

EFFECTS OF SUGAR PRICE INCREASE IN INDONESIA

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Abstract. This paper studies the effects of the increase on sugar price in Indonesia. The understanding of sugar price policy is of great interest since the Indonesian government would try to increase the domestic production in order to fulfill the domestic demand by its policy. The CGE (computable general equilibrium) was designed to evaluate the sugar price policy and its effects. The study shows that the increased of the domestic sugar price by 10-30% will increase the producer welfare as well as the output, the export and import of other sectors but it would reduce the real income of households, firms and government. This study proved that the rise of sugar price more than 20% would have the worst effects to the consumers. So, the government should maintain the domestic sugar price in order to protect the producers and the consumers wisely.

JEL Classification: A11, B22, C68, D58

Keywords: domestic sugar prices, households, producers' welfare, CGE.

1. Introduction

Since 1996, the Indonesian government has tried to increase the sugar production to fulfill the domestic demand. The first effort is to include the sugar as a sensitive list in AFTA (ASEAN Free Trade Agreement) which allowed the tariff import rise to 40%. However, the tariff import setting has a tradeoff since the rise of tariff will increase the domestic price. The rise of domestic price will benefit to producer but it hurt to consumers. The initial of sugar price was established at the auction market, but in 2004 the floor price policy was set which aim to give a higher price to farmers and to increase the sugar production. After that time, the government always revise these price every year especially when the production declined. In fact, the auction price higher than the floor price is used as the reference price.

The import tariff as well as the floor price policy setting has an effect to production. In 2007, the price was set at 4,900 IDR (Indonesian Rupiah)/kg and the sugar auction price was 5,407.30 IDR/kg. The sugar production increased from 2.3 million tons to 3.296 million tons in 2008 although the consumption increased from 4 million tons to 4.8 million tons at the same period. But, when the sugar price was reduced from 5,407.30 IDR/kg to 5,112.00 IDR/kg in 2008, the production in 2009 was declined to 2.5 million tons (Ministry of Trade, 2009 and KPPURI (Komisi

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Pengawas Persaingan Usaha Republik Indonesia) “Indonesian Business Competition Supervision Commission”, 2010). In 2009, the government set again the price to rise at 8,000 IDR/kg but the domestic production still declined to be 2.3 million in 2010. In 2010, the government still increased the price up to 9,000 IDR/kg.

The increase of the sugar price will benefited to producers but it will hurt to consumers. Price has a function of allocation and distribution internally of input factors, such as land, labor, capital and skill. This means that price will be the basis for farmers to combine all of production factors to produce a number of production with a minimum price (Anindita, 2004). In the context of general equilibrium, the Stolper-Samuelson theorem can be used as a basis to understand the impact of the increase sugar prices. This theorem states that the increase in the relative prices of goods will increase the price of the real factor that is used intensively in the goods and lower the real price of other factors, so when the price increased it will not only influence the sugar industry but also it will affect the others. On the other hand, when the price increased it will lower the consumers expenditure as well as their welfare. Therefore, the Indonesian government's efforts to achieve sugar self-sufficiency by applying sugar prices control policies need to be evaluated using CGE models to find out how much it is reasonable. To what extent the increase in sugar prices and how they affect domestic output, exports and imports as well as household income and household welfare.

The objectives of this study is to analyze the effect of the increase of domestic sugar price toward the quantity of domestic output, exports and imports as well as households income and households welfare in Indonesia.

