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Examining Specialization and Diversification of Manufacturing Industries on Regional Economic Resilience in Indonesia

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Abstract

Economic resilience is a discourse in economics that will not stop. Each country and region that is part of it will ensure sufficient economic resilience capabilities. This is related to economic conditions that cannot be predicted with certainty. When economic conditions are shaken, a country that has better resilience tends to be able to survive. Economic activity is one of the essential keys to sustaining economic resilience from shocks. The industrial structure is a reflection of economic activity. Therefore, this study aims to map Indonesia's economic resilience based on regional distribution and empirically analyze the effect of diversification and specialization industrial structures on economic resilience from 1997 to 2015. The samples tested are from 25 provinces. Empirical analysis of the effect of industrial diversification structure and specialization on economic resilience in this study only covers the manufacturing industry using Large and Medium Industry Data. The estimation test applied is a static panel with a fixed effect model. The results of this study indicate that first, there are differences in conditions of resistance and recovery in regional economic resilience. The average regional resistance is above national conditions, while the average regional recovery is below national conditions. Second, specialization in the manufacturing industry positively affects regional economic resilience. Third, the diversification of the manufacturing industry sub-sector significantly negatively affects regional economic resilience.

Keywords: *Economic Resilience, Industrial Structure, Specialization, Diversification*

INTRODUCTION

In the past few decades, Indonesia and even the world have faced with moments that threaten the economy, namely economic crises (Basri, 2018). The condition that has occurred recently is the economic shock due to the Covid-19 pandemic (Roy, 2020). Looking further back, there were two other economic shocks: the 1997–1998 *Global Financial Crisis* and the 2008–2009 *Asian Monetary Crisis*. However, Indonesia is one of the countries affected by these crises, to varying degrees of depth. In 1998, this period was considered the most profound in terms of its effects.

However, in subsequent events, Indonesia was better able to face the economic shocks in the 2009 period. Indonesia's aggregate success at the national level indicates that Indonesia has prepared relatively better and more profitable economic instruments. This success is related to Sugema (2007), who stated that during the 2009 financial crisis period, the Indonesian economy did not rely too much on the export-oriented industrial

sector. Hence, the level of exports was less than half of the national *Gross Domestic Product (GDP)* and the domestic market potential at that time was relatively huge.

Does this phenomenon also reflect conditions at the regional level? This question is the basis for examining regional economic resilience capabilities in Indonesia. Based on the assumption that development is centred on the island of *Java*, provinces in the *Java* Island region may have higher economic resilience capabilities than provinces on other islands. Therefore, the truth of this view requires empirical proof.

The economic crisis is the most visible moment to see how it impacts economic growth. However, in the long term, economic conditions are not always in an increasing condition, but also in a stagnant and even declining condition. From 1996 to 2020, Indonesia's economic growth rate experienced ups and downs. In that period, there have been six times economic downturns; this case is what is called a *recession period*. There were also five times economic improvements in the same period; this is what is called the *expansion period*.

In 1999, the growth of the processing industry on the island of *Sumatra* could not stem the shock of the crisis. Industry in *Lampung* is the province most affected. At the same time, the impact on *Riau* was relatively small, but after the crisis in 2003, the growth of the processing industry in *Riau* experienced a significant decline. Apart from conditions on the island of *Sumatra*, the provinces of *Java* and *Bali* also experienced negative impacts due to the economic crisis. It can be seen in most regions in *Java* and *Bali* that the growth of the processing industry in 1999 was negative.

The following explanation is for provinces in the *Outer Java Sumatra Bali* region: *Nusa Tenggara*, *Kalimantan* and *Sulawesi Maluku*. There were differences in the growth of the processing industry in 1999. The provinces of *Central Kalimantan* and *South Kalimantan* grew positively at a time when other provinces experienced a decline. However, the two provinces only felt the effects of the decline one year later, namely in 2000. Different conditions occurred in *Maluku*; 1999–2000, there was a continued decline. However, in the following year, in the long term, there was a trend that tended to increase. The growth movement during 1996–2020 in this region tends to differ from *Java* and *Bali*. The development of the processing industry growth in this region tends to stagnate. This means that the development of the processing industry outside *Java Sumatra Bali* is smaller than in *Java Sumatra Bali*.

