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Determinants of Horizontal and Vertical Intra-Industry Trade of Indonesian Manufacturing with ASEAN-4

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Abstract

Intra-industry trade between Indonesia and some neighbouring countries like the Philippines, Malaysia, Thailand, and Vietnam can be characterised as an imperfectly competitive market and be driven by increasing returns to achieve economies of scale. This research investigates the dynamics of Indonesia's intra-industrial trade in the manufacturing industry with ASEAN-4 countries, namely the Philippines, Malaysia, Thailand, and Vietnam, from 2005 to 2021. The independent variables used are the difference in Gross Domestic Product (GDP), real exchange rate, and Foreign Direct Investment (FDI). We also estimate the Grubel-Lloyd Index and decompose the intra-industry trade either dominated by vertical or horizontal intra-industry trade. The data is then analysed by the panel data method. Our findings show that intra-industry trade taking place in the region has a strong level dominated by vertical intra-industry trade, resulting in goods traded of different quality. Next, the variable of difference in GDP has a significant negative effect on intra-industry trade, the variable of the real exchange rate has a significant positive impact, and FDI has a positive and not significant effect.

Keywords: *ASEAN-4, Intra-Industry Trade, Manufacture, Panel Data*
JEL Classification: F16; F16; F41

INTRODUCTION

Trade activities between countries result in gains from trade, making them achieve economies of scale in production (Krugman dan Obstfeld, 2003; Hussin & Saidin, 2012). One strategy to increase that gain from trade is establishing a Free Trade Area (FTA), which removes trade barriers, like tariff and non-tariff, between its member countries (Surono, 2012). In the FTA, competition, economic integration, and specialisation increasingly occur, driving intra-industry trade (IIT). The IIT is a trading activity between countries on goods or services the same industry produces (Balassa, 1986). This theory is more relevant in explaining FTA than inter-industry trade, where countries generally have the same endowment factor (Basri, 1992). The theory also helps to explain the development of trade activities that show trade between countries can not only be explained through the theory of comparative advantage, especially in the manufacturing industry. Hence, the concept of intra-industrial trade emerged. Further, the intra-industry trade indices are used to measure two-way trade activity between countries that tend to have similarities in endowment factors.

One example of the establishment of regional liberalisation is the ASEAN Free Trade Area (AFTA), which accommodates trade between countries in the Southeast Asia of Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. The AFTA was established in 1992 to increase intra-industry trade among ASEAN member states. Thus, the economic resources of member states can be maximally empowered and increase production. In addition, intra-ASEAN trade can reduce export instability due to economic activities in developed countries (Yuliati, 2007).

One industry that largely benefits from the AFTA is the manufacturing industry, which has contributed almost a quarter of Indonesia's GDP. The free trade area is expected to improve the quality and quantity of output to increase competitiveness in the global market, with manufactured products as an important component in intra-industrial trade in the Asian region. The increase in trade in Indonesia's manufacturing industry in the international market reflects increased production, which can increase the export value (Sawyer, et.al., 2010; Nisa, 2017; Asian Development Bank Institute, 2017; Soseco, 2024).

The intensity of Indonesia's intra-industry trade (IIT) with ASEAN member states has been researched by Wibowo (2010) and Hussin & Saidin (2012). It shows that from 1992 to 2010, Indonesia's intra-industrial manufacturing trade with ASEAN member states belonged to the category of intra-industrial trade. This condition is contradictory when viewed from the value of Indonesia's manufacturing industry exports to ASEAN member countries from 2005 to 2021, which tend to fluctuate. (Yuliati, 2007) found some factors that cause the fluctuation of Indonesia’s trade, for example, the price level that can affect the movement of volume and quality of goods, the quality of goods that do not meet the importing countries’ standards, and Indonesia’s products that are too homogeneous and less diversified (Yuliati, 2007).

The focus should be on ASEAN-4, which consists of the Philippines, Malaysia, Thailand, and Vietnam, as they tend to have the same endowment factor and per capita income (Purba & Saputra, 2015). The Philippines had a high rate of urbanisation in the 20th century (Pernia & Quising, 2003). The Philippines' economic structure focuses on the industrial sector, which includes textile, electronic, and food processing. Its economy is also highly dependent on agriculture and mining and abundant in natural resources like chromites, copper, and nickel.