2. Theoretical Framework

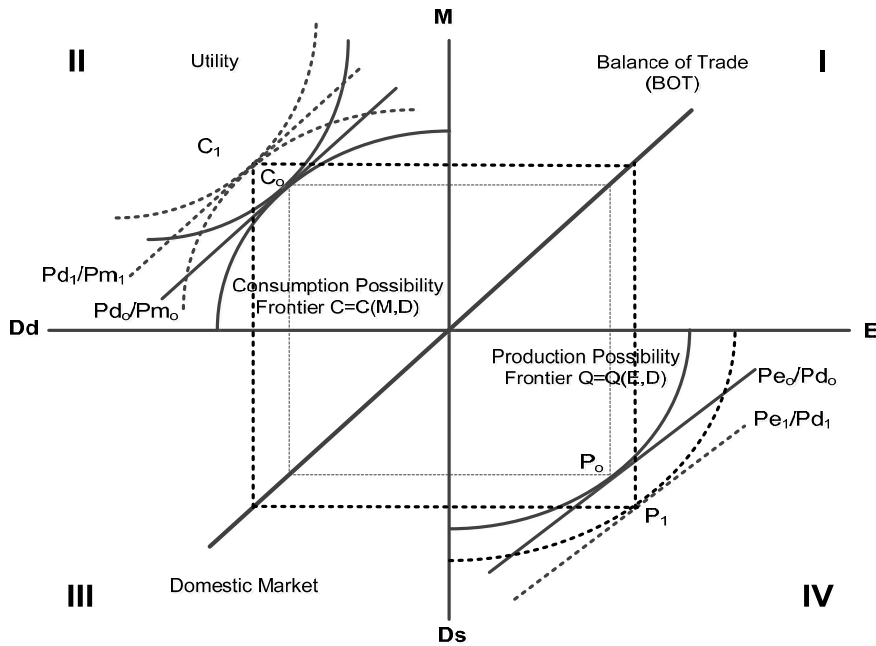
2.1. Effect of Price Changes in Computable General Equilibrium

CGE models developed in this research in order to investigate the sugar price changes and its effect onto the behavior of domestic sugar production, import and export of sugar and other sectors, as well as household income and household welfare. In the macroeconomic context, the price stability is the main focus of policies and the government should maintain the instability commodity prices (Trif et al., 2011 and Pop, 2011).

Sadoulet and de Janvry (1995) state that CGE models have advantages in revealing the effect of the production, consumption, trade, investment and overall spatial interaction of a policy or shock. The CGE model can also be used to simulate the effect of international trade policies and government policies in changing economy (Buehrer and Mauro, 1995). Also it can be used for other needs such as: modeling for development planning, finance, environment, resource management, as well as changes in economic and market transition (Yeah et al., 1994). In addition, the CGE is a system of mathematical equations that represent the activities of the agents, i.e factors of production (labor, capital and land), production, and institutions (households, government and firms) in the economy (Resosudarmo, 1997), and indicates basic general equilibrium relationship between the structure of production, and the income of various society groups (Dervis et al., 1982). The CGE model is an experimental device to analyze of economic change, in which the basis of microeconomic theory used include elasticity parameters and input-output data.

Using standard rules of CGE models to describe the effects of the increase of sugar price in the framework of macroeconomic equilibrium, the impact on each related market is illustrated in Figure 1. In this figure, the condition of equilibrium in various markets before and after the increase of sugar price is drawn in four-quadrants approach.

Figure 1. Effect of Sugar Price Increase of Macroeconomic Balance



Description: M = commodities imports, E = commodities export, D = commodities domestic, C_0 = the consumption frontier before domestic sugar prices increase, P_0 = the production frontier before the domestic sugar prices increase, C_1 = the consumption frontier after domestic sugar prices increase, P_1 = the production frontier after domestic sugar prices increase, Pe_0/Pd_0 = export prices relative to domestic prices before domestic sugar prices increase, and Pd_0/Pm_0 = domestic prices relative to import prices before the domestic sugar prices increase, Pe_1/Pd_1 = export price relative to domestic prices after domestic sugar prices increase, and Pd_1/Pm_1 = domestic prices relative to import prices after the price of domestic sugar increase.

Source: adapted from Sadoulet and de Janvry (1995).

It is assumed that all factors of production have been used (fully employed), aggregate production level represented by the production possibility frontier curve that lies in quadrant IV, and reflecting the possibility of transformation between exports destination (E) and domestic market destination (D). Exported sugar (E) is used to obtain imported sugar (M) through trading in foreign exchange

markets are depicted in quadrant I, where the relationship between the two items resulted in the balance of trade. Domestic production of sugar that are not exported (D) sold in the domestic market are depicted in quadrant III. In relation to the third quadrant, it can be seen that the level of consumption frontier in quadrant II fulfilled from a combination of domestic sugar (D) and import sugar (M).

In quadrant I it is assumed that there is no foreign capital inflow and export price equal to the import price shown by the slope of the line balance of trade. In quadrant II, the steepness of the utility curve is a function from the consumption frontier at point C and the relative equilibrium prices P_d/P_m . As for the production side in quadrant IV associated with P production, the curvature of the production possibility frontier curve is determined by the relative prices of exports and domestic sugar (P_e/P_d). Furthermore, the solution of macroeconomic equilibrium in this model can be observed in quadrant II, which shows the consumer demand behavior ie a certain level of utility at the C consumption and the P production.

