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Determinants of Indonesian agricultural exports: A gravity model approach

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Abstract---*This paper analyses determinants of agricultural exports and imports from Indonesia, including demand and supply factors capturing effects of income, market size, prices, and variables related to logistics, competitiveness, trade policy, and innovation. Trade creation and diversion effects are estimated as Indonesia experienced a deep liberalization of markets. A gravity model is employed to analyse agricultural exports disaggregated into raw goods and food. The dataset comprises 50 countries from 2007 until 2017. The results find trade creation effects for both categories, with larger effects in exports within agricultural raw goods, and higher trade creation through imports in food. Indonesia also experience trade expansion with non-free trade partners suggesting that demand variables (e.g. income, market size, sophistication) is a more important driver of growth rather than agreements. Price factors affect agricultural goods, with food products experience elastic price demand, while raw goods being affected by prices and exchange rate. Gains in competitiveness, logistic performance, and innovation is supporting agricultural exports (imports as well). The implementation of the FTAs should be critically evaluated with respect to food products as imports have expanded more rapidly than exports and domestic goods may have experience pressure from liberalization.*

Keywords---*Agricultural Trade; Gravity Model, Trade creation and trade diversion effects, GMM*

I. Introduction

This study analyses the determinants of agricultural exports from Indonesia distinguishing two categories; agricultural raw materials and food processing. Data covers the years 2007 to 2017 capturing exports and imports of Indonesia with 50 partner countries, from which 23 have a Free Trade Agreement (FTA) in place. The period is of particular importance considering five reasons. 1) The rapid raise in agricultural exports as new markers emerge (e.g., China, India) and new competitors in global food supply are shaking the structure of markets. Indonesia alone reported an increase from US$ 23 billion in agricultural exports in 2007 to nearly US$ 50 billion in 2017, expanding at least twice faster than global growth rates. 2) A change in consumer behavior in both emerging countries (as income increased rapidly) and in advanced ones. 3) Important technological changes that allows larger trade in process food [2]. 4) Large shocks in prices, global demand, and exchange rate volatility during the period of study. Volatile exchange rate, price fluctuation, and global demand seems to affect exports of agricultural raw commodities in a more significant way than to food, particularly for emerging countries [3]. Agricultural goods also face lower income elasticity, making it more sensitive to global shocks. 5) Indonesia experienced a large liberalization in trade moving from 10 FTA agreements in place in 2007 to 23 by the end of 2017. A larger trade integration by removing barriers and lowering tariffs allowed Indonesia greater access to new markets but also imposes larger competition from foreign goods at home [4].

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This paper looks at the role played by supply and demand factors in shaping agricultural exports and imports from Indonesia. While demand function for exports (imports) is mainly related to incomes and to prices (Serrano & Pinilla, 2010), this study also includes factors related to distance, indexes capturing logistic performance (LPI), human development (HDI), competitiveness (GCI), innovation (GII), and governance (GI), plus factors related to prices; consumer price index (CPI), tariffs, and exchange rates. Besides, facilitation in trade and removal of barriers to trade under Free Trade Agreements (FTAs) are included to measure trade creation, expansion, or diversion effects.

The study includes Agricultural Materials categorized under SITC under codes (0+1+2 – 27 -28 + 4), and further decomposed into two groups 1) Agricultural Raw Materials and 2) Food products. The distinction arises as income and price elasticity differ between raw goods and processed goods (food). Distance, logistics, competitiveness, innovation and governance indexes may reflect important differences in the role they play to promote deeper integration.

II. Empirical Evidence - Literature Review

This section offers evidence on studies addressing export / import demand employing gravity models, as well as evidence of variables likely to have influence in the pattern of agricultural trade from Indonesia. The main intention is to provide support for the model proposed in this paper as well as to highlight empirical gaps in the literature. In trade creation and diversion, the logic implies that trade is driven by demand side factors (income), prices, exporter production capability, and trade cost often associated with distance [6] and logistics. Trade creation describes how having a free trade deal could lead to a substitution of goods previously imported from non-member countries, by products from within new country members (more efficient allocation of resources). By contrast, trade diversion takes place when goods from outside the bloc substitute intra-bloc goods (FTA members). Nevertheless, not all agreements offer evidence of trade creation [7], and some deals are instead mix in dimension [8–10], suggesting the need to look at specific country-time-industry-agreement effects. Besides, FTAs could lead to stronger trade creation for imports than for exports, while diversion effects could harm domestic trade [4].

