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An Assessment of Indonesia's Monetary Integration with Oil Exporter Countries in Islamic Nations: Evidence from Panel Data

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ABSTRACT

The paper aims to assess the monetary integration between Indonesia and oil exporting countries in Islamic countries. Increasing the oil trade intensity between Indonesia and oil-producing countries can drive monetary integration among them. This study applies the Optimum Currency Area (OCA) index to measure the degree of monetary integration between Indonesia and 21 oil-producing countries in the Organization of Islamic Cooperation. The results exhibit that the majority of oil-producing countries are strongly integrated with Indonesia. The panel regression test highlights two variables – the inflation similarity and trade openness – which had a significant effect on the OCA. This study provides an important policy base for Indonesia, primarily in improving its relations with oil-producing countries. Two channels – trade openness and maintaining harmonious price stability – are the entry point for Indonesia to integrate with oil countries.

Keywords: Monetary Integration, Optimum Currency Area, Islamic Nations, Indonesia, Oil Countries

JEL Classifications: E42, F36, F33

1. INTRODUCTION

Indonesia makes at least three significant contributions to the economy of the Organization of Islamic Cooperation (OIC). First, Indonesia has the largest Gross Domestic Product (GDP) in the OIC, having reached almost 1 Trillion US \$ by 2017 (Bank Indonesia, 2018). Theoretically, the country has a large economy that is capable of maintaining the stability of its currency. A large GDP indicates greater foreign exchange reserves, and allows the country to intervene in the money market when its currency suffers instability. Second, the share of Indonesia's foreign trade in the OIC intra-trade reached 10%, and was listed among the top five countries in the OIC (SESRI, 2018). Indonesia is a main partner of oil trading to the OIC members, such as Saudi Arabia, Kuwait, Malaysia, Nigeria, Algeria, Azerbaijan, and Oman. Theoretically, the trade openness experienced by Indonesia can strengthen the symmetry of its currency with its trading partners. Increasing

trade between two countries leads to the growing demand for both currencies (McKinnon, 1963; Silva and Tenreiro 2010). Third, the population of Indonesia is the largest in the OIC, having reached 250 million. The large Islamic population is a potential market for halal foods and Islamic tourism. Indonesia is the largest contributor in terms of *hajj* and *umrah* in the world, reaching more than 250 thousand people per year.

Although Indonesia has had an important role in world crude oil exports since 1970, in the last two decades it has begun to decline. During the 1970-1990 period the oil and gas sector contributed 62.88% to Indonesia's state revenue. In 2008, Indonesia decided to leave OPEC. The Special Task Force for Upstream Oil and Gas Business Activities states that Indonesia's oil production was only 831,000 barrels per day in 2016 (SKK Migas, 2017). This is far below the national needs, as Indonesia requires 1.6 million barrels per day (Figure 1). To meet the domestic oil needs, Indonesia

continues to import oil from several countries. The countries of origin from where Indonesia imports oil are Saudi Arabia, Malaysia, South Korea, Nigeria, Kuwait, and Azerbaijan. Since 2004, Indonesia has the status of a net oil importer. Indonesia returned to OPEC in 2016, registering as the fifth largest country in the world in terms of liquid natural gas (LNG) production and exports. Indonesia's LNG exports are to Asian countries, such as Japan, China, the Philippines, South Korea, and China.

Since the monetary crisis 1997-1998, the vulnerability of the Rupiah against the US \$ has continued to depreciate sharply (Figure 1). At the end of 1998, the Indonesian Rupiah (IDR) was recorded at IDR 8000 per US \$, and now (2018) the Rupiah has reached its lowest point, IDR 14,777 per US \$. IDR has become one of the worst performing currencies in the region. An important source of vulnerability for Indonesia is related to the potential for hot money outflows due to high foreign ownership in the local stock and bond markets. Foreign ownership of IDR-denominated government bonds is around 40%, and they also hold 61% of the total general government debt (Bank Indonesia, 2018). Turkey also experienced a financial and economic crisis in 2018. The Turkish Lira (TRY) has lost more than 40% of its value against the dollar. TRY dropped from 1904 in 2013 to 3648 in 2017 (SESRIC, 2018). In contrast, the exchange rate of oil-producing countries, such as Saudi Arabia, Qatar, Kuwait, Syria, Bahrain, and others has been very stable against the US \$ over the past 20 years. Those contractive facts give an indication that monetary integration between Indonesia and oil-producing countries might not be symmetrical.

