

## THE RELATIONSHIP BETWEEN ECONOMIC INDICATORS, GROSS DOMESTIC PRODUCT (GDP) AND SUPPLY CHAIN PERFORMANCE

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**Abstract:** The supply chain dynamics has been broadly examined and experienced by the academes, industrialists as well as economists. However, still the literature is missing with the effect of economic indicators on supply chain performance, particularly in fishing industry. Therefore, the objective of the current study is to examine the role of economic indicators on supply chain performance in fishing industry of Indonesia. Economic indicators such as interest rate, inflation rate and human development index (HDI) has relationship with supply chain performance. Increases or decrease in interest and inflation has direct effect on the supply of fish products which ultimately influence the whole supply chain performance. Fishing industry is one of the industries which is working from many centuries and now growing rapidly and considered to be the important element of economic growth in different countries like Indonesia. Six hypotheses were formulated with the help of previous studies, concerning the relationship between inflation rate, interest rate, human development index (HDI), gross domestic product (GDP) and supply chain performance. GDP was considered as the mediating variable. Managerial employees of fishing companies were selected as the respondents of this study. Primary data was collected by conducting the questionnaire survey. Total number of one hundred and ninety-six (196) responses was received. These responses were analysed with the help of statistical software namely; Partial Least Square (PLS). It was found that economic indicators have influence on supply chain performance. Increases in inflation rate and interest rate decreases the supply chain performance. However, increases in HDI enhances the GDP and promote supply chain performance. Additionally, GDP is a mediating variable between HDI and supply chain which positively enhances the supply chain performance through HDI. Thus, study provides the clues for government to promote supply chain performance by controlling inflation and interest rate.

**Key words:** supply chain, inflation, interest rate, gross domestic product (GDP), human development index (HDI)

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### Introduction

Fishing industry has significant impact on the economy of various countries which heavily based on supply chain performance (Hameri & Pálsson, 2003). The fishing industry comprises any industry concerned with processing, storing, culturing,

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preserving, selling fish, transporting and marketing fish products which requires well managed supply chain system. In all these processes, inflation rate, interest rate and human development index (FDI) are important. These three elements have major contribution in supply chain performance. As demonstrated by various studies that inflation rate and interest rate are both have important relationship with return (Fama, 1990; Lee, 1992; Kovács and Kot, 2017).

The supply chain performance has been largely examined and experienced in academes, industrialists and economists (FORRESTER, 1961; Kot et al., 2018; Hugos, 2018). However, still the literature is missing with the effect of economic indicators on supply chain practices, particularly in fishing industry. Economic indicators include; inflation rate, interest rate, human development index (FDI) and gross-domestic product (GDP). Fishing industry is an industry which is working from numerous centuries. Recently it is growing speedily and considered to be the vital element of economic growth in various countries.

Figure 1 shows the fish exports by various countries. It is clear that China is leading in Fish exports. Fishing industry of China has major importance of its economy. However, as the study has focused on Indonesian Fishing industry, the Indonesia is on number second in Fish exports. Indonesia exports are approximately 5813.800 thousand tons each year. Followed by the United States having 5128.381 thousand-ton exports, India has 4862.861 thousand-ton exports, Peru has 4841.524 thousand-ton exports, Russian Federation has 4331.398 thousand-ton exports, Japan has 3644.328 thousand-ton exports, Myanmar has 3579.250 thousand-ton exports, Vietnam has 2622.200 thousand-ton exports and finally, Chile has 2572.881 thousand-ton fish exports each year. Therefore, apart from China, the Indonesian fishing industry is on top. As the industry is growing, it also has threat from the inflation rate, interest rate, HDI and GDP. Therefore, the current study focused on these elements to examine the effect of economic indicators on supply chain performance of fishery industry in Indonesia.