Tentatively, FTA agreements could support lower trading cost and promote larger trade. Nevertheless, literature suggest heterogeneous effects across agreements, across countries, and sectors. Baier, Yotov, and Zylkin (2019) offer evidence of four sources of heterogeneity. First, noticing that countries with large barriers previous to the signature of the FTA deal have larger potential gains. Second, countries with relatively lower market power grant relatively smaller allowances when signing FTA deals. Third, countries with prior trade agreements in place tend to have lower effects in successive deals. Fourth, FTA deals tend to be weaker for further away partners. The different factors suggesting heterogeneous results, opens a gap for empirical research when dealing with specific country -Indonesia-, different agreements in place, and the special case of agriculture, where so far there is no conclusive evidence on trade effects. Besides, Urata and Okabe (2010) find more frequent trade diversion effect among developing countries, while Schaak (2015) find larger trade creation in imports than in exports (in dairy products in China), advising a more critical evaluation of policies for countries playing essential roles in global supply that can lead to volatility in global prices. The large concentration of exports from Indonesia in few strategic goods (rubber, Crude Palm Oil CPO, paper, cork & wood, shrimps, coffee, among others), opens a gap for empirical analysis. Other studies suggest that late comers to FTAs (e.g., Indonesia) may have lower potential benefits from trade agreements [8].

Nevertheless, studies within the Association of Southeast Asian Nations (ASEAN) and partners find evidence of net trade creation within agriculture [13]. Szalanczi and Trinh (2017) find trade creation and higher levels of intra-regional trade as a result of that the ASEAN-Japan deal (AJCEP). Yang and Martinez-Zarzoso (2014) find that FTAs contributed to trade expansion for partner members and non-members of China.

Besides estimating trade creation and diversion effects, empirical literature covers effects from multilateral resistance factors (MR) often associated with trade cost (transportation and coordination cost) [16]. In literature of determinants of agricultural trade, incomes often appear as the main positive driver of trade [3,5], together with market size (population, purchasing power) as in Sasaki (2015). Nevertheless, the role of GDP tends to be lower for agricultural raw goods than in manufacturing (Urata & Okabe, 2014).

Prices are also important determinants of exports as lower prices, favorable exchange rate, and stable prices, could be a driver of larger exports (Serrano & Pinilla, 2010). While exchange rate depreciation could lead to lower prices and increasing export flows [18], it could also be associated to higher transaction cost and for instance, to higher trade cost. Volatility in exchange rate could make things bad within agro exports [19]. Price elasticity, tariffs, and exchange rates seems to affect more sharply commodities than food, while non-price factors tend to affect more sharply trade of food products (Baiardi et al., 2015). Price stability for both domestic food and exports help to reduce negative impacts due to high volatility [20].

Lower tariffs can support larger trade flows [21], although effects in agricultural trade may be lower than manufacturing (Urata & Okabe, 2014). Nevertheless, tariffs and trade relations require time before bringing benefits and effects may experience diminishing benefits as trade relation matures [7,11].

Empirical studies observing effects on trade due to transportation cost, conclude that improvements in logistics index could lower transportation cost, driving positive effects in trade expansion [22]. Available high-quality logistics services are likely to influence the volume of trade [23]. In the ASEAN region, Korinek and Melatos (2009) suggest potential gains in agricultural trade as a result of improvements within logistic performance. Although, [24] argue that transportation cost has not fallen as much as expected. Institutions also play a role as negative unstable economic and political environment could create adverse effects (Kuncic, 2013), and positive ones when institutions are well in place [26].

A final note on control variables covers global competitiveness, innovation, and human development. Studies as that of [27] finds positive relationship between foreign investment inflows and trade, often related to innovation, higher competitiveness, and transparency. Improvements in Human development (HDI) is also possibly associated with trade flows [28]. Other studies suggest unidirectional effect from trade liberalization to human development, but not necessarily the other way around [29], opening an empirical question for this study. Although Indonesia reports large improvements in competitiveness related indicators, the country runs behind versus main trading partners. Large number of agreements are in place in Indonesia. However, it is still an empirical question if the agreements have benefited or affected the trade pattern and the trade balance.

III. Methodology

This paper applies a gravity model employing a data panel incorporating country and time specific effects [10], and *country-pair fixed* effects [30]. The attention focuses in agricultural trade, disaggregating goods into agricultural raw goods and food products. This research follows the structural gravity model proposed by Anderson and Van Wincoop (2003) in which trade flows are a function of income, prices and relative trade cost (multilateral resistance terms, MR). The MR captures country-specific and time-specific conditions among partners (Feenstra, 2015).

Considering the presence of endogeneity problem in the data a Generalized Method of Moment is selected as a suitable approach [12,33]. To account for unobserved multilateral resistance and to account for unobservable endogeneity the model proposes for the demand side, the real GDP and the market size (population) to capture income effects. To account for trading cost and supply (relative role) the model includes the Logistic Performance Index (LPI), Human Development (HDI), distance, Global Competitiveness (GCI), Global Innovation (GII), and public policy - Government (GI). Those variables are measured in relative terms (performance of exporter and importer). Besides, three variables capture the effects of prices;

namely, applied tariffs, Consumer Price Index (CPI), and Exchange Rates. To capture possible effects on trade creation/diversion in exports/imports, a dummy variable indicates whether country pairs have an FTA in place (one) or not (zero).

