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# TRADE LIBERALIZATION AND ITS EFFECTS ON SUGAR TABLE INDUSTRY, WELFARE, AND ECONOMY: A CASE OF INDONESIA

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***ABSTRACT:***

*This paper examines the effects of trade liberalization on the sugar industry, the consumer welfare, and the whole economy in Indonesia using a computable general equilibrium model based on 2008 Indonesia Input-Output Table. The common argument concerning the effects of trade liberalization is that consumers benefit from trade liberalization while domestic industries suffer from that. However, this paper found that both the consumers and the domestic industries suffer from trade liberalization scenario. The smaller the tariff rate, even if the subsidy rate was applied, the lower the welfare and the utility. The more decrease in the consumer's welfare and in the utility would be suffered when the trade liberalization scenario was financed by increasing the production tax rate or the income rate. Finally, when the tariff rate was increased and assumed that the government consumption would adjust, the consumer's welfare, the utility and the overall producer's income would increase. Even though, the domestic producer in the sugarcane and sugar refinery industry would suffer. Finally, manufacturing sector seems has the highest benefit from trade liberalization while in the agriculture sector is estimated has a minor outcome*.

**Key Words:** *Trade Liberalization, Computable General Equilibrium (CGE), Sugar, Welfare, Utility*

**ABSTRAK:**

Makalah ini membahas dampak liberalisasi perdagangan terhadap industri gula, kesejahteraan konsumen, dan keseluruhan ekonomi di Indonesia dengan menggunakan *computable general equilibrium model* yang dihitung berdasarkan Tabel Input-Output Indonesia tahun 2008. Perdebatan umum mengenai efek dari liberalisasi perdagangan adalah bahwa konsumen mendapat manfaat dari liberalisasi perdagangan sementara industri dalam negeri menderita dari perdagangan bebas. Namun, dari hasil penelitian ini, peneliti menemukan bahwa konsumen dan industri domestik, sama-sama menderita dari skenario liberalisasi perdagangan. Semakin kecil tingkat tarif, meskipun dengan pemberian subsidi oleh pemerintah, maka semakin rendah tingkat kesejahteraan konsumen dan utilitas. Penurunan kesejahteraan konsumen dan utilitas yang lebih besar akan diderita ketika skenario liberalisasi perdagangan dibiayai dengan menaikkan tarif pajak produksi atau tarif pajak penghasilan. Akhirnya, ketika tingkat tarif meningkat dan diasumsikan bahwa konsumsi pemerintah akan disesuaikan, kesejahteraan konsumen, utilitas dan pendapatan produsen secara keseluruhan akan meningkat. Meski demikian, produsen dalam negeri di industri tebu dan gula rafinasi akan menderita. Akhirnya, sektor manufaktur diperkirakan mendapat manfaat tertinggi dari liberalisasi perdagangan, sedangkan di sektor pertanian, diperkirakan mendapat manfaat yang rendah.

**Kata kunci:** Liberalisasi Perdagangan, *Computable General Equilibrium (CGE)* Gula, Kesejahteraan, Utilitas

## 1. Background

This paper studies the effects of free trade policy to the sugar refinery industry in Indonesia on the sugar industry by using a computable general equilibrium (CGE) model. This model uses the 2008 Indonesian Input-Output Table. In addition, this study also analyzes the consequences of the policy to the consumer welfare and the Indonesian economy as a whole.

Historically, the sugar industry is one of the eldest and the most important estate crop industry in Indonesia. Indonesia experienced a golden age of the sugar industry in the 1930s, which operated 179 sugar refinery factories with the productivity level of 14.8%. Indonesia also experienced a peak production level of 3 million tons and exported 2.4 million tons (Sudana et al., 2000). The current Indonesian sugar refinery industry, however, only operates 60 productive factories which 43 factories are operated by the state-own company and 17 factories are operated by the private company. The plantation area of sugarcane, the raw material of sugar, was approximately 341.057 hectare in 1999 which most of them located on East Java, Central Java, Lampung and South Sulawesi Province of Indonesia.

Starting from the early 2000s, the Indonesian sugar industry faced some serious problems. One of them was indicated by the sugar import volume which was continuously increased, from only 194,000 tons in 1986 to 1.348 million tons in 2004. In other words, the import volume grew by 11.4% annually. This was caused by the 1.2% annual growth of the Indonesian sugar consumption, while the Indonesian sugar production decreased by 1.8% per year. Another significant problem was the continued decrease in the international price of sugar. This price decrease was suspected comes from the fact that sugar market is the second most distortive market after the rice market. Almost all of the main sugar producer and consumer countries apply a very strong intervention on the sugar industry and on the sugar trading, such as imposing more than 50% tariff rate on the sugar import. Price support policy and export subsidy policy are other types of intervention on the sugar market performed by the United States and European Countries (Groombridge, 2001).

There are several reasons why the Indonesian sugar industry must be protected from the adverse effects of the massive import volume. First, off all, there are approximately 1.4 million farmers and labors involved either in the sugarcane plantation or in the sugar mill factory. Secondly, the sugar industry possesses a huge value asset, around Rp. 50 trillion. The third reason, for Indonesian people, sugar is an essential necessity which has significant effect on inflation in Indonesia. Eventually, the sugar import activity induces a huge amount of government expenditure, around US$ 200 million annually (Sudana et al., 2000).

This paper quantitatively examines the effects of trade liberalization of the sugar refinery industry in Indonesia on the sugar industry, the consumer welfare, and the aggregate economy, by using a computable general equilibrium (CGE) model. The latest Indonesian Input-Output Table for the year 2008 is used to get simulation results which are closed to the reality.

There are some interesting results found in this paper. Firstly, by using trade liberalization scenario, the consumer's welfare and the utility decreases. The smaller the tariff rate, even if the subsidy rate is applied, the lower the welfare and the utility. When the lower government revenue caused by the decrease in the tariff rate is satisfied by the decrease in the

government consumption, the lower tariff rates will reduce the consumers' welfare. The lower government consumption will be responded by a decrease in the production of the all another sector since the government only consumes on that sector. This decrease will lower the income of the all other sector and the overall income since this sector contributes more than 99% of the total production. The larger decrease in the consumers' welfare and in the utility would be suffered when the trade liberalization scenario was financed by increasing other government policy instruments. The most overwhelming outcomes for the economy would be incurred when the production tax rate was modified in such way to satisfy the decrease in the government revenue. In this scenario, the utility and the domestic producers' income would diminish the most. Other interesting results are found when the income tax is used to finance the lower government budget. In this scenario, the consumers suffer while the domestic producers benefit from the trade liberalization. This result is opposites to the common argument that consumers will benefit while producers will suffer from trade liberalization. Finally, when the tariff rate was increased and assumed that the government consumption would adjust, the consumers' welfare, the utility and the overall producer's income would increase. Even though, the domestic producer in the sugarcane and sugar refinery industry would suffer.

## 2. Literature Review

There are several studies concerning the effects of trade liberalization on economy. F.G. Adams (1995) studied the macroeconomic effects of ASEAN Free Trade Area (AFTA) with a linked CGE system. In addition, Vanzetti et al., (2005) examined the effects of Indonesia pursuing alternative trade policy path using a general equilibrium model.

In terms of the effects of trade liberalization on the sugar industry, there are some related studies. A study conducted by Susila and Sinaga (2005) showed that under heavily distorted international market of sugar, policies directly related to farm gate price are more effective in affecting some aspects of Indonesia sugar industry. Sugarcane smallholders, in general, are more responsive toward government policies, compared to state-owned estates and private estates. The policy implication of this study is that to create a fairer playing ground, Indonesia sugar industry still needs some government support policies. Provence price, tariff-rate quota, import tariff, input subsidy, are policies that can be used to achieve the goal.