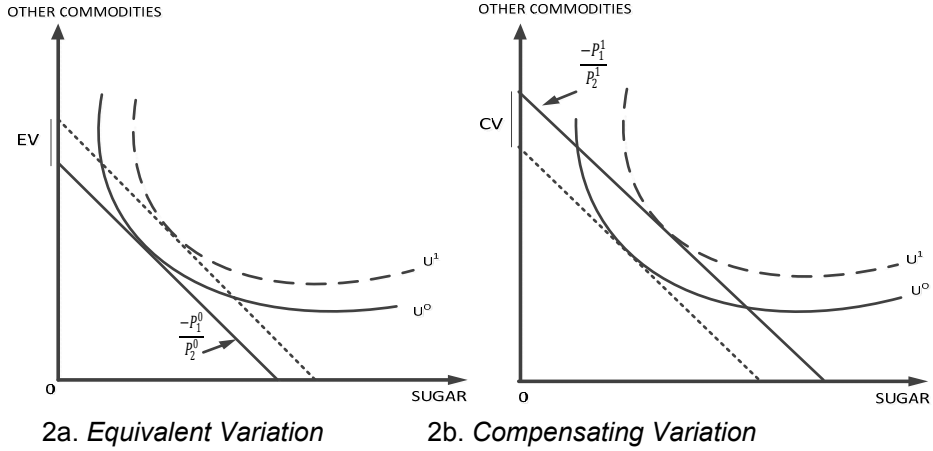
The increase of sugar prices would be responded by sugar producers to increase their production. As basic needs, the rise of sugar price will be followed by the increase of other commodity prices in which the producers will also give the same response as sugar producers so that the production of goods in the economy will rise from P_0 to P_1 . Assuming, as previously mentioned, and the additional assumption that the decline in the production of commodities that compete with sugar less than another commodity production increase, the amount of the commodity supplied to the domestic and export markets will also increase. Because of the exported goods used to obtain goods imports, the imported goods will also increase. Ultimately, the economy will be able to increase the consumption of C_0 to C_1 .

2.2. Welfare Concept

Changes in the economic environment (eg, changes in domestic sugar prices as a result of the change in policy) will make consumers (households) be better off or be worse off. According to Varian (1992), changes in households welfare in the context of a change in policy would be more appropriate when measured by the compensating and equivalent variations. Graphically, effect of the sugar prices increase on households welfare measured by the EV and CV are presented in Figure 2 (2a and 2b). Similarly, the analysis the influence of the rise of sugar price on the producers welfare, also used EV and CV approach.

EV uses the old in sugar prices (before the increase) as a base and can be defined as the change in income as great as the effect of changes in sugar prices on the utility of consumers (Figure 2a). CV using the new in sugar prices (after the increase) as a base and can be defined as the amount of money needed to keep consumers can reside on the same utility as before the increase in sugar prices (Figure 2b). Hanemann and Morey (1992) also states that the CV and EV are the exact measurements for the effects of changes in welfare policy.

Figure 2. The Welfare Change because of the Increase of Domestic Sugar Price



3. Methodology

This study used secondary data which derived in Table Input-Output (IO) and Social Accounting Matrix (SAM) of Indonesia in 2008. The parameters of the system of equations obtained from the previous studies.

To evaluate the effect of the price increase of sugar in Indonesia the author used a static CGE models based on the model developed by Hosoe, et al. (2010), Lofgren, et al. (2002) and Woods-Early (2006). This model using the MPSGE (Mathematical Programming System for General Equilibrium) approach was operates as subsystem to the mathematical programming languages GAMS (Generalized Algebraic Modelling System) (Markusen and Rutherford (2004). With MPSGE, the errors which sources from the model specification can be eliminated because the model represented by data provided in tabular (Cretegny et al., 2004). In this CGE model, the equations can be divided into the equations of production, the equations of utility, budget constraints and other provisions, market clearing, identity and the relationship between prices