Data

The study includes 50 countries from which 23 have FTA agreements with Indonesia. The 23 countries under FTA are: Nine ASEAN countries; East Asia (China, Japan, S.Korea,); South Asia (Bangladesh, India, Pakistan); Others (Australia, Egypt, Arab Rep; Iceland; New Zealand; Nigeria; Norway; Switzerland; Turkey). The dataset covers from the year 2007 to 2017. Agricultural exports are further aggregated within agricultural raw materials and food.

The variables in the model include: The Human Development Index (HDI) value ranges from 0 to 1 (highest). The Logistics Performance Index (LPI) ranges from 1 to 5 (highest). The Global Innovation Index (GII) ranges from 0 to 100 (highest). Global Competitiveness Index (GCI) ranges from 1 to 7 (highest), Governance Index (GI) goes from -2.5 to 2.5 with higher values representing better performance. Relative Consumer Price Index (CPI) among countries adjusted by exchange rate. Real Exchange Rate (ER) between partners. LPI, HDI, GCI, GII, Tariff, and GI are computed as an average bilateral index among partners.

Model Specification

Within the gravity model, trade flows are expected to be positively related to income and size of the importing country, and negatively related to a set of factors reflecting cost. A large cost may be linked to production, transportation, coordination, distance, logistics, competitiveness, innovation, and so forth. The model is estimated including time dimension. X_{ijt} is the exports (imports) from the country of origin *i* to country destination *j* at time *t* expressed in current USD $. Data for each of the different groups (*r*) is run independently, namely: Total Agricultural trade, Agricultural Raw goods, and Food. The model is linearized by taking natural logs (*Ln)*, except for the indexes and tariff variables.

$$lnExp^{r}_{ijt} = \beta_1 lnExp^{r}_{ijt-1} + \beta_2 lnGDPi_{jt} + \beta_3 lnPop_{ijt} + \beta_4 LPI_{ijt} + \beta_5 HDI_{ijt} + \beta_6 lnDist_{ijt} + \beta_7 GCI_{ijt} + \beta_8 GII_{ijt} + \beta_9 Tariff^{r}_{ijt} + \beta_{10} GI_{ijt} + \beta_{11} CPI_{ijt} + \beta_{12} ER_{ijt} + \beta_{13} FTA_{ij} + \varepsilon_{ij} \quad (1)$$

$$lnImp^{r}_{ijt} = \beta_1 lnImp^{r}_{ijt-1} + \beta_2 lnGDPi_{jt} + \beta_3 lnPop_{ijt} + \beta_4 LPI_{ijt} + \beta_5 HDI_{ijt} + \beta_6 lnDist_{ijt} + \beta_7 GCI_{ijt} + \beta_8 GII_{ijt} + \beta_9 Tariff^{r}_{ijt} + \beta_{10} GI_{ijt} + \beta_{11} CPI_{ijt} + \beta_{12} ER_{ijt} + \beta_{13} FTA_{ij} + \varepsilon_{ij} \quad (2)$$

Where *ln* denotes variables in natural logs, Exp_{ijt} denotes bilateral exports from *i (Indonesia*) to country *j* in period *t* in current thousand US$. Imp_{ijt} denotes bilateral imports from country *j* to country *i* (*Indonesia*) in period *t* in current thousand US$. The subscript *j* includes 23 trade partner countries in free trade agreements with Indonesia and 27 of Indonesia's largest trading counterparts. *t* captures time from the year 2007 to 2017. $\ln GDPi_{jt}$ indicates Real GDP of country *i* and *j* years in year *t* (USD), in natural logarithms (*ln*). $lnPop_{ijt}$ denotes total population of country *i* and *j* in year *t*. LPI_{ijt} indicates the Logistic Value Performance Index, HDI_{ijt} signifies the value of the Human Development Index, $LnDist_{ij}$ captures the distance between countries *i* and *j*, GCI_{ij} records the Global Value of Competitivity Index of partners (*i* and *j*) in year *t*. GII_{ij} represents the value of the Global Innovation Index of countries *i* and *j* in year *t*, $Tariff_{ij}$ *signifies the average tariff rate in country i* from *j* in year *t* for a specific sector *r*. GI_{ij} is the Institution Value Index between country *i* and *j* in year t. CPI captures the Consumer Price Index adjusted by exchange rate among partners *i* and *j*. EX represents the bilateral exchange among partners *i* and *j*. FTA_{ijt} is a dummy variable that takes the value of 1 if Indonesia and the partner are on a trade agreement, and it takes

the value of 0 (zero) if the opposite is true. The effect of trade creation occurs if the coefficient of this variable is positive and significant, while trade diversion if the coefficient of this variable is negative.