Another study done by the Economic Research Service (ERS) of USDA (1997) quantitatively analyzed the effects of the trade liberalization agreements negotiated under the Uruguay Round on sugar production, consumption, trade, and prices of the major sugar exporting and importing countries using a Computable General Equilibrium (CGE) framework. This study concluded that the Uruguay Round will enlarge global trade, and social welfare would increase in all countries, except China. The developing countries will obtain a relatively high benefit. In addition, the demand for sugar will increase through the trade liberalization. Moreover, Thailand will experience better terms of trade, while the terms of trade of other ASEAN countries, including Indonesia, will get worse.

This paper, particularly, elaborates the effects of trade liberalization of the Indonesian sugar industry using a CGE framework. Furthermore, this paper divides the Indonesian economy into 3 sectors which two of them are closely related, the sugarcane industry and the sugar refinery industry. This division is performed because the sugarcane industry is the supplier of the main raw material (cane) for the sugar refinery industry.

## 3. Data and Model Specification

### 3.1. Data

The major data used in this paper are the Indonesian Input-Output Table (I-O Table) and the Indonesian Social Accounting Matrix (SAM) for the year 2008. This is the latest I-O Table produced by the BPS-Statistics Indonesia. Based on that I-O Table, I constructed the Indonesian SAM. The original Indonesia I-O Table 2008 contains 66 sectors. However, I disaggregated the table into 3 sectors, sugar cane sector (sector no.8), sugar refinery sector (sector no. 31), and all another sector (sector no. 1-7, 9-30, and 32-66). The annual report of the year 2008 of Directorate General of Taxation of Indonesian Ministry of Finance is used to get the amount of tax paid by households to the government.

SAM is a thorough, comprehensive, consistent, disaggregated, complete, and economy-wide data framework, representing the economy of a nation (Lofgren et al., 2002 and Kehoe, 1996). SAM presents some valuable information's such as the relationship among sectors in the economy, how income is distributed among groups in the economy, and the relationship between domestic and foreign economy. Shortly, SAM is a square matrix with rows and columns. It explains flows among activities during the production process, factor markets, and institutions. The payment flows are illustrated from the account of its column to the account of its row. On the other hand, the receipt flows are demonstrated from the account of its row to the account of its column.

Table 1 shows the SAM table used in this paper. The model contains three productions sectors, sugar cane sector, sugar refinery sector and all another sector. The three sectors produce goods or services using principal factors, labor and capital, and intermediate inputs which are both domestically produced and imported.

### 3.2. General Equilibrium Model

A general equilibrium model is a model in which all markets clear in equilibrium (Shoven and Whalley, 1984). This is the main difference between general equilibrium model and partial equilibrium model, a model which merely takes into account one market with related variables as endogenous variables and assumes that all other variables are given. Though the modern concept of general equilibrium had been developed in the 1950s, however, it was no more than a theoretical concept until the 1970s. In 1967, Herbert Scarf firstly developed Applied General Equilibrium (AGE) Model which was implemented by John Shoven and John Whalley later in 1972 and 1973. Due to its inability to offer an accurate solution and its expensive computation, AGE model was replaced by Computable General Equilibrium (CGE) model in the mid-1980s. The characteristic of the equilibrium in the general equilibrium model is the existence of prices and production levels in each industry which equalizes market demand to its supply for all commodities.

The CGE model contains several simultaneous equations which most of them are nonlinear. The equations explain the behavior of each agent and its constraint

which has to be satisfied. The constraints consist of markets and macroeconomics constraint.

### 3.3. Model Specifications

This paper heavily adopts the computable general equilibrium model constructed by Mohiuddin and Kato (2009). This is a conventional static model which does not consider any explicit time dimension. By using this general equilibrium framework, the latest Indonesian I-O table is incorporated to make the analysis close to the real Indonesian economy. In this paper, there are three agents assumed, households, government, and firms. The behavior of production decision is driven by the maximization of profit while the behavior of consumption decisions is motivated by the maximization of utility. Another important assumption is full competitive economy; which demand is equal to supply. It means that the endowment of primary factors by the households will be entirely absorbed by the firms. On the other hand, the output produced by the firms will be completely consumed by the household.

#### 3.3.1. Households

Households are assumed to be homogenous, and their utility is given by :

$$U(X_1X_2X_3) = \prod_{i=1}^{3} X_i^{\alpha i},$$

where $X_i$ denotes consumption of good i. $\sum_{i=1}^{3} \alpha_i = 1$ is assumed. $i$ denotes each sector, and $i$=1 is the sugarcane sector, $i$=2 is the sugar refinery sector, and $i$=3 is all another sector. The parameter value of each $\alpha_i$ is determined by using the actual social accounting matrix, which is given in Table 3.

It is assumed that households decide their levels of commodities consumptions, in order to maximize the utility, subject to their income constraint. This assumption yields:

$$\sum_{i=0}^{n} P_i X_i = I\,(1 - r^I) - S^I$$

where $P_i$ and $I$ denote the price of good $i$ and income, respectively. $r^I$ is the proportional income tax rate, and it is calculated by using the actual social accounting matrix. Not only to spend on consumption, the households' income may be used to pay tax to the government and to save. Moreover, it is assumed that they save a relatively constant amount, sI, of their disposable income which is exogenously given. By denoting $S^I$ as the amount of savings, $S^I$ is assumed to be given by:

$$S^I = s^I(1 - r^I)I$$

The value of $s^I$ has been calculated by using the actual social accounting matrix. Additionally, the households earn their income from their endowment of labor and capital factor such that:

$$I = r\bar{K} + w\bar{L},$$

where $r$ and $w$ denote the rental cost and the wage rate, respectively. $\bar{K}$ and $\bar{L}$ are endowments of capital and labor, respectively. Note that the amount of r $\bar{K}$ and w$\bar{L}$ are both obtained from the actual social accounting matrix.

The first order condition yields the demand functions such that:

$$X_i = X_i\,(P_i, Y; \alpha_i) = \frac{\alpha_i\, I(1 - r^I)(1 - s^I)}{P_i}, i = 1,2,3$$

note that $\alpha_i$ can be calculated by using the demand function and the actual social accounting matrix so that:

$$\alpha_i = \frac{P_i X_i}{I(1-r^I)(1-s^I)}$$
$$= \frac{P_i X_i}{(r\bar{K} + w\bar{L})(1-r^I)(1-s^I)}, i = 1,2,3$$

where both the values of the denominator and the nominator can be obtained from the actual social accounting matrix.

### 3.3.2. Firms

There are 4 steps carried out by firms to produce final consumption goods. Each step involves one or more decision making over diverse options. First of all, each firm produces composite goods, $Y_i$, using capital and labor. Each firm is assumed to maximize its profit given by:

$$\pi_i = P_i^Y Y_i(K_i, L_i) - rK_i - wL_i,$$

where $Y_i$ and $P_i^Y$ denote the composite goods produced by firm *i* and its price, respectively. $K_i$ and $L_i$ denote capital and labor used by firm *i* in order to produce its composite goods, respectively. The production technology is given by:

$$Y_i(K_i, L_i) = K_i^{\beta_{K,i}} L_i^{\beta_{L,i}}, i = 1,2,3$$

where $\beta_{K,I} + \beta_{L,I} = 1$ is assumed for all *i=1,2,3*. Each firm is assumed to maximize its profit with respect to labor and capital subject to the production technology function, and the first order conditions yield the demand functions such that :

$$K_i = K_i\left(P_i^Y, r, w; \beta_{K,i}, \beta_{L,i}\right) = \frac{\beta_{K,i}}{r} P_i^Y Y_i,$$
$$L_i = L_i\left(P_i^Y, r, w; \beta_{K,i}, \beta_{L,i}\right) = \frac{\beta_{L,i}}{r} P_i^Y Y_i, i = 1,2,3$$

note that $\beta_{K,I}$ and $\beta_{L,I}$ can be calculated by using above equations and the actual social accounting matrix so that :

$$\beta_{K,i} = \frac{rK_i}{P_i^Y Y_i},$$

$$\beta_{L,i} = \frac{wL_i}{P_i^Y Y_i}, i = 1,2,3$$

where $rK_i$, wLi, and $P_i^Y Y_i$ can be obtained from the actual social accounting matrix.