The results of empirical studies of monetary integration in the Islamic nations, and, specifically, in oil-producing countries, highlighted the mixed results. Ruzita et al. (2011) identified weak integration in OIC countries because of their limited diversification of export products, predominantly oil and gas products. Only 11 commodities from 50 commodities in intra-OIC trade are complementary (Ruzita et al., 2011). Some other studies proved that the prospects of monetary integration among oil producing countries, such as the Gulf Cooperation Council (GCC), and the Middle East and North Africa (MENA) are feasible (Agustiar, 2019; Kandil and Trabelsi, 2010; Lee, 2011). Bacha (2006) predicted that it is more feasible for oil-producing countries in the GCC to form currency unions. However, Laabas and Limas (2002) assessed that GCC countries were not ready to form currency unions. By observing 24 Islamic countries, Lee (2011) found that Indonesia was less integrated than the majority of OIC countries. Although the recorded rapid economic and infrastructure developments in the Gulf countries are remarkable, they are inadequate to form a currency union (Raison, 2011). The prospect of monetary integration in Islamic countries is gradually strengthening in line with the passage of time.

The purpose of this paper is to assess the monetary integration between Indonesia and oil exporting countries in Islamic countries. The study involved 21 oil exporting countries in the OIC region where Indonesia was one of the participant countries in the region. This study attempts to explain whether increasing trade openness, particularly oil trade within the OIC countries, drives towards closer monetary integration. Theoretically, increasing

trade openness has a robust impact on monetary integration and business cycle synchronization. This study is organized as follows: Section 2 presents the literature and empirical review. Section 3 provides the methodology for the estimation. Section 4 discusses the findings of this study, and the last section provides the conclusion and recommendations.

2. THEORETICAL AND EMPIRICAL REVIEWS

The theory of monetary integration was initially proposed by Mundell (1961) through his theory of the optimum currency area (OCA). By definition, the OCA is a geographical region of a group of member states that commits to use one new currency replacing their own national currencies (De Grauwe, 2014). Within the unions, they apply a single currency pegged to be irrevocable but fluctuate against external currencies. OCA is a currency regime that switches the paradigm from: one country-one currency to one market-one currency, better known as currency regionalism (Rose, 2000; Alesina and Barro, 2001). This shifting paradigm reduces the number of world currencies as a preliminary process towards a single world currency.

By joining in the OCA, member countries are expected to increase their economic efficiency and maintain their currency instabilities from the pressure of external shocks. OCA may eliminate exchange rate risks, which have always been a scourge of monetary policy. A single currency benefits for encouraging more efficient trade, pushing free factor mobility among member countries, and having a shared system in resisting the risks (Mongelli, 2008). On the other hand, the OCA also has some costs, such as the loss of national monetary sovereignty, which is now being taken over by the Union Central Bank. The local economic policies that remain in member countries are fiscal policies. Member states are still autonomous in regulating their own state budgets. They must contribute to a joint funding in the union's financial scheme. Until now, the European Union itself has still not reached the stage of fiscal union.

The initial (ex-ante) criteria for forming OCA have been proposed by the proponents. Mundell (1961) proposed free factor (workers) mobility, and the volatility of currencies among prospective countries must be symmetrical. McKinnon (1963) offered trade openness and trade intensity as key criteria. Furthermore, Kenen (1969) claimed that candidate members should not be dependent on the similar structure of trade (like depending on oil) because it may limit intra-trade among them. Recent researchers have widened the OCA criteria by including a number of variables, such as the similarity of inflation, the size of the economy, synchronization of the business cycle, integration of financial markets and fiscal integration (Ishiyama, 1975; Blanchard and Quah, 1989; Silva and Tenreyro, 2010).