Different studies examined the relationship of supply chain performance and fishery industries but none of the study formally documented the role of economic indicators in supply chain performance (Hameri and Pálsson, 2003; Islam and Habib, 2013; Ogden, 2008). Therefore, the objective of the current study is to examine the role of economic indicators in supply chain performance. The other objectives are given below. Figure 2 shows that how economic indicators effect on supply chain performance.

1. To examine the role of economic indicators, namely; inflation rate, interest rate and HDI on supply chain performance.
2. To examine the meditating role of GDP between HDI and supply chain performance.

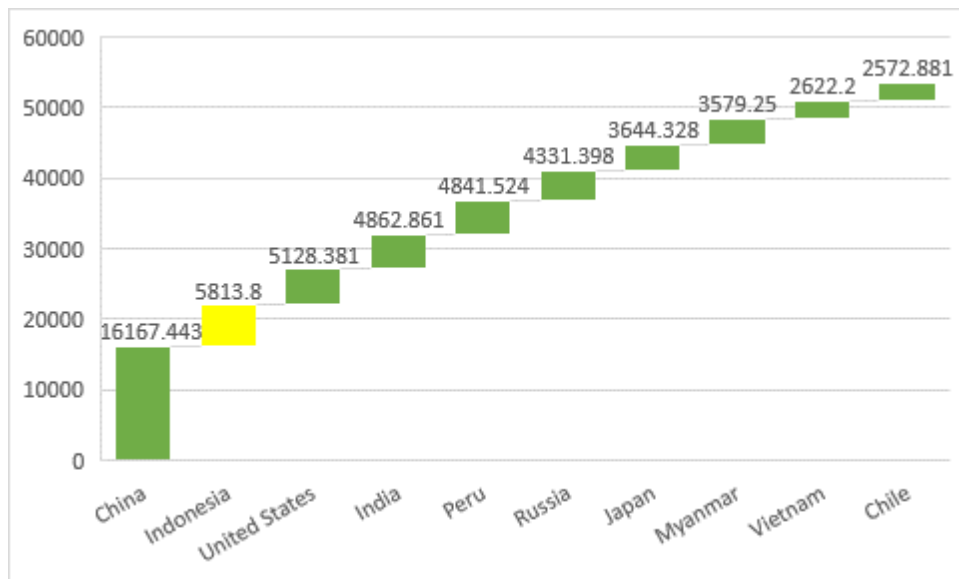


Figure 1. Comparison of fish export by various countries with Indonesia

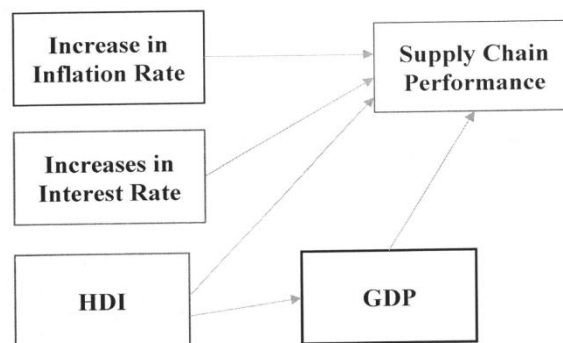


Figure 2. Theoretical framework of the study showing that how economic indicators effect on supply chain performance

### Literature Review

#### *Increase in Inflation and Supply Chain Performance*

Inflation is one essential variable in macroeconomics. Inflation is characterized as the expansion in the general price of goods after some time. At whatever point the general price of goods increases, the purchasing power of consumer decreases, which effect negatively on supply chain performance activities of goods. Normally, monetary strategies assume to control the inflation situations in a nation. The central bank utilizes those fiscal strategies to control the economic performance with the end goal to maintain and avoid inflation (Jayanthi, 2016).

