THE IMPACTS OF THE INDONESIA-INDIA FREE TRADE AGREEMENTS ON AGRICULTURAL SECTOR OF INDONESIA: A CGE ANALYSIS

Dampak Kerja Sama Perdagangan Bebas Indonesia-India terhadap Sektor Pertanian Indonesia: Analisis CGE

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Diterima: 3 Desember 2016 Direvisi: 5 Januari 2017 Disetujui terbit: 1 Maret 2017

ABSTRAK

India merupakan salah satu negara mitra utama Indonesia dalam perdagangan pertanian. Indonesia dan India kini sedang berunding tentang kerja sama perdagangan bebas bilateral (FTA). Penelitian ini bertujuan untuk mengevaluasi potensi dampak FTA Indonesia-India terhadap sektor pertanian dan perekonomian Indonesia secara keseluruhan. Penelitian menggunakan model Global Trade Analysis Project yang dikaitkan dengan model keseimbangan umum (CGE) Indonesia *the Enormous Regional* model menggunakan Tabel Input-Output 2005. Hasil penelitian menunjukkan bahwa implementasi FTA Indonesia-India dapat meningkatkan kesejahteraan kedua negara. Kenaikan kesejahteraan (PDB) India lebih besar dari pada Indonesia. Sebaliknya, surplus neraca perdagangan Indonesia lebih besar daripada India. Di sisi regional, PDB Sumatera dan Kalimantan meningkat, sedangkan PDB riil Sulawesi, Bali-NT, dan Papua-Maluku menurun. Dampak terhadap output tampak bervariasi antarsektor dan daerah. Ekspor sayuran dan buah, serta minyak nabati dan lemak menunjukkan peningkatan. Impor Indonesia untuk beberapa komoditas akan mengalami peningkatan dengan persentase yang berbeda. Tingkat kemiskinan di wilayah Sumatera, Kalimantan, Sulawesi, dan Bali-Nusa Tenggara diperkirakan akan menurun. FTA Indonesia-India layak untuk diwujudkan.

Kata kunci: *input-output, investasi, keseimbangan umum, perdagangan bebas, tarif*

ABSTRACT

India is one of the Indonesia's most important partners in agricultural trade. Indonesia and India are now negotiating bilateral free trade cooperation (FTA). This study aims to evaluate potential impacts of the Indonesia-India FTA on agricultural sector and the Indonesian economy as a whole. The study uses a Global Trade Analysis Project model that is associated with the regional Computable General Equilibrium (CGE) Indonesia the Enormous Regional model using the Indonesia Input-Output Table 2005. The results show that the implementation of the Indonesia-India FTA could improve welfare of both countries. The increase in welfare of India is higher than that of Indonesia. In contrast, Indonesia's trade balance surplus is larger than that of India. On regional side, real GDP of Sumatra and Kalimantan is predicted to increase, while real GDP of Sulawesi, Bali-NT, and Papua-Maluku to decrease. The output impacts vary across sectors and regions. Exports of vegetables and fruits, as well as vegetable oils and fats, are expected to increase. Indonesia's import for some commodities increase with different percentages. Poverty rates in Sumatra, Kalimantan, Sulawesi, and Bali-Nusa Tenggara regions are expected to decline. FTA Indonesia-India is feasible to be realized.

Keywords: *free trade, general equilibrium, input-output, investment, tariff*

INTRODUCTION

Export earnings are part of the sources of economic growth in Indonesia. Therefore, Government of Indonesia is always trying to increase trade performance by conducting a series of free trade agreements, such as bilateral, regional and multilateral (WTO). One of the FTA conducted by Indonesia is trade cooperation between Indonesia and India. This trade cooperation is done because India is ranked 11th as an export destination of Indonesian non-oil products. India with the second largest population in the world is one of the countries in Asia that still has a positive economic growth at a relatively high level when other countries experience negative growth.

The bilateral free trade agreement between India and Indonesia is a development of the trade agreement between ASEAN and India (ASEAN-India Free Trade Agreement/AIFTA). The bilateral free trade agreement between India and Indonesia began with the signing of the MoU in November 2005 within the framework of the Comprehensive Economic Cooperation Agreement (CECA). Joint Study Group stated that CECA offers the opportunity to increase non-oil exports of both countries (Soesastro 2009). Analysis using the Computable General Equilibrium (CGE) model shows that by 2020 Indonesia's exports to India are expected to reach US$9.7 billion while India's exports to Indonesia are estimated at US$7.8 billion.

India is a big emerging market for Indonesia. One of Indonesia's primary export commodities to India is palm oil, while India wants to export beef to Indonesia. The JSG further recommends each government to continue the CECA negotiations through the establishment of the Trade Negotiating Committee (TNC). This cooperation was also developed by forming two working groups, one is on trade investment and the other one is on trade facilitation and resolution, which aim to increase bilateral trade rate further.

The large Indian population and the mastery of information technology can be a potential market for Indonesian agricultural commodity exports in the future. In 2011, Indonesia's agricultural commodity exports to India stood at US$13.3 billion or increased by 34% compared to 2010 at US$9.9 billion. However, Indonesia's agricultural commodity export to India decreased to US$10 billion in 2016. In 2016, agricultural commodity export of Indonesia to India was accounted for 7% of Indonesia's total exports. Indonesia's export commodities to India have been dominated by industrial and mining products.

Four products that contributed the most to the export of Indonesian agricultural products include fats and oils products, rubber, coffee, and cocoa and derivative products. However, during 2014–2016, the export value of fats and oils products and rubber decreased by 4.01% and 9.27% per annum, respectively. The product that showed the greatest increase was preparations of vegetable products which increased by about 28.7%, from US$592 thousand in 2014 to US$1,231 thousand in 2016. Export of coffee also showed a relatively sharp increase of about 13.95% per annum, during 2014–2016 (TradeMap 2017).

Imports of agricultural commodities from India that showed an increase were cocoa, coffee and tea products, and skin and leather products with a growth rate of 49.04%, 11.69%, and 1.61% per annum, respectively. During the period 2014–2016, the import value of cereal from India drastically decreased by 240%, from US$423,626 thousand in 2014 to only US$16,741 thousand in 2016. In 2016, Indonesia has begun importing buffalo meat from India. It has passed the strict quarantine process in India. Also, the foot and mouth disease (FMD) free guarantee is granted directly by the Indian quarantine authority (TradeMap 2017).

By 2025, India-Indonesia bilateral economic cooperation shall blossom to reach a bilateral trade volume of US$50 billion and two-way investment of US$50 billion in the next nine years. Today India has become a center of growth in the Asian continent besides China. India is included in a group of five BRICS-Brazil, Russia, India, China, and South Africa countries whose economic growth is quite high, at about 8% in 2009 and 2010, higher than Indonesia's growth at 6% (Soesastro 2009).

With the enactment of the free trade between Indonesia and India, Indonesia will not only increase the export market potential for Indonesian agricultural commodities to India. At the same time, the threat from Indian agricultural commodities imports to Indonesian agricultural commodities also increases. Nevertheless, trade between Indonesia and India is very promising given that both have a large population, high economic growth, and high potential income per capita increase. This growth indicates that the increased consumption of the two countries will provide sustainability for the economic growth of both countries. Therefore, a review of potential implications of the Indonesia-India FTA on the agricultural sector in Indonesia is necessary to be an input for trade policymakers and for making systematic and useful planning to benefit from a free trade agreement between Indonesia and India.