The Philippines recorded a strong economic performance in 2004 and 2005, with GDP growth of 6% and 5.1%, respectively. Public sector deficits and debts were also reduced. Income per capita for 2005 had also increased by 2.9% (World Bank, 2011). Greater macroeconomic stability coupled with the implementation of structural reforms in 2000-2016 led to a near-doubling of the Philippines’ GDP per capita, from US$1,607 in 2000 to US$2,753 in 2016 (World Bank, 2018).

Malaysia, is a leading exporter of electrical appliances, parts, and components, driving remarkable growth that elevated the nation from low- to upper-middle-income status within a single generation (World Bank, 2023a).

Gross National Income (GNI) per capita has demonstrated impressive growth, averaging 6.9% annually between 1960 and 2017. Moreover, Malaysia has achieved notable success in poverty reduction, with less than 1% of its population living below the international extreme poverty line of US$1.90 a day and only 2.7% below the average poverty line among its upper-middle-income peers at US$5.50. Additionally, the country boasts extensive global trade connections, engaging with 90% of countries worldwide, surpassing many of its regional counterparts (World Bank, 2023a).

Over the last four decades, Thailand has made remarkable progress in social and economic development, moving from a low-income to an upper-middle-income country in less than a generation (World Bank, 2023b). Thailand's economy grew at an average annual rate of 7.5% in the boom years of 1960-1996 and 5% during 1999-2005 following the Asian Financial Crisis (World Bank, 2023b). This growth was made possible by some factors such as abundant natural resources and labour, prudent fiscal policy, and openness to foreign investment. Thailand is the world's main rice exporter, which absorbs more than 60% of its labour in the agriculture sector.

Vietnam has been a development success story. GDP per capita increased 6-fold in less than 40 years, from less than $600 per person in 1986 to almost US$3,700 (constant 2015 US$). Poverty rates (US$3.65/day, 2017 PPP) declined from 14 in 2010 to 4.2% in 2022. The agriculture sector has supported economic growth and ensured food security, as indicated by its growth rate of 2.5 to 3.5% per year over the past three decades. It contributed 13% of GDP and 29% of employment in 2021 (World Bank, 2023). In the last three decades, GDP per capita has grown four and half times, from $598.9 (USD2015) in 1986 to $3,409 by 2021. Meanwhile, annual household wages tripled, increasing by nearly 100 million VND during the same period (World Bank, 2023c; 2023d).

Considering the importance of intra-industry trade to increase productivity within the frame of a free trade framework, it is important to investigate the role of Indonesia's intra-industry and agricultural trade with a focus on ASEAN-4. This research aims to investigate Indonesia's trade relations with ASEAN-4 in the manufacturing sector. We begin the following section by presenting the methods and data sources, followed by the empirical results and their discussion. Last, we conclude with suggestions for future research.

DATA AND METHODS

We used panel data from four of Indonesia's trading partner countries that are members of ASEAN (Philippines, Malaysia, Thailand, and Vietnam). We collected information on the manufacturing industry data between 2005 and 2021. The data used in this study are exports and imports of Standard International Trade Classification (SITC) Revision 3, Gross Domestic Product (GDP), real exchange rate, and Foreign Direct Investment (FDI). The SITC classification is based on UNCTAD (2023) where SITC 5 refers to chemicals and related products, SITC 6 is manufactured goods, SITC 7 is machinery and transport equipment, and SITC 8 is miscellaneous manufactured articles.

To measure intra-industry, we calculate the intra-industry trade index obtained from measuring the export-import exchange of goods in a particular industry to a particular country by using the Grubel-Lloyd Index (Murshed, 2001):

$$IIT_j^i = 1 - \frac{\left|X_j^i - M_j^i\right|}{\left(X_j^i + M_j^i\right)}$$

Description:
X_j^i = exports i to country j
M_j^i = import I to country j

The IIT index produced by the formula above has values between 0 and 1, with the following criteria (Lima & Alvarez, 2008):

- Classification 1: GL > 0,33 = Intra-industry trade
- Classification 2: 0,10 ≤ GL ≤ 0,33 = Potential for intra-industry trade
- Classification 3: GL < 0,10 = Inter-industry trade

Estimation of intra-industry trade is further categorised into Vertical (VIIT) or Horizontal Intra Industry Trade (HIIT). Aturupane, et.al. (1999) mentioned a distinction between VIIT and HIIT is important as the determinants of each type of IIT differ. In particular, vertical IIT is more likely to be driven by differences in endowments, as in practice much of this will reflect subcontracting activities and slicing up the value chain. Horizontal IIT, in contrast, is more likely to be driven by scale economies and imperfect competition.