Inflation effect the buying and selling of goods and services between buyer and seller which has significant relationship with supply chain of goods and services. Increases in inflation, decreases the supply chain activities. The buyer tends to pay the price as late as could reasonably be expected, or, in other words not restricted by the seller. The inflation of the money devalues the services and products which result in disadvantages for the seller on late instalment. The buyer tends to pay back late to build his aggregate cash esteem. Hence, the inflation likewise assumes a critical job to the two parties' sellers and buyers of the short-lived items. This situation drives an ideal methodology to determine the requesting approach for ordering policy for a supply chain system (Sarker et al., 2000). As the supply chain industry is generally based on transfer of goods and services (Ellram et al., 2004; Stadler, 2008; Ibrahim and Ali, 2014; Sarwar and Mubarik, 2014; Okoye, 2014; Wilson et al., 2014; Chidoko, 2014; Ekpung, 2014; Kasasbeh et al., 2018; Hawamdeh, 2018; Yu-Chi and Lin, 2018), therefore it has significant effect by the inflation rate. Increases in inflation also increase the prices of goods which influence negatively on supply chain activities.

The stock level changes with time because loss of materials due to inflation. Give  $I(t)$  a chance to be the stock level at time  $t$ . Depletion of stock happens because of the demand and decay of materials. The deterioration could happen when the materials are physically existing in the stock at time  $t$  ( $I(t) > 0$ ), and no damage of materials while lack period since it doesn't exist while the rest of the remaining period  $[t_1, t_2]$ . The supply chain model under inflation model is shown in Figure 2. Thus, below hypothesis is proposed.

$$\frac{dI(t)}{dt} + \theta I(t) = -D, \quad 0 \leq t \leq T.$$

**H1:** Increase in inflation rate has significant negative effect on supply chain performance.

### ***Increases in Interest and Supply Chain Performance***

The interest rate is a yearly price charged by the lenders to the borrowers. Generally financial foundations or lenders force an interest on the borrower's dependent on the whole loans that was taken. Hristov et al. (2014) considered the development of retail bank interest in Europe from 2003 to 2011. The study inspected structural changes and interest rate in Europe. The examination found that there is a huge connection between basic changes and interest rate spread in Europe. It is said that financial issues have made the neighbourhood banks in Europe fix the insurance necessities. At the point when a bank settles on a choice to fix the base necessity, banks in Europe would confront money related unpredictability. This change in interest rate has significant influence on supply chain performance of various products as well as services.

Hristov et al. (2014) found that the interest rate should be stable in order to avoid unwanted economic results. Because it increases the price and decreasing the purchasing power which has negative effect on supply chain performance. Were

and Wambua (2014) intended the various elements of interest rate spread in Kenya's banking industry from the year 2002 to 2011. These financial organizations are turn into the principle specialists controlling the monetary development for 44.4 million individuals. The outcome demonstrates that the variable (bank particular) give more critical outcomes contrasted with different factors (macroeconomics) with the end goal to decide the interest rate spreads in Kenya. Better control by financial institutions on interest rate has impact on supply chain of goods and services. However, the political influent may disturb the financial matters (Fitriandi et al., 2014; Aremu and Ediagbonya, 2018; Okafor and Shaibu, 2016; Mokuolu, 2018; Khemili and Belloumi, 2018; Zhang, 2018; Okon and Monday, 2017; Edeme, 2018; Maqbool et al., 2018).

The client pays no interest while find period they are assumed to settle the amount; but in case of instalment is deferred and not paid in specified time, interest will be charged. The client can begin to aggregate incomes on the deal or utilization of the item, and gain interest on that income. So, it is to the benefit of the client to allow the instalment to the provider until the end of the period (Sarker et al., 2000). The increases in interest rate decreases the ability of customer to purchase the goods and decreases the supply chain performance (Balassa, 1964; Fisher, 2006; Jayanthi, 2016). Therefore, an increase in interest rate has negative influence on supply chain performance.

*H2: Increase in interest rate has significant negative effect on supply chain performance.*

### ***Human Development Index (HDI), Gross-Domestic Product (GDP) and Supply Chain Performance***

The Human Development Index (HDI) is one of the statistic composite index of life expectation, per capita income and education comprise of various indicators which are utilized to rank different countries into four layers of human development. A country scores a higher HDI when the education level is higher than others, the lifespan is higher and the GDP per capita is higher. HDI is one of the important development indicators (Bray et al., 2012; McGillivray, 1991; McGillivray and White, 1993) which has significant relationship with GDP as well as supply chain performance among different firms.