The modern OCA theory was introduced by Frankel and Rose (1997) who proposed that the candidate countries that failed to meet the "ex-ante" criteria may fulfil it after (ex-post) they joined the union. They believe that there are no problems with the initial criteria, because symmetry can occur after they join. Gouveia and

Correia (2013) prove that the enlargement of the Eurozone by involving new countries with inadequate economic conditions, are now enjoying better economic growth. Krugman (1993) estimates that economic openness, on the one hand, can stimulate a positive effect on economic equality among countries, while, on the other hand, inequality appears in the time of globalization, due to the emergence of polarization effects pushing extraordinary growth in main growth poles. The conclusion is that synchronization and symmetry or vice versa are temporary and non-linear in nature.

A number of previous studies of the monetary union reported mixed results. Using multi-sector and multi-country general equilibrium models, they ensured positive benefits from trade liberalization to Malaysia and Indonesia, but threatened prosperity losses for Bangladesh (Acar et al., 2009). They estimate that closer integration of the whole OIC region can be achieved in the long term, and it must begin with a small-scale integration. Othman et al. (2013) examined the welfare effect of trade liberalization among D-8 countries using a multi-country general equilibrium model. They prove that a few countries experienced an increase in welfare under free trade arrangements. Liu (2012) tests whether East Asia has been a dynamic trend towards OCA. The result highlighted that monetary integration in East Asia runs gradually from small groups, and, afterwards, extends to a larger scale. Raison (2011) examined the possibility of the GCC forming a single currency (Gulf Dinar) using a coefficient t-test, and employing inflation, real GDP, government debt, and fiscal as explanatory variables. The result shows that the massive economic progress in the GCC has not been strong enough to maintain monetary integration. Bacha (2006) tested the feasibility of OCA for 10 MENA countries, using the VAR (vector auto-regression) for 34 countries from 1970-2003. This study found that monetary integration in MENA was too weak, due to low product diversification between countries. Most of the MENA region heavily depend on oil products, which, in fact, are traded very little among them.

3. METHODOLOGY

When Mundell (1961) published the OCA theory, the mathematical model for measuring OCA was not ready to be practiced. The effort to produce an empirical model for calculating OCA was in a vacuum for nearly 35 years. Bayoumi and Eichengreen (1997) initially introduced a formula for calculating OCA, expressed by an index. They used the data of standard deviation (SD) changes in the nominal exchange rates of two pairs of countries pegged to one of the world's strong currencies. This study used the OCA-index derived from Bayoumi and Eichengreen (1997), as follows:

$$OCA_index = SD(\Delta \log e_{ij}) \quad (1)$$

Where, the OCA-index calculates the SD of change (Δ) in the nominal exchange rate (e) between country i and country j . The small OCA index displays a strong degree of monetary integration, and vice versa. Referring to Bayoumi and Eichengreen (1997), the OCA-indices are classified into three categories. The OCA-index varies from 0.0000 to 0.0250, which is nominated as prime converged countries, 0.0251 to 0.0770 are the converging countries, and 0.0770 and above are the little converged countries.

This study uses a panel regression model to estimate the effects of OCA criteria on the monetary integration. The use of panel regression is related to the type of data used. If the main data of 21 cross sections (countries) are examined using the ordinary least squares regression model, the observation is too small. If we test the data using time series data for each individual country, the problem arises that the calculation of the SD of the OCA-index only produces one SD value for the whole time. Both types of data, cross-section and time series, may exhibit a limited number of observations. For this reason, this study uses panel data by dividing the data into three periods that vary every 10 years. This panel data would produce 63 observations, derived from 21 cross-sections and three periods included for each country.

