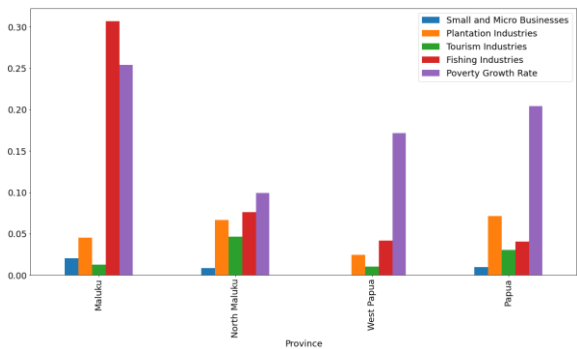


Fig. 6. Industrial Data in Maluku and Papua Islands

In Maluku and Papua Islands, the poverty growth rate is quite low compared to the poverty growth rate in Java Island. The number of industries is also low except in Maluku where the number of fishing industries is high.

C. Correlation Analysis

After the data is normalized, the industries variable and poverty growth rate as the impact of Covid-19 is analyzed using bivariate correlation, the result is shown in the table below.

TABLE 3. BIVARIATE CORRELATION RESULT

Variable	$\alpha_1$	Correlation Coefficient	Interpretation
Micro and small businesses.	0.000	0.587	Moderate Correlation.
Plantation Industry.	0.035	-0.315	Low Correlation
Tourism Industry.	0.000	0.727	High Correlation
Fishing Industry.	0.411	-	No Correlation

In four major industries, the highest correlation is achieved by the tourism industry, which means this industry is more affected by the Covid-19 pandemic than the other. From this data, we could say that provinces with a high tourism industry will most likely suffer more and create new poor citizen than the provinces that have low tourism industry. This shows that tourism industry is not resilience while facing Covid-19 pandemic. For visualization, the linear graph between Covid-19 impact (that is shown by poverty growth rate) and the (number) of industries are presented below.

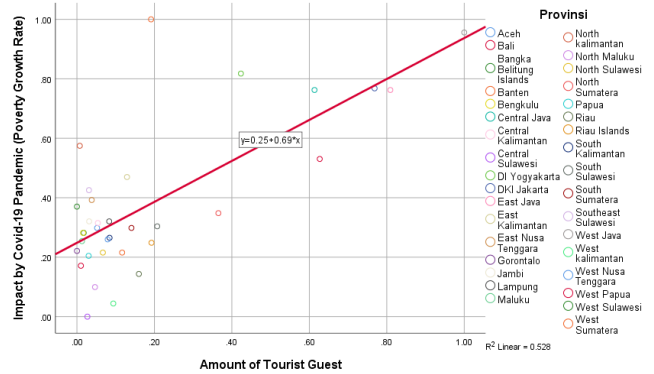


Fig. 7. Impact of Covid 19 in Tourism Industry

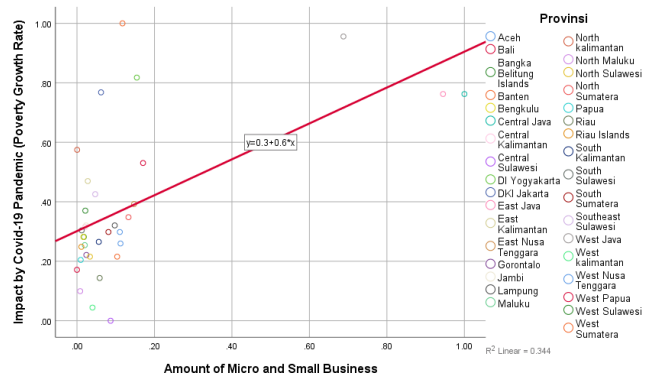


Fig. 8. Impact of Covid 19 on Micro and Small Industry

Another industry that's really affected by the Covid-19 pandemic is small and micro-businesses. The amount of small and micro businesses in 2019 has a moderate correlation with the increasing of poverty in the year 2020. This means provinces that focused on small and micro business such as Central Java are less likely to be resilience in Covid-19 pandemic situation.

of oil palm and industrial plantation become the top contributors to Indonesia's carbon dioxide emission [21]. Nevertheless, this industry had the highest revenue contribution to the Provision of Forest Resources for non-timber forest products with an annual average of 15.8 trillion Rupiah [22]. This investment in oil palm has also been used as an alternative approach to overcome Indonesia's economic downturn in 1998 [23].

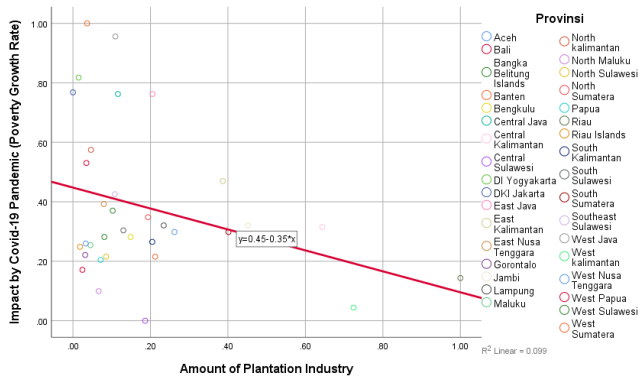


Fig.9. Impact of Covid 19 on Plantation Industry

Meanwhile, the number of plantation industries has an inverse relationship with the Covid-19 impact. Although the overall poverty growth rate is increasing, the province that has a bigger amount of plantation industry only has a small growth poverty rate compared to other provinces that have lesser plantation industry.