Kandemir (2012) considered a couple of elements like education, income of people and wellbeing with the end goal to discover which human advancement elements assumes an essential worldwide. The information for this investigation was gathered from the World Bank and the HDI information from the United Nations Development Program. The results show that people generally attract more to those countries having good HDI. Therefore, better HDI of country attract people to work in a better way which enhances the GDP having significant effect on supply chain performance.

As the supply chain is based on the transfer of goods and services (Christopher, 2016; Werner, 2000) which requires certain level of skills and education, thus, HDI

is most crucial in supply chain performance. Better education and skills enhances the productivity which influence positively on GDP as well as supply chain performance. As both the supply chain performance and GDP has significant association with each other's (Akkermans et al., 2003). Thus, it is evident that HDI has significant role to enhance GDP and GDP has significant role in supply chain performance. Therefore, below hypotheses are proposed.

*H3: Increases in HDI has significant positive effect on supply chain performance.*

*H4: Increases in HDI has significant positive effect on GDP.*

*H5: Increases in GDP has significant positive effect on supply chain performance.*

*H6: GDP mediates the relationship between HDI and supply chain performance.*

### **Research Methodology**

Self-visit to the fishing companies was preferred to collect the data in order to find the impact of economic indicators on supply chain performance in fishing industry of Indonesia. According to Polit and Hungler (1999), information obtained during the investigation or study is called data. In this research, questionnaire is used for the purpose to collect information which is associated to objectives as well as research questions of the study. Therefore, in order to obtain information, questionnaire was distributed among the managerial employees of fishing companies. In this study cluster sampling technique was selected to analyse the data. Cluster sampling was selected to overcome the issue of sampling frame. Because the current study does not have sampling frame. Cluster sampling is suitable when the study does not have sampling frame and population spread on a wide area (Hameed et al., 2018; Sekaran, 2003). Moreover, this study utilized 5-point Likert scale. Likert scale is suitable to decrease the frustration of respondents and increases the reliability of data which shows significant effect on the outcomes of the study. Data collection procedure was based on three major steps. In first step, the Indonesia was divided in to five clusters by following the area cluster sampling techniques. In second step, three clusters out of five were chosen randomly. In third step, questionnaires were distributed in selected clusters. Total three hundred questionnaires were distributed through email survey. Data collection was started in July 2018 and completed in September 2018.

Prior to start the analysis of study, the missing value was examined. It was found that increases in interest rate has 05 missing values, increases in inflation has 03 missing values, supply chain performance has 02 missing values, GDP has 01 missing value and HDI has 04 missing values. All these missing values were settled with the help of SPSS. Moreover, outlier in the data may also influence the results of the study. Therefore, the treatment of outlier was also performed with the help of SPSS version 21. Moreover, multicollinearity between the independent variables was also examined. According to the literature, VIF value should not exceed 5.0. More than 5.0 value indicates the problem which may effect on the hypotheses results. Results of multicollinearity are shown in Table 1.

Table 1. Multicollinearity

Variables	VIF
Gross Domestic Product (GDP)	3.008
Human Development Index (HDI)	4.726
Increases in interest rate (IINR)	3.231
Increases in inflation (IIR)	2.150

Data Analysis

Confirmatory Factor Analysis

This study adopted structural equation modelling to test the developed hypotheses. In this study, the instructions of previous studies are followed (Henseler et al., 2009; Reinartz et al., 2009). It is evident from the literature that PLS-SEM requires various steps such as outer model assessment and inner model assessment (Hair, 2010; Hair et al., 2012; Hair Jr et al., 2016). In first step, factor loading is required more than 0.5 for all items, composite reliability and AVE required to be more than 0.7 and 0.5 respectively. Figure 3 shows factor loading and Table 2 and Table 3 shows all the results.