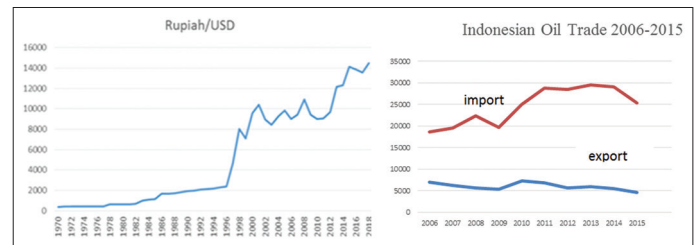
The selected explanatory variables – business cycle synchronization, inflation similarity, intra-trade openness and size of the economy – are used to determine the OCA. The formula for each explanatory variable is written as follows:

Business cycle synchronization:

$$\delta\gamma_{(ij)t} = \sigma \left(\frac{y_{it}}{y_{jt}} - \frac{y_{i,t-1}}{y_{j,t-1}} \right) \quad (2)$$

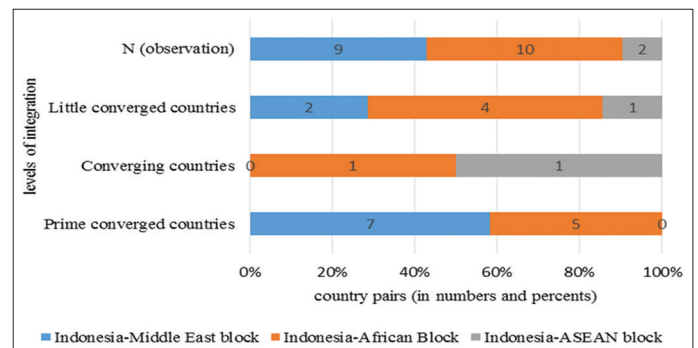
Where, $\delta\gamma_{(ij)t}$ is the difference of change in real GDP in country i and country j . We subtract the GDP change in i and j to find how close the difference is between them. A close difference in the GDP between two countries indicates a more synchronized business cycle in both countries.

Figure 1: Indonesia exchange rate and oil trade (1000 of tons)



Source: BPS (Indonesia Central of Statistics), 2017

Figure 2: Integration of Indonesia with Organization of Islamic Cooperation regional blocs (calculated by Optimum Currency Area - Indexes)



Source: Author calculation

Inflation similarity:

$$inf_{(ij)t} = \frac{(cpi_{i(t+1)} - cpi_{it})}{cpi_{it}} - \frac{(cpi_{j(t+1)} - cpi_{jt})}{cpi_{jt}} \quad (3)$$

Where, $inf_{(ij)t}$ is the inflation similarity between country i and j , which is calculated by the mean of the consumer price index (cpi). A similar inflation pattern between the two countries indicates a more stable price between two countries.

Intra-trade openness:

$$xm_{(ij)t} = (x + m)_i + (x + m)_j \quad (4)$$

Where, $xm_{(ij)t}$ intra-trade openness between country i and j , which is calculated by summing the mean of intra-trade (export + import) of the two countries. A greater intra-trade between two countries indicates a greater chance to integrate monetarily.

Size of the economy:

$$siz_{(ij)t} = \frac{\ln(yi + yj)}{2} \quad (5)$$

Where, $siz_{(ij)t}$ is the sum of the economic size (measure by GDP at current prices) of country i and country j . Countries of large economic size may have a better ability to maintain the symmetry of exchange rate than a smaller one.

From the serial formulas of the explanatory variable, this study develops the panel regression model as follows:

$$OCA_{(ij)t} = \beta_0 + \beta_1 \delta_{(ij)t} + \beta_2 inf_{(ij)t} + \beta_3 xm_{(ij)t} + \beta_4 siz_{(ij)t} + e_{(ij)t} \quad (6)$$

This study uses the panel regression model, which includes a cross-section of 21 pairs of countries and three dynamic periods: 1986-1995, 1996-2005, and 2006-2015. The combination of the 21 cross-sections and three periods produced 63 (balanced) observations. All the data were obtained from the SESRIC regular publication (<http://www.sesrtic.org/>).