Following Greenaway, et.al. (1995) and Sharma (2004), horizontal IIT is defined to exist for trade-in product *i* in industry *j* that satisfies the criterion:

$$1 - \alpha \leq \frac{exportUV_{ijk}}{importUV_{ijk}} \leq 1 + \alpha$$

Vertical IIT comprises trade where:

$$\frac{exportUV_{ijk}}{importUV_{ijk}} < 1 + \alpha \quad \text{or} \quad \frac{exportUV_{ijk}}{importUV_{ijk}} > 1 + \alpha$$

Relative unit values (UV) of exports and imports are utilised to disentangle horizontal from vertical IIT. As in Greenaway, et.al. (1995) and Aturupane, et.al. (1999), we use a unit value dispersion of 15 percent (i.e., a=0.15) for the analysis.

To estimate the impact of variables on the intra-industry trade, we use the panel data method, with the econometric model as follows:

$$IIT_{ijt} = \beta_0 + \beta_1 logDGDP_{ijt} + \beta_2 logRER_{ijt} + \beta_3 logFDI_{jt} + \varepsilon_{ijt}$$

Description:
IIT = Intra-industry trade fluctuations
$logDGDP$ = The difference between the GDP of Indonesia and other countries j
$logRER$ = The real exchange rate between Indonesia and country j in year t
$logFDI$ = Foreign Direct Investment
i = Indonesia country
j = Partner country (Philippines, Malaysia, Thailand, and Vietnam)
t = Time series
ε = Error term

We use model selection to find the best model, either Common Effect Model (CEM), Fixed Effect Model (FEM), or Random Effect Model (REM). To determine CEM or FEM, we use the Chow test with the hypothesis:
H0: Common Effect Model (CEM)
H1: Fixed Effect Model (FEM)
sTo determine the calculation, use a significant level of α = 0.05 or 5% (95% confidence level). If the probability value is less than 0.05, then H0 is rejected, which means the best panel model for research is the Fixed Effect Model (FEM). Vice versa, if the probability value is greater than 0.05, then H0 is accepted, meaning the best panel model for research is the Common Effect Model (CEM). However, if the Chow test results state that H0 is rejected, then to verify whether FEM is the best model, it is necessary to carry out the next step, Hausman Test.

The Hausman test is required if the results of the Chow test show that H0 is rejected (or the best model is FEM). The Hausman test tests the two best model choices of FEM and REM. The hypothesis is:
H0: Random Effect Model
H1: Fixed Effect Model
This specification test will be assessed through Chi-Square Statistics calculations. This test uses a tolerance level of α = 5% or 0.05. If the probability value of the calculation result is smaller than 0.05, then H0 is rejected, which means the best panel model in the research is FEM. In contrast, if H0 is accepted, it shows that REM is the best model.

The third test is the Lagrange Multiplier, which decides between the REM and CEM. The hypothesis is:
H0: Common Effect Model
H1: Random Effect Model

The significance level in this test is α = 5% or 0.05. However, the LM test probability is based on the results of the Breusch-Pagan test. If the Breusch-Pagan probability value is less than 0.05, then H0 is rejected, indicating that the best model is REM. Conversely, if H0 is accepted, it indicates that the CEM model is the best.

RESULTS AND DISCUSSION

Dynamics of Indonesia's Intra-Industry Trade with ASEAN-4

Table 1-4 presents the estimations of intra-industry trade by using the Grubel-Lloyd Index for the Philippines, Malaysia, Thailand, and Vietnam from 2005 to 2021. Table 1 shows trade interactions between Indonesia and the Philippines. When compared to other commodity groups, SITC 8 has the highest average IIT value of 0.840. In contrast, the lowest average IIT is SITC 6 with a value of 0.290. During 2005-2021, the trade between Indonesia and the Philippines is dominated by inter-industry trade (69.2%) with vertical intra-industry trade occurring (92.9%).