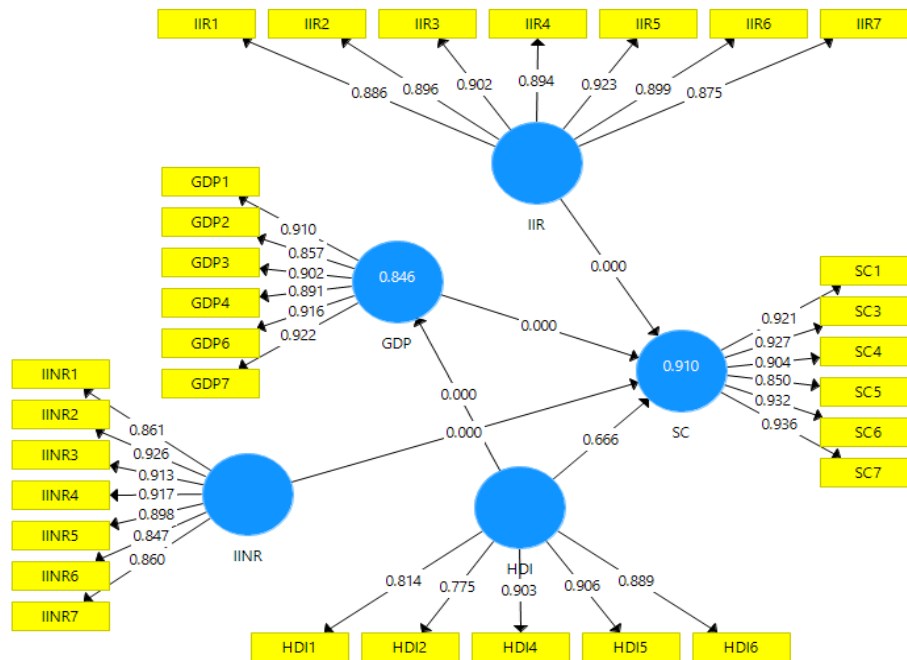


Figure 4. Assessment of measurement model

Table 2. Factor loadings

	GDP	HDI	IINR	IIR	SC
GDP1	0.910				
GDP2	0.857				
GDP3	0.902				

GDP4	0.891		
GDP6	0.916		
GDP7	0.922		
HDI1		0.814	
HDI2		0.775	
HDI4		0.903	
HDI5		0.906	
HDI6		0.889	
IINR1			0.861
IINR2			0.926
IINR3			0.913
IINR4			0.917
IINR5			0.898
IINR6			0.847
IINR7			0.860
IIR1			0.886
IIR2			0.896
IIR3			0.902
IIR4			0.894
IIR5			0.923
IIR6			0.899
IIR7			0.875
SC1			0.921
SC3			0.927
SC4			0.904
SC5			0.85
SC6			0.932
SC7			0.936

**Table 3. Measurement model results**

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
GDP	0.953	0.954	0.962	0.810
HDI	0.911	0.923	0.933	0.738
IINR	0.956	0.957	0.964	0.791
IIR	0.959	0.96	0.966	0.804
SC	0.959	0.961	0.967	0.832

Discriminant validity was examined with the help of Heterotrait-Monotrait ratio. It is shown in the Table 4. It is evident that the all the values are below 0.85 which is one of the evidence of discriminant validity achievement.

