PAPER NAME

Comparative analysis of ports to the economy of Indonesia A Cointegration approach.pdf

WORD COUNT

4872 Words

CHARACTER COUNT

26343 Characters

PAGE COUNT

10 Pages

FILE SIZE

505.8KB

SUBMISSION DATE

Sep 23, 2023 10:22 AM GMT+7

REPORT DATE

Sep 23, 2023 10:23 AM GMT+7

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Rizal et al., Journal of Islamic Economics Lariba (2021). vol. 7. iss. 2, pp. 145-154
DOI : 10.20885/jielariba.vol7.iss2.art6

UNIVERSITAS ISLAM INDONESIA

Comparative Analysis of ports to the Economy of Indonesia: Cointegration Approach

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Recieved: 2021-10-12
Accepted: 2021-12-02

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Abstract

The study intended to explore the effectiveness between import of bovine and export of fish to economy of Indonesia. Three variables are utilized which are Import of Bovine, Export of fish and GDP constant 2010. To analyses the existences of short run and long run between variable, Vector Error Correction Model are conducted in this study. The result shows that only bovine import has impact to GDP in short run. On the other hand, bovine import and fish export together contribute to long run economic growth in Indonesia. This research suggest that resources allocation for import of bovine should be maintained as capital for livestock sector in Indonesia rather than being imported as meat for consumption per se, which means incentive for capitalization of imported living bovine should be kept by government. Meanwhile, fishery industry must be supported with long term program such that its impact to economic growth can be optimized.

Keywords: Bovine Import, Fish Export, Economic Growth, Vector Error Correction Model (VECM)

INTRODUCTION

Indonesia is the largest archipelago country with the second longest coastline in the world which is 99.000 KM. As archipelago country, Indonesia have large of natural's resources that must be managed sustainably to promote public welfare as mandated in the 1945 Constitution of the Republic of Indonesia. The total area of Indonesia is 7.81 KM^2 consisting of 2, 01 million KM^2 of land, 3, 25 million KM^2 of ocean and 2, 55 million KM^2 of Exclusive Economic Zone (ZEE). In other worlds, Indonesia's sea area is wider than land area. Furthermore, Indonesia's inhabitant is the fourth most crowded population after China, India and United State with 237.641.326 population(Stats, 2019).

One of the government obligations is to guarantee the right of food for citizen. Food availability means the adequate quantities and quality assurance and affordable price for the community (Arifin, 2004). Inadequate domestic production encourages import policies on products. On the other hand, excess domestic production encourages the government to export. As an agrarian country, Indonesia produces various kinds of strategic food products, even for certain products experiencing a surplus. Therefore the government z-must ensure adequate food availability for all people before exporting or importing some products. If balanced with governance and support from the government, Indonesia is believed to be able to sufficient all domestic food needs.

Economy growth of a country is associated with the increase of income and grow in consumptions, savings, and investment, which ultimately results in market productivity and Gross Domestic Product (Akter & Bulbul, 2017). Since 2014, Indonesia highest economy growth was occur in 2017 which is 5.07% higher than previous achievement 5.03% in 2016 (BPS Indonesia, 2011). Based on Executive summary of consumption and expenditure of population of Indonesia 2017, monthly average per capita expenditure was 1.095.676 Rupiah which are 50,62% for food expenditure. Ministry of Agriculture data shows that in 2012 the volume of beef imports reached 39.4 thousand tons with a value of US$ 164, 89 million. In 2014, Indonesia import 246, 5 thousand tons beef with the value of US$ 681, 23 million. A year later beef import decreased to 197, 6 thousand tons with value of US$ 545, 57 million (Tradedata International, 2015).

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DOI : 10.20885/jielariba.vol7.iss2.art6

Studies on the relationship between exports, imports and economic development have been widely carried out. Among the studies have shown that an expansion of trade has a significant positive impact on economic growth are found that export and import contribute to economic growth of Bangladesh, Indonesia, Egypt in sort run and Nigeria, Malaysia in long run (Akter & Bulbul, 2017; Bakari, 2017; Bakari & Mabrouki, 2017; Elbeydi, Hamuda, & Gazda, 2010; Esfahani, 1991). In contrast, studies by found that export and import had significant negative effect on economic growth (Bakari & Krit, 2017; Kartikasari, 2017).