RESEARCH METHOD

Analysis of the potential impacts of Indonesia-India FTA was undertaken by using the model of the Global Trade Analysis Project (GTAP), namely the General Equilibrium Economic model (Computable General Equilibrium/CGE) of many countries and many commodities. CGE models are one of the analytical approaches to calculate the economic impact in a country or region as a result of the monetary shock or policy change. CGE models' ability to link the macro and micro-

economic performance of an influence shock makes CGE models can be used as an information retrieval comprehensive policy (James 2007). Even some economists, like Ross (2011), Burfisher (2011), Dixon and Jorgenson (2012), and Manuel et al. (2012), classify CGE models as the analytical approach that sees the economy as a comprehensive system with components that are related to one another (industry, households, investors, governments, importers, and exporters).

As other CGE models, GTAP standard model also provides the specifications of the various theories and agent behavior explicitly in the form of a mathematical equation. The selection of the function relates to the three most important things: namely (i) the suitability of the theory, (ii) the empirical reality, and (iii) needs assessment. One functional form (referred to as nesting) frequently utilizes Cobb-Douglas functional form where the parameters which indicate the proportion of its components are kept. If the relative price of a commodity changes, hence its use, says for consumption will also experience changes to maintain the proportion of the nominal amount of by predetermined parameters (relative share).

GTAP model was processed using software RunGTAP. Aggregation process of sectors and countries/territories was carried out by utilizing GTAPAgg. The data processing by RunGTAP was done by adjusting the closure and shock in accordance with the purposes of the study. GTAP model will generate output as the solution file, changes in volume, and decomposition. The structure of GTAP model consists of production technology, producer choices, the structure of private and public final demand, the zero profit and market clearance equations (Rutherford 1998; Avinas and Norman 2002).

In the GTAP model there are two types of produced commodities, namely goods produced for domestic markets and goods produced for export. In the base GTAP model these goods are assumed to be imperfect substitutes produced as joint products with a constant elasticity of transformation. Specifically, if D_{ir} is domestic outputs and X_{ir} is exports, then

$$Y_{ir} = \left[\alpha_{ir}^{Y} D_{ir}^{1+1/\eta} + \beta_{ir}^{Y} X_{ir}^{1+1/\eta}\right]^{1/(1+1/\eta)}$$

where Y_{ir} is the activity level for good *i* in region *r*. Producers are competitive, implying that given a value of Y_{ir}, supplies to the domestic and export markets are given by

$$D_{ir} = Y_{ir}\ a_{ir}^{D}(p_{ir}^{D}, p_{ir}^{X})$$

$$X_{ir} = Y_{ir}\ a_{ir}^{X}(p_{ir}^{D}, p_{ir}^{X}).$$

Inputs to production include primary factors and intermediate inputs. Intermediate demands are proportional to the level of activities, so the total intermediate demand for good *i* in region *r* is

$$ID_{ir} = \sum_{j} Y_{jr} a_{ijr}.$$

In the core model we assume that all intermediate input coefficients (a_{ijr}) are fixed, unresponsive to price. Following Armington (1982) intermediate demand is represented as a composite of imported and domestic goods as imperfect substitutes. The demand equation is as follows:

$$ID_{ir} = \left[\alpha_{ir}^{I} DI_{ir}^{\rho} + \beta_{ir}^{I} MI_{ir}^{\rho}\right]^{1/\rho}$$

in which DI_{ir} is domestic intermediate and MI_{ir} is imported intermediate demand.

A Cobb-Douglas production function relates activity levels and factor inputs. Producers minimize unit cost given factor prices and applicable taxes. The factor demands solve

$$\min \sum_{f} p_{fr}^{F}(1 + t_{fir}^{F}) FD_{fir} \quad \text{s.t.} \quad \psi_{ir} \prod_{f} FD_{fir}^{\theta_{fir}} = Y_{ir}$$

taking Y_{ir} as given. Linear homogeneity of the production function implies that factor demands may be expressed as the product of an activity level and compensated demand function depending on factor prices and factor taxes:

$$FD_{fir} = Y_{ir}\ a_{fir}^{F}(p_{r}^{F}, t_{ir}^{F})$$

Public sector output is assumed to represent a Cobb-Douglas aggregation of market commodities:

$$G_r = \Gamma_r \prod_{i} GD_{ir}^{\theta_{ir}^{G}}$$

As is the case of intermediate demand, an Armington aggregation of domestic and imported inputs defines public sector demand:

$$GD_{ir} = \left[\alpha_{ir}^{G} DG_{ir}^{\rho} + \beta_{ir}^{G} MG_{ir}^{\rho}\right]^{1/\rho}$$

Public sector output is exogenous, however the composition of public sector inputs responds to relative prices, gross of applicable tax, hence:

$$GD_{ir} = \overline{G}_r\ a_{ir}^{G}(p_{ir}^{D}, p_{ir}^{M}, t_{ir}^{G})$$

A representative agent determines final demand in each region. These consumers are

endowed with primary factors, tax revenue, and an exogenously-specified net transfer from other regions. This income is allocated to investment, public demand and private demand. Investment and public output are exogenous while private demand is determined by utility maximizing behavior. The utility function is Cobb-Douglas:

$$U_r = \sum_i \theta_{ir}^C \log(CD_{ir})$$

As in the case of intermediate and public demand, an Armington aggregation of domestic and imported inputs defines each commodity is as follows:

$$CD_{ir} = \left[\alpha_{ir}^C DC_{ir}^\rho + \beta_{ir}^C MC_{ir}^\rho\right]^{1/\rho}$$

Aggregate final demand is then defined by regional expenditure and the unit price of aggregate of domestic and imported goods, gross of applicable tax:

$$CD_{ir} = \frac{\theta_{ir}^C \; M_r}{p_{ir}^C(1+t_{ir}^C)}$$

Regional expenditure (M_r) includes factor income, net capital flows and tax revenue, net of the cost of investment and public expenditure.

There are three types of imports in the model: imports to intermediate demand (MI_{ir}), imports to public sector demand (MG_{ir}) and imports to final consumer demand (MC_{ir}). The maintained assumption is that while the aggregate import share may differ between these three functions, each of these shares has the same regional composition within the import aggregate. A Constant Elasticity of Substitution (CES) aggregation across imports from different regions s forms the total import composite:

$$MI_{ir} + MG_{ir} + MC_{ir} = \left[\sum_s \alpha_{isr}^M M_{isr}^\rho\right]^{1/\rho}$$

Two tax margins and a transportation cost apply on bilateral trade in the model. Real transport costs are proportional to trade and these inputs are defined by a Cobb-Douglas aggregate of international transport inputs supplied by different countries:

$$T_{irs} = \tau_{irs} M_{irs}$$

$$\sum_{irs} T_{irs} = \psi_T \prod_{i,r} TD_{ir}^{\theta_{ir}^T}$$

International transportation margins are transportation services which are provided by perfectly competitive producers from different regions with an Armington aggregation across services from different countries and an elasticity of substitution equal to unity. The technology providing transportation services exhibits constant returns to scale, so we can specify a price p^T representing the unit cost of transportation on all commodity trade flows.