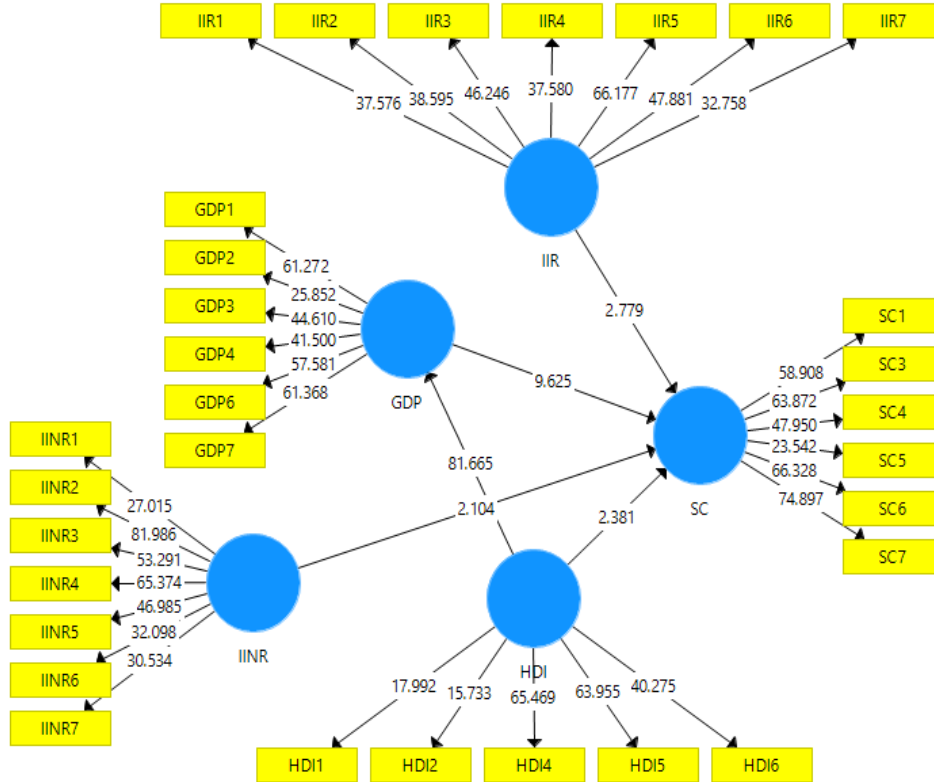
**Table 4. Discriminant validity**

	GDP	HDI	IINR	IIR	SC
GDP					
HDI	0.845				
IINR	0.744	0.786			
IIR	0.729	0.796	0.675		
SC	0.690	0.961	0.762	0.730	



**Hypotheses Testing**

Below Figure 4 shows PLS bootstrapping. The Table 5 shows the results of PLS bootstrapping. According to these results, all the direct hypotheses (H1, H2, H3, H4, and H5) are supported. As it is evident from the Figure 4 that the t-value is above 1.96 for all the hypotheses. Moreover, it is also shown in Table 5. T-value above 1.96 and p-value below 0.05 is the indication of acceptance of hypotheses (Haseeb et al., 2018; Suryanto et al., 2018).



**Figure 3. Assessment of structural model**

**Table 5. Hypotheses results**

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV)	P Values	Decision
GDP -> SC	0.724	0.722	0.075	9.625	0.000	Supported
HDI -> GDP	0.92	0.920	0.011	81.665	0.000	Supported
HDI -> SC	0.218	0.212	0.091	2.381	0.018	Supported
IINR -> SC	-0.183	0.185	0.087	2.104	0.036	Supported
IIR -> SC	-0.153	0.147	0.055	2.779	0.006	Supported

Effect of mediation was also examined with the help of PLS bootstrapping technique. In this step, it was found that the mediation effect of GDP is significant. As the p-value is below 0.05 which is the indication of significant relationship, as shown in Table 6.

**Table 6. Mediation effect of GDP**

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
HDI -> GDP -> SC	0.666	0.664	0.071	9.434	0.000

Additionally, the effect size of each variable is also given. According to the results, GDP and HDI have strong effect on supply chain performance. Moreover, increases in inflation rate have moderate effect on supply chain performance. However, increases in interest rate have small effect. All the results are shown in Table 7. Finally, the  $R^2$  for the current study is 0.910 which is substantial (Chin, 1998). Moreover, effect size was examined based on the recommendations of Cohen (1988).