The $\beta_1 - \beta_{13}$ represents the *slope*, while ε is the *error* term. This model assumes dynamic relationship in the dependent variable, capturing lagged effects of exports and imports. According to Baltagi (2008) *Dynamic panel data model* is shown as follows:

$$y_{it} = \delta_{i,t-1} + x_{1it}\beta + u_{it} \; ; = 1,..., N \; ; t = 1,2,...,T \qquad (3)$$

in which δ is a scalar and x_{1it} is a matrix measuring 1 x *K*, and β is a *K* x sized matrix 1. It is assumed that the u_{it} follows the one-way component model as follows:

$$u_{it} = \mu_i + v_{it} \qquad (4)$$

μ_i is the individual effect assumed μ_i~N (0, σ 2 / μ) and v_{it} is the error term assumed to be v_{it}~N (0, σ 2 / μ), where μ_i and v_{it} are mutually independent.

The panel data model that includes the lag of the dependent variable as a regressor within the regression as trade is likely to be related to previous flows. The lag causes endogeneity problems but the Generalized Method of Moments (GMM) overcomes this difficulty (Baltagi, 2008). This paper follows the specifications in Blundell and Bond (1998) and applied in papers as that of [33]. The core of the GMM method is estimating a system of equations at first difference level by employing a different instrument for each equation. The instrument used at the level is the first difference lag. Misspecification in the estimators is lower employing GMM System.

IV. Results

Exports of Agricultural goods increased a 107% during the 2007-2017 period. The largest expansion of exports was registered to FTA partners (363,8% growth), a shift from non-FTA to FTA partners. Food products expanded 133%, accounting for more than 80% of total agricultural exports. After 2012 prices and global demand of agricultural exports collapsed, particularly within agricultural raw materials (Esquivias, 2017). Exports of agricultural raw materials fluctuated sharply, reaching its peak in 2011 (US$ 15,2 billion) and its lowest point in 2016 (US$ 6.9 billion). By the end of 2017, Agro raw material exports accounted for 20.6% share of total agricultural exports, down from the 30% it accounted for in 2007. Within agricultural raw, 90% of the exports correspond to rubber (US$ 5.6 billion), pulp and paper (US$ 2,4 billion), and cork & wood (US$ 1 billion). Rubber and paper grew at nearly 8% CARG (see Table 1), while other goods, as hide & skin goods collapsed at CARG -10% a year.

Food exports by contrast, experienced an overall growth, although a slowdown from 2012 to 2015. As noted in Baiardi et al., (2015), agricultural raw goods experience higher competition and exposure to prices as it faces higher price elasticity compared to process food. Besides, raw goods face higher income elasticity, making it more sensitive to global shocks.

In both agricultural materials and food Indonesia has a net surplus. Nevertheless, imports have been rising faster than exports. In agricultural raw materials imports are concentrated in textile fibers, pulp, and rubber, while in food products there is large concentration in cereals, feeds, sugar, vegetables and fruit (see *Table 1*). Four food import categories expanded more than 200% during the period; animal and vegetable oils (233%), coffee/tea/cocoa/spices (314%), fish (455%), and meat (238%).

In terms of GDP, Population, LPI, HDI, and GCI, Indonesia improved significantly versus most top partners. Nevertheless, Indonesia has lower LPI, HDI, and GCI indexes versus most top trade partners. Indonesia's price Index depreciated by 32% versus 2007 level (weakened versus the US Dollar).

Determinants of Agricultural Exports

The results of the model are significant for most of the variables (*Table 2*). Estimators based on aggregate or disaggregate data gives different result, suggesting using disaggregated data. For agricultural exports, the lag exports variable, the GDP_j of the importing country, and the population are all positive and significant (all proxies of demand). The lagged exports and the GDP_j are relatively similar for agricultural raw and food exports, while the population has a larger marginal effect for agricultural raw goods, reflecting the role large countries play on it. Four large nations import nearly 65% of Indonesia's raw goods (China, India, Japan, and United States).

Demand variables are important. As an example, in 2007 the accumulated GDP of Indonesia's FTA partners accounted for US$ 5,6 Trillion, by 2017 the market size increased to US$ 25 Trillion. The population of FTA partners also increased from 1,64 billion people to more than 4 billion.