Secondly, by using its own composite goods, $Y_i$, and its intermediate goods, $X_{i,j,}$ it is assumed that each firm produces its domestic goods, $Z_i$. $X_{i,j}$ denotes the final consumption goods produced by firm j used by firm I as intermediate goods for its production. In order to maximize its profit, each firm produces domestic goods in such way that:

$$\max_{Y_i, X_{i,j}} \pi_i = P_i^z Z_i - (P_i^Y Y_i - \sum_j^3 P_j^x X_{i,j})$$
$$s.t. \quad Z_i = \min\left(\frac{X_{i,j}}{ax_{i,j}}, \frac{Y_i}{ay_i}\right), \qquad i = 1,2,3$$

where $X_{i,j}$, and $P_j^x$ denote intermediate good *j* used by firm *i* and its price, respectively. $P_i^z$ is the price of $Z_i$. $ax_{i,j}$ denotes the amount of intermediate good *j* used for producing one unit of a domestic good of firm *i* , and ay*i* denotes the amount of its own composite good for producing one unit of its domestic good. Note that the production function at this step is assumed to be the Leontief type. Using $ax_{is,j}$, and ay*i*, and assuming that the market is fully competitive, the zero-profit condition can be written by:

$$P_i^z = P_i^Y\, ay_i - \sum_j^3 P_j^x ax_{i,j}\,, \quad i = 1,2,3$$

After finishing the production of its domestic goods, $Z_i$, each firm is furthermore assumed to make an optimal decision about the decomposition of its domestic goods into exported goods, $E_i$, and final domestic goods, $D_i$.

Each firm is assumed to maximize its profit such that:

$$\pi_i = P_i^e E_i + P_i^d D_i - \left(1 + \tau_i^p\right) P_i^z Z_i,$$

where $P_i^e$ and $P_i^d$ denote the price when the domestic goods are sold abroad, and the price when the domestic goods are sold domestically, respectively. Note that $P_i^e$ is measured in the domestic currency. $\tau_i^p$ is the tax rate of a production tax imposed on the production of *Zi*, and it is calculated by using the actual social accounting matrix. The decomposition is assumed to follow the Cobb-Douglas technology such that:

$$Z_i = E_i^{K_i^e} D_i^{K_i^d}, i = 1,2,3$$

where $K_i^e + K_i^d = 1(i=1,2,3)$ is assumed. Each firm is assumed to maximize its profit with respect to $E_i$ and $D_i$ subject to $Z_i$, and the first order conditions yield:

$$E_i = E_i\left(P_i^e, P_i^d, P_i^z; \tau_i^p, K_i^e, K_i^d\right) = \frac{K_i^e(1+\tau_i^p)P_i^z Z_i}{P_i^e},$$

$$D_i = D_i\left(P_i^e, P_i^d, P_i^z; \tau_i^p, K_i^e, K_i^d\right) = \frac{K_i^d(1+\tau_i^p)P_i^z Z_i}{P_i^e}, i = 1,2,3$$

Note that $K_i^e$ and $K_i^d$ can be calculated by using $E_i$ and $D_i$ the actual social accounting matrix so that:

$$K_i^e = \frac{P_i^e E_i}{(1+\tau_i^p)P_i^z Z_i},$$

$$K_i^d = \frac{P_i^d D_i}{(1+\tau_i^p)P_i^z Z_i}, i = 1,2,3$$

where $P_i^e E_i$, $P_i^d D_i$, $P_i^z Z_i$, and $\tau_i^p P_i^z Z_i$ can be obtained from the actual social accounting matrix.

Eventually, it is assumed that each firm produces its final consumption goods, $Q_i$, by using its final domestic goods, $D_i$, and imported goods, $M_i$. In this step, each firm has to reach an optimal decision on how much each firm uses imported goods, $M_i$, and its final domestic goods, $D_i$, to produce its final consumption goods, $Q_i$, which are consumed by domestic households.

Assuming that the production technology to produce final consumption goods is Cobb-Douglas, then:

$$Q_i = M_i^{\gamma_i^m} D_i^{\gamma_i^d}, i = 1,2,3$$

where $\gamma_i^m + \gamma_i^d = 1$ ($i$=1,2,3) is assumed. Each firm is assumed to maximize its profit with respect to $M_i$ and $D_i$ subject $Q_i$. Its profit is given by:

$$\pi_i = P_i^Q Q_i - (1+\tau_i^m)P_i^m M_i - P_i^d D_i,$$

$$i = 1,2,3$$

where $P_i^Q$ and $\tau_i^m$ denote the price of its final consumption goods, $Q_i$ and the import tariff rate, respectively. The import tariff rate is calculated by using the actual social accounting matrix. Then, the first order conditions yield:

$$M_i = M_i\left(P_i^m, P_i^d, P_i^Q; \tau_i^m, \gamma_i^m, \gamma_i^d\right) = \frac{\gamma_i^m P_i^Q Q_i}{(1+\tau_i^m)P_i^m},$$

$$D_i = D_i\left(P_i^m, P_i^d, P_i^Q; \tau_i^m, \gamma_i^m, \square_i^d\right) = \frac{\gamma_i^d P_i^Q Q_i}{P_i^d}, i = 1,2,3$$

Note that $\gamma_i^m$ and $\gamma_i^d$ can be calculated by using $M_i$ and $D_i$, and the actual social accounting matrix so that:

$$\gamma_i^m = \frac{(1+\tau_i^m)P_i^m M_i}{P_i^Q Q_i},$$

In short, to determine all prices endogenously in each related market, all market clearing condition must be reached. Moreover, it is assumed that each firm

maximizes its profit by deciding the optimal amount of variables at each activity.

### 3.3.3. Government

The revenue of the government comes from taxes collected from other agents. This revenue is used to consume commodities and make savings. The government decides its revenue and consumption to satisfy its budget constraint which is given by:

$$\sum_{i=1}^{3} P_i^Q X_i^Q + S^g = T^I + T^p + T^m,$$

where the left-hand side is the total government expenditure, and the right-hand side is the total government revenue. $X_i^Q$ and $S^g$ denote government consumption of final consumption good $i$ and government savings, respectively. The total government revenue, or the total tax revenue is given by:

$$T^I = \tau^I I = \tau^I (r\bar{K} + w\bar{L}),$$

$$T^p = \sum_{j}^{3} \tau_i^p (P_i^z Z_i),$$

$$T^m = \sum_{j}^{3} \tau_i^m (P_i^m M_i),$$

where $T^I$, $T^p$, and $T^m$ denote the total income tax revenue, the total production tax revenue, and the total import tariff revenue, respectively. The government is assumed to save the constant amount relative to the total amount of tax revenue, and the government savings are assumed to be given by :

$$S^g = s^g (T^I + T^p + T^m),$$

where the constant ratio, $s^g$, is given exogenously, and its value has been calculated by using the actual SAM.