Bilateral trade flows are determined by cost-minimizing choice, given the fob export price from region r, p^X_{ir}, the export tax rate, t^X_{ir}, and the import tariff rate, t^M_{ir} , demand for bilateral imports as

$$M_{irs} = M_{is}\; a_{irs}^M(p_{ir'}^X, t_{ir's}^X, p^T, t_{ir's}^M)$$

Consumer expenditures for a representative agent are the sum of factor earnings and tax revenue, net the cost of investment, public sector output and net capital outflows:

$$\begin{array}{lll}
M_r = & \sum_f p_{fr}^F \; F_{fr} & \text{! factor income} \\
& + \sum_i t_{ir}^X \; (p_{ir}^D D_{ir} + p_{ir}^X X_{ir}) & \text{! indirect taxes} \\
& + \sum_{ij} t_{ijr}^{ID} \; p_{ir}^{ID} \; Y_{jr} \; a_{ijr} & \text{! taxes on intermediate goods} \\
& + \sum_{fi} t_{fir}^F \; p_{fr}^F \; FD_{fir} & \text{! factor tax revenue} \\
& + \sum_i t_{ir}^G \; p_{ir}^{GD} \; GD_{ir} & \text{! public tax revenue} \\
& + \sum_i t_{ir}^C \; p_{ir}^{CD} \; CD_{ir} & \text{! consumption tax revenue} \\
& + \sum_{is} t_{irs}^X \; p_{ir}^X \; M_{irs} & \text{! export tax revenue} \\
& + \sum_{is} t_{isr}^M \; (p_{is}^X \; M_{isr} \; (1 + t_{isr}^X) + p^T T_{isr}) & \text{! tariff revenue} \\
& - \sum_i p_{ir}^D I_{ir} & \text{! investment demand} \\
& - \sum_i p_{ir}^G \; (1 + t_{ir}^G) \; GD_{ir} & \text{! public sector demand} \\
& - p_n^C B_r & \text{! current account balance}
\end{array}$$

Capital flows in the base year are represented by B_r in this expression, and in a counterfactual equilibrium these are held fixed and denominated in terms of the numeraire price index, the consumer price level in region n.

In the market clearance conditions, domestic output equals demand for intermediate inputs to production, public sector use, final consumer demand plus domestic investment:

$$\begin{array}{lllll}
D_{ir} & = DI_{ir} & +DG_{ir} & +DC_{ir} & +I_{ir} \\
& = ID_{ir}\; a_{ir}^{D,I} & +GD_{ir}\; a_{ir}^{D,G} & +CD_{ir}\; a_{ir}^{D,C} & +I_{ir}
\end{array}$$

where $a^{D,I}$, $a^{D,G}$, and $a^{D,C}$ represent the compensated demands for domestic inputs by submarket, each of which are functions of p^D_{ir} and p^M_{ir}.

Aggregate supply of imports, defined by the Armington aggregation across imports from different regions must equal aggregate import demand for intermediate, public and private consumption:

$$\begin{array}{lllll}
M_{ir} & = MI_{ir} & +MG_{ir} & +MC_{ir} & \\
& = ID_{ir}\; a_{ir}^{M,I} & +GD_{ir}\; a_{ir}^{M,G} & +CD_{ir}\; a_{ir}^{M,C} &
\end{array}$$

in which $a^{M,I}$, $a^{M,G}$, and $a^{M,C}$ represent compensated demands for imported inputs by submarket, each functions of p^{D}_{ir} and p^{M}_{ir}.

Export supplies equals import demands across all trading partners plus demands for international transport:

$$\begin{aligned} X_{ir} &= \sum_s M_{irs} &+TD_{ir} \\ &= \sum_s M_{is} a^{M}_{irs} &+T\ a^{T}_{ir} \end{aligned}$$

In the second equation a^{M}_{irs} represents the unit demand for region r output per unit of region *s* aggregate imports.

The model includes supply-demand conditions for the Armington composite goods entering intermediate demand, public and private demand, as has already been specified above in the equations defining *IDir*, *GDir*, and *CDir*. Primary factor (labor, capital, land, resource) endowment equals primary factor demand:

$$F_{fr} = \sum_i Y_{ir}\ a^{F}_{fir}$$

Competitive producers operating constant-returns technology earn zero profit in equilibrium. For the GTAP producer, the value of output to the firm equals the value of sales in the domestic and export markets net of applicable indirect taxes. Costs of production include factor inputs (taxed at rate t^{F}) and intermediate inputs (taxed at rate t^{ID}):

$$(p^{D}_{ir}\ a^{D}_{ir} + p^{X}_{ir}\ a^{X}_{ir})(1 - t^{Y}_{ir}) = \sum_f a^{F}_{fir} p^{F}_{fr}(1 + t^{F}_{fir}) + \sum_j a_{jir} p^{ID}_{jr}(1 + t^{ID}_{jir})$$

Zero profit conditions apply to trade activities as well as production. In equilibrium, the value of imports at the domestic cif price, therefore equals the fob price gross of export tax, the transportation margin, and the applicable tariff:

$$p^{M}_{ir} = \sum_s a^{M}_{irs} \left[p^{X}_{is}(1 + t^{X}_{isr}) + \tau_{irs} p^{T}\right](1 + t^{M}_{isr})$$

Armington aggregation functions transform domestic and imported goods into composite goods for intermediate demand, public sector demand and private demand. Zero profit for these activities provides the following equilibrium identities:

$$p^{I}_{ir} = c(p^{D}_{ir}, p^{M}_{ir}, \alpha^{I}_{ir}, \beta^{I}_{ir})$$

$$p^{G}_{ir} = c(p^{D}_{ir}, p^{M}_{ir}, \alpha^{G}_{ir}, \beta^{G}_{ir})$$

$$p^{C}_{ir} = c(p^{D}_{ir}, p^{M}_{ir}, \alpha^{C}_{ir}, \beta^{C}_{ir})$$

The unit cost function defined by the constant-elasticity-of-substitution aggregate of domestic and imported input of production.

$$\begin{aligned} c(p^{D}, p^{M}, \alpha, \beta) &\equiv \min_{D,M} \quad p^{D}D + p^{M}M \quad \text{s.t.} \quad (\alpha D^{\rho} + \beta M^{\rho})^{1/\rho} = 1 \\ &= \left(\alpha^{\sigma} p_{D}^{1-\sigma} + \beta^{\sigma} p_{M}^{1-\sigma}\right)^{1/1-\sigma} \end{aligned}$$

In general, closures used in the simulation are following the standard GTAP closures as follows: (1) variables are the price and quantity of a commodity that can be traded across countries and are not included in the category of endowment commodities, placed as endogenous variables; (2) revenue per region is endogenous; and (3) policy variables, productivity (technical changes), and the population were placed as exogenous variables. In simulating the predicted impact of Indonesia-India FTA, it is assumed that Indonesia and India liberalize trade by removing import tariffs for agricultural products. The simulation results from the GTAP model are further used as inputs for CGE inter-regional model or designated as an Indonesia the Enormous Regional model (IndoTerm model). It is the model of a Computable General Equilibrium (CGE) inter-regional that models specifically provinces in Indonesia. This is done to obtain a comprehensive picture of the influence of Indonesia-India FTA up to the regional level.