The characteristics of the distribution of industrial structures in a region are related to the ability of economic growth. In favorable conditions, industry constitutes a relatively large share of the economy and has relatively high labor absorption. Apart from being related to the ability of economic growth, the condition of the industrial structure is also related to the region's ability to survive the adverse effects of economic shocks (*shocks*). This ability to survive can be linked to the general concept of *resilience*. The notion of *resilience* refers to the ability of an entity or system to "elastically recover shape and position" after a disruption or disruption of some similar type (Evenhuis, 2020; Hu & Hassink, 2020; Simmie & Martin, 2010; Sutton & Arku, 2022).

Martin et al. (2016) explained that there are two characteristics of industrial structure: *diversification* and *specialization*. A single conclusion cannot be ascertained about the influence of industrial structure on economic resilience (Ženka et al., 2021). It means that a diversified industry can positively or negatively influence economic resilience; the same thing also applies to industrial specialization (He et al., 2022). Several studies state that areas that are considered to have a high level of resilience are those that have adequate structural conditions, one of which is a diversified industrial structure and is supported by technological superiority and environmental capacity for innovation (Balland et al., 2015; Tan et al., 2020; Xiao et al., 2018).

Martini (2020) found different results; industrial specialization is considered one of the main characteristics supporting regional economic resilience. It means that the effect of diversification or specialization on economic resilience is a condition that can still be discussed and proven to be refuted. Therefore, research on the issue of economic resilience is relevant to be proven in Indonesia, especially within the provincial regional scope. The primary analysis in this research broadly refers to Martini (2020), who places economic resilience as the dependent variable and industrial structure and other independent variables as influential independent variables.

Studies regarding Indonesia's regional economic resilience still need to be completed. Therefore, based on the background described previously, this research will answer whether there are differences in the characteristics of economic resilience between provinces in Indonesia. Does manufacturing industry specialization affect regional economic resilience in Indonesia? Does diversification of manufacturing industry sub-sectors affect regional economic resilience in Indonesia? Then, based on the research questions, this research aims to map the resilience index (resistance and recovery) of the Indonesian economy, which is represented based on the provincial regional scope. Then, find out the influence of the manufacturing industry on economic resilience. Finally, determine the effect of diversification of the manufacturing industry sub-sector on economic resilience.

The hypothesis proposed in this research consists of two hypotheses, namely H1: There are differences in the characteristics of economic resilience between provinces in Indonesia. H2: $\beta 1 \neq 0 \beta 1 \square = 0$; Manufacturing industry specialization influences regional economic resilience in Indonesia. H3: $\beta 1 \neq 0 \beta 1 \square = 0$; Diversification of the manufacturing industry sub-sector influences regional economic resilience in Indonesia. This hypothesis refers to several previous studies, namely Tan et al. (2020), Martini (2020) and Brown & Greenbaum (2017).

While previous studies have explored economic resilience from various angles, the novelty of this research lies in its focus on the regional level within Indonesia, particularly the interplay between *specialization* and *diversification* in the manufacturing sector. Additionally, this research uses fixed-effect panel data analysis to measure the effects of industrial structure on economic resilience, a method that provides more

accurate insights by controlling for regional variations over time. This approach has not been extensively applied in the context of Indonesian provinces.

Understanding the factors that contribute to economic resilience is crucial, especially in the wake of global financial crises and the ongoing economic recovery from the Covid-19 pandemic. As Indonesia continues to face economic challenges, it is imperative to assess the resilience of its regional economies. By identifying the role of industrial structure in fostering resilience, this research can provide valuable insights for policymakers, business leaders, and development planners seeking to build more resilient economies.

This research aims to achieve the following objectives: to map the resilience of the Indonesian economy based on regional characteristics, analyze the impact of industrial specialization on regional economic resilience, assess the effect of diversification in the manufacturing industry sub-sectors on regional resilience, and provide empirical evidence of the relationship between industrial structure and economic resilience in Indonesian provinces. The findings of this research are expected to contribute to a deeper understanding of the relationship between industrial structure and economic resilience. This knowledge can assist policymakers in designing targeted interventions to strengthen the resilience of vulnerable regions. Furthermore, businesses and industries can leverage these insights to adapt their strategies, ensuring their operations remain robust in the face of future economic shocks.