### 3.4. Equilibrium Condition

This paper assumes 2-factor markets and 3 goods markets exist in the economy. The factor market consists of labor market and capital market, while the goods market consists of sugar cane market, sugar refinery market, and all another market. The equilibrium condition of each factor market is given by:

$$\bar{K} = \sum_{i=1}^{3} K_i,$$

$$\bar{L} = \sum_{i=1}^{3} L_i$$

In terms of the market clearing condition of good $i$ ($i$=1,2,3), a private investment sector is introduced in order to close the economy in this paper. Denoting the amount of good $i$ consumed by the private investment sector by $X_i^s$, the market clearing condition of good $i$ is given by:

$$Q_i = X_i + X_i^g + X_i^s + \sum_{j}^{3} X_{i,j,}\ i = 1,2,3,$$

where the left-hand side is the total supply, and the right-hand side is the total demand for good $i$. Note that the budget constraint of the private investment sector is given by:

$$\sum_{i=1}^{3} P_i^Q X_i^s = S^I + S^g + S^f$$

where the left-hand side is the total amount of its consumption, and the right-hand side is the total amount of its income. $S^f$ denotes

the total amount of savings by the foreign sector, or the deficits in the current account, and it is exogenously given as the difference between the number of exports and the number of imports in the actual social accounting matrix. Moreover, the foreign trade balance is given by:

$$\sum_{i=1}^{3} P_i^{w,e} E_i + S^f = \sum_{i=1}^{3} P_i^{w,m} M_i,$$

where $P_i^{w,e}$, and $P_i^{w,m}$ denote the world price of export goods, and import goods of good *i* measured in the foreign currency, respectively. $P_i^{w,e}$ and $P_i^{w,m}$ are assumed to be given exogenously. $P_i^{w,e}$, and $P_i^{w,m}$ can also be expressed in $P_i^e$ and $P_i^m$ , which are export and import price of good *i* measured in the domestic currency, respectively, such that:

$$P_i^e = \varepsilon P_i^{w,e},,$$

$$P_{\square}^m = \varepsilon P_i^{w,m}, \qquad i = 1,2,3$$

where $\varepsilon$ denotes the exchange rate. Since the world prices are assumed as exogenously given, then the exchange rate is endogenously determined within the model.

## 4. Result and Discussion

### 4.1. Calibration

As explained in the previous section, the Indonesian economy is assumed in a full competition which requires that demand equals supply. In this assumption, their factors endowments are completely taken up by firms. Moreover, households maximize their utility and have the Cobb-Douglas function of preferences. On the other hand, firms produce outputs which are entirely absorbed by households.

In a CGE modeling, the construction of the benchmark is very crucial. To carry out a realistic simulation, a fine benchmark which can illustrate the Indonesian economy is needed. To have a reliable one, therefore, a benchmark should be well calibrated so that all endogenous variable values of the model are closest to the actual values. There are several equilibrium conditions to satisfy the benchmark (Shoven and Whalley, 1992). First of all, demands equal supplies for all commodities. Secondly, nonpositive profits are made in all industries. Moreover, all domestic agents (including the government) have demands that satisfy their budget constraints.

This paper has successfully calibrated the benchmark which is indicated by the similar values between the actual and the benchmark variables as shown in Table 2. The CGE model applied in this paper is used to numerically measure the value of Indonesian economy and to elaborate the effects of policy changes on sugar refinery industry and other macroeconomic variables. In order to do that, tax policies are used to shock the economy. Particularly, this paper will elaborate the effects of trade liberalization on sugar refinery industry by changing the tax rate.

The actual SAM confirms that the current import tariff rate in the Indonesian sugar industry is 69,32%. This number can be found by dividing the total amount of the import tariff of the sugar refinery industry by the total amount of its import value. It must be noted that this 69,32% is the average tariff rate for the Indonesian sugar refinery industry. The model specification in the previous section illustrates that when the tariff rate is increased, the amount of the import tariff will be larger. As result, the government revenue collected from taxes will increase which in turn will enlarge the amount of the government expenditure. On the other hand, when government reduces

the tariff rate, its revenue from taxes collection will be less. In this case, the government has to cut its expenditure whether by diminishing its consumptions or by decreasing its savings. Therefore, to maintain its budget, the government has to find out additional revenue from taxes other than the import tariff.

### 4.2. Simulations

This section performs several simulations which can be applied by the government. There are three scenarios of policy change in this paper. In simulation A, the government abolishes the import tariff rate of the sugar refinery industry. This implies that the government conducts a total trade liberalization on the Indonesia sugar refinery industry by imposing 0% import tariff rate on the refined sugar import. The next two simulations, simulation B, and C, apply different combinations of tax policy to perform the full trade liberalization while keeping the government budget relatively unchanged. In simulation b, the government eliminates the import tariff rate on the sugar refinery industry and increases the income tax rate for all industry by 1.24% from 4.82% to 4.88%. The additional government revenue obtained from the increase in the income tax is expected can be used to compensate the diminish of the import tariff. Similar to simulation B, simulation C also treats a complete trade liberalization by imposing 0% import tariff rate. Unlike the previous one, this 0% rate is levied on the sugar cane and sugar refinery industry. The consideration is that the two industries are closely related each other where the sugar cane industry is the supplier of the main raw material for the sugar refinery industry. Furthermore, to give more incentive to them, the production tax rate of the sugar cane and the sugar refinery industry are reduced by 50%. This means that the new rates are 0.71% and 1.12% for the sugar cane and sugar refinery, respectively. To compensate the decrease in the government revenue from the import tariff and the production tax, this last simulation amplifies the production tax rate only for the all other industry, the third sector, by 1.79% from 1.90% to 1.93%.

Theoretically, trade liberalization makes consumers better off or get benefit from it, while domestic producers worse off or suffer from it. The simulations conducted in this paper, however, display some interesting results.

### 4.3. Results Analysis

This paper uses the equivalent variation to analyze how trade liberalization affects the welfare of the consumers. In addition, this paper also elaborates the effect on the economy as a whole which is indicated by the change in utility. Table 4, 5, 6, 7 and 8 illustrate the results of the simulations.

#### 4.3.1. Simulation A

In this first simulation, the full trade liberalization will be simulated in this section. In a complete trade liberalization scenario, the economy is shocked by abolishing the import tariff rate for the sugar refinery industry, from its current rate, 69.32%, to 0%. The policy to lower the import tariff rate induces a positive change in terms of import goods, not only for the sugar refinery industry but also for the sugar cane industry as the supplier of raw material (cane) to the sugar refinery industry. All of the price, the quantity, and the value of the import goods of the sugar refinery ($M_2$) and the sugarcane industry ($M_1$) rise. However, the magnitude of the increase in the sugar refinery industry is larger than it in the sugarcane industry since merely the import tariff rate of the sugar refinery industry reduced.

As explained above, the reduction of the import tariff rate on the sugar refinery

industry has boosted the import goods in this industry. It is predicted, therefore, that the final consumption goods of the sugar refinery industry ($Q_2$) will increase. By looking at Table 5, it can be seen that all of the price, the quantity and the value of $Q_2$ increase. Not only in the sugar refinery industry, but the final consumption goods of the sugarcane industry ($Q_1$) also increase in terms of its price, quantity, and value. However, unlike in $M_1$ and $M_2$, the incremental magnitude of $Q_1$ is relatively similar to it of $Q_2$. Doing backward linkage analysis, it is clear that the increase in $Q_2$ induces the increase of the composite goods ($Y_2$), domestic goods ($Z_2$), final domestic goods ($D_2$), and export goods ($E_2$) in the sugar refinery industry. Additionally, the sugarcane industry also has the same direction of change.

In terms of private consumptions ($Xy$), there is relatively no change either in the sugar refinery industry or in the sugarcane industry. Moreover, there is no any change in government consumption in both industries because government does not consume on them in the actual value and in the benchmark. Furthermore, the capital income ($K$) and the labor income ($L$) in the sugar refinery industry and the sugarcane industry slightly increase with larger change in the sugarcane industry.