Table 1. VIIT and HIIT Indonesia and Philippines, 2005-2021

Year	IIT				Inter-Industry	Intra-Industry	VIIT	HIIT
	SITC 5	SITC 6	SITC 7	SITC 8	%	%	%	%
2005	0.401	0.166	0.713	0.653	0.657	0.343	0.886	0.114
2006	0.440	0.368	0.435	0.771	0.714	0.286	0.857	0.143
2007	0.373	0.294	0.467	0.884	0.686	0.314	0.829	0.171
2008	0.465	0.423	0.924	0.989	0.657	0.343	0.914	0.086
2009	0.493	0.210	0.620	0.941	0.571	0.429	0.971	0.029
2010	0.365	0.296	0.577	0.730	0.714	0.286	0.943	0.057
2011	0.378	0.232	0.632	0.823	0.771	0.229	0.943	0.057
2012	0.326	0.203	0.621	0.867	0.771	0.229	0.914	0.086
2013	0.301	0.270	0.523	0.781	0.771	0.229	0.943	0.057
2014	0.293	0.110	0.518	0.762	0.714	0.286	0.914	0.086
2015	0.503	0.377	0.425	0.939	0.629	0.371	0.857	0.143
2016	0.438	0.523	0.296	0.939	0.686	0.314	0.943	0.057
2017	0.469	0.444	0.280	0.842	0.714	0.286	0.971	0.029
2018	0.428	0.318	0.319	0.820	0.686	0.314	1.000	0.000
2019	0.406	0.332	0.246	0.851	0.657	0.343	0.971	0.029
2020	0.268	0.198	0.237	0.710	0.657	0.343	0.943	0.057
2021	0.255	0.204	0.478	0.921	0.714	0.286	1.000	0.000
Average	0.388	0.292	0.489	0.837	0.692	0.308	0.929	0.071

Table 2. VIIT and HIIT Indonesia and Malaysia, 2005-2021

Year	IIT				Inter-Industry	Intra-Industry	VIIT	HIIT
	SITC 5	SITC 6	SITC 7	SITC 8	%	%	%	%
2005	0.877	0.443	0.659	0.497	0.371	0.629	0.743	0.257
2006	0.890	0.814	0.789	0.518	0.343	0.657	0.771	0.229
2007	0.978	0.920	0.879	0.614	0.286	0.714	0.686	0.314
2008	0.728	0.825	0.829	0.741	0.286	0.714	0.857	0.143
2009	0.789	0.900	0.769	0.720	0.314	0.686	0.943	0.057
2010	0.681	0.842	0.711	0.929	0.343	0.657	0.943	0.057
2011	0.607	0.737	0.685	0.953	0.457	0.543	0.943	0.057
2012	0.646	0.756	0.688	0.893	0.514	0.486	0.943	0.057
2013	0.745	0.930	0.727	0.896	0.429	0.571	0.914	0.086
2014	0.609	0.849	0.634	0.878	0.543	0.457	0.914	0.086
2015	0.496	0.788	0.784	0.975	0.543	0.457	0.914	0.086
2016	0.557	0.863	0.772	0.973	0.514	0.486	0.914	0.086
2017	0.597	0.904	0.815	0.924	0.429	0.571	0.714	0.286
2018	0.510	0.778	0.825	0.876	0.429	0.571	0.886	0.114
2019	0.524	0.646	0.811	0.896	0.400	0.600	0.629	0.371
2020	0.587	0.820	0.749	0.938	0.514	0.486	0.914	0.086
2021	0.558	0.803	0.859	0.988	0.486	0.514	0.943	0.057
Average	0.669	0.801	0.764	0.836	0.424	0.576	0.857	0.143

Table 3. VIIT and HIIT Indonesia and Thailand, 2005-2021

Year	IIT				Inter-Industry	Intra-Industry	VIIT	HIIT
	SITC 5	SITC 6	SITC 7	SITC 8	%	%	%	%
2005	0.666	0.666	0.597	0.639	0.429	0.571	0.914	0.086
2006	0.589	0.978	0.604	0.796	0.400	0.600	0.971	0.029
2007	0.893	0.913	0.567	0.620	0.486	0.514	1.000	0.000
2008	0.618	0.731	0.424	0.637	0.400	0.600	0.914	0.086
2009	0.590	0.729	0.514	0.688	0.400	0.600	0.943	0.057
2010	0.576	0.748	0.546	0.623	0.457	0.543	0.829	0.171
2011	0.462	0.749	0.554	0.563	0.429	0.571	0.886	0.114
2012	0.455	0.726	0.508	0.546	0.514	0.486	0.829	0.171
2013	0.454	0.701	0.521	0.532	0.486	0.514	0.943	0.057
2014	0.512	0.726	0.536	0.541	0.400	0.600	0.943	0.057
2015	0.480	0.691	0.625	0.655	0.371	0.629	0.914	0.086
2016	0.525	0.752	0.631	0.641	0.429	0.571	0.943	0.057
2017	0.530	0.722	0.648	0.623	0.429	0.571	0.943	0.057
2018	0.463	0.727	0.633	0.597	0.457	0.543	0.829	0.171
2019	0.472	0.700	0.695	0.597	0.371	0.629	0.886	0.114
2020	0.506	0.759	0.800	0.741	0.343	0.657	0.886	0.114
2021	0.526	0.807	0.656	0.548	0.429	0.571	0.914	0.086
Average	0.548	0.754	0.592	0.623	0.425	0.575	0.911	0.089