This model is a static model for single-country with 23 sectors and a small open economy where households maximize their utility and producers maximize their profits. The assumptions are consistent with the state of the sugar industry in Indonesia and its position in world sugar trade. Indonesia is a net importer of sugar, in which the domestic sugar price changes will not affect the world price of sugar. Another assumptions were used: Indonesia is a small country in the world sugar trade, perfectly competitive markets, supply of the production factors are fixed, the labor are used entirely (full employment), the primary input is fully mobile across sectors and the production is constant returns to scale. The supply of goods are differentiated on domestic goods and imports, so that the export prices and import prices are different. In this case the assumption of Armington (1969) will be used, in which the intermediate inputs and finished goods are differentiated by

source of imports and domestic goods. Households were divided into eight groups as in the Indonesian SAM year 2008 and labors were divided into skilled labor and unskilled labor.

4. Results and Discussion

The analysis was conducted by simulating the domestic sugar price increases by 10%, 20%, and 30%. The following part explains the effects of the increases in the domestic sugar price on domestic output, exports, imports, households income and households welfare.

4.1. Effect on Domestic Output

The increase of domestic sugar prices about 10-20% will only increase domestic output of sugar industry and sugarcane 14-29% 11-24%, while other sectors of domestic output will decrease (see Table 1). According to the Stolper-Samuelson theorem, the increase of sugar price will cause a rise in the sugarcane price. Sugarcane farmers respond to the price increase by enhance output through expansion of sugarcane planting area which has depressed areas and other agricultural crops. As a result, the output of food crops and other agriculture will be reduced.

Table 1. The Change of Domestic Output Quantity

No	Sectors	Baseline (Trillion IDR)	Percentage Change since the Rise in Domestic Sugar Price at		
			10%	20%	30%
1	Food Crops	469	-1.81	-28.51	3.39
2	Sugarcane Plantation	17	11.76	23.53	88.24
3	Other Agriculture Crops	719	-1.54	-66.56	23.11
4	Sugar Industry	42	14.63	29.27	75.61
5	Food and Beverage Industry	700	-0.30	-1.06	13.77
6	Fertilizer and Pesticides Industry	44	0	-6.52	6.52
7	Other Industry	4,425	-1.59	-12.42	19.35
8	Services	17,120	-0.49	-28.5	6.51

IDR = Indonesian Rupiah

Source: own calculations using GAMS/MPSGE

However, the fact showed that the increase in sugarcane output was not supported by the fertilizers and pesticides industry, even the increase of domestic sugar prices at 20%, in which the output of sugarcane increased by almost 24%, the production of fertilizers and pesticides industry declined nearly 7%. This indicates that more fertilizers and pesticides were used in agricultural crops compared to sugarcane. The decline in the crop production leads to the reduction in the use of fertilizers and pesticides, eventually the reduction in the production of

fertilizer and pesticide. Meanwhile, the production of the food and beverage industry which used consumers of sugar, also decreased. Sugar is the main raw material in the food and beverage industry. The increase in sugar prices would increase the cost of production so that the profits of sugar producers will decline, assuming the price of industrial output still be unchanged. Producers respond to this situation by reducing their production.

4.2. Effects on Quantity Export

The rise in domestic sugar prices have an impact on the exports quantity of some sectors, depend on the magnitude of the sugar prices increase (see Table 2). If sugar domestic price rise by 20%, the quantity of exports of food and beverage industry, and other industries will increase respectively 1.25% and 1.51% from a baseline of 407 trillion IDR and 2127 trillion IDR, while exports of other agricultural and services will decrease by 2.68% and 14.45% from a baseline of 41 trillion IDR and 201 trillion IDR. If the domestic price of sugar increase of 30%, shows that exports in all sectors increased greatly, especially the agricultural sector and other services. There are allegations that the increase of domestic sugar prices by 30% which is able to increase the quantity of domestic output of other agriculture crops of 23:11% will allow the sector to export as previously was a net importer. Meanwhile, the export quantity of services jumped because of sugar price increases that pushed up the output in all sectors will increase the variety of services that accompany it.