The use of the CGE model enables us to take into custody how all agents in the economy interact with them. In this first simulation, only the all other industry suffers from the trade liberalization. However, since the all other industry shares 99.66% of the total production, then it can be said that the overall economy suffers from the trade liberalization. The actual data and the benchmark show us that the government only consume on the all other industry but nothing on the sugarcane industry and on the sugar refinery industry. In addition, in this type of simulation, it is assumed that the reduction of the government revenue caused by the decrease of the import tariff rate be compensated by lowering the government expenditure. Specifically, the government decreases its expenditure on consumptions. Table 5 shows that the government consumption ($Xg_3$) of the all other industry lessons which in turn reduces the demand on the output of the all other industry. Since the economy is assumed in a full competition, this decrease in demand is satisfied by another decrease in supply from the all other industry. Therefore, it is not surprising that all production stages in the all other industry diminish. The price, the quantity, and the value of each production stage from composite goods ($Y_3$) to final consumption goods ($Q_3$) diminish. Finally, the top to bottom decrease in the production stage of the all other industry lowers the capital and labor income in this sector. Conversely, the other 2 sectors, sugarcane, and sugar refinery, benefit from this simulation.

The model in this paper assumes that government receives income from three sources; income tax, production tax, and import tariff. Table 5 shows that income tax and production tax are relatively unchanged while import tariff received by the government decreases. In addition, it is assumed that the budget constraint of the private investment sector comprises of private savings, government savings, and foreign savings. In Table 5, it can be seen that the government deficits (negative government savings, $S^g$) and the foreign deficits (negative foreign savings, $S^f$) diminish while the private savings ($S^I$) keeps unchanged. The government deficit diminishes as result from the decrease of the government consumption ($X_g$) which is larger than the decrease of the government revenue.

The effect of trade liberalization on the consumers' welfare is measured by the equivalent variation (EV). The negative amount of EV in Table 5 demonstrates that

there will be a welfare reducing when simulation A is applied. In other words, the consumers are worse off. The reason behind this is that the large decrease of the government consumption in the all other industry reduces the income of this industry. Because the all other industry shares 99.66% of total production, the aggregate income reduces too. As a whole, the economy also suffers from the trade liberalization which is indicated by the decrease in the utility.

### 4.3.2. Simulation B

In the first simulation, it is assumed that the decrease or increase in the government revenue is simply satisfied by the decrease or increase in the government consumption, respectively. In this part, simulation B, a full trade liberalization scenario is elaborated. The decrease in the government revenue in simulation B is financed by increasing the current income tax rate for all industries by 1.24% from 4.82% to 4.88%. With this scenario, the government total revenue is relatively unchanged, as shown in Table 4. In other words, the decrease in the import tariff is well balanced by the increase in the income tax.

Now let us examine the effects of this simulation B on each industry. First of all, the policy to abolish the import tariff rate induces an increase in the import value in the sugar refinery industry. However, it is the only increase in the sugar refinery and sugarcane industry since the price, the quantity, and the value of other goods decline. The possible reason to explain this results is as follows. Although the import value increases as result of the 0% tariff rate policy, the increase of the income tax rate causes a decrease in the consumers' disposable income. This lower income forces the consumers to reduce their demand for goods produced by both industries. Therefore, the supply of goods from the sugarcane and the sugar refinery industry adjusts to declining. Finally, the income of both industries diminishes.

The effects of the scenario B on the all other industry are not the same as the effects of the sugarcane and the sugar refinery industry. Although the consumers reduce their consumption in the all other industry, however, the government consumes more on the all other industry. This larger consumption is feasible due to the increase in the government revenue obtained from its higher income tax. Moreover, this higher demand is satisfied by the all other industry by increasing its supply. That is why the all other industry receives higher income with simulation B. Additionally, Table 4 shows that the private savings and the government deficits are relatively unchanged. Nevertheless, the foreign deficits being smaller.The full trade liberalization in this scenario reduces the consumers' welfare which is shown by the negative EV in Table 4. Furthermore, this scenario reduces the utility, representing that the whole economy suffers from the combination of the import tariff and the income tax policy.

### 4.3.3. Simulation C

In simulation C, it was assumed that the decrease in the government revenue caused by the 0% tariff rate on the sugar refinery industry was financed by increasing the income tax rate for all industries by 1.24%. The last scenario, simulation C, is still a full trade liberalization conducted by combining the policy using import tariff and production tax instrument. Specifically, the import tariff rate of the sugarcane and the sugar refinery industry are eliminated. In addition, the production tax rate of those two industries is reduced by 50%. Finally, the production tax rate of the all other industry is increased by1.7963%. The essence of this scenario is that the less

government revenue caused by the lower import tariff and the production tax of the sugarcane and the sugar refinery industry is balanced by increasing the production tax of the all other industry. Table 5 shows the results of this last scenario.

The total revenue received by the government relatively does not change. Particularly, the income tax and the import tariff reduce while the production tax enlarges. The policy to eliminate the import tariff rate of the sugarcane and the sugar refinery industry induces an increase in the import value of both industries. However, the magnitude of this increase in the sugar refinery industry is much more than it in the sugarcane industry. Meanwhile, the policy to lower the production tax rate of the sugarcane and the sugar refinery industry induces those industries to produce more domestic goods ($Z_1$ and $Z_2$). Furthermore, the price, the quantity, and the value of other goods in the sugarcane industry increase. However, this positive change is not completely experienced by the sugar refinery industry. Its final domestic goods ($D_2$), export goods ($E_2$), and final consumption goods ($Q_2$) diminish. This reduction is a reaction to compensate the decrease in the private consumption. But, in general, the sugar refinery industry benefits from this scenario which is shown by the higher income received by that industry.

The increase in the production tax rate of the all other industry induces this industry to decrease its supply to the market. This behavior results in the decrease of its income. In addition, the consumers react to this lower supply by reducing their consumption on the all other industry output.

Similar to the result of simulation B, the consumer and the whole economy suffers from this simulation C. The decrease in the consumer welfare is shown by the negative value of the EV, while the fall in utility represents that the economy as a whole suffers from this scenario. However, compared to simulation B, the magnitude of the negative EV and the utility change is smaller.

## 5. Conclusion

This paper has examined the effects of trade liberalization on the sugar industry, the consumer welfare and the whole economy in Indonesia. Using the latest the year 2008 Indonesia Input-Output Table, the author constructed a 3 sector Social Accounting Matrix. This SAM was then used to get a realistic benchmark using a CGE model. Moreover, this paper simulated several simulations using various rates of the import tariff on the sugar industry and some alternative methods to satisfy the decrease in the government revenue. These simulations demonstrated some interesting results. The most interesting results are related to the changes in the welfare and in the economy as a whole. In terms of the effects of trade liberalization, the common argument is that consumers obtain benefits from trade liberalization while domestic industries suffer from that. However, this paper found some interesting results.

By conducting the trade liberalization idea, the consumers' welfare and the utility would diminish. The smaller the tariff rate, even if the subsidy rate was applied, the lower the welfare and the utility. Assuming that the decrease in the government revenue was satisfied by the decrease in the government consumption, the lower tariff rates would reduce the consumers' welfare and increase the producers' income in the sugarcane and sugar refinery industry. However, the overall producers' income diminishes since the income of the all other industry reduces much more than the increase of the producer income in the sugarcane and sugar refinery industry. A larger decrease in the consumers' welfare

and in the utility would be suffered when the trade liberalization scenario was financed by increasing other government policy instruments. The most devastating outcomes for the economy would be incurred when the production tax rate was modified in simulation C to satisfy the decrease in the government revenue. In this scenario, the utility and the domestic producers' income would reduce the most. Other interesting results are shown by simulation B in which the consumers suffer while the domestic producers benefit from the trade liberalization. This result is opposites to the common argument that consumers will benefit while producers will suffer from trade liberalization.