Table 4. VIIT and HIIT Indonesia and Vietnam, 2005-2021

Year	IIT				Inter-Industry	Intra-Industry	VIIT	HIIT
	SITC 5	SITC 6	SITC 7	SITC 8	%	%	%	%
2005	0.159	0.093	0.354	0.387	0.771	0.229	0.943	0.057
2006	0.261	0.213	0.290	0.739	0.800	0.200	0.971	0.029
2007	0.256	0.525	0.334	0.667	0.686	0.314	0.886	0.114
2008	0.315	0.957	0.499	0.931	0.657	0.343	0.886	0.114
2009	0.305	0.780	0.801	0.900	0.543	0.457	0.971	0.029
2010	0.463	0.968	0.974	0.857	0.486	0.514	0.829	0.171
2011	0.537	0.799	0.889	0.777	0.400	0.600	0.771	0.229
2012	0.805	0.617	0.682	0.670	0.514	0.486	0.714	0.286
2013	0.748	0.569	0.509	0.542	0.457	0.543	0.771	0.229
2014	0.770	0.603	0.410	0.556	0.457	0.543	0.829	0.171
2015	0.806	0.649	0.493	0.469	0.429	0.571	0.886	0.114
2016	0.678	0.741	0.518	0.424	0.543	0.457	0.857	0.143
2017	0.707	0.675	0.701	0.461	0.514	0.486	0.857	0.143
2018	0.667	0.663	0.998	0.405	0.543	0.457	0.829	0.171
2019	0.871	0.509	0.822	0.384	0.457	0.543	0.886	0.114
2020	0.868	0.628	0.891	0.392	0.457	0.543	0.771	0.229
2021	0.948	0.630	0.892	0.401	0.486	0.514	0.857	0.143
Average	0.598	0.625	0.650	0.586	0.541	0.459	0.854	0.146

Table 2 shows the development of trade interactions between Indonesia and Malaysia. Among the four groups, SITC 8 has the highest average value (0.840) while SITC 5 has the lowest average value (0.669). Indonesia's trade with Malaysia is dominated by intra-industry trade (57.6%) and vertical intra-industry trade (85.7%). Table 3 shows that SITC 6 has the highest average value (0.754) while SITC 5 has the lowest average value (0.548) in the trade relationship between Indonesia and Thailand. The results also show the trade dominantly is intra-industry (57.5%) and vertical intra-industry (91.1%). Table 4 shows in interactions between Indonesia and Vietnam, SITC 7 has the highest average IIT value of 0.650. In contrast, SITC 8 has the lowest average IIT of 0.586. The interactions are dominated by inter-industry trade (54.1%) and vertical intra-industry trade occurs (85.4%).

Determinants of Indonesia's Intra-Industry Trade with ASEAN-4

In the model testing using the Hausman test, the best model is the fixed effect model. The selection of this model assumes that each individual is used; namely, the value of intra-industry trade is heterogeneous. Table 5 shows the estimation results using the fixed effect model. The t-test with a significance level of 5% and df = 64 has a t-table of 1.669 which is compared with the t-statistical value. The GDP difference variable has a t-count of -3,192 with a probability of 0,002, indicating that the variable GDP difference has a negative and significant relationship to intra-industry trade. The real exchange rate variable has a t-count of 2.335 with a probability of 0.022, indicating that the real exchange rate variable has a positive and significant relationship to intra-industry trade. Lastly, the FDI variable has a t-count of 0.831 with a probability of 0.409, indicating that the FDI variable has a positive and insignificant effect on intra-industry trade.