RESEARCH METHODS

This research was conducted based on provincial distribution. The data was obtained from the *Central Bureau of Statistics* publication of the Republic of Indonesia. The information to be processed consists of the growth rate of total output in the manufacturing industry sector, the number of workers on a national scale and their distribution at the provincial level, and *gross regional domestic product (GRDP)* per capita. This data is used to determine the level of resilience of provincial regions in Indonesia during the economic crisis.

Economic resilience is seen in the economy in the *Processing Industry*. Therefore, economic resilience in this research means the resilience of the processing industry in regional Indonesia. The resilience calculation was carried out in 25 provinces. The way to do the calculation is to follow the direction of the national economic growth rate from 1997 to 2015. When there is negative national economic growth, this condition is assumed to be *regional resistance*, whereas if national economic growth is positive, then this is *regional recovery*. This research adopts the economic resilience calculation formula from Martin et al. (2016) and Tan et al. (2020) in previous research to do this step. Resilience value can be determined through two stages. The first step is calculating the expected regional (provincial) recession value. Then, the next step is to compare the factual recession value in the region with this expected value. These two stages refer to equations (1), (2), and (3).

$$E(\Delta V_r^{t+k}) = \sum_m V_{mr}^t * g_N^{t+k} \text{ .....(1)}$$

$E(\Delta V_r^{t+k})$: the expected value of provincial recession (expansion) of Manufacturing Industry GDP at time t to $t + k$. V_{mr}^t: production value of the Manufacturing Industry (m) in province r at time t at the beginning of the period (recession/expansion). g_N^{t+k}: Manufacturing Industry GDP growth rate during a national recession (expansion). After getting the expected value of recession and expansion, the results are entered into equations (2) and (3). Equation (2) is used to determine the value of the level of resistance (Resist), assuming the GDP growth condition is negative (recession). Then, equation (3) is calculated to determine the value of the

recovery rate, assuming the GDP growth condition is positive (expansion). Equations (2) and (3) are as follows.

$$Resist_r = \frac{(\Delta V_r^{t+k}) - E(\Delta V_r^{t+k})}{|E(\Delta V_r^{t+k})|} \text{ .....(2)}$$

$$Recover_r = \frac{(\Delta V_r^{t+k}) - E(\Delta V_r^{t+k})}{|E(\Delta V_r^{t+k})|} \text{ ..... (3)}$$

$Resist_r$: recovery rate value in province r. $Recover_r$: recovery rate value in province r. ΔV_r^{t+k}: the value of the recession (expansion) level that occurred in province r from time t to t + k. $E(\Delta V_r^{t+k}$: the expected value of provincial recession (expansion) of national GDP in the manufacturing sector at time t to t + k. he above equation will produce the values of $Resist_r$ and $Recover_r$ at zero range. Result of $Resist_r$ or $Recover_r > 0$; resistance or recovery is more robust than expected under regional conditions. $Resist_r$ or $Recover_r = 0$; resistance or recovery is as expected under regional conditions. $Resist_r$ or $Recover_r < 0$; resistance or recovery is weaker than expected under regional conditions.

The following way to measure diversification is through the diversification index. The data used is on the workforce's regional and national distribution to obtain the results of the diversification index. This diversification index aims to determine the level of industrial diversity based on regional workforce relative to national conditions. Then, the calculation formulation used to determine the results of the diversification index (DIV) refers to equation (4) as follows.

$$DIV = \sum_{i=1}^{n} \left(\frac{e_{kr}}{e_{mr}}\right) * \ln\left(\frac{1}{e_{kr}/e_{mr}}\right) = -\sum_{i=1}^{n} \left(\frac{e_{kr}}{e_{mr}}\right) * \ln\left(\frac{e_{kr}}{e_{mr}}\right) \text{ .....} \quad (4)$$

DIV: diversification of manufacturing sub-industry in province r with measurement of n sub-industry. e_{kr}: number of workers (k) in the manufacturing sector

based on the 2-digit KBLI in province r. e_{mr}: total manufacturing industry workforce (m) in province r. The DIV value from equation (4) produces a DIV value ≥ 0. The DIV value means that the greater the diversification index value, the more diverse the relative industry distribution (diversification). In extreme conditions, if only one industry exists in a region, the DIV value = 0 (Brown & Greenbaum, 2016).