IndoTerm model is the development of the Orani-G model (single country), whose structure consists of a system of equations that describe, among others, the demand for labor, production factors, intermediate inputs, investment goods, household demand, export demand and final demand, demand margin, the sales price, market equilibrium, indirect tax, GDP on the revenue side and expenditure, balance of trade, the return on capital, and the accumulation of capital and investment (Horridge 2003). The equations in the Orani-G model are presented in Annex 1. The equations were solved by utilizing software packages GEMPACK (General Equilibrium Modeling Package) version 11.2 in 2012.

The Indoterm model approach is bottom-up in which the optimization is completed on a particular level of the provinces then being aggregated to the national level, using the aggregate functions Constant Elasticity of Substitution (CES) and the Leontief function. This bottom-up approach allows the prices and quantities vary independently between regions. This disaggregation means that variations in the price and quantity of each area can be calculated by using this model. The model is accompanied by several closures, namely (1) technical change variables; (2) tax rate variables; (3) domestic supply factors (labor, land, and capital); (4) the foreign price; (5) the exchange rate, which is the

numeraire, the price relative to the price of goods that is not absolute; and (6) household subsistence expenses.

Data utilized in this study are secondary data. The primary data is GTAP database version 8 published by the Centre for Global Trade Analysis, Purdue University in 2012. The GTAP data are data that covers the Input-Output Table individual countries and trade flows between countries with various commodities, consisting of 129 countries and 57 sectors. For this study, data were aggregated into three countries/ regions and ten commodities because this study was concentrated on the analysis of the impact of the implementation of Indonesia-India FTA, particularly in the agricultural sector.

The aggregations of countries are as follows: (1) Indonesia, (2) India, and (3) the rest of the world. Out of ten commodities being aggregated, there are six commodities related to agriculture: grain crops, vegetables and fruit, vegetable oils and fats, sugar, animal production and animal products, and other agriculture products. Furthermore, the database utilized in the IndoTerm model is Input-Output Indonesia in 2005, which is aggregated to 175 sectors into 10 sectors, such as economic sectors contained in the GTAP database (Annex 2).

The scenario analyzed is lowering import tariffs Indonesia and India to 0% for all commodities traded between Indonesia and India. In other words, the total liberalization of the trade is done bilaterally between Indonesia and India. Meanwhile, tariffs on imports from other countries to India and Indonesia or not changed. The analysis results of the GTAP model are then used for inter-regional CGE model (IndoTerm model) to evaluate the influence of Indonesia-India FTA more detail up to the province/region in Indonesia.

RESULTS AND DISCUSSION

India Trade Policy

The role of India in the global food agricultural trade is more dominant than before the 1990s. Until the 1990s agricultural trade is formally regulated by high tariffs and nontariff, such as quantitative restrictions and channeled through public trading agencies. Indian agricultural export policy has liberalized most since 1994. Reforms do with the reduction of products controlled by the parastatal, the reduction of export quotas, and the elimination of the minimum export price.

India's agricultural policy has three main objectives, namely food security, self-sufficiency, and income support for farmers. In other words, India's agricultural policy is to protect domestic producers from foreign competition and consumers from price fluctuations in the domestic and global market for staple foods, such as wheat, rice, and vegetable oils. To achieve this goal, India relies on several policy instruments such as (1) protection of the minimum price; (2) food subsidies for consumers; (3) market control; (4) input subsidies for producers; and (4) trade policy (Cameron 2008). The Indian government explicitly uses tariffs and nontariff (NT) to deal with these objectives. The contradiction between the desire to raise food prices for the benefit of farmers and the desire to lower prices for the benefit of consumers led the Indian government to conduct a large-scale intervention in the agricultural sector with multiple policy instruments. Extensive government intervention in the agricultural sector to respond to the current challenges contributed to the low level of agricultural exports from Indonesia.

Indian farmers are a politically influential voting block that has a significant impact on domestic and international trade policy. Indian agricultural policy supports to promote domestic production at the expense of imports. These policies include input support program, output price support program, and farmers' income program. Input supports are focused on fertilizer, irrigation water, electricity, and diesel fuel. Support output prices are mainly composed of minimum support price for certain staple crops. The program increased incomes, lower borrowing costs for farmers, and increased wages for farm workers.

India's tariff policy concentrated on supporting India's domestic agricultural policy. The high import duties of agricultural products are major obstacles for Indonesia's agricultural exports to India. Average bound tariff of India is the highest among all WTO members with an average of 114%. India’s bound tariff is the highest tariff rate in the world and is higher than the majority of developing countries, such as Brazil (36%) and China (16%) (USITC 2009). Whereas, tariff applied for agricultural products ranging from 10% to 150% and mostly based on the ad-valorem tariff. India imposes high import duties by the policy objective of India to protect domestic farmers from outside competition as well as to protect consumers from world price fluctuations, especially on commodities such as wheat, rice, and vegetable oils (especially CPO).

The product group with a highest average bound rates and tariff applied is a set of products

that are considered sensitive by the Indian government. The average applied tariff rates have decreased significantly from 113% in 1991, before the liberalization of the Indian economy, to about 34% in 2007. However, India remains one of the countries that apply the highest tariffs in the world.

A wide gap between bound and applied tariff rates for numerous agricultural products allows the Indian government to modify tariff rates in response to domestic and international market conditions substantially. This gap creates uncertainty for Indonesian agricultural exporters. The Indian government is often changing tariffs on commodities that are traded in the global market. If farm prices in the country increase, the tariff level is lowered to create pressure on the prices to minimize the impact on consumers. As prices fall, import tariff is raised to protect farmers by increasing the cost of imports.

The policy of free trade cooperation between Indonesia and India within the framework of the FTA is still a part of the policy of cooperation between ASEAN and India (AIFTA = ASEAN-India Free Trade Agreement) in 2010. Bilateral free trade cooperation between India and Indonesia was initiated by a signing of the MoU in November 2005 within the framework of the Comprehensive Economic Cooperation Agreement (CECA), then followed by bilateral talks between the governments of India and Indonesia in January 2011 in the II-CECA forum in New Delhi. CECA covers trade in goods, services, and investment. Both countries consider expanding the India-ASEAN (Association of Southeast Asian Nations) trade agreement.

Within the framework of the ASEAN-India FTA/AIFTA, it is stipulated that the tariff rate is applicable equally, enter the quota levels, and must obey the two following rules. *First*, in the case of member states of ASEAN (which are WTO members as of 1 July 2007) and India, referring to the level of individual tariff in force since July 1, 2007, except for products which have been identified as particular products in the schedule commitment. *Second*, in the case of member states of ASEAN (which is not a member of WTO since July 1, 2007), referring to the tariff rate applicable to India since July 1, 2007, except for products which have been identified as specific products (Francis 2011).