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**Table 1. Indonesian Social Accounting Matrix of year 2008 (in million rupiah)**

| | sugar cane | sugar refinery | all other | capital | labor | tax production | tax tariff | households | government | investment | foreign trade | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| sugarcane | 316018 | 9641703 | 309300 | | | | | 63878 | 0 | 112802 | 695 | 10444396 |
| sugar refinery | 0 | 533011 | 13660263 | | | | | 15962730 | 0 | 245312 | 259796 | 30661112 |
| all other | 2901448 | 6695659 | 5301652017 | | | | | 3179777823 | 616568644 | 1508472462 | 1486977355 | 12103045408 |
| capital | 4634259 | 3710997 | 3579793625 | | | | | | | | | 3588138881 |
| labor | 2441192 | 1957179 | 1601851875 | | | | | | | | | 1606250246 |
| production tax | 146470 | 505102 | 198993054 | | | | | | | | | 199644626 |
| tariff | 187 | 3118737 | 63532906 | | | | | | | | | 66651830 |
| households | | | | 3588138881 | 1606250246 | | | | | | | 5194389127 |
| government | | | | | | 199644626 | 66651830 | 250480000 | | | | 516776456 |
| investment | | | | | | | | 1748104696 | -99792188 | | -139481932 | 1508830576 |
| foreign trade | 4822 | 4498724 | 1343252368 | | | | | | | | | 1347755914 |
| Total | 10444396 | 30661112 | 12103045408 | 3588138881 | 1606250246 | 199644626 | 66651830 | 5194389127 | 516776456 | 1508830576 | 1347755914 | |

Table 3. Parameter Values

| | Value | | Value | | Value | | Value |
|---|---|---|---|---|---|---|---|
| $\alpha_1$ | 0.00001998808 | $ax_{11}$ | 0.03070247239 | $\kappa^e_1$ | 0.00006657479 | $\gamma^m_1$ | 0.00047961925 |
| $\alpha_2$ | 0.00499490202 | $ax_{12}$ | 0.42778721026 | $\kappa^e_2$ | 0.01127408152 | $\gamma^m_2$ | 0.25056352824 |
| $\alpha_3$ | 0.99498510990 | $ax_{13}$ | 0.00002946481 | $\kappa^e_3$ | 0.13901843601 | $\gamma^m_3$ | 0.13251471891 |
| $\beta_{K1}$ | 0.65497718803 | $ax_{21}$ | 0.00000000000 | $\kappa^d_1$ | 0.99993342521 | $\gamma^d_1$ | 0.99952038075 |
| $\beta_{K2}$ | 0.65470744028 | $ax_{22}$ | 0.02364886045 | $\kappa^d_2$ | 0.98872591848 | $\gamma^d_2$ | 0.74943647176 |
| $\beta_{K3}$ | 0.69086038885 | $ax_{23}$ | 0.00130131613 | $\kappa^d_3$ | 0.86098156399 | $\gamma^d_3$ | 0.86748528109 |
| $\beta_{L1}$ | 0.34502281197 | $ax_{31}$ | 0.28188782636 | $ay_1$ | 0.68740970125 | $gsai_1$ | 0.00007476121 |
| $\beta_{L2}$ | 0.34529255972 | $ax_{32}$ | 0.29707586766 | $ay_2$ | 0.25148806163 | $gsai_2$ | 0.00016258419 |
| $\beta_{L3}$ | 0.30913961115 | $ax_{33}$ | 0.50505069335 | $ay_3$ | 0.49361852571 | $gsai_3$ | 0.99976265460 |
| $s^I$ | 0.33653710826 | $s^g$ | -0.1931051364 | | | | |

**Table 4. The Results of Simulation A**

| | Sugar Cane | | | Sugar Refinery | | | All Other | | |
|---|---|---|---|---|---|---|---|---|---|
| | Before | After | Δ ↑ (↓) | Before | After | Δ ↑ (↓) | Before | After | Δ ↑ (↓) |
| COMPOSITE GOODS (Y) | | | | | | | | | |
| Value | 7075451 | 7075780 | 329.45 | 5668176 | 5668290 | 114.28 | 5181645500 | 5181644835 | (664.91) |
| Quantity | 21201561.7 | 21201561.75 | (0.00) | 16969556.73 | 16969556.73 | 0.00 | 17529577038 | 17529577038 | 0.00 |
| Price | 0.3337231 | 0.3337386 | 0.0000 | 0.3340203 | 0.3340270 | 0.0000 | 0.2955944 | 0.2955944 | (0.0000) |
| DOMESTIC GOODS (Z) | | | | | | | | | |
| Value | 10292917 | 10293396.26 | 479.26 | 22538549 | 22539003.4 | 454.40 | 10497267080 | 10497265733 | (1347.00) |
| Quantity | 18990804 | 18991314.01 | 509.97 | 27072875.23 | 27073365.97 | 490.74 | 16092886612 | 16092885009 | (1603.11) |
| Price | 0.5419948 | 0.54200548 | 0.0000 | 0.83251405 | 0.832515743 | 0.0000 | 0.652292366 | 0.652292347 | (0.0000) |
| FINAL DOMESTIC GOODS (D) | | | | | | | | | |
| Value | 10438692 | 10439178 | 486.04 | 22783855 | 22784314 | 459.34 | 9209282779 | 9209281597 | (1181.73) |
| Quantity | 19000265.89 | 19000776.17 | 510.28 | 28542326.70 | 28542843.45 | 516.75 | 23633637654 | 23633635409 | (2245.06) |
| Price | 0.54939715 | 0.549407979 | 0.0000 | 0.798247992 | 0.798249634 | 0.0000 | 0.389668443 | 0.38966843 | (0.0000) |
| EXPORT GOODS (E) | | | | | | | | | |
| Value | 695.00 | 695.03 | 0.03 | 259796.00 | 259801.24 | 5.24 | 1486977355.00 | 1486977164.19 | (190.81) |
| Quantity | 695.00 | 695.03 | 0.03 | 259796.00 | 259801.24 | 5.24 | 1486977355.00 | 1486977164.19 | (190.81) |
| Price | 1 | 1 | 0.00 | 1 | 1 | 0.00 | 1 | 1 | 0.00 |
| IMPORT GOODS (M) | | | | | | 1.69 | | | |
| Value | 4822 | 4822 | 0.22 | 4498724 | 7617615 | 3118891 | 1343252368 | 1343252196 | (172.37) |
| Quantity | 4601523.71 | 4601659.88 | 136.17 | 23102618.95 | 23103039.35 | 420.40 | 1298222937.97 | 1298222315.64 | (622.33) |
| Price | 0.00104791 | 0.001047932 | 0.0000 | 0.194727879 | 0.329723482 | 0.1350 | 1.034685799 | 1.0346858 | 0.0000 |
| FINAL CONSUMPTION GOODS (Q) | | | | | | | | | |
| Value | 10443701.00 | 10444187.28 | 486.28 | 30401316.00 | 30401928.92 | 612.92 | 10616068053 | 10616066691 | (1362.25) |
| Quantity | 18987347.61 | 18987857.57 | 509.96 | 27069521.92 | 27070012.63 | 490.71 | 16089330861 | 16089329258 | (1602.93) |
| Price | 0.55003475 | 0.550045588 | 0.0000 | 1.123082855 | 1.12308514 | 0.0000 | 0.659820358 | 0.659820339 | (0.0000) |
| CONSUMPTION | | | | | | | | | |
| Private (Xy) | 63878 | 63878 | (0.00) | 15962730 | 15962729 | (1.05) | 3179777823 | 3179777614 | (209.46) |
| Government (Xg) | 0 | 0 | 0.00 | 0 | 0 | 0.00 | 616568644 | 612847630.2 | (3721013.75) |
| INCOME | | | | | | | | | |
| Capital | 4634259 | 4634475 | 215.78 | 3710997 | 3711072 | 74.82 | 3579793625 | 3579793166 | (459.36) |
| Labor | 2441192 | 2441306 | 113.67 | 1957179 | 1957218 | 39.46 | 1601851875 | 1601851669 | (205.55) |