This research aimed to explore the effectiveness between export of fish and import of bovine to economy of Indonesia. In previous research, most of variable used were all data import and export of countries. The author uses bovine import as a variable because in this sector Indonesia has been depending on import to meet the demand and community nutrition needs. On the other hand, Indonesia export fish to several countries where domestic fish consumption not evenly distributed and less desirable (DeeWaluyo, 2019) compared with Malaysia and Singapura (Nurjanah, Hidayat, & Perdana, 2015). Even though, fisheries sector plays an important role in domestic economy especially in the provision of employment (labor intensive), income source for fishermen, animal protein and country devisa. Meanwhile, ministry of marine declared that the biggest problem of fishery sector is decline the number of fishermen's which are 1,6 million to 800 thousands.

Furthermore, Indonesian fishermen have been classified as poor group (Muflikhati, Hartoyo, Sumarwan, Fahrudin, & Puspitawati, 2010; Qodriyatun, 2013) with monthly income per capita around 7-10 US dollars.(Rakhmanda, 2014) Moreover, fisheries sector contribution to gross domestic product in 2017 only 2.14% (California Environmental Associates, 2018). The author believe that both bovine and fish have important contribution in economic growth, and as a maritime country Indonesia should optimize its marine potential to meet food needs and economic source of country. Hopefully, this research can give recommendation for government to provide more attention in maritime sector, especially fishery industry.

LITERATURE REVIEW

Some study confirmed that exports lead to economic growth, while others found that export affected by economic growth. Natural resources were been very important sector for some countries. Some studies found that the effect of agricultural exports have a positive strong correlation on economic growth (Bakari & Mabrouki, 2017; Verter & Bečvářová, 2016). On the other hand, a research found that in Indonesia agricultural sector found that export, import and GDP growth do not give significant effect to the agricultural GDP growth. On the other hand agricultural GDP growth does significantly affect the level of agricultural export, import and investment (Suharjon, Marwanti, & Irianto, 2017). Meanwhile, there are researches that estimated the relationship between GDP, agricultural and non-agricultural export. The finding showed that agricultural export has negative and significant on economic growth in Pakistan (Faridi, 2012). In fishery sector, some researches found positive relationship between fishery export and economic growth in Indonesia (Hilwa, 2016; Sjarif, Kotani, & Lin, 2011).

Rudatin in his study analyze the effect of imported beef price, per capita income (GDP) and domestic beef price toward the volume of Indonesia's beef import. The research shows that in short term, all variable have significant effect except per capita income but in long term all variables have significant effect. Furthermore, it is found that in Cameroon banana export has a positive and significant relationship on economic growth, otherwise cocoa export was found to have negative significant effect (Rudiatin, 2016).

A research investigated relationship between export-import the European Union countries during the period of 1995-2005. The research show that even among those countries have different results, causal link between export and economic growth has great implication on development strategies for the euro countries. Furthermore, it is found that Egypt's GDP, importer's population, regional trade agreements and the border between Egypt and its trading partner are the main factors affecting trading exports to its main trading partners (Dudzevičiūtė, Šimelytė, & Antanavičienė, 2017).

Previous studies showed that export and import have different impact in economic growth. For those purpose, the different method have been conducted. The summary of empirical studies in

export and import sectors can be showed in table below:

Table 1 Summary of the Existing Empirical Studies Concerns the Relationships between Export, Imports and Economic Growth

No	Authors	Countries	Periods	Econometrics Technique
1	Nurcahyo Sjarif at all	Indonesia	1969-2005	Cointegration and Error-Correction Model
2	Dwi Kartikasari (2017)	Indonesia (Riau Island)	2009-2016	Panel data regression
3	Bader S.S Hamdan (2017)	Arabic countries	1995-2013	Panel data regression Cointegration Analysis
4	Akter and Bulbul (2017)	8 Countries	2001-2005	VECM Granger causality test
5	Bakari and Krit (2017)	Mauritania	1970-2015	Cointegration analysis VECM Granger causality test
6	Suharjon at all (2017)	Indonesia	2000-2015	VAR Cointegration analysis
7	Hussaini et al (2015)	India	1980-2013	VECM Granger causality test
8	Bakari and Mabrouki (2018)	South-Eastern Europe	2006-2016	Static Gravity Model
9	Verter, Becvarova (2016)	Nigeria	1980-2012	OLS Regresion
10	Armand Gilbert, Samah Gustav and Gwah Munchunga (2013)	Cameroon	1975-2009	VECM
11	Gitana Dudzeviciute at all (2017)	European Union Countries	1995-2015	Granger Causality
12	Ari Rudatin	Indonesia	1983-2014	Error-Correction Model
13	Bakaari and Mabrouki (2017)	Panama	1980-2015	Vector Auto Regression Model and Grangger-causality test