Table 1. Exports and Imports from Indonesia (Billion US$) Selected Years and selected categories

	Exports						**Imports**					
	2007	2011	2017	Growth 07-17	CAR G	% Share	2007	2011	2017	Growth 07-17	CAR G	% Share
Total Agricultural Raw	7,1	15,3	10	42,6%	3,3%	20,6%	2,6	5,7	5,1	95%	6%	21%
Cork and wood	0,6	0,8	1,1	89%	6%	11%	0,1	0,1	0,3	133%	8%	6%
Rubber	4,9	11,8	5,6	13%	1%	55%	0,3	1,0	0,8	197%	10%	15%
Pulp and waste paper	1,1	1,6	2,4	127%	8%	24%	1,0	1,8	1,8	72%	5%	35%
Textile fibres	0,4	0,8	0,6	69%	5%	6%	1,1	2,6	2,0	80%	6%	40%
Total Food	17	33	39	134%	8,1%	79,4%	7,9	16,7	18,6	137%	8%	79%
Animal feed	0,3	0,5	0,6	87,6%	5,9%	1,5%	1,1	2,2	2,9	156%	9%	16%
Animal/veg oils	0,9	1,6	3,4	290,6%	13,2%	8,7%	0,0	0,1	0,1	233%	12%	1%
Coffee/tea/cocoa/spices	2,0	3,3	3,6	77,1%	5,3%	9,1%	0,2	0,7	1,0	314%	14%	5%
Fish/shellfish/etc.	2,1	3,2	4,2	100,4%	6,5%	10,7%	0,1	0,3	0,3	455%	17%	2%
Fixed veg oils/fats	9,4	20,3	21,6	128,4%	7,8%	55,1%	0,0	0,1	0,1	173%	10%	0%
Oil seeds/oil fruits	0,0	0,1	0,0	23,9%	2,0%	0,1%	0,6	1,5	1,6	192%	10%	9%

Sugar/sugar prep/honey	0,1	0,2	0,2	146,1%	8,5%	0,6%	1,1	1,9	2,6	137%	8%	14%
Vegetables and fruit	0,5	0,8	1,4	176,8%	9,7%	3,5%	0,7	1,5	2,2	195%	10%	12%
Growth	**23,8**	**48,1**	**49,3**	**107%**	**7%**	**126%**	**10,5**	**22,4**	**23,7**	**127%**	**8%**	**61%**

The lag variable for exports (*Lag Export*) signals that historical trade plays a positive (large) role in explaining current exports. A high lag variable can denote concentration of markets, strong links with partners, a growing demand, but also a relatively low change in the pattern of exports destinations. The top main partners of 2007 are the same as 2017. Few changes are; a lower share of exports to North America (from 20% of raw exports in 2007 to only 11% in 2017) and Singapore (from 5% to 1%). India and China significantly expanded its trade with Indonesia.

Logistics (LPI), human development Index, and the Global Competitiveness Index are all positive, suggesting that the largest the average Index, the largest the flows. Both Indonesia and main partners improved in the three indexes. Nevertheless, in most indexes Indonesia underperforms versus trade partners.

The coefficient of distance has a negative relationship with trade, meaning that the largest the distance, the lowest the exports, in line with trade theory and close to those findings in [11]. The coefficient of distance for food is larger than that of agricultural raw goods explaining the nature of food goods where freshness and proximity is important, logistics are more complex (costly), and access to raw materials is crucial. ASEAN Plus Six strategic regional partners (India, China, Japan, South Korea, Australia, and New Zeeland) account for 52% of food exports.

As for supply variables, global competitiveness GCI for Indonesia is positive and significant suggesting that the more competitive the country becomes, the larger the exports. Within food, logistics tend to be more complex, offering larger potential with transportation and infrastructure (logistics) improvements. While exports of raw goods are more directed to developing countries, food has largest markets among more advance countries (nearly 40%).

The coefficient of GDP_i for Indonesia capturing local purchasing power or production capability is negative, perhaps signaling the increase in local demand (volume/prices) as income rises, with domestic market competing for exports.

Tariffs has a positive effect, opposite to the theory. Tariffs with some partners increased overtime. A possible explanation is that although tariffs increased, in products with low price elasticity increases in tariffs are often passed to consumers.

Prices captured by the CPI index are negative for both groups, suggesting that agricultural exports are price elastic as the change in volume is affected in a larger scale by the change in price. Agricultural raw goods have a significant negative effect of -1.027 suggesting that a 1% change in price could lead to a decrease of exports in 1%. Food by contrast has a coefficient of -1.527 signaling a much larger effect (1.5 times) on volumes over a change in prices. Nevertheless, agricultural raw goods are more expose to changes in prices, not always captured by the CPI indicators as commodities are not fully represented in the basket of goods. As indicated in the variable of exchange rate for agricultural goods, the coefficient is negative for raw goods and positive for food (opposite to CPI effects). A possible explanation is that raw goods have larger price elasticity reflected in substantial fluctuations in volume as a result of change in prices and variations in exchange rates [3,5]. Competition in commodities focuses in prices and less in differentiation. Food on the other hand has lower price elasticity (generally) suggesting that higher exchange rates (currency appreciation) leads to larger flows of good (price transfer to buyers not to producers.