In addition, India set specific policies (import tariff of 0%) for some Indonesian export products in India. The products can be categorized into two groups, namely (1) agricultural products which include live animals, meat, cashews, fishery products, milk, butter, eggs, animal products, live trees and cut flowers, vegetables, fruits, coffee, tea, spices, seeds, resin, rubber, fats and vegetable oils, meat and fish products, sugar and confectionery, and chocolate; and (2) industrial products, which consist of agricultural and chemicals products, pharmaceutical products, fertilizers, tannic and dye materials, photographic products, plastic and plastic products, rubber and rubber products, leather and leather products, wood and wood products, straw and wicker products, paper and paper products, textiles and textile products, ceramics and glass, iron and metals, tooling and machinery, automobile parts and components, electronics and electronic products, furniture, artwork, and a variety of miscellaneous manufactured articles.

In 2013, the government of India was less consistently running trade policies that have been adopted with protectionist measures that could hinder the export of crude palm oil or crude palm oil (CPO) from Indonesia to India. Protection policy was carried out by setting a new base price for CPO imports of US$802 per ton. The policy made the price of CPO imports was much higher. This protection was held because the Indian government sought to protect domestic seed oil farmers from cheapening import price of palm oil from Southeast Asia. The Government of India has been established for basic CPO a reference price of US$447 per ton that has not changed since 2006. However, the Indian government then lifted a freeze on the policy that has been continued for six years in January 2013. This policy is an attempt to suppress the rate of imports of vegetable oils, including CPO, from Indonesia and Malaysia.

Indian policy that does not maintain to this commitment is detrimental to farmers and traders of palm oil in Indonesia. It is required a strong action from the Government of Indonesia in establishing policies and monitoring the implementation of policies that have been set. At the same time, Indonesia is also faced with the new policy of Malaysia and India. Malaysian policy that will affect Indonesia's CPO exports is the determination of the CPO export tax of 0% since February 2013 and Indian policy that would charge CPO import admission by 2.5%. Implementation of both policies will affect Indonesia’s export of CPO. This policy can be explained by the fact that Malaysia, as an Indonesia’s competitor country, can sell CPO at a price lower than the price before February 2013. In addition, the application of import duty by India will reduce the demand for imports which could mean also reduce Indonesia's CPO exports. Thus, CPO faces competition for lower prices in Malaysia and high prices in the Indian market

because of the tariff or the entry fee. Being more flexible and anticipatory will help Indonesia's CPO exports continue to grow as long as this oil into the mainstay of domestic commodity exports and India is major markets of Indonesian CPO exports. At this time, the consumption of vegetable oils in India reached about 19 million tons/year. In 2012, India imported about 7.7 million tons of palm oil, of which 6.1 million was in the form of CPO and the remainder was palm olein. Approximately 2.6 million tons of CPO India's total imports was from Malaysia, and the rest was brought from Indonesia. Therefore, it is necessary to implement anticipatory action so that Indonesian CPO exports continued to increase.

India's non-tariff trade policy focused on aspects of the Sanitary and Phyto-sanitary (SPS) as it has been released as the Trade Policy Review (WTO 2015). The Indian govern-ment establishes a body that regulates food safety for imported products. This policy was implemented in 2010. Agricultural commodities and derivatives imported products have to be certified free of pests and diseases of protection body of the Indian government import-export. Particularly for CPO from Indonesia, the Indian government established that the content of beta-carotene should reach 20%. When the content of beta-carotene is less than these figures, the CPO is not acceptable to India. At the beginning of 2013, the Indian government issued a policy to lower the selling price of rubber in the local market. This policy is made to reduce imports of rubber into the country that the trend is likely to increase over time.

Other non-tariff barriers are minimum prices setting, import restrictions, import licenses, and some safeguards measures. Besides, the lack of transparency of the trade policy of India is also an obstacle for Indonesian exporters. Exporters often have difficulties in customs valuation, tariffs, internal taxes, trade remedies, and inconsistent procedures.

FTA Impacts

The impact of a total liberalization of the bilateral trade between Indonesia and India towards macroeconomic variables is shown in Table 1. GTAP model simulation results indicate that the impact of Indonesia-India FTA will improve the welfare of Indonesia and India as much as US$375.67 million and US$ 1,671.01 million, respectively. Similarly, Indonesia's real GDP is expected to increase by 0.01% due to an increase in Indonesia's trade balance of about US$ 165.13 million, while India obtains a surplus of US$4.89 million. Table 1 also describes that terms of trade of Indonesia increased by 0.29%, whereas India experienced a decline in trade of around 0.08%. Different results will be achieved if there is full liberalization of all ASEAN members. Percentage change in the value of India's GDP is estimated to decrease by -1.07%. On the contrary, Indonesia's GDP is expected to increase by 1.08% (Sikdar and Biswajit 2011). Indonesia-India FTA will also affect the economy of other countries (rest of the world/ROW). Welfare and trade balance of ROW experienced negative changes, amounting to US$136.64 million and US$170.02 million, respectively. Meanwhile, GDP, export value, import value, and terms of trade are unchanged.

The finding is in line with the overall macro numerous studies that have concluded that free trade has some positive implications for the countries involved. Besides enhancing the quality of life, it also increases the quantity and efficiency of world trade (Sherlock and Reuvid 2004; Bleischwitz et al. 2011). However, there is no doubt that trade cooperation will also incre-ase competition among members (Anderson et al. 2009). However, if it is addressed wisely, the benefits that can be obtained include the growth in specialization and trade itself. Each country can focus on the production of goods that have comparative advantages so that there will be a reallocation of production factors efficiently. In the end, it will create a balance between lower prices and more output to provide greater prosperity to the countries involved.

Table 1. Potential impact of Indonesia-India FTA on national macroeconomic performance

No.	Variable	Indonesia	India	Row
1.	Welfare (million US$)	375.67	1,671.01	-136.64
2.	Trade balance (million US$)	165.13	4.89	-170.02
3.	GDP (%)	0.01	0.15	0.00
4.	Export value (% change)	0.63	0.57	0.00
5.	Import value (% change)	0.60	0.45	0.00
6.	Term of trade (%)	0.29	-0.08	0.00

Impact of Indonesia-India FTA on output changes can be seen in Table 2. Indonesia-India FTA is not in a position to increase output in all economic sectors. In Indonesia, for example, sectors that experienced an increase in output are vegetables and fruit, vegetable oils and fats, while other sectors experienced a decrease in output. By contrast, in India, almost all sectors except vegetable oil and fats experienced an increase in outputs. The sugar sector in India shows the largest increase at 0.56%. The different situation happened in ROW, where there was no increase in output. Even some sectors of the economy suffered a decline in output.

Although the impact of Indonesia-India FTA is not always able to increase the output of various sectors of the economy, the influence may affect the price of the output of various sectors of the economy (Table 3). The direct impact of the implementation of Indonesia-India FTA will increase the prices of all sectors in Indonesia. This price increase detects a decrease of supply of all commodities, along with the increase in the demand for these commodities. The case is different with India, where most of the sectors indicate a price decline. Meanwhile, in ROW, grain crops, vegetables, and fruits experience a price decline, whereas there is no change for other commodities.