RESEARCH METHODS

This research utilized time series data for Indonesia fishery export, bovine import and GDP constant. The study covered annual data of all variable form 1962 to 2016. We exploit fishery export and bovine import data from Observatory of Economic Complexity and World Bank for GDP. The data set entails of observation with US$ currency. All data analysis in this study in conducted with E-views 9 software.

In this study, three variables are utilized in analysis. They are: (i) Real Gross Domestic Product (GDP), which is number of goods and services produced in Indonesia, as proxy of market size. Measured in constant 2010 US Dollar; (ii) Export of Fish (EXPFISH) in this study we use fish fillet, fish-preserved, fresh fish, frozen fish fillet, frozen fish, inedible flour of meat and fish, meat and fish extract and miscellaneous fish, which is number of exported fish from Indonesia. As measured in US Dollar; (iii) Import of Bovine (IMPBOV), which is number of bovine and bovine meat products to Indonesia. As measured in US Dollar. Data for variables are taken from World Bank for GDP data, while other two variables data are taken from Observatory of Economics Complexity of Massachussets Institute of Technology (OEC MIT). All variables are converted to natural log form (LN).

Vector Error Correction Model (VECM) is established to analyse the existence of short run and long run relationship between variables, which in this study are sectoral real GDP, Import of bovine and Export of Fish. We follow steps conducted by Furqani and Mulyany in utilizing VECM approach for

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DOI : 10.20885/jielariba.vol7.iss2.art6

data analysis in related topic (Furqani & Mulyany, 2009). In general, VECM formulae utilized in this study can be written as following:

$$\Delta Ln\_GDP_{tj} = \alpha_0 + \sum_{i=1}^{k} \alpha_1 . \Delta Ln\_GDP_{t-1,j} + \sum_{i=1}^{k} \alpha_2 . \Delta Ln\_EXPFISH_{t-1,j} + \sum_{i=1}^{k} \alpha_3 . \Delta Ln\_IMPBOV_{t-1,j} + \alpha_4 . \gamma_{t-1,j} + \varepsilon_t \dots (1)$$

$$\Delta Ln\_\text{EXPFISH}_{tj} = \beta_0 + \sum_{i=1}^{k} \beta_1 . \Delta Ln\_EXPFISH_{t-1,j} + \sum_{i=1}^{k} \beta_2 . \Delta Ln\_GDP_{t-1,j} + \sum_{i=1}^{k} \beta_3 . \Delta Ln\_IMPBOV_{t-1,j} + \beta_4 . \gamma_{t-1,j} + \varepsilon_t \dots (2)$$

$$\Delta Ln\_\text{IMPBOV}_{tj} = \theta_0 + \sum_{i=1}^{k} \theta_1 . \Delta Ln\_IMPBOV_{t-1,j} + \sum_{i=1}^{k} \theta_2 . \Delta Ln\_GDP_{t-1,j} + \sum_{i=1}^{k} \theta_3 . \Delta Ln\_EXPFISH_{t-1,j} + \theta_4 . \gamma_{t-1,j} + \varepsilon_t \dots (3)$$

The meanings of above notations are shown below:

ΔLn_GDP:	Real GDP in first difference
ΔLn_EXPFISH:	Export of Fish in first difference
ΔLn_IMPBOV:	Import of Bovine n first difference
Γ	Error Correction Term, depicts long run relationship between variables
E	Error term
α_0, β_0, and θ_0:	Intercept
α_1, β_1 and θ_1:	Coefficient for short run effect within variable
α_2, β_2, θ_2 α_3, β_3, and θ_3	Coefficient for short run effect between variables
α_4 β_4 and θ_4:	Coefficient for Error Correction Term
Subscript k:	Maximum lag (i) of each model
Subscript j:	Economic sector