**Table 7. Effect Size ( $f^2$ )**

Variables	Value	Effect Size ( $f^2$ )
Increases in Inflation Rate	0.151	Moderate
Increases in Interest Rate	0.025	Small
HDI	0.851	Strong
GDP	0.690	Strong

### **Findings**

This study investigated about the supply chain performance of fishing industry of Indonesia. Mainly, the role of economic indicators was investigated on supply chain performance. Three main economic indicators were selected, namely; inflation rate, interest rate and human development index (HDI). Moreover, the mediating role of GDP between HDI and supply chain performance was examined. Managerial employees of fishing companies were selected to gather the information about the effect of economic indicators on supply chain performance in fishing industry. Total number of six hypotheses was formulated with the help of literature. In total six hypotheses, five was established to examine the relationship of inflation and supply chain performance, interest and supply chain performance, HDI and supply chain performance, HDI and GDP, GDP and supply chain performance. One mediation hypothesis was established to examine the mediation effect on GDP between HDI and supply chain performance. The relationship between increases in inflation rate and supply chain performance found t-value 2.779 and beta value -0.153. These results show significant relationship; however, beta value shows negative sign. Negative beta value indicates indirect relationship

between supply chain performance and increases in inflation rate. Increases in inflation rate decreases the supply chain performance among fishing companies. In line with this, the relationship of increase in interest rate and supply chain performance also found similar results. In this relationship t-value is 2.104 and beta value -0.183. Similar with previous results beta value shows negative sign. Increases in interest rate decreases the supply chain performance. Moreover, the relationship between HDI and supply chain performance found significant with t-value 2.381 and beta value 0.218. In this case beta value is positive showing that the relationship between HDI and supply chain performance is positive. Increases in HDI increases the supply chain performance. In line with these outcomes, relationship between HDI and GDP also found significant positive with beta value 0.92. Increases in HDI increases the GDP. Moreover, increases in GDP increases the supply chain performance as the t-value found 9.625 and beta value 0.724. Final hypothesis of the study found that GDP is a mediating variable between HDI and supply chain performance. Mediation effect found t-value 9.434 and beta value 0.666. Thus, GDP enhances the positive effect of HDI on supply chain performance. The current study is most significant for managers to enhance supply chain performance. This study can be helpful for managers while making the strategies for supply chain. Managers must consider economic indicators while making various plans related to supply chain, particularly in fishing industry. Managers must consider interest rate and inflation rate in supply chain of fishing industry. As these factors have crucial role in supply chain performance.

### Conclusion

While analysing the data, it was found that economic indicators have influence on supply chain performance. Increases or decreases in the performance have significant influence on supply chain performance, particularly in fishing companies of Indonesia. According to the findings, increases in inflation rate decrease the supply chain performance. However, decreases in inflation rate increases the supply chain performance. Moreover, it is found that increases in interest rate decreases the supply chain performance. In cases, increases of inflation and increases of interest rate decreases the supply chain performance. However, in cases of human development index (HDI), generally the supply chain performance increases. Increases in the per capita income and education among people increases the supply chain performance. Same results were found in cases of GDP, increases in HDI increases the GDP. Therefore, HDI is important for both GDP and supply chain performance. Finally, the GDP also has positive effect on supply chain performance. It is recommended to the Indonesian government to decrease the inflation rate, decrease the interest rate and increase the human development index (HDI). Fishing companies must consider interest rate and inflation rate while developing the supply chain activities. Inflation and interest must be at minimum level to enhance supply chain performance. However, this study covered the limited area of Indonesia; therefore, results can be different if the next study

considers the whole Indonesia. Moreover, this study is cross-sectional, and data were collected at one point of time, therefore, next study should be carried out on longitudinal data which can provide better results. Additionally, future research is required to analyse that how much each economic indicator contributes to the supply chain performance.