Then, in the previous presentation, it was explained that when an industry does not diversify, a region will have a certain level of industrial specialization. Therefore, this research will use the location quotients (LQ) method to determine the level of industrial specialization. However, this method is only one approach among others. The location quotient (LQ) value is obtained by following equations (5) and (6), and then the notation used in the equation refers to Tan et al. (2020). Equation (5) is used to calculate the manufacturing industry specialization (LQ) value in the province, and then equation (6) is used to calculate the manufacturing sub-industry specialization (LQ) value based on the 2-digit KBLI in the province.

$$LQ_{mr} = \left({}^{e_{mr}}/_{e_r}\right)/\left({}^{e_{mN}}/_{e_N}\right) \text{ ..... (5)}$$

e_{mr}: number of workers in the manufacturing industry in province r. e_r: total workforce in province r. e_{mN}: number of workers in the manufacturing industry nationally. e_N: total national workforce. LQ_{mr}: location quotient of the manufacturing industry in province *r*.

$$LQ_{kr} = \left({}^{e_{kr}}/_{e_{mr}}\right)/\left({}^{e_{kN}}/_{e_{mN}}\right) \text{ ..... (6)}$$

e_{kr}: number of workers (k) in the manufacturing sector based on the 2-digit KBLI in province r. e_{mr}: total workforce in province r. e_{kN}: number of workers in the manufacturing industry based on the 2-digit national KBLI. e_{mN}: total national workforce in the manufacturing industry. LQ_{kr}: *location quotient of manufacturing sub-industry based on 2-digit KBLI in province r*. The results of the calculation of equations (5) and (6) produce three meanings of LQ values, namely: LQ > 1; then regions are considered to have an industrial structure of specialization in specific industries, and certain industries are considered to have export capabilities. LQ = 1; then regional areas are considered to reflect the same distribution of labor as national conditions. LQ < 1; then the region is considered to have relatively few employment opportunities in specific industries, or employment opportunities in certain industries are below the national average.

Martin et al. (2016); apart from that, other research by Tan et al. (2020), Brown & Greenbaum (2017) and Cainelli et al. (2019). The five control variables consist of GDP per capita, population density, unemployment rate, the ratio of foreign direct investment (FDI) to GDP, and governance, which is proxied by the ratio of fixed asset investment to

GDP. Regression testing is carried out using the fix-effect approach. The equation model used is as follows.

Furthermore, the regression analysis used in this research is static panel data regression. It was done to determine the relationship between the influence of industrial structure (diversification and specialization) and economic resilience. The focus of the analysis is to look at the economic resilience of each province in Indonesia. Therefore, the model that is built will use the five control variables that have been carried out by Martin et al. (2016); apart from that, other research by Tan et al. (2020), Brown & Greenbaum (2017) and Cainelli et al. (2019). The five control variables consist of GDP per capita, population density, unemployment rate, the ratio of foreign direct investment (FDI) to GDP, and governance, which is proxied by the ratio of fixed asset investment to GDP. Regression testing is carried out using the fix-effect approach. The equation model used is as follows.

$$RES_{rt} = \beta_0 + \beta_1 Industri_{rt} + \beta_2 GRDPCPTA_{rt} + \beta_3 POPDNSITY_{rt} + \beta_4 UNEMPLOY_{rt} + \beta_5 FDIGRDP_{rt} + \beta_6 FXASTINV_{rt} + u_{rt} \quad \text{..... (7)}$$

Equation (7) answers the three research hypothesis questions through the $Industry_{rt}$ variable, which includes a proxy for the structure of the manufacturing industry, namely manufacturing industry specialization, diversification of manufacturing industry sub-sectors and specialization of manufacturing industry sub-sectors in provinces in Indonesia. RES_{rt}: Economic resilience of province r in year t. $Industry_{rt}$: Manufacturing industry structure in the province in year t. $GRDPCPTA_{rt}$: Per capita income in province r in year t. $POPDNSITY_{rt}$: Population density in province r in year t. $UNEMPLOY_{rt}$: The unemployment rate in province r in year t. $FDIGRDP_{rt}$: Ratio of foreign direct investment to the gross regional domestic product in province r in year t. $FXASTINV_{rt}$: Ratio of fixed asset investment to the gross regional domestic product in province r in year t. β_{0-6} : Coefficient.. u_{rt} : Error that varies in province r and year t. RES is the dependent variable, and Industry is the independent variable. Then, the control variables consist of $GDPCPTA$, $POPDNSITY$, $UNEMPLOY$, $FDIGRDP$, dan $FXASTINV$.