Table 2 GMM System Estimation Results (Exports)

Variabel	Exports			Imports		
	Agricultural	Agr_Raw	Food	Agricultural	Agr_Raw	Food
Lag Export	0,549***	0,616***	0,690***	0,519***	0,869***	0,177***
GDP_i	-0,4766***	-0,865***	-0,213***	-0,585***	-2,269***	-2,052***
GDP_j	0,166***	0,122***	0,101***	0,072**	0,055***	0,111**
$Population_{ij}$	0,747***	1,204***	0,480***	0,847***	0,211***	2,094***
LPI_{ij}	1,751***	2,047***	1,166***	2,701***	0,476***	4,448***
HDI_{ij}	1,032***	5,199***	1,054***	2,891***	0,719	5,617***
$Distance_{ij}$	-0,399***	-0,219***	-0,394***	0,003	-0,079***	0,315*
$GCIi_i$	0,192***	6,452***	4,830***	0,442***	6,603***	9,456***
$GCIij_j$	-0,457**	0,309**	-0,407*	-0,016	1,832***	1,451*
$Tariff_{ij}$	0,347***	0,127**	0,534***	0,415***	0,327***	-0,319**
GII_{ij}	-0,456***	-1,396***	-0,316**	0,228	-0,328*	0,803*
GI_{ij}	-0,038***	0,149***	-0,028***	0,088***	-0,162***	0,072***
CPI_{ij}	-0,385***	-1,027***	-1,527***	-0,396***	-0,342***	-0,579
Exchange $Rate_{ij}$	0,829*	-0,025**	0,032***	-0,030**	-0,023*	-0,240***
FTA1	1,109***	1,713***	0,480**	0,452***	0,242***	1,046***
FTA2	0,393***	2,013***	0,765***	0,299***	0,229***	0,334**
Constant					44,573***	
AR (1)	0,235	0,039	0,194	0,034	0,008	0,019
AR (2)	0,503	0,129	0,352	0,899	0,852	0,118
Sargan Test	0,002	0,000	0,005	0,688	0,129	0,941
Hansen Test	0,284	0,563	0,644	0,746	0,653	0,981
Hansen Test (GMM)	0,071	0,178	0,165	0,387	0,196	0,896
Hansen Test (Diff GMM)	0,999	0,997	0,996	0,950	0,989	0,954
Hansen (IV)	0,038	0,207	0,347	0,767	0,305	0,938
Hansen (Diff IV)	0,990	0,988	0,937	0,495	0,980	0,917
Prob > F	0,000	0,000	0,000	0,862	0,000	0,000

Notes. Regression estimaton indicates ***, **, * significant level at 1%, 5%, 10%.

The FTA dummy variable capturing trade creation indicate a positive and significant value meaning that having an agreement has positively supported exports to FTA partners. Trade creation impacts through exports are nearly 4 times larger in agricultural raw goods than in food, meaning that having FTA deals supports more the exports of raw goods than food.

Nevertheless, the dummy variable capturing non-FTA partners (*FTA2*) increased in a larger extend than those for FTA partners (*FTA1*), indicating both trade creation with partners and trade expansion with non-FTA trade partners. From 2007 to 2017, agricultural exports shifted from 71% share of exports initially to non-FTA partners to only 34%. Share of exports to non-FTA (as a group) fell by 2,1% (CARG) while exports to FTA partners increase 363,8% (CARG). In value terms exports increase with both.

Determinants of Agricultural Imports

The coefficients for imports reflect first, that both demand and supply factors support the expansion of imports, meaning that the larger and the more sophisticated the Indonesian market, the larger the imports. Imports increase at a faster speed than exports likely as both domestic demand increased as a result of higher incomes and as a result of a relocation of factors in the agricultural sector, shifting to different crops.

The coefficient for lagged imports in raw agro goods is four times larger than that of food products, meaning dependency from previous partners is important. The variable GDP_i of the exporter is negative, possibly signaling a shift of imports to Indonesia formerly from developed countries to lower income nations, or signaling that the larger the GDP of exporters, the largest domestic demand (less exports). The market of Indonesia captured by GDP_j and $Population_j$ reflects that the larger and stronger the purchasing power of Indonesians, the larger the imports of goods, particularly from food. Improvements in logistics (LPI), human capital (HDI), and competitiveness in Indonesia (GCI) also supports larger imports. More sophisticated logistics in Indonesia supports not only larger exports from Indonesia to the World, but also larger imports. Nevertheless, the coefficients indicate that the role of CPI, LPI, and HDI on the exporters is more important than that on the importer.

Distance plays a negative effect in raw materials but a positive effect in food. As noted earlier, food logistics required more advanced systems and lower transport times. The largest imports of food come from advanced countries, located farther away, possibly explaining why the estimate for distance is positive within food products.