**Table 4. (continued) The Results of Simulation A**

| TAXES | Income Tax | Production tax | Import Tariff | Total |
|---|---|---|---|---|
| *Before* | 250480000 | 199644626 | 66651830 | 516776456 |
| *After* | 250479989 | 199644617 | 63533085 | 513657692 |
| Δ ↑ (↓) | (11) | (9) | (3118745) | (3118764) |

| CV | EV | Utility Before | Utility After | Utility Δ ↑ (↓) |
|---|---|---|---|---|
| (153.01) | (153.01) | 4679939950 | 4679939726 | (224.07) |

| SAVINGS | Private | Government | Foreign | Total |
|---|---|---|---|---|
| *Before* | 1748104696 | -99792188 | -139481932 | 1508830576 |
| *After* | 1748104696 | -99189939 | -136363028 | 1512551729 |
| Δ ↑ (↓) | (0) | 602249 | 3118904 | 3721153 |

| INC Before | INC After | INC Δ ↑ (↓) |
|---|---|---|
| 5194389127 | 5194388906 | (221.18) |

**Table 5. The Results of Simulation B**

| | Sugar Cane Before | Sugar Cane After | Sugar Cane Δ ↑ (↓) | Sugar Refinery Before | Sugar Refinery After | Sugar Refinery Δ ↑ (↓) | All Other Before | All Other After | All Other Δ ↑ (↓) |
|---|---|---|---|---|---|---|---|---|---|
| COMPOSITE GOODS (Y) | | | | | | | | | |
| Value | 7075451 | 7072183 | (3268.26) | 5668176 | 5665325 | (2851.36) | 5181645500 | 5181655437 | 9937.30 |
| Quantity | 21201561.7 | 21201561.75 | 0.00 | 16969556.73 | 16969556.73 | 0.00 | 17529577038 | 17529577038 | 0.00 |
| Price | 0.3337231 | 0.3335690 | (0.0002) | 0.3340203 | 0.3338522 | (0.0002) | 0.2955944 | 0.2955950 | 0.0000 |
| DOMESTIC GOODS (Z) | | | | | | | | | |
| Value | 10292917 | 10288162.55 | (4754.45) | 22538549 | 22527211.05 | (11338.0) | 10497267080 | 10497287212 | 20131.55 |
| Quantity | 18990804 | 18985743.8 | (5060.24) | 27072875.23 | 27060629.85 | (12245.4) | 16092886612 | 16092910571 | 23959.08 |
| Price | 0.5419948 | 0.541888833 | (0.0001) | 0.83251405 | 0.832471793 | (0.0000) | 0.652292366 | 0.652292646 | 0.0000 |
| FINAL DOMESTIC GOODS (D) | | | | | | | | | |
| Value | 10438692 | 10433870 | (4821.79) | 22783855 | 22772394 | (11461.4) | 9209282779 | 9209300440 | 17661.46 |
| Quantity | 19000265.89 | 18995202.71 | (5063.18) | 28542326.70 | 28529433.02 | (12893.7) | 23633637654 | 23633671207 | 33553.40 |
| Price | 0.54939715 | 0.549289753 | (0.0001) | 0.798247992 | 0.798207018 | (0.0000) | 0.389668443 | 0.389668637 | 0.0000 |
| EXPORT GOODS (E) | | | | | | | | | |
| Value | 695.00 | 694.68 | (0.32) | 259796.00 | 259665.31 | (130.69) | 1486977355.00 | 1486980206.71 | 2851.71 |
| Quantity | 695.00 | 694.68 | (0.32) | 259796.00 | 259665.31 | (130.69) | 1486977355.00 | 1486980206.71 | 2851.71 |
| Price | 1 | 1 | 0.00 | 1 | 1 | 0.00 | 1 | 1 | 0.00 |
| IMPORT GOODS (M) | | | | | | | | | |
| Value | 4822 | 4820 | (2.23) | 4498724 | 7613629 | 3114905 | 1343252368 | 1343254944 | 2576.07 |
| Quantity | 4601523.71 | 4600172.66 | (1351.05) | 23102618.95 | 23092129.26 | (10489.7) | 1298222937.97 | 1298225005.80 | 2067.83 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Price | 0.00104791 | 0.001047737 | (0.0000) | 0.194727879 | 0.329706671 | 0.1350 | 1.034685437 | 1.034685773 | 0.0000 |
| FINAL CONSUMPTION GOODS (Q) | | | | | | | | | |
| Value | 10443701.00 | 10438876.90 | (4824.10) | 30401316.00 | 30386022.70 | (15293.3) | 10616068053.0 | 10616088412.4 | 20359.38 |
| Quantity | 18987347.61 | 18982287.62 | (5059.99) | 27069521.92 | 27057277.90 | (12244.0) | 16089330861.2 | 16089354817.7 | 23956.53 |
| Price | 0.55003475 | 0.549927232 | (0.0001) | 1.123082855 | 1.123025857 | (0.0001) | 0.659820358 | 0.659820641 | 0.0000 |
| CONSUMPTION | | | | | | | | | |
| Private | 63878 | 63816 | (62.26) | 15962730 | 15947172 | (15557.9) | 3179777823 | 3176678693 | (3099129.93) |
| Govmnt | 0 | 0 | 0.00 | 0 | 0 | 0.00 | 616568644 | 616568658.8 | 14.77 |
| INCOME | | | | | | | | | |
| Capital | 4634259 | 4632118 | (2140.63) | 3710997 | 3709130 | (1866.81) | 3579793625 | 3579800490 | 6865.29 |
| Labor | 2441192 | 2440064 | (1127.62) | 1957179 | 1956194 | (984.55) | 1601851875 | 1601854947 | 3072.01 |

**Table 5 (continued) The Results of Simulation B**

| TAXES | Income Tax | Production tax | Import Tariff | Total |
|---|---|---|---|---|
| *Before* | 250480000 | 199644626 | 66651830 | 516776456 |
| *After* | 253598568 | 199644686 | 63533215 | 516776468 |
| Δ ↑ (↓) | 3118568 | 60 | (3118615) | 12 |

| CV | EV | Utility | | |
|---|---|---|---|---|
| | | Before | After | Δ ↑ (↓) |
| (3115290.96) | (3115290.43) | 4679939950 | 4675377915 | (4562035.15) |

| SAVINGS | Private | Government | Foreign | Total |
|---|---|---|---|---|
| *Before* | 1748104696 | -99792188 | -139481932 | 1508830576 |
| *After* | 1748104696 | -99792190 | -136367174 | 1511945332 |
| Δ ↑ (↓) | (0) | (2) | 3114758 | 3114756 |

| INC | | |
|---|---|---|
| Before | After | Δ ↑ (↓) |
| 5194389127 | 5194392945 | 3817.69 |