RESULTS AND DISCUSSION

Regional economic resilience is seen based on resistance conditions when there is an economic downturn (gross domestic product) and recovery when there is an economic increase (gross domestic product). Almost all provinces have resistance, as expected, during an economic crisis or economic downturn. It can be seen in 1997, 1998, 2001, 2006, 2008, 2009, 2011, 2012, 2013, 2014, and 2015. Meanwhile, for resilience based on recovery, almost all provinces' abilities differ from expected because the recovery index value is less than zero. However, two provinces have recovery capabilities

as expected, namely Bengkulu and Central Sulawesi. Recovery capacity can be seen based on years of economic improvement, namely 1999, 2000, 2002, 2003, 2004, 2005, 2007 and 2010.

If we look at the movement pattern of resilience trends, the majority of provinces in Indonesia had the same pattern throughout 1997 – 2015. The economic resilience of each province is measured based on the amount of manufacturing industry output. One of the causes of the movement of relatively similar resilience patterns is the manufacturing industry's structural condition, which does not change much every year and between provinces. This manufacturing industry includes the large and medium industry category. Therefore, changes in the market are relatively small.

In 1999, 2000, 2003, and 2005, all provinces in Sumatra were at the expected recovery level; namely, the regional recovery value was more significant than zero. However, in 2002, 2004, 2007, and 2010, all provinces experienced unexpected recovery levels because the recovery values were negative. Variations in recovery levels in Sumatra were seen in 2004 and 2005, while they were relatively the same for other years. If we look more precisely, Bengkulu is a region that has a high recovery rate compared to other regions in Sumatra.

In contrast to conditions in Java and Bali, almost all regions are at a recovery level that tends to be the same. If we look more precisely, DI Yogyakarta was the province with the highest recovery in 2004 and 2005. Meanwhile, in the same year, the lowest recovery was in Bali in 2010. Regional recovery levels in Java and Bali are similar to the Sumatra region.

The recovery outside Java, Bali, and Sumatra shows Southeast Sulawesi had the best recovery rate in 2007, but this region was in a better condition in other years. Then, 2007 showed relatively high variations in values compared to other years. The varying recovery values outside Java, Sumatra, and Bali indicate significant differences in the manufacturing industrial sector. It is visible when compared with Java and Bali, with slight differences in recovery levels. This is because the distribution of the manufacturing industry in the Java-Bali region is more even.

The model chosen for measuring industrial structure is the fixed effect model. This model provides the best estimation results between the expected effect and random effect model choices. Then, through this fixed effect model, variations in observations in each region are also considered. The results of testing industrial structure on regional economic resilience can be seen in Table 1 below.

Table 1. Estimation Results of the Relationship between Resilience and Manufacturing Industry Specialization and Diversification of Manufacturing Sub-Industry 2 Digit KBLI

Variable	(1) RES	(2) RES	(3) RES	(4) RES	(5) RES	(6) RES
LQ_MANU	0,205*	0,1839*	0,183*	0,082	0,087	0,073
	(0,09)	(0,07)	(0,07)	(0,08)	(0,08)	(0,09)
DIV_SUB MANU	-0,581***	-0,440***	-0,442***	-0,369***	-0,353***	-0,374***

Variable	(1) RES	(2) RES	(3) RES	(4) RES	(5) RES	(6) RES
	(0,11)	(0,10)	(0,10)	(0,09)	(0,09)	(0,09)
LNGRDPCPTA		-0,097***	-0,095***	-0,111***	-0,110***	-0,114***
		(0,02)	(0,02)	(0,01)	(0,01)	(0,02)
POPDNSITY			-0,00005**	-0,0001***	-0,0001***	-0,0001***
			(0,00)	(0,00)	(0,00)	(0,00)
UNEMPLOY				-0,061***	-0,059***	-0,061***
				(0,01)	(0,01)	(0,01)
FDIGRDP					0,313***	0,313***
					(0,07)	(0,07)
FXASTINV						-21,16
						(22,51)
_CONS	0,775**	2,088***	2,100***	2,81***	2,76***	2,91***
	(0,23)	(0,27)	(0,27)	(0,32)	(0,32)	(0,40)
OBSERVATION	475	475	475	475	475	475
R2	0,02617	0,03512	0,03529	0,04987	0,05078	0,05177
R2_A	0,02204	0,02897	0,02708	0,03974	0,03861	0,03756