Tariffs play a positive effect within raw materials, and a negative effect in food. Raw materials may have lower elasticity, also reflected in CPI and exchange rate variables, when dependency from certain sources limit the possibility of substitution. Food by contrast have larger negative effects regarding tariffs, prices (CPI), and exchange rate, as increases may lead to higher prices and for instance, to lower demand for imports. Nevertheless, the effects of the thee variables although negative, they are inelastic as the coefficient is less than one. Tariffs or a weaker Rupia may discourage imports at some degree but effects of the tariffs or currency may be transfer to consumers at home (as demand for imports may likely continue).

The effects of the dummy FTA variables indicate a trade creation effect in imports, both from partners and non-partners. While imports from FTA partners increase, perhaps it has not resulted in substitutions of goods from other regions (non-FTA), and for instance Indonesia may not have achieved lower import prices as a result of FTA deals. Trade from Non-FTA partners continue to increase even though no-FTA deal was in place. The effects of trade creation of agricultural raw goods exports is larger than trade creation through imports. On the other hand, the effect of trade creation is larger through imports in food than that of exports, in line with [4]. As exports and imports in Indonesia are larger within food rather raw goods, it is possible that the liberalization of the last two decades have resulted in lower benefits for Indonesia.

Imports have expanded at a fastest speed than exports, trade is highly concentrated in specific commodities, and little substitution of cheaper goods from within the FTA partners seem to have occurred during the last decade.

V. Conclusion

This study estimates trade creation/diversion within agricultural exports from Indonesia, covering the period of 2007 to 2017 where a number of Free Trade Agreements were implemented. The study includes variables from the demand and supply side to capture determinants of exports and imports by implementing a Generalized Method of Movements System (GMM-SYS). Demand variables explain an important share of growth of exports, both captured by larger incomes (GDP), larger markets (population), and more sophistication (HDI, LPI, GCI). The results suggest that the large expansion of agricultural trade for Indonesia is supported by income and population growth. Distance plays a negative role, suggesting stronger possibilities to expand trade with regional partners than with extra-regional ones.

Prices and exchange rate play a role in trade; both raw goods and food are price elastic, suggesting that periods of price volatility, a collapse in agricultural prices, or exchange rate affect exports of agricultural goods; food is more affected by through prices changes, and raw goods through exchange rates and prices.

Supply factors are important to escalate exports, as LPI, HDI, and GCI are positively related with larger exports, suggesting the importance of infrastructure development, human capital, and more competitive sector for larger exports. Trade cost have negative effects (distance), however, higher sophistication in transportation and logistics seems to counterbalance the negative effects, suggesting a continued effort to improve logistic performance. Better transportation also supports larger imports of food, putting pressure on both domestic players and the balance of trade (at a lower extend than exports).

Liberalization of markets through FTA agreements supported trade creation with FTA partners, at a higher degree in raw materials than in food. Trade creation in imports is larger than that of exports within food, meaning that liberalization may have also brought larger competition at home, while not necessarily lower import prices. There is evidence of export expansion to non-FTA partners, even at a higher degree than with FTA members, meaning that the role play by demand may be larger than the effects of having FTA agreements in place.

In line with Baiardi et al., (2015), industrial and trade policy to support further processing in agricultural goods may allow Indonesia to lower substitutability in global markets, to be less expose to price fluctuations (less price elastic demand), to increase market power and to raise exports. Further processing, a shift towards price setter rather than price taker, requires increasing quality standards and more market orientation to successfully adapt goods to global markets and further specialize (differentiation).

REFERENCES

[1] Jongwanich J 2009 The impact of food safety standards on processed food exports from developing countries *Food Policy* **34,5** 447–457

[2] Athukorala P-C 2003 Jayasuriya S. Food Safety Issues Trade and WTO Rules: A Developing Country Perspective *The World Economy* **26,9** 1395–416.

[3] Baiardi D, Bianchi C, Lorenzini E. 2015 Food Competition in World Markets: Some Evidence from a Panel Data Analysis of Top Exporting Countries *Journal of Agricultural Economics* **66,2** 358–91

[4] Dai M, Yotov YV, Zylkin T 2014 On the trade-diversion effects of free trade agreements. Economics Letters **122,2** 321–5

[5] Serrano R, Pinilla V 2010 Causes of world trade growth in agricultural and food products, 1951–2000: a demand function approach *Applied Economics* **42,27** 503–18

[6] Urata S, Okabe M 2010 Trade creation and diversion effects of regional trade agreements on commodity trade. *Discussion papers.*

[7] Ghosh S, Yamarik 2004 Does trade creation measure up? A reexamination of the effects of regional trading arrangements *Economics letters* **82,2** 213–219