Impact of Indonesia-India FTA on the export performance of all sectors in Indonesia and India presented in Table 4. The table suggests that almost all sectors in Indonesia, except vegetables and fruit and vegetable oils and fats, experience a decrease in some exports. This decrease is because the output of the sector is not competitive or has no advantage. In addition, the decline in exports can also be resulted from the inability of domestic production to satisfy the requirements of importing countries, in terms of quality, innovation, and technology.

Unlike Indonesia, almost all commodities of the agricultural sector in India increase in the volume of exports, in which the largest percentage change is demonstrated by the vegetable oil and fats sector by 17.52%. On the

Table 2. Impact of Indonesia-India FTA on output of economic sector

No.	Sector	Indonesia	India	ROW
1.	Grains	-0.47	0.19	0.00
2.	Vegetables and fruit	0.08	0.13	-0.01
3.	Vegetable oils and fats	6.86	-8.84	-0.31
4.	Sugar	-1.74	0.56	-0.04
5.	Animal products	-0.63	0.19	0.00
6.	Other agricultural	-0.49	0.25	0.00
7.	Manufacturing	-0.55	0.12	0.00
8.	Oil and gas	-0.22	0.05	0.00
9.	Mining	-0.37	0.09	0.00
10.	Other sectors	-0.02	0.08	0.00

Table 3. Impact of Indonesia-India FTA on the output prices

No.	Sector	Indonesia	India	ROW
1.	Grains	0.92	-0.17	-0.01
2.	Vegetables and fruit	1.31	-0.35	-0.01
3.	Vegetable oils and fats	1.45	-2.04	-0.02
4.	Sugar	0.39	-0.09	0.00
5.	Animal products	0.46	-0.31	0.00
6.	Other agricultural	0.28	-0.15	0.00
7.	Manufacturing	0.16	-0.02	0.00
8.	Oil and gas	0.03	0.01	0.00
9.	Mining	0.19	-0.02	0.00
10.	Other sectors	0.26	-0.01	0.00

Table 4. Impact of Indonesia-India FTA on total exports

No.	Sector	Indonesia	India	ROW
1.	Grains	-5.15	0.95	0.03
2.	Vegetables and fruit	9.88	1.14	-0.03
3.	Vegetable oils and fats	16.1	17.52	-1.01
4.	Sugar	-1.74	6.33	-0.27
5.	Animal products	-2.95	2.44	0
6.	Other agricultural	-1.06	1.58	0
7.	Manufacturing	-0.81	0.37	0
8.	Oil and gas	-0.25	-0.02	0.01
9.	Mining	-0.41	0.31	0.01
10.	Other sectors	-0.98	0.05	0.01

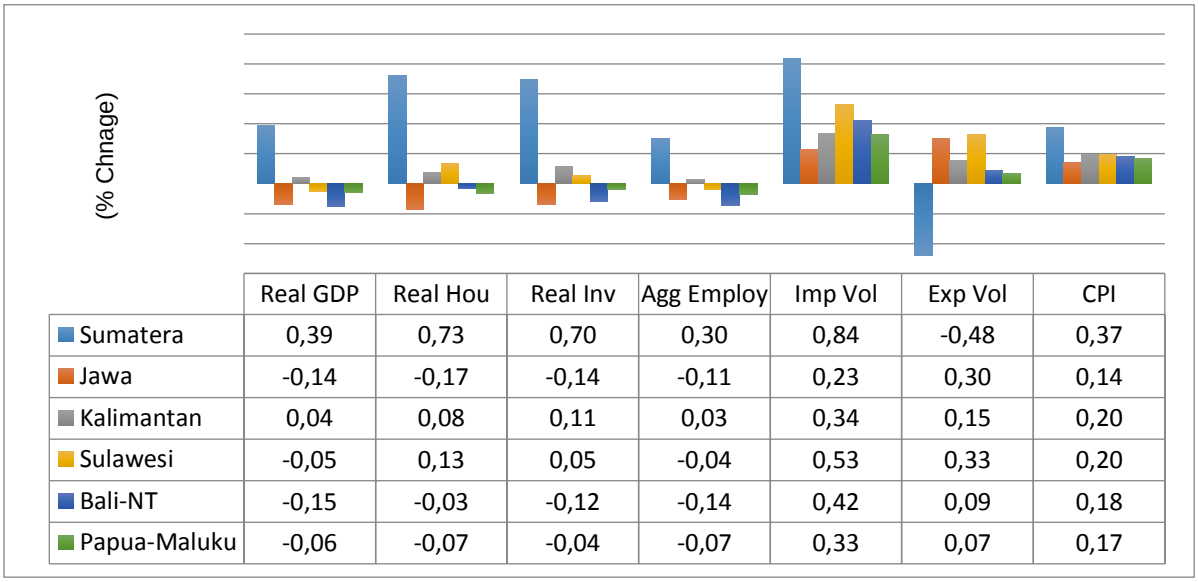
other hand, ROW experiences a decline in the export of vegetables and fruit, vegetable oils and fats, and sugar sectors. Implementation of Indonesia-India FTA also encourages an increase in some imports as shown in Table 5. Almost all sectors of the economy in Indonesia, except oil and gas sector, experience an increase in imports with different percentages. The largest increase in imports occurred in vegetable oil and fat sector, followed by the fruit and vegetable sector. The percentage increase of imports of vegetable oils and fats is estimated to be about 14.24%. On the other hand, the smallest increase percentage of imports is experienced by manufacturing sector, namely by 0.25%. In India, some sectors show an increase in import volume, namely grain, vegetables oils and fats by about 33.03%, mining by about 0.19%, and vegetables and fruit by about 0.83%.

Import growth is dominated by imported products for consumption. Moreover, the increase in import volume of some sectors in Indonesia and India happens because they are required as raw materials of some consumer goods and some export products industries. The increase in demand for consumer goods is mainly due to the population and income growth, which finally would enhance the volume of imports.

Implementation of Indonesia-India FTA could also affect the regional level. Simulation results of linking GTAP model and IndoTerm model illustrate its impacts on the regional macro-economics, as shown in Figure 1. Percentage change of Indonesia's GDP is estimated at about 0,006%. The percentage increase in real GDP will also occur in Sumatera by 0.39% and Kalimantan by about 0.04%. This increase is presumably because a lot of primary products (oil sector) in Sumatera and Kalimantan are directly exported towards India. Therefore, the impact of Indonesia-India FTA will mainly increase the market access of some of the leading commodities in the region. These conditions contributed to investment increase in Sumatera by 0.70% and Kalimantan by 1.11%. As a result, aggregated employment also grew by 0.3% in Sumatera region and by 0.03% in Kalimantan region.