Some tests should be conducted to produce good analysis with VECM method. The tests are as following. *First*, stationarity test by using Phillips-Perron (PP) test. VECM can be conducted if the model is stationary at first difference. The hypotheses tested in this test are shown below:

H_0: The variable is not stationary
H_a: The variable is stationary

The decision criteria for stationary test are as following:

If p_{value} .05 → H_0 can be rejected at 95% confidence level
If p_{value} .05 → H_0 cannot be rejected at 95% confidence level

Stationarity test in a variable is initially conducted at level. If the variable is found to be not stationary at level, then another test is taken place at first difference. In VECM, all variables should be stationary at first difference to let them be analysed with VECM.

Second, finding appropriate lag by using AIC and SIC criterion on Vector Auto Regression (VAR) model involving all variables. Optimum lag of VECM will be one less than lag of VAR model. *Third,* Julius-Johansen test for cointegration is conducted to make sure the existence of cointegration between variables with following hypotheses to be tested:

H_0: No cointegration between variables
H_a: There is at least one cointegration between variables

The criteria for decision making in this hypothesis testing are shown below:

If p_{value} <.05 → H_0 can be rejected at 95% confidence level
If p_{value} >.05 → H_0 cannot be rejected at 95% confidence level

In Julius-Johansen test, Pantula principle is guidance in conducting the test. It is a principle to guide in determining restriction imposed in VECM. There are some types of restriction on Julius-Johansen cointegration test: a) The level data have no deterministic trends and the co-integrating equations do not have intercepts (Most restriction); b) The level data have no deterministic trends and the co-integrating equations have intercepts; c) The level data have linear trends but the co-integrating equations have only intercepts; d) The level data and the co-integrating equations have linear trends; e) The level data have quadratic trends and the co-integrating equations have linear trends (Least restriction). Pantula principle stated that in conducting cointegration, starts with most restriction to least restriction assumption until the null hypothesis of no cointegration is rejected (Asteriou & Hall, 2007). However, *a* and *e* assumptions above are regarded as unrealistic, so it usually conducted from b assumption up to d assumption.

Fourth, Test of significance in VECM output. To test for short run relationship between variables, the hypotheses in this test are shown below:

H_0: $\alpha_2=\beta_2=0$ → No short run relationship between variables
H_a: α_2 and/or $\beta_2 \neq 0$ → Short run relationship exists between variables

Meanwhile, the hypotheses long run relationships in this test are shown below:

H_0: $\alpha_3=\beta_3=0$ → No long run relationship between variables
H_a: α_3 and/or $\beta_3 \neq 0$ → Long run relationship exists between variables

The test statistics for these tests is t-statistics with following criteria:

If t_{stat} >1.96→H_0 can be rejected at 95% confidence level
If t_{stat} <1.96→H_0 cannot be rejected at 95% confidence level

Fifth, Last test conducted weak exogenity test to see whether a variable is weakly exogenous or endogenous. It is related to which variable is involving in long run adjustment process. The hypotheses tested in test are:

H_0:The variable is weakly exogenous
H_a:The variable is endogenous

The test statistics for these tests is chi-square statistics with following criteria:

If p_{value} <.05→H_0 can be rejected at 95% confidence level
If p_{value} >.05→H_0 cannot be rejected at 95% confidence level

All diagnostic tests (not only number 4) as well as significance tests within this study using 95% level of confidence ($\alpha = 0.05$).

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RESULTS AND DISCUSSION

Before conduction co-integration test, diagnostic test of stationarity should be conducted first. Result on ADF stationarity test for all variables is shown below:

Table 2 Summary of ADF Stationarity Test

Variable	ADF Test				Status
	Level		First Difference		
	t-statistics	p-value	t-statistics	p-value	
LN_GDP	-1.764208	0.7079	-5.542969	0.0002	Stationary at first difference
LN_EXPFISH	-1.843466	0.6696	-6.689998	0.0000	Stationary at first difference
LN_IMPBOV	-3.305903	0.0762	-8.455328	0.0000	Stationary at first difference

Table 2 above shows that all variables are stationary at first difference. It means all variables are eligible for further analysis with VECM. After that, lag length criteria is found by looking at AIC and SC criterion as shown below:

Meanwhile, the adequacy of factors needs to be measured, to matching and selecting the suitability of the factors in order to further data analysis. The measures of sampling adequacy described on the table below.