**Table 6. The Results of Simulation C**

| | Sugar Cane | | | Sugar Refinery | | | All Other | | |
|---|---|---|---|---|---|---|---|---|---|
| | Before | After | Δ ↑ (↓) | Before | After | Δ ↑ (↓) | Before | After | Δ ↑ (↓) |
| COMPOSITE GOODS (Y) | | | | | | | | | |
| Value | 7075451 | 7201149 | 125697.75 | 5668176 | 5730050 | 61873.9 | 5181645500 | 5179997141 | (1648358.93) |
| Quantity | 21201561.7 | 21201561.75 | (0.00) | 16969556.73 | 16969556.73 | 0.00 | 17529577038 | 17529577038 | 0.00 |
| Price | 0.3337231 | 0.3396518 | 0.0059 | 0.3340203 | 0.3376664 | 0.0036 | 0.2955944 | 0.2955004 | (0.0001) |
| DOMESTIC GOODS (Z) | | | | | | | | | |
| Value | 10292917 | 10475774.11 | 182857.11 | 22538549 | 22784580.27 | 246031.3 | 10497267080 | 10493927742 | (3339337.66) |
| Quantity | 18990804 | 19183931.35 | 193127.32 | 27072875.23 | 27338291.67 | 265416.4 | 16092886612 | 16088912094 | (3974517.90) |
| Price | 0.5419948 | 0.546070246 | 0.0041 | 0.83251405 | 0.833431019 | 0.0009 | 0.652292366 | 0.652245949 | (0.0000) |
| FINAL DOMESTIC GOODS (D) | | | | | | | | | |
| Value | 10438692 | 10549608 | 110915.76 | 22783855 | 22780135 | (3720.45) | 9009580804 | 9209429787 | 199848983 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Quantity | 19000265.89 | 19193490.43 | 193224.54 | 28542326.70 | 28825373.09 | 283046 | 23835756910 | 23626799392 | (208957517) |
| Price | 0.54939715 | 0.549645089 | 0.0002 | 0.798247992 | 0.790280649 | (0.0080) | 0.377985933 | 0.389787446 | 0.0118 |
| EXPORT GOODS (E) | | | | | | | | | |
| Value | 695.00 | 702.38 | 7.38 | 259796.00 | 259753.58 | (42.42) | 1486977355.00 | 1487001091.72 | 23736.72 |
| Quantity | 695.00 | 702.38 | 7.38 | 259796.00 | 259753.58 | (42.42) | 1486977355.00 | 1487001091.72 | 23736.72 |
| Price | 1 | 1 | 0.00 | 1 | 1 | 0.00 | 1 | 1 | 0.00 |
| IMPORT GOODS (M) | | | | | | | | | |
| Value | 4822 | 5062 | 240.22 | 4498724 | 7616217 | 3117493 | 1343252368 | 1343273810 | 21442.43 |
| Quantity | 4601523.71 | 4648610.35 | 47086.64 | 23102618.95 | 23321192.81 | 218574 | 1298222937.97 | 1298262663.97 | 39726.00 |
| Price | 0.00104791 | 0.001088976 | 0.0000 | 0.194727879 | 0.326579227 | 0.1319 | 1.034685437 | 1.034670293 | (0.0000) |
| FINAL CONSUMPTION GOODS (Q) | | | | | | | | | |
| Value | 10443701.00 | 10554669.99 | 110968.99 | 30401316.00 | 30396351.67 | (4964.34) | 10416366078.00 | 10616237517.99 | 199871439.99 |
| Quantity | 18987347.61 | 19180441.35 | 193093.74 | 27069521.92 | 27334871.37 | 265349 | 16089232238.83 | 16085358298.56 | (3873940.27) |
| Price | 0.55003475 | 0.550282957 | 0.0002 | 1.123082855 | 1.111999075 | (0.0111) | 0.647412252 | 0.659993848 | 0.0126 |
| CONSUMPTION | | | | | | | | | |
| Private | 63878 | 63850 | (27.79) | 15962730 | 15955785 | (6944.64) | 3179777823 | 3178394449 | (1383373.82) |
| Govmnt | 0 | 0 | 0.00 | 0 | 0 | 0.00 | 616568644 | 616568648.6 | 4.57 |
| INCOME | | | | | | | | | |
| Capital | 4634259 | 4716588 | 82329.16 | 3710997 | 3751506 | 40509.32 | 3579793625 | 3578654839 | (1138785.89) |
| Labor | 2441192 | 2484561 | 43368.59 | 1957179 | 1978544 | 21364.61 | 1601851875 | 1601342302 | (509573.04) |

**Table 5 (continued) The Results of Simulation C**

| TAXES | Income Tax | Production tax | Import Tariff | Total |
|---|---|---|---|---|
| *Before* | 250480000 | 199644626 | 66651830 | 516776456 |
| *After* | 250409559 | 202832981 | 63533920 | 516776460 |
| Δ ↑ (↓) | (70441) | 3188355 | (3117910) | 4 |

| | | Utility | | |
|---|---|---|---|---|
| CV | EV | Before | After | Δ ↑ (↓) |
| (2068090.93) | (2067652.43) | 4679939950 | 4676912077 | (3027872.78) |

| SAVINGS | Private | Government | Foreign | Total |
|---|---|---|---|---|
| *Before* | 1748104696 | -99792188 | -139481932 | 1508830576 |
| *After* | 1748104696 | -99792189 | -136366458 | 1511946049 |
| Δ ↑ (↓) | 0 | (1) | 3115474 | 3115473 |

| INC | | |
|---|---|---|
| Before | After | Δ ↑ (↓) |
| 5194389127 | 5192928340 | (1460787.26) |

# Table 2. Benchmark Model

| | Sugar Cane | Sugar Refinery | All Other |
|---|---|---|---|
| COMPOSITE GOODS (Y) | | | |
| Value | | | |
| *Actual* | 7075451 | 5668176 | 5181645500 |
| *Benchmark* | 7075451 | 5668176 | 5181645500 |
| Quantity | 21201562 | 16969557 | 17529577038 |
| Price | 0.333723 | 0.334020 | 0.295594 |
| DOMESTIC GOODS (Z) | | | |
| Value | | | |
| *Actual* | 10292917 | 22538549 | 10497267080 |
| *Benchmark* | 10292917 | 22538549 | 10497267080 |
| Quantity | 18990804 | 27072875 | 16092886612 |
| Price | 0.541995 | 0.832514 | 0.652292 |
| FINAL DOMESTIC GOODS (D) | | | |
| Value | | | |
| *Actual* | 10438692 | 22783855 | 9209282779 |
| *Benchmark* | 10438692 | 22783855 | 9209282779 |
| Quantity | 19000266 | 28542327 | 23633637654 |
| Price | 0.549397 | 0.798248 | 0.389668 |
| EXPORT GOODS (E) | | | |
| Value | | | |
| *Actual* | 695 | 259796 | 1486977355 |
| *Benchmark* | 695 | 259796 | 1486977355 |
| Quantity | 695 | 259796 | 1486977355 |
| Price | 1 | 1 | 1 |
| IMPORT GOODS (M) | | | |
| Value | | | |
| *Actual* | 4822 | 4498724 | 1343252368 |
| *Benchmark* | 4822 | 4498724 | 1343252368 |
| Quantity | 4601524 | 23102619 | 1298222484 |
| Price | 0.001048 | 0.194728 | 1.034686 |
| FINAL CONSUMPTION GOODS (Q) | | | |
| Value | | | |
| *Actual* | 10443701 | 30401316 | 10616068053 |
| *Benchmark* | 10443701 | 30401316 | 10616068053 |
| Quantity | 18987348 | 27069522 | 16089330861 |
| Price | 0.550035 | 1.123083 | 0.659820 |

| | Sugar Cane | Sugar Refinery | All Other |
|---|---|---|---|
| PRIVATE CONSUMPTION (Xy) | | | |
| *Actual* | 63878 | 15962730 | 3179777823 |
| *Benchmark* | 63878 | 15962730 | 3179777823 |
| GOVERNMENT CONSUMPTION (Xg) | | | |
| *Actual* | 0 | 0 | 616568644 |
| *Benchmark* | 0 | 0 | 616568644 |
| CAPITAL INCOME | | | |
| *Actual* | 4634259 | 3710997 | 3579793625 |
| *Benchmark* | 4634259 | 3710997 | 3579793625 |
| LABOR INCOME | | | |
| *Actual* | 2441192 | 1957179 | 1601851875 |
| *Benchmark* | 2441192 | 1957179 | 1601851875 |
| TAX RATE (%) | | | |
| *Prod* | 1.42% | 2.24% | 1.90% |
| *Tariff* | 3.88% | 69.32% | 4.73% |

| TAXES | Inc Tax | Prod tax | Tariff |
|---|---|---|---|
| *Actual* | 250480000 | 199644626 | 66651830 |
| *Benchmark* | 250480000 | 199644626 | 66651830 |

| SAVING | Private | Government | Foreign |
|---|---|---|---|
| *Actual* | 1748104696 | -99792188 | -139481932 |
| *Benchmark* | 1748104696 | -99792188 | -139481932 |

| | |
|---|---|
| INCOME TAX RATE (%) | 4.82% |