Table 5. Impact of Indonesia-India FTA on total imports (%)

No.	Sector	Indonesia	India	ROW
1.	Grains	2.01	-0.29	0.01
2.	Vegetables and fruit	2.26	0.83	0.00
3.	Vegetable oils and fats	14.24	33.03	-0.16
4.	Sugar	2.01	-0.08	0.00
5.	Animal products	1.40	-0.13	0.00
6.	Other agricultural	0.74	-0.01	0.00
7.	Manufacturing	0.25	0.08	0.00
8.	Oil and gas	-0.05	0.06	0.00
9.	Mining	0.45	0.19	0.00
10.	Other sectors	0.43	0.08	0.00



	Real GDP	Real Hou	Real Inv	Agg Employ	Imp Vol	Exp Vol	CPI
Sumatera	0,39	0,73	0,70	0,30	0,84	-0,48	0,37
Jawa	-0,14	-0,17	-0,14	-0,11	0,23	0,30	0,14
Kalimantan	0,04	0,08	0,11	0,03	0,34	0,15	0,20
Sulawesi	-0,05	0,13	0,05	-0,04	0,53	0,33	0,20
Bali-NT	-0,15	-0,03	-0,12	-0,14	0,42	0,09	0,18
Papua-Maluku	-0,06	-0,07	-0,04	-0,07	0,33	0,07	0,17

Figure 1. Impact of the implementation of Indonesia-India FTA on the regional macroeconomic

On the other hand, Java, Sulawesi, Bali-NT, and Papua-Maluku will experience a decrease in real GDP by -0.14%, -0.05%, -0.15%, and 0.06%, respectively. These decreases could happen because investments fall in areas such as Java, Bali-NT, and Papua-Maluku. Even though Sulawesi experiences an increase in investment by 0.05%, but its aggregate employment is estimated to decrease by 0.045%, resulting in a decline in real GDP. The decline in real GDP in the region is also partly resulted from an increase in the value of the Consumer Price Index (CPI).

Implementation of Indonesia-India FTA also offers a varied impact on output in each region. Only vegetable oils and fats sector that experiences an increase in output ranging from 4.27% (Papua-Maluku) to 9.65% (Sumatera), while the output of other sectors is estimated to decline (Table 6). On the other hand, sugar sector indicates the largest percentage decrease in all region ranging from -0.5% (Java) to -2.92% (Sumatera). Other agricultural sectors in Sumatera show a growth rate of 0.37%.

The decline in agricultural output in some regions of Indonesia is associated with the decline in agricultural commodity prices. This price decrease relates to the fall of the regional economy due to global economic pressures. In addition, Indonesia also consists of many provinces. Each of which would have a distinct comparative characteristic. Therefore, the influence of the implementation of Indonesia-India FTA on the agricultural output will have a different intensity and is heavily dependent on the conditions and characteristics of each region.

The agricultural output will relate to the number of employment in the sector. The increase in total use of labor in vegetable oils and fats sector represents an implication of an

Table 6. Impact of Indonesia-India FTA on regional output

No.	Sector	Sumatera	Java	Kalimantan	Sulawesi	Bali-NT	Papua-Maluku
1.	Grains	-0.77	-0.46	-0.96	-0.8	-0.63	-0.32
2.	Vegetables and fruit	-0.15	-0.21	-0.31	-0.22	-0.12	-0.19
3.	Vegetable oils and fats	9.65	7.74	10.64	7.99	4.4	4.27
4.	Sugar	-2.92	-0.5	-2.51	-1.85	-0.81	-1.85
5.	Animal products	-0.33	-0.38	-0.4	-0.35	-0.35	-0.23
6.	Other agricultural	-1.3	-1.21	-0.99	-1.17	-1.14	-0.53
7.	Manufacturing	-1.04	-0.22	-0.11	-0.85	-0.71	-0.44
8.	Oil and gas	-0.53	0.02	-0.01	-0.05	0	0.01
9.	Mining	-0.12	-0.02	-0.02	-0.06	-0.04	-0.04
10.	Other sectors	0.37	-0.17	-0.11	-0.05	-0.1	-0.08

increase in output of vegetable oils and fats sector. The percentage change of total labor use in vegetable oils and fats sector is ranging from 4.33% (Papua-Maluku) to 10.74% (Kalimantan). On the other hand, the largest decline in labor utilization is in the sugar sector, ranging from -0.65% to -3.07% (Table 7).

The analysis of regional poverty level carried out by using a formulation of the poverty incidence and poverty line in urban and rural areas is determined based on the standard of capability poverty measure (CPM) in 2008, amounting to Rp204,896 and Rp161,831 per capita per month, respectively. Meanwhile, the head-count index values are aggregated into six regions before simulation, namely Sumatera (17.21%), Java (16.06%), Kalimantan (10.92), Sulawesi (16.84), Bali-NT (21.25), and Papua-Maluku (33.29%). These figures represent the proportion of the population below the poverty line to the total population.

Figure 2 and Table 8 indicate the impact of the Indonesia-India FTA on the percentage of poor people at the national level (0.05%). Sumatera, Kalimantan, Sulawesi, and Bali-Nusa Tenggara will enjoy a negative rate of poverty changes. That indicates a decrease in the poverty level. Sumatera and Kalimantan are estimated experiencing the biggest decline in poverty level by 0.31% and 0.11%, respectively. This decline in poverty occurs because the implementation of the Indonesia-India FTA would improve the market efficiency and thus have a positive effect on economic growth, which in turn reduces the level of poverty. By contrast, Java and Papua-Maluku experience an increase in the level of poverty. This increase is presumably because income levels in Java and Papua-Maluku are very responsive (elastic) to changes in economic conditions after the Indonesia-India FTA is applied.

Table 7. Impact of Indonesia-India FTA on total use of labor

No.	Sector	Sumatera	Java	Kalimantan	Sulawesi	Bali-NT	Papua-Maluku
1.	Grains	-0.79	-0.47	-0.98	-0.81	-0.64	-0.33
2.	Vegetables and fruit	-0.16	-0.22	-0.32	-0.23	-0.12	-0.19
3.	Vegetable oils and fats	9.47	7.67	10.74	8.08	4.51	4.33
4.	Sugar	-3.07	-0.64	-2.65	-1.96	-0.95	-1.99
5.	Animal products	-0.58	-0.55	-0.66	-0.60	-0.52	-0.47
6.	Other agricultural	-1.53	-1.30	-1.27	-1.30	-1.19	-0.72
7.	Manufacturing	-1.39	-0.21	-0.26	-0.89	-0.69	-0.48
8.	Oil and gas	-0.73	0.02	-0.06	-0.06	0.00	0.01
9.	Mining	-0.21	-0.03	-0.03	-0.09	-0.05	-0.06
10.	Other sectors	0.18	-0.11	-0.11	-0.03	-0.05	-0.04

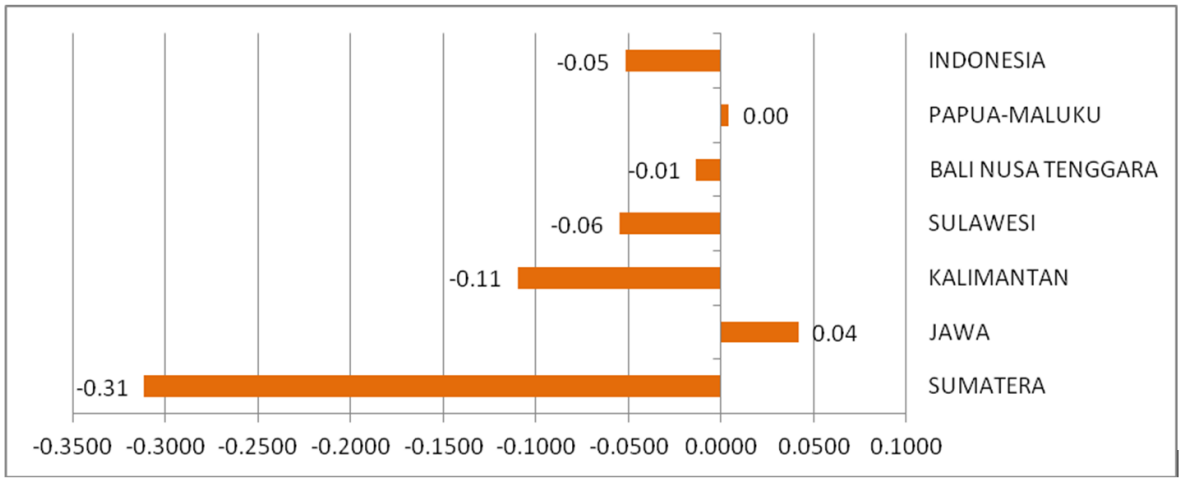


Figure 2. Impact of Indonesia-India FTA on changes in poverty level by region (%)