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Author's data processing results

Based on testing the fixed effect model, specialization in the manufacturing industry significantly positively affects economic resilience, especially in the manufacturing sector economy. In the robustness check, the direction of the relationship between specialization in the manufacturing industry consistently has a significant positive effect. However, when the manufacturing industry's specialization conditions consider other variables, this has an insignificant effect. In model (6), the coefficient produced by the manufacturing industry specialization variable is 0.073. It means that every time there is an increase in the level of specialization in the manufacturing industry by 1%, this condition will positively affect regional economic resilience by 7.3%. It reflects national industrial conditions; the manufacturing sector is one of the industries in the Indonesian economy. The manufacturing sector is a labor-intensive industry, but this sector is an industry that is vulnerable to shocks, both economic and non-economic factors.

Furthermore, in the model (6), many control variables negatively affect the economic resilience of the manufacturing sector. Four control variables hurt economic resilience, namely GRDP Per Capita (LNGRDPCPTA), population density (POPDNSITY), unemployment rate (UNEMPLOY), and the ratio of fixed asset investment to GRDP (FXASTINV). The control variables with a significant adverse

effect are LNGRDPCPTA, POPDNSITY and UNEMPLOY. The Per Capita GDP coefficient value is (-0.114). Then, the population density variable with a coefficient value of (-0.0001). It means that every 1% increase in population density in a particular area will reduce economic resilience by (-0.0001) points. Apart from that, the value of the unemployment rate variable (UNEMPLOY) is negative, meaning that if there is an increase in unemployment, there will be a decreasing effect on economic resilience. Next is the variable ratio of foreign direct investment to GRDP, with a coefficient of 0.313. The positive effect of FDIGRDP is significant for the economic resilience of the manufacturing sector. This value means that a % increase in the FDI to GRDP ratio of 1% will increase the manufacturing economy's resilience by 0.313 points.

The manufacturing industrial sector is still the leading sector supporting economic growth. This condition often occurs in developing countries. This sector is capable of absorbing labor on a massive scale. Therefore, it is synonymous with the labor-intensive industry. However, in the manufacturing industry sub-sector, there are also industries with capital-intensive characteristics, such as the primary metals industry. Therefore, manufacturing industry specialization is transmitted to economic resilience through contribution to Gross Domestic Product (GDP) and relatively large employment absorption. Internal and external factors influence these two conditions. The performance of the manufacturing industry plays an essential role because it influences GDP support. It happened in 2006 – 2007 at the national level, manufacturing industry growth was 4.6% and 4.7%, and economic growth was 5.5% and 6.3%, and this is supported by the role of the manufacturing industry in GDP in 2002 of 27.9% to 27.4% in 2007 (Wibowo, 2010). It means that the competitiveness of the manufacturing industry needs to be considered to maintain its performance. It is needed because it impacts economic growth and especially economic resilience. Therefore, the estimation results produce a linear relationship between manufacturing industry specialization and economic resilience. The better the performance of the manufacturing industry, the more it will support economic resilience.

External factors that influence the manufacturing industry are regional and global economic conditions. Economic downturn and even an economic crisis will push the manufacturing industry to decline. First, from the market demand side, it will be disrupted, so if demand decreases, this will affect the amount of output produced by the manufacturing industry. Producers will tend to refrain from expanding commodities, and as a result, industrial operations will be efficient. This condition will encourage a reduction in the workforce, which will affect the unemployment rate. It also contributes negatively to the condition of per capita income. Based on the estimation results, it is known that the relationship between per capita income and economic resilience is linear. The decline in per capita income harms economic resilience. Conversely, the unemployment rate is inversely related to economic resilience. It means that high levels of unemployment will trigger a decline in economic resilience.

The manufacturing industry can be seen more specifically. This is because the manufacturing sector has a relatively broad industrial structure. There are various types

of industrial activities in it. The diversification measurement in the manufacturing sub-sector was carried out with 9 types of industry, 23 and 24 types of industry following the period 1996 - 2015. This research measured sub-sector diversification based on each grouping of industry types according to time conditions. Each type of industry has been described in the previous discussion, starting from the food, beverage and tobacco industries to industry. Therefore, it is essential to see the effect of diversification of the manufacturing industry sub-sector on economic resilience. This estimate was carried out to see whether it is essential for a region to have high diversification of the manufacturing sub-sector to affect economic resilience in the region. The estimated results of the influence of diversification in the manufacturing sub-industry can be seen in Table 2 as follows.