[8] Anderson JE, Yotov YV 2016 Terms of trade and global efficiency effects of free trade agreements, 1990–2002 *Journal of International Economics* **1,99** 279–98

[9] Kohl T, Brakman S, Garretsen H 2016 Do Trade Agreements Stimulate International Trade Differently? Evidence from 296 Trade Agreements *The World Economy* **39,1** 97–131.
[10] Urata S, Okabe M 2014 Trade Creation and Diversion Effects of Regional Trade Agreements: A Product-level Analysis The World Economy **37,2** 267–289
[11] Baier SL, Yotov YV, Zylkin T 2019 On the widely differing effects of free trade agreements: Lessons from twenty years of trade integration. Journal of International Economics. **1;116** 206–26
[12] Schaak H 2015 The Impact of Free Trade Agreements on International Agricultural Trade: A Gravity Application on the Dairy Product Trade and the ASEAN-China-FTA Perspektiven für die Agrar-und Ernährungswirtschaft nach der Liberalisierung **181**
[13] Korinek J, Melatos M 2016 Trade impacts of selected regional trade agreements in agriculture 2009 [cited 2016 Nov 24]; Available from: http://www.oecd-ilibrary.org/trade/trade-impacts-of-selected-regional-trade-agreements-in-agriculture_225010121752
[14] Szalanczi A, Trinh M 2017 Trade Creation and Trade Diversion Effects of ASEAN-Japan Comprehensive Economic Partnership (AJCEP)
[15] Yang S, Martinez-Zarzoso I 2015 A panel data analysis of trade creation and trade diversion effects: The case of ASEAN–China Free Trade Area. China Economic Review **29** 38–151.
[16] Bergstrand JH, Larch M, Yotov YV 2015 Economic integration agreements, border effects, and distance elasticities in the gravity equation. European Economic Review. 2015 Aug **1,78** 307–27
[17] Sasaki H 2015 International trade and industrialization with negative population growth. Macroeconomic *Dynamics* **19,08**1647–58.
[18] Bahmani-Oskooee M, Aftab M 2017 On the asymmetric effects of exchange rate volatility on trade flows: New evidence from US-Malaysia trade at the industry level *Economic Modelling* **63** 86–103
[19] Asteriou D, Masatci K, Pılbeam K 2016 Exchange rate volatility and international trade: International evidence from the MINT countries *Economic Modelling* **58** 133–140
[20] Pieters H, Swinnen J 2016 Trading-off volatility and distortions? Food policy during price spikes. Food Policy **1,61** 27–39
[21] Fugazza M, Maur J-C 2008 Non-tariff barriers in CGE models: How useful for policy? Journal of Policy Modeling **30,3** 475–90
[22] Saslavsky D, Shepherd B 2014 Facilitating international production networks: the role of trade logistics *The Journal of International Trade & Economic Development* **23,7** 979–999
[23] Gani A 2017 The Logistics Performance Effect in International Trade The Asian Journal of Shipping and Logistics **33,4** 279–288
[24] Disdier A-C, Head K 2008 The puzzling persistence of the distance effect on bilateral trade The Review of Economics and statistics **90,1** 37–48
[25] Kuncic A 2013 Trade and institutions: do not forget institutional distance
[26] Campi M, Dueñas M 2019 Intellectual property rights, trade agreements, and international trade. *Research Policy* **48,3** 531–45
[27] Llatja A 2015 Competitiveness and it's influence in the trade balance a study for the Western Balkan *European Scientific Journal, ESJ* **11,10**
[28] Cieślik A, Michalek J, Mycielski J 2016 Globalization, international trade, and human development: a case of Central and Eastern Europe *Czech J Soc Sci Bus Econ* **5,2** 6–15
[29] Mustafa G, Rizov M, Kernohan D 2017 Growth, human development, and trade: The Asian experience *Economic Modelling* **1** 93–101
[30] Baier SL, Bergstrand JH 2007 Do free trade agreements actually increase members' international trade? *Journal of international Economics* **71,1** 72–95
[31] Anderson JE, Van Wincoop E 2003 Gravity with gravitas: a solution to the border puzzle *American Economic Review* **93,1** 170–192
[32] Feenstra RC 2015 Advanced international trade: theory and evidence. *Princeton university press*
[33] Martinez-Zarzoso I, Felicitas N-LD, Horsewood N 2009 Are regional trading agreements beneficial?: Static and dynamic panel gravity models *The North American Journal of Economics and Finance* **20,1** 46–65
[34] Baltagi B 2008 Econometric analysis of panel data *John Wiley & Sons*
[35] Blundell R, Bond S 1998 Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* **87,1** 115–143
[36] Esquivias MA 2017 The Change of Comparative Advantage of Agricultural Activities in East Java Within the Context of Asean Economic Integration *AGRIS on-line Papers in Economics and Informatics* **9,1** 33–47