Table 2. The Change of Export Quantity

No	Sectors	Baseline (Trillion IDR)	Percentage Change since the Rise in Domestic Sugar Price at		
			10%	20%	30%
1	Food Crops	0,857	0,01	0	16,7
2	Sugarcane Plantation	0	0	0	0
3	Other Agriculture Crops	41,033	0,01	-2,68	756,9
4	Sugar Industry	0	0	0	0
5	Food and Beverage Industry	407	0	1,25	5,01
6	Fertilizer and Pesticides Industry	4	0	0	125
7	Other Industry	2.127	0	1,51	2,85
8	Services	200,979	0	-14,45	830,92

Source: own calculations using GAMS/MPSGE

4.3. Effects on Import Quantity

The increment of domestic sugar prices would increase the quantity of imports in all sectors except sugar industry and services (see Table 3). If the domestic sugar prices increased at 10% would increase slightly the quantity of sugarcane and other agricultural imports were relatively small. The increase of

domestic sugar prices at 20% would enhance quantity of imports of all sectors, except for the sugar industry, fertilizers and pesticides industry, and services. While the increase of the domestic sugar prices at 30% will also increase the quantity of imports in all sectors, except for the sugar industry, sugarcane, other agricultural and services. Imported sugar is still being done to baseline 2 trillion IDR shows that the domestic sugar production has been unable to fulfill the domestic sugar demand.

The increased imports of a commodity can also be caused by the lower commodity competitiveness as the domestic commodity prices are relatively higher than the prices of imported commodities. While the decline in imports of a commodity due to an increase the production of commodities is concerned as the effects of higher prices.

Table 3. The Change of Import Quantity

No	Sector	Baseline (Trillion IDR)	Percentage Change since the Rise in Domestic Sugar Price at		
			10%	20%	30%
1	Food Crops	29	0	10	166,67
2	Sugarcane Plantation	0.009	0,05	0,18	-62,19
3	Other Agriculture Crops	17.813	0,04	5,44	-62,29
4	Sugar Industry	2	0	0	0
5	Food and Beverage Industry	36	0	2,63	31,58
6	Fertilizer and Pesticides Industry	24	0	0	8,33
7	Other Industry	1.332	0	1,17	1,28
8	Services	176	0	-1,92	-1,23

Source: own calculations using GAMS/MPSGE

4.4. Effects on Household Income

The increase of domestic sugar prices affect the decline in real incomes all of economic agents, namely households, firms and government (see Table 4). If the domestic price of sugar increase by 10%, farm household income and non-farm households income in the rural and in the urban will decline from 0.71 to 0.72%. If domestic sugar prices rise about 20-30%, farm household income would decrease from 25.35 to 28.96%, household income, non-farm in the rural and in the urban would decrease from 25.35 to 28.98%. Thus, the higher price of sugar, the decrease of real incomes of households. The increase of commodities prices caused households to purchase commodities in fewer numbers. The same result in the consumption of gas with time series analysis showed by Ban (2012) that the consumption of gas is influenced by price and not by income level.

The same things is also happened on the producers and the government. The increase of domestic sugar prices at 10%, 20% and 30% caused of the decline in producers revenues respectively 2.68%, 3.36%, 27.33%, while government

revenues decrease respectively by 0.7%, 25, 23%, and 28.80%. Thus, the higher domestic sugar prices, the lower real incomes of producers and government. Based on the percentage decline in real income, producers are the economic actors with least suffered losses due to increased in domestic sugar prices. This shows that the marginal revenue gained producers are still less than the marginal cost.

Table 4. The Change of Households Income

No	Household Classification	Baseline (Trillion IDR)	Percentage Change since the Rise in Domestic Sugar Price at		
			10%	20%	30%
1	Farm-worker households	7.896	-0,72	-25,35	-28,96
2	Agricultural-entrepreneur households	8.001	-0,71	-25,36	-28,96
3	Low-income rural households	7.866	-0,71	-25,35	-28,96
4	Non-labor force rural households	7.396	-0,72	-25,37	-28,98
5	High-income rural households	7.296	-0,71	-25,36	-28,97
6	Low-Income urban households	7.77	-0,71	-25,35	-28,96
7	Non-labor force urban households	7.382	-0,72	-25,36	-28,98
8	High-income urban households	7.349	-0,71	-25,35	-28,97
9	Firms	11.626	-2,68	-3,36	-27,33
10	Government	7.538	-0,70	-25,23	-28,80

Source: own calculations using GAMS/MPSGE

4.5. Effect on Household Welfare

The increase of domestic sugar prices also has an effect on household welfare decrease, but increase producers welfare (see Table 5). If the of domestic price of sugar increase by 10%, household welfare is unchanged, while the welfare of the firm would decrease about 2.02%. If