Table 8. Impact of Indonesia-India FTA on poverty by province in Indonesia

Province	Poverty level (%)	Province	Poverty level (%)
SUMATERA	-0.31	Central Kalimantan	-0.16
Nanggroe Aceh Darussalam	-0.18	South Kalimantan	0.00
North Sumatera	-0.49	East Kalimantan	0.06
West Sumatera	-0.05	SULAWESI	-0.06
Riau	-0.12	North Sulawesi	-0.07
Jambi	-0.20	Gorontalo	-0.02
South Sumatera	-0.62	Central Sulawesi	-0.13
Bangka Belitung	-0.18	South Sulawesi	-0.06
Bengkulu	-0.19	Southeast Sulawesi	0.07
Lampung	-0.19	BALI NUSA TENGGARA	-0.01
JAVA	0.04	Bali	0.03
DKI	0.05	West Nusa Tenggara	0.05
West Java	0.04	East Nusa Tenggara	-0.11
Banten	0.06	EAST INDONESIA	0.00
Central Java	0.03	Maluku	-0.01
DIY	0.07	North Maluku	-0.14
East Java	0.04	Papua	0.06
KALIMANTAN	-0.11	INDONESIA	-0.05
West Kalimantan	-0.29		

CONCLUSION AND POLICY IMPLICATIONS

The FTA is a promotion beneficial to both countries in terms of welfare gains. Indonesia's welfare gain appears to be positive due to increasing trade balance and terms of trade. However, India's welfare grows bigger than that of Indonesia due to an increase of trade balance and GDP, while the negative terms of trade are explained by a larger fall in India's output prices.

The country's welfare improves as liberalization expands and the markets open up substantially. Indonesia gains the broader market accesses of vegetables and fruits and vegetable oils and fats products in India. However, these products would be available at higher prices compared with prices before trade liberalization. This gain is possible only when Indonesia can use the better quality of imported intermediary goods. Indonesia needs to invest in technology with a proper redistribution of the factors of production to achieve a benefit through the Indonesia-India FTA.

Within Indonesia, the FTA impacts vary by region. The regions which show the percentage increase of GDP includes Sumatera and Kalimantan due to increases in investment and aggregate employment. The increase in GDP reduces poverty level in Sumatera and Kalimantan by -0.31% and -0.11%, respectively.

Overall, the bilateral FTA of Indonesia-India would benefit both countries, so it is advisable to be realized. Potential opportunities and negative impacts by region need to be further studied to prepare anticipatory steps.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the reviewers for their valuable comments on this manuscript and the editors who have provided many useful and constructive suggestions. Acknowledgements are also conveyed to the Ministry of Trade which helps provide valuable data and information for the analysis of this paper.

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Annex 1. Orani-G model

Identifier	Description	Equation	Number
	Commodity and factor demands		
(1.1)	Domestic commodities for domestic use	$d = f_d (z, c, p_1, p_2, q_d)$	n
(1.2)	Imported commodities	$m = f_m (z, c, p_1, p_2, q_m)$	n
(1.3)	Export demand	$e = f_e(p_1^*, q_e)$	n
(1.4)	Demands for primary factor	$l = f_l (z, p_3, q_l)$	k
(1.5)	Commodity supplies pricing [a]	$y = f_y (z, p_1, q_y)$	n
(1.6)	in production	$v(p_1, q_y)=w(p_1, p_2, p_3, q_w)$	h
(1.7)	in exporting	$p_1 = p_1^*s$	n
(1.8)	in importing	$p2 = p_2^*t$	n
	Market clearing		
(1.9)	for commodities	$d + e = y$	n
(1.10)	for primary factors	$l = l^*$	k
	Other equations		
(1.11)	Balance of trade	$b = (p_1^*)e-(p_2^*)m$	1
(1.12)	CPI	$= f (p_1, p_2)$	1
(1.13)	Wage indexation	$p_3 = f_{p3} (, q_{p3})$	k
Total		7n +h+3k+2	

Source: Dixon et al. (1982); Note: [a] denotes diagonal matrix

Variable	Description	Number
D	Demands for domestically produced commodity	n
Z	Activity levels for each industry	h
C	Aggregate real absorption	1
P_1	Local prices of domestic commodities	n
P_2	Local prices of imported commodities	n
M	Demand for imported commodities	n
E	Exports	n
P_1*	Foreign currency price for exports	n
P_2*	Foreign currency price for imports	n
L	Demands for primary factors	k
P_3	Prices for primary factors	k
Y	Commodities output levels	n
	Exchange rate (Rp/US$)	1
T	One plus ad valorem rates of protection	n
S	One plus ad valorem rates of export subsidy	n
L*	Factor employment levels	k
B	Balance of trade	1
	Consumer price index	1
Q_{P3}	Shift terms factor price equations	k
Total		10n+h+4k+4
Q_D, Q_M, Q_E, Q_L Q_Y, Q_V, Q_W	Large number of variables designed to assist in the simulation of exogenous changes in technology, export demands, household preferences and indirect taxes	

Source: Dixon et al. (1982)

Annex 2. Sector of economy in GTAP model

No.	Aggregated sector	Commodity
1.	Grains	Paddy rice, wheat, cereal grains nec
2.	Vegetables and fruit	Vegetables, fruit
3.	vegetable oils and fats	Oil seeds, vegetable oils and fats
4.	Sugar	Sugar cane, sugar beet, sugar
5.	Animal production and animal products	Cattle, sheep, goats, horses, animal products nec, raw milk, meat: cattle, sheep, goats, horse, meat products nec, dairy products, leather products
6.	Other agricultural	Plant-based fibers, crops nec, wool, silk-worm cocoons, forestry, fishing, food products nec, beverages and tobacco products, paper products, rubber
7.	Manufacturing	Textiles, wearing apparel, motor vehicles and parts, transport nec, electronic equipment, machinery and equipment nec, manufactures nec, electricity
8.	Oil and gas	Oil, gas, petroleum, coal products, gas manufacture, distribution
9.	Mining	Coal, minerals nec, mineral products nec, ferrous metals, metals nec metal products
10.	Other sectors	Water, construction, trade, transport nec, sea transport, air transport, communication, financial services nec, insurance, business services nec, recreation and other services, pubadmin/defence/health/educat, dwellings