Table 2. Estimation Results of the Resilience Relationship with Manufacturing Industry Specialization and Diversification of Manufacturing Sub-Industry 2-Digit KBLI Between Java Bali Sumatra and Outside of Java, Sumatra Bali

Variable	(1)	(2)
	RES	RES
	Java, Bali & Sumatra	Outside of Java, Bali & Sumatra
LQ_MANU	-0,0318	0,1184
	(0,086)	(0,264)
DIV_SUBMANU	-0,184	-0,713**
	(0,127)	(0,203)
LNGRDPCPTA	-0,141***	0,0469
	(0,018)	(0,046)
POPDNSITY	-0,00010823**	-0,0108**
	(0,000)	(0,003)
UNEMPLOY	-0,0547**	-0,0651*
	(0,017)	(0,025)
FDIGRDP	0,358**	15,034
	(0,091)	(10,50)
FXASTINV	-3,369	-79,465
	(33,22)	(40,036)
_CONS	3,151***	1,4513
	(0,524)	(0,952)
OBSERVATION	266	209
R2	0,0439	0,0879
R2_A	0.0179	0,0562

Note : ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Source : Author's data processing results

Based on the estimation results in Table 2, regional specialization of the manufacturing industry on Java, Bali and Sumatra islands hurts economic resilience. Different conditions are shown in provinces on the islands of Kalimantan, Nusa Tenggara

and Sulawesi, Maluku. Specialization in the manufacturing industry positively affects provinces outside Java, Bali and Sumatra.

Then, the 2-digit KBLI manufacturing sub-industry diversification variable has a negative effect. This condition occurs in Java, Bali, and Sumatra regions and outside. However, the magnitude produced differs between Java, Bali, Sumatra and regions outside it. It means that the more diversified the manufacturing sub-sector is in regions outside Java, Bali, and Sumatra, the less the industry can withstand adverse economic effects. Then, the variable ratio of foreign direct investment to GRDP significantly affects the Java, Bali and Sumatra regions. Although diversification of the manufacturing sub-industry has negatively affected Java, Bali and Sumatra, this will not significantly impact economic resilience.

Based on the descriptive analysis in the previous discussion, even though a region is considered diversified in the manufacturing sub-sector, each region has certain dominant sub-industries. The geographical characteristics of each region influence this. Apart from that, this condition is also supported by the distribution of industrial structures based on business fields in Indonesia. The manufacturing industry is one of the business sectors among 17 other sectors such as agriculture, forestry and fisheries, mining and quarrying, construction, transportation and warehousing, financial services and insurance, real estate, educational services, government administration, defense and mandatory social security, and others.

CONCLUSION

This research shows differences in resilience characteristics in regional Indonesia based on *resistance* and *recovery* values. The *resistance* value in each region is positive, while the *recovery* value is negative. It proves that almost all regions in Indonesia have resistance capabilities, as expected. On the other hand, recovery capabilities tend to be weaker than expected in each regional condition. It means that the condition of the manufacturing industry in the province still has good survival capabilities compared to recovery capabilities. Furthermore, the recovery capacity of the manufacturing industry in the province requires intervention through both stimulus support in the manufacturing sector and support for strengthening competitiveness.

The results of testing the influence of *specialization* in the regional manufacturing sector on regional resilience show a positive direction of impact. However, the effect of manufacturing sector *specialization* on regional resilience is not significant. These results are from research conducted by Martini (2020), which concluded that *specialization* in the manufacturing industry in a region has a positive effect in the short term. It is related to the development of the manufacturing industry in Indonesia. Manufacturing growth tends to fluctuate, even in the *Java* and *Bali* regions; the long-term economic growth of the manufacturing sector is experiencing a downward trend. Then, the growth of the manufacturing sector in *Sumatra* tends to experience stagnation. It indicates that industrial sectors other than manufacturing are experiencing further improvement to support regional resilience in Indonesia.