Table 3 VAR Optimum Lag

Lag	AIC	SC
1	-1.351205	-1.007041*
2	-1.493188*	-0.804860
3	-1.246692	-0.214199
4	-1.054502	0.322154
5	-1.055947	0.664873

Table 3 told us that AIC and SC criterion have optimum lag of 2 and 1 respectively. To determine which lag is used, we conduct VAR model involving and check for existence of serial correlation. The result is autocorrelation LM test on VAR models is shown below:

Table 4 Autocorrelation LM Test

Lags	VAR (1)/SC		VAR (2)/AIC	
	LM-Stat	Prob	LM-Stat	Prob
1	18.07131	0.0344*	6.022643	0.7376
2	7.629972	0.5718	4.441417	0.8800
3	5.610906	0.7781	3.606842	0.9353
4	4.934298	0.8400	6.889055	0.6487
5	7.021257	0.6349	6.729335	0.6653
6	3.905548	0.9175	3.456700	0.9434
7	5.812669	0.7585	10.51379	0.3105
8	7.513077	0.5839	5.941636	0.7457

Above table suggests that the optimum lag length of VAR model involving all variables with no serial correlation problem is lag of 2. Thus, for VECM, the lag length will be 1, minus 1 from the VAR model's lag length.

Next step is Julius-Johansen Cointegration test with Pantula Principle applied. The result of Julius-Johansen Cointegration test is shown below:

Table 5 Julius-Johansen Cointegration Test

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.391410	42.83661	35.19275	0.0062
At most 1	0.202903	16.51625	20.26184	0.1516
At most 2	0.081348	4.496947	9.164546	0.3431

Trace test indicates 1 co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Above table shows us that deterministic condition number 2 (the level data have no deterministic trends and the co-integrating equations have intercepts), there is one co-integration equation between variables. In other words, conducting VECM to reveal relationship between variables is possible in this study. The result of VECM analysis is shown on table below:

Table 6 Result of VECM Analysis

Error Correction:	D(LN_GDP)	D(LN_EXPFISH)	D(LN_IMPBOV)
CointEq1	0.044638	0.076942	0.252303
	(0.00802)	(0.12635)	(0.20382)
	[5.56679]*	[0.60895]	[1.23785]
D(LN_GDP(-1))	0.147214	1.597740	-0.312053
	(0.12357)	(1.94716)	(3.14103)
	[1.19133]	[0.82055]	[-0.09935]
D(LN_EXPFISH(-1))	0.019595	-0.031952	0.156962
	(0.01021)	(0.16095)	(0.25964)
	[1.91836]	[-0.19852]	[0.60455]
D(LN_IMPBOV(-1))	0.023216	-0.061846	-0.125201
	(0.00608)	(0.09587)	(0.15465)
	[3.81592]*	[-0.64512]	[-0.80959]
R-squared	0.284293	0.028298	0.067290
Adj. R-squared	0.240474	-0.031194	0.010185
Sum sq. Resids	0.041504	10.30520	26.81629
S.E. equation	0.029104	0.458596	0.739778
F-statistic	6.487910	0.475660	1.178364
Log likelihood	114.3311	-31.80620	-57.14976
Akaike AIC	-4.163440	1.351177	2.307538
Schwarz SC	-4.014738	1.499879	2.456239
Mean dependent	0.052632	0.129603	0.170512
S.D. dependent	0.033395	0.451606	0.743574

*significant at α=0.05
( ): standard deviation
[ ]: t-statistic value

Above table indicates that relationship between variables only prevail towards GDP in the long run as indicated by significant t-statistic value of CointEq1 as well as in the short run by IMPBOVINE variable as shown by its significant t-statistic value at one lag period. Moreover, both have positive sign which indicated there are positive and significant relationship of the long-run and short-run. Other directions of relationships are found to have no significant coefficients among variables, neither to EXPFISH nor to IMPBOVINE.