4. RESULTS AND DISCUSSION

4.1. OCA-index

This study has successfully calculated the SD of the changes in the nominal exchange rates for each country with the following results (Table 1 and Figure 2). First, the OCA-index identifies that Indonesia has successfully integrated strongly with 12 of the 21 OIC oil countries, two of which fall into the converging category. The other seven countries are in the little converged countries. The percentage of the prime and converging category is 67%. Such a result clearly identifies Indonesia as a potential country to integrate with many oil countries in the OIC.

Second, from the view of regional blocs, this study finds that Indonesia's monetary integration with oil-producing countries is stronger with the Middle East and the African bloc (Figure 2).

Table 1: Calculation of OCA-index of Indonesia to the OIC oil countries

Level of integration	Pairs of country	OCA-index
Prime converged countries	Indonesia-Kuwait	0.00111
	Indonesia-Niger	0.00278
	Indonesia-Senegal	0.00278
	Indonesia-Cameroon	0.00278
	Indonesia-Cote d'Ivoire	0.00278
	Indonesia-Gabon	0.00278
	Indonesia-Oman	0.02317
	Indonesia-Qatar	0.02317
	Indonesia-Saudi Arabia	0.02317
	Indonesia-Syria	0.02317
	Indonesia-UAE	0.02317
	Indonesia-Bahrain	0.02317
Converging countries	Indonesia-Algeria	0.04277
	Indonesia-Malaysia	0.07638
Little converged countries	Indonesia-Nigeria	0.08777
	Indonesia-Iran	0.13560
	Indonesia-Brunei	0.13640
	Indonesia-Libya	0.30433
	Indonesia-Egypt	1.23007
	Indonesia-Iraq	1.44514
	Indonesia-Mozambique	2.92353

Source: Author calculation. OCA: Optimum Currency Area, OIC: Organization of Islamic Cooperation

It is recorded that almost 77% of oil-producing countries in the Middle East are strongly integrated with Indonesia, with only 50% for the African bloc. Increasing the intensity of export and import trade between Indonesia and the Middle East countries is an important reason for the strong monetary integration. There is little difficulty in explaining the strength of Indonesia's monetary integration with the African bloc, because the international trade between them is not strong enough. One reason is that the similar dependence of those on superpowers (especially in imports and foreign debt) may systemically generate the volatility of the exchange rate and inflation among those moving in a similar pattern. Small countries like Indonesia and some African countries that are highly dependent on external markets are quite vulnerable to external shocks.

This study considers that weak monetary integration between Indonesia and other oil countries is due to a dichotomous condition: economic slowdown or vice versa. Of the seven countries that experienced weak integration against Indonesia, four of them – Libya, Egypt, Iran, and Iraq – were experiencing economic slowing down associated with internal political conflict. These countries generally experience chronic inflationary pressures, currency instability, and a trade embargo. Conversely, Brunei Darussalam and Nigeria have experienced economic strengthening and exchange rate stability in recent decades. These two contractive conditions have caused a wide gap with the macroeconomic fundamental that is being experienced by Indonesia. Differences in currency regimes between countries have little influence on monetary integration as long as the intensity of trade between the two countries is getting stronger. Through increasing trade, the demand for currency between the two countries will increase and this gradually become an important prerequisite for monetary integration.