While plantation industries are the most resilient industry in the Covid-19 pandemic situation, the tourism industry is the most vulnerable in the Covid-19 situation, and one of the Indonesia provinces which are really famous because it's a tourist destination is Bali. Previously, before the Covid-19 pandemic, Bali can be visited by visitors from 160 countries without any visa. In 2019, there are 6,275,210 visitors from a foreign country where 19.78% of the foreign visitors are from Australia and 18.9% are from China [24]. But the Australian government has been giving advice to its citizens to not come to Indonesia because there's a high risk of a terrorist attack on the Australian people, and the Indonesia Covid-19 testing rate and also Indonesia infection control facilities are significantly below the available standard in Australia [25].

And for China, where the Covid-19 first case happens, most countries ban China to travel to their country, including Indonesia. Not only that the Indonesian government has also closed the recreation places temporarily including Bali beaches. This makes the tourism industry have a decreased income while they also have to pay for maintenance costs. Local news says that Balinese now turn their focus to seaweed farming to make some extra income.

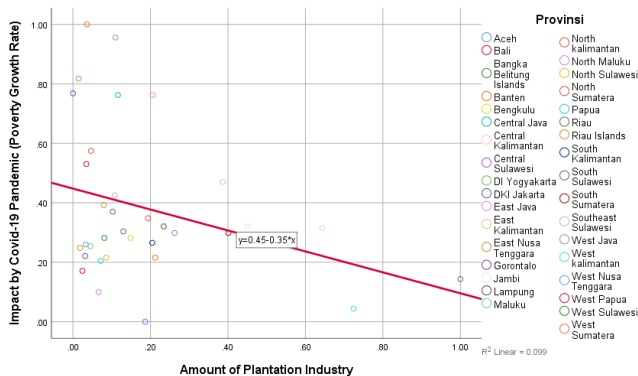


Fig.10. Impact of Covid 19 on Fishing Industry

Lastly, the fishing industry shows no correlation at all with the growth of the poverty rate in 2020, this could mean that the fishing industry in Indonesia is almost doesn't get affected by Covid-19 and is one of the resilient industries in the Covid-19 pandemic situation.

D. Qualitative Analysis on Riau and Bali Province

From the previous result, the plantation industries are the most economic resilience than the other industries and Riau province has the highest amount of plantation industry mainly on oil palm production. The growth of poverty in Riau is 0.14% which can be considered small compared to other provinces. From the industrial perspective, the oil palm tree has many uses from fuel, making concrete [18], the leaves can be used as fertilizer and its wood can be used for furniture. The maintenance of the plantation area is also considered cheap and easy since fire is used to clear the land and maintain the plantation [19,20]. This makes the industry

V. CONCLUSION

This study tried to find which industries are the most resilient while facing the Covid-19 pandemic based on the poverty growth rate in each province. We found that the most resilient industry in the Covid-19 pandemic is the plantation industry, wherein Indonesia, this plantation industry is dominated by oil palm industry, this industry has also helped Indonesia in financial crisis in 1998 making it the most resilient industry. However, there are also some drawbacks regarding these plantation industries, such as they always use fire to maintain and clear the land for opening new plantation areas. The carbon dioxide produced from this industry is really high and could affect local people's health and even neighboring countries.

The second most resilient industry is the fishing industry, Indonesia with a massive amount of water area makes this industry one of the best economic resilience. Creating a local fish farm could be one of the alternative industries to do while facing the Covid-19 pandemic. We also think that those fishing areas that mostly are situated in remote areas make them difficult and rare to be visited by foreigners or international tourists. This then makes the coastal areas tend to be the least exposed to the Covid-19 virus spreading.

Meanwhile small and micro businesses and the tourism industry are facing a hard time in the Covid-19 pandemic. The most vulnerable industry in the Covid-19 pandemic situation is the tourism industry. The implementation of the travel ban by the government and recent conflict in Papua and West Papua is the factor that the tourism industry is not doing so well, but all the travel ban regulation is needed to

recover from the Covid-19 pandemic. For provinces that have been focusing on the tourism industry also small and, micro-businesses might need special attention and recovery program in the post-Covid-19 situation.

There are still a lot of industries in Indonesia that have not been explored yet including technology industries, and manufacturing industries, as well as mining industries. The lack of data makes it really hard to analyze in more detail. Another research gap that might complete this study is analyzing on covid impact not only on economic resilience but also on the other sectors such as education and health since many aspects are causing others too.

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