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### ZALEŻNOŚĆ POMIĘDZY WSKAŹNIKAMI EKONOMICZNYMI, PRODUKTEM KRAJOWYM BRUTTO (PKB) A WYDAJNOŚCIĄ ŁAŃCUCHA DOSTAW

**Streszczenie:** Dynamika łańcucha dostaw została szeroko zbadana przez środowiska akademickie, przemysłowców i ekonomistów. Brakuje jednak nadal literatury poświęconej wpływowi wskaźników ekonomicznych na wydajność łańcucha dostaw, szczególnie w sektorze rybołówstwa. Dlatego też celem artykułu jest zbadanie roli wskaźników ekonomicznych dla funkcjonowania łańcucha dostaw w Indonezji w sektorze rybołówstwa. Wskaźniki ekonomiczne, takie jak stopa procentowa, stopa inflacji i wskaźnik rozwoju społecznego (HDI), mają związek z wynikami w łańcuchu dostaw. Wzrost lub spadek odsetek i inflacji ma bezpośredni wpływ na podaż produktów rybnych, które ostatecznie

wpływają na wyniki całego łańcucha dostaw. Przemysł rybny jest jedną z gałęzi przemysłu, która działa od wielu stuleci, a obecnie szybko rośnie i jest uważana za ważny element wzrostu gospodarczego w różnych krajach, takich jak Indonezja. Dzięki wcześniejszym badaniom dotyczącym związku między stopą inflacji, stopą procentową, wskaźnikiem rozwoju społecznego (HDI), produktem krajowym brutto (PKB) a wynikami łańcucha dostaw, sformułowano sześć hipotez. PKB uznano za zmienną pośredniczącą. Jako respondentów tego badania wybrano menedżerów firm rybackich. Dane pierwotne zebrano za pomocą ankiety. Otrzymano całkowitą liczbę 196 odpowiedzi. Uzyskane odpowiedzi przeanalizowano za pomocą oprogramowania statystycznego, metodą cząstkowych najmniejszych kwadratów (PLS). Stwierdzono, że wskaźniki ekonomiczne mają wpływ na wyniki w łańcuchu dostaw. Wzrost inflacji i stopy procentowej zmniejsza wydajność łańcucha dostaw. Jednakże wzrost wskaźnika HDI zwiększa PKB i promuje wydajność łańcucha dostaw. Dodatkowo PKB jest pośrednią zmienną między wskaźnikiem HDI a łańcuchem dostaw, co pozytywnie wpływa na wydajność łańcucha dostaw poprzez wskaźnik HDI. W związku z tym badanie dostarcza wskazówek dla rządu w zakresie promowania wydajności łańcucha dostaw poprzez kontrolowanie inflacji i stóp procentowych.

**Słowa kluczowe:** łańcuch dostaw, inflacja, stopa procentowa, produkt krajowy brutto (PKB), wskaźnik rozwoju społecznego (HDI)

#### 经济指标, 国内生产总值 (GDP) 与供应链绩效的关系

**摘要:** 供应链动态已被学术界, 工业界和经济学家广泛研究和体验。但是, 仍然是文学。因此, 目的是研究渔业在渔业中的作用。经济指标 (HDI) 与供应链绩效有关。增加鱼产品供应。工业捕鱼业元素产业元素像许多像许多像很多像许多人一样的元素。印度尼西亚。采用了六个假设, 分析结果, 国内生产总值 (GDP) 和供应链绩效。

GDP 被视为中介变量。渔业公司的管理人员被选为本研究的受访者。通过问卷调查收集主要数据。收到的答复总数为 196 (196)。这些反应是分析性的; 偏最小二乘法 (PLS)。这是供应链的结果。通货膨胀率和利率上升。但是, 它增加了 GDP 并促进了供应链绩效。因此, GDP 是 HDI 和供应链之间的中介变量, 通过 HDI 积极提升供应链绩效。因此, 该研究为政府通过控制通货膨胀和利率来促进供应链绩效提供了线索。

**关键词:** 供应链, 通货膨胀, 利率, 国内生产总值 (GDP), 人类发展指数 (HDI)