Table 2: Steps for selecting the best model for panel regression

Test	Result	Summary
Chow test	Cross-section Chi-square statistic: 55.04662. P-value: 0.0732 >0.05	Ho: Accepted Best model: CE
Lagrangian multiplier test (LM)	Cross-section Breusch Pagan: 0.003241. P-value 0.9437 >0.05	Ho: Accepted Best Model: CE
Autocorrelation test	Durbin-Watson statistic: 2.632871 <DU <DU DW table	Autocorrelation detected
Normality test	Jarque-Bera: 20154.26. P-value 0,00000 <0,05	H1 accepted (residual data have not distributed normally)
Outlier test	Absolute standardized residuals: Two pairs of country are >3	Outlier detected
CE model	CE suffers from autocorrelation, residual data have not distributed normally, and outliers	CE is not the best model. We retest FE as the second option model (excluding data outliers)

Table 3: Fixed effect (FE) assumption test

Result/Summary	The Glejser test	Pesaran CD test	Jarque-Bera test	Correlation matrix
Result	All p-partial t-values (Prob) >0.05	P-value of 0.6671 >0.05	P-value 0.1361 >0.05	All coefficient correlations below 25%
Summary	The model is free from heteroscedasticity	There are no cross-sectional dependence	The residual data have distributed normally	All explanatory variables are free from multicollinearity

4.2. Panel Least Squares Regression Model

Testing the panel regression model to explain variations in the OCA index between Indonesia and oil exporting countries produces findings through the following process. First, this study tests to find the best panel regression model using the Chow test and Lagrangian Multiplier (LM) involving 21 country pairs (Table 2). This selection process proves that the Common Effect (CE) is the best model. However, the robustness test shows that CE suffers from autocorrelation, which is indicated by the Durbin-Watson value of 2.632871 <Durbin Upper (DU) or (4-2.632334) <DU table. We also tested the Jarque-Bera Normality Test on CE, the result is a p value of 0.000000 <0.05, indicating that the residue was not normally distributed (Table 2). This might be because there are data outliers. We find outliers for two pairs of countries (Indonesia-Iran and Indonesia-Iraq) with absolute values for standard residues >3.

Second, because CE does not meet the requirements as the best model as it contains heterogeneity and outlier data, we will make a diagnosis of robustness for the second-best model that is the Fixed Effect (FE). The first step is to test the Glejser Test to determine whether the FE contains heteroscedasticity. The Glejser Test results in all values of P-partial (Prob) >0.05, which means the FE model is free from the problem of heteroscedasticity (Table 3). Likewise, with the cross-sectional dependence tests, the results show no cross-sectional dependence, as indicated by the P-value of 0.6671 >0.05 (Table 3). The detection of multicollinearity using the Pearson matrix correlation shows that there is no strong relationship between the explanatory variables, meaning that the symptoms of multicollinearity do not appear in the FE model (Table 4). A number of these tests successfully selected the FE as the best model to be used in the panel regression model to test OCA determinations. Even though in the early stages of testing, CE was better than FE, FE succeeded in the robustness test, so it was worthy of being the best model.

After searching for the best model and diagnosing robustness, the next step is to estimate the effect of explanatory variables on OCA using the White period coefficient of fixed effect. As in the Table 5, the panel fixed-effect regression model is feasible to estimate the

Table 4: Correlation matrix

	OCA	y	p	xm	siz
OCA	1.000000	0.127815	0.578339	-0.275332	0.013067
y		1.000000	-0.004434	0.055848	0.070015
inf			1.000000	-0.222459	0.057515
xm				1.000000	0.265434
siz					1.000000

Optimum Currency Area

OCA (indicated by a 1% significance level of F). The coefficient of determination (R^2) produces a value of 60%, which confirms that the explanatory variables are able to explain 60% of OCA behaviour. These estimation results have succeeded in providing a comprehensive explanation of the OCA criteria for Indonesia.

The partial test of each explanatory variable against the OCA produces certain findings. First, of the four explanatory variables, only two have a significant effect on 1%, namely the similarity of inflation and trade openness. The similarity of inflation has a t-value of 5.332567, which is stronger than the t-value for trade openness, which is only at -2.977335. Two other explanatory variables – business cycle synchronization and size of the economy – have relatively little effect on the OCA. The interpretation of the positive and significant effects of the similarity of inflation on the OCA explains that if the patterns of inflation between countries are similar then it may encourage strong economic integration between countries. While the negative and significant effects on trade openness means that if intra-trade is more open between the two countries, their monetary integration will also strengthen (shown by the OCA-index which narrows to zero). Each 1% increase in trade openness can reduce the OCA-index by 0.06. This result goes according to the OCA theory that asserts that the increasing trade may encourage monetary integration (Rose, 2000). The main advantage of this study is that the choice of oil-exporting countries as observation units provides a clear focus to detect the impact of the emergence of trade intensity on OCA. The position of Indonesia as an oil importer and LGN exporter within the OIC region play an important role in encouraging the integration of Indonesia to the rest of the OIC.

Table 5: Summary of panel fixed-effect least squares estimation (white period)

Variable	Coefficient	Std. error	t-statistic	Prob.
C	0.550365	0.364443	1.660822	0.1678
y	1.668596	1.452532	1.245266	0.2500
inf	0.027329	0.104841	5.332567**	0.0000
xm	-0.059043	0.204732	-2.977335**	0.0021
siz	-0.255607	0.040543	-1.435430	0.1713
Effects specification				
Cross-section fixed (dummy variables)				
R-squared	0.732111	Mean dependent var.		0.060754
Adjusted R-squared	0.600321	S.D. dependent var.		0.042118
S.E. of regression	0.030112	Akaike info criterion		-3.770352
Sum squared residual	0.060230	Schwarz criterion		-2.665377
Log likelihood	275.2424	Hannan-Quinn criteria		-3.400042
F-statistic	5.444021	Durbin-Watson stat		2.507831
Prob (F-statistic)	0.000000			

Dependent Variable: OCA, Method: Panel least squares, sample: 1995 2015, periods included: 3, Total panel (balanced) observations: 61. (**) identifies the significant level at 1%.

OCA: Optimum Currency Area

5. CONCLUSION

The majority of oil countries are the prime and converging monetary integrated with Indonesia, which account for 76%. Only seven countries are in the status of the little converged countries. In fact, Indonesia has the strongest integration with Middle Eastern countries. The strong integration between Indonesia and oil-producing countries is due to two things, namely, the similarity of inflation and trade openness (evidenced by the value of *t* with a confidence level of 1% for the two explanatory factors). The increasing export and import of oil and LNG between Indonesia and oil-producing countries is the trigger point for Indonesia to go to the monetary union into a wider scope.

From a policy point of view, the findings of this study build an empirical stigma that the strong influence of trade between countries may create an even pattern of inflation between countries, and, in turn, may encourage strong monetary integration. Referring to this finding, the integration step that starts from trade integration, and then moves to monetary integration is in accordance with Balassa's integration theory.

This study has several limitations, especially in respect of its methodology and interpretation. In terms of the methodology, the use of the OCA-index as a measure of monetary integration is considered rather rigid, because it only uses one reference currency, namely, US \$. For example, West and Central African countries have been referring to the Euro as a benchmark for a long time, while Gulf countries fanatically peg to the US \$. Brunei Darussalam pegs its currency to the Singapore Dollar. This difference in benchmarks causes a bias in the interpretation of integration, as countries that set the Euro as their benchmark are certainly more symmetrical than when they are measured in US \$. For further studies, it might be better to compare two or more currencies as a reference for calculating the OCA index. Another weakness of this study is that it only assesses trade openness and the similarity of inflation as 'ex-ante conditions', and what happens if the two variables are opposite as ex-post. Whether the intensity of trade will increase and the symmetry of the exchange rate and inflation will improve if the monetary

union is formed is an empirical question that is useful for further studies. This kind of question is only relevant for the Eurozone, but for a currency union that has not yet been formed, this may construct a simulation model, even if only in an index, to assess the ex-post impacts of a currency union on selected macroeconomics indicators.

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