Manufacturing industry *specialization* in this research was also looked at more specifically based on the 2-digit *KBLI* classification, resulting in nine types of manufacturing sub-sector *specialization*. The results of testing the *specialization* of the manufacturing sub-sector are divided into two regional groups: *Java Sumatra Bali* and *Outside Java Sumatra Bali*. The results show that only a few specializations in the manufacturing subsector significantly affect resilience. The manufacturing sub-sectors in the *Java Sumatra Bali* region that significantly influence are the *Food, Beverage and Tobacco Industry*, *Non-Metal Mineral Goods Industry except Petroleum and Coal*, and *Basic Metal Industry*. Meanwhile, there is no specialization in the manufacturing sub-sector for areas *outside Java, Sumatra, and Bali* that significantly affects resilience.

Specialization in the manufacturing industry has been proven to affect economic resilience in regional Indonesia positively. The limitation of this test is that there is no comparison with other industrial sectors such as the agricultural, mining, financial services, transportation, and other industries. Then, the sample taken in this research was at the provincial level; due to limitations, it has yet to be carried out at the district/city level in Indonesia. This research can provide opportunities for further development by looking at regional policy strategies in developing industries to increase regional resilience. This research can also provide policy implications, namely that policymakers need to pay attention to the direction of the region's manufacturing industry's development.

REFERENCES

Balland, P.-A., Rigby, D., & Boschma, R. (2015). The technological resilience of US cities. *Cambridge Journal of Regions, Economy and Society*, *8*(2), 167–184.

Basri, M. C. (2018). Twenty years after the Asian financial crisis. *Realizing Indonesia's Economic Potential*, 21–45.

Brown, L., & Greenbaum, R. T. (2016). The role of industrial diversity in economic resilience: An empirical examination across 35 years. *Urban Studies*, *54*(6), 1–20. https://doi.org/10.1177/0042098015624870

Brown, L., & Greenbaum, R. T. (2017). The role of industrial diversity in economic resilience: An empirical examination across 35 years. *Urban Studies*, *54*(6), 1347–1366. https://doi.org/10.1177/0042098015624870

Cainelli, G., Ganau, R., & Modica, M. (2019). Industrial relatedness and regional resilience in the European Union. *Papers in Regional Science*, *98*(2), 755–778. https://doi.org/https://doi.org/10.1111/pirs.12377

Evenhuis, E. (2020). New directions in researching regional economic resilience and adaptation. In *Handbook on regional economic resilience* (pp. 69–86). Edward Elgar Publishing.

He, D., Miao, P., & Qureshi, N. A. (2022). Can industrial diversification help strengthen regional economic resilience? *Frontiers in Environmental Science*, *10*, 987396.

Hu, X., & Hassink, R. (2020). Adaptation, adaptability and regional economic resilience: A conceptual framework. In *Handbook on regional economic resilience* (pp. 54–68). Edward Elgar Publishing.

Martin, R., Sunley, P., Gardiner, B., & Tyler, P. (2016). How regions react to recessions: Resilience and the role of economic structure. *Regional Studies*, *50*(4), 561–585.

Martini, B. (2020). Resilience and economic structure. Are they related? *Structural Change and Economic Dynamics*, *54*, 62–91. https://doi.org/10.1016/j.strueco.2020.03.006

Roy, S. (2020). Economic impact of Covid-19 pandemic. *A Preprint*, *1*, 29.

Simmie, J., & Martin, R. (2010). The economic resilience of regions: towards an evolutionary approach. *Cambridge Journal of Regions, Economy and Society*, *3*(1), 27–43.

Sutton, J., & Arku, G. (2022). Regional economic resilience: towards a system approach. *Regional Studies, Regional Science*, *9*(1), 497–512.

Tan, J., Hu, X., Hassink, R., & Ni, J. (2020). Industrial structure or agency: What affects regional economic resilience? Evidence from resource-based cities in China. *Cities*, *106*(September), 102906. https://doi.org/10.1016/j.cities.2020.102906

Xiao, J., Boschma, R., & Andersson, M. (2018). Industrial diversification in Europe: The differentiated role of relatedness. *Economic Geography*, *94*(5), 514–549.

Ženka, J., Chreneková, M., Kokešová, L., & Svetlíková, V. (2021). Industrial structure and economic resilience of non-metropolitan regions: An empirical base for the smart specialization policies. *Land*, *10*(12), 1335.