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DOI : 10.20885/jielariba.vol7.iss2.art6

The last test in this research is exogenity test to see whether a variable is weakly exogenous or endogenous, the result is shown in table below:

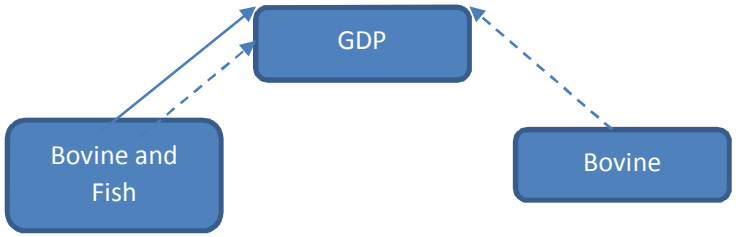
Table 7 Exogenity Test

Variable	Chi-Square	P-value	Status
LN_GDP	14.24061	0.000161	Endogenous
LN_EXPFISH	0.334791	0.562851	Weakly exogenous
LN_IMPBOV	0.994996	0.318532	Weakly exogenous

Above table shows only LN_GDP is the variable that is not weakly exogenous. It means deviation from long run pattern due to shocks to any of above variables will be adjusted by GDP in order to return to long run pattern.

With respect to result of analysis above, there is an indication that import of bovine can generate economic growth in Indonesia, both in short-run or about one year. Furthermore, import of bovine and export of fish together contributed to long-run economic growth in Indonesia.

Figure 1.1 Correlations between Import of Bovine, Export of Beef and GDP



This means import of bovine has important role in maintaining Indonesia's economic growth. Although import seems to reduce GDP as indicated by GDP measurement from expenditure side, but one plausible explanation for this condition is import of bovine is not necessarily in form of meat which is just consumed but also living bovine as well that can be used as capital for livestock sector. This means usage of bovine as capital may be a generator for economic growth in both short-run and long-run. This is because the Indonesian demand level of beef in Indonesian society tend to increase along with the population growth and community awareness of the importance of animal nutrition (Burhani, Fariyanti, & Jahroh, 2013). Therefore, the Indonesian government must formulate a strategy in order to reduce dependency of bovine import to satisfy community demand. It's very possible if there are cooperation between investors, entrepreneurs, breeders and support from the government. Another obstacle is limited distribution channel whereas many regions have the potential to produce bovine.

One of the strategies that can be hold are establishing bovine breeders in every potential region, such as Aceh, South Kalimantan, Sumbawa and others. In addition to reduce the dependence on bovine import, the presences of bovine breeders are expected to open new employments. Furthermore, the government must give attention by open-handed for training and assistance so that farmer breeders are able to compete both in term of production and human resource.

On the other side, impacts of export of fish towards economic growth in Indonesia are found to be significant in Indonesia only in the long run. This means export of fish is important to maintain economic growth but its impact cannot be seen immediately. If we compared between the income of fisheries sector and potential of Indonesia than the fisheries sector should be able to contribute in GDP more than 3%. Furthermore, fishery sector also not able to improve fisherman's welfare and coastal communities. According to data BAPENAS data 2010, Suhana illustrate that babies in the national fish barn are dealing with lack nutrition (Suhana, 2015). Even though catches fishes in those region are excellent source of nutrition for human growth, especially for children.

Therefore, the Indonesian government has to make programs to optimize opportunities in marine resource and optimize the economy of coastal communities, especially in fishery industry. Economy

of coastal communities means coastal resource management activities by communities living in the area (Witarsa, 2015). Among the program that can be hold by government are: 1) Build and develop fishery industry which oriented towards sustainability and hospitable environment 2) Product differentiation 3) Build fisheries distribution lines 4) Promote fish as a main consumption product for Indonesian 5) Making cooperative as a fisherman's economic driver.

CONCLUSION

Results from this study indicates importance of bovine import and fish export for economic growth in Indonesia in the long run, while import of bovine alone also contributed to the growth even in the short run. A policy implication from this study is resources allocation for import of bovine should be maintained as capital for livestock sector in Indonesia rather than being imported as meat for consumption per se, which means incentive for capitalization of imported living bovine should be kept by government. Meanwhile, fishery industry must be supported with long term program such that its impact to economic growth can be optimized, such as conservation of the sea, financing access to the fishermen and promotion of Indonesia fish products in international market.

Future research may add other macroeconomic variables to include, such as inflation and custom and others to give more comprehensive understanding the role of trade for Indonesian macro economy.

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