Table 5. Estimation Result of Intra-Industry Trade Function

Variable	Coefficient	Standard Error	t-Statistic	Probability
C	-3.127	1.305	-2.396	0.019
LOGGDP	-0.481	0.150	-3.192	0.002
LOGRER	0.557	0.238	2.335	0.022
LOGFDI	0.021	0.025	0.831	0.409
Weighted Statistics				
R-squared				0.654
Adjusted R-squared				0.620
F-statistic				19.231
Prob (F-statistic)				0.000
Unweighted Statistics				
R-squared				0.566
Adjusted R-squared				0.523

The values of R-squared which reflect the coefficient of determination is 0.654 which indicates that 65.41% of intra-industry trade index diversity can be explained by the independent variables ($logDGDP$, $logRER$, and $logFDI$), while the rest 34.6% is explained by other variables outside the model. While this research tests country-specific and industry-specific, the GDP variable shows a negative and significant influence on intra-industry trade, meaning that a higher difference in GDP of trading activity can reduce intra-industry trade. Vice versa, if the difference in GDP between the two countries is lower, it can affect increasing intra-industrial trade between the two countries.

Differences in demand structure also influence in some ways. First, the difference in the market size observed through GDP shows the difference in a country's ability to market different products (Krugman, 1981). The results also align with Bagchi & Bhattacharyya (2019) who observed intra-industry trade in

India. Their findings show if one of the countries has a larger GDP, the export or import value of one of these countries will tend to be greater, so the trade between the two countries can be inter-industrial. Based on the assumption that the division of labor will intensify with increasing market size (Ito & Umemoto, 2004). The market size can indicate the potential for large variations of products in trade, and large markets tend to have the opportunity to increase the scale of their production of various products based on conditions of economies of scale (Krugman, 1979). The difference in GDP, which shows a significant value, indicates that implementing manufacturing industry trade cooperation in the ASEAN-4 region optimises. In addition, GDP, which shows the level of economic growth with cooperation in international trade, can optimally reduce economic growth inequality between countries.

Second, the real exchange rate shows the level of economic actors in trading goods from one country to another expressed in foreign currency per domestic currency, hence, the value is already equated with the inflation rate in each country (Kıpıcı & Kesriyeli, 1997). The estimation results show that the exchange rate variable has a positive and significant influence on intra-industry trade, hence, this variable affects intra-industry trade. These results are in line with findings from Purba & Saputra (2015), which found a positive influence of the exchange rate on trade activities, especially on export activities, and impacts countries with low per capita income. Theoretically, as previously outlined, the relationship of the real exchange rate to intra-industry trade is negative where a country's high real exchange rate causes domestic goods to be relatively expensive compared to foreign goods. The opposite situation is that when the real exchange rate is low, domestic goods are relatively cheap to foreign goods, thus encouraging an increase in exports (Mankiw, 2012:151).

On the industry-specific side used in this study is FDI, which is used as a measure of the role of multinational companies that trade on the same product, but the product is differentiated both vertically and horizontally, which is used to meet consumer demand that has different incomes or depends on the country of origin (Chen, 2000). The estimation results show that the FDI variable has not significantly contributed to intra-industry trade. A possible cause of such insignificant FDI is the need for time to prepare products and services. These results follow the research of Nguyen et al. (2020), who examined intra-industrial trade in Vietnam. Other studies have shown a positive and significant influence between FDI and intra-industrial trade (Fontagné, 1999). In this case, FDI is the role of multinational companies in intra-industrial trade, where FDI has a positive relationship with intra-industry trade (Balassa & Bauwens, 1987; Greenaway et al., 1994; Greenaway & Milner, 1983). The existence of multinational companies that enter and invest in them can increase intra-industry trade. However, when a country applies trade barriers, FDI can negatively affect intra-industry trade (Veeramani, 2014).

CONCLUSIONS

Based on the development of the value of Indonesia's intra-industrial trade with ASEAN-4 (Philippines, Malaysia, Thailand, and Vietnam) in the manufacturing industry from 2005 to 2021, Indonesia's intra-industrial trade with ASEAN-4 is relatively strong. The variable of GDP difference negatively and significantly influences intra-industry trade, which illustrates that the smaller the difference in a country's market/economy, the higher the intra-industrial trade. The variable of the real exchange rate has a positive and significant influence on intra-industry trade, which means that the lower the real exchange rate, the lower the intra-industry trade. The FDI variable has a positive and not significant influence on intra-industry trade which means that the lower the real exchange rate, the lower the intra-industry trade.

However, these findings should be interpreted cautiously because the models do not include data for certain significant variables (namely, productivity and endowment, transportation costs, and technological innovation). Future studies should also build a more advanced technique and continue to refine the parameters utilised to distinguish between horizontal and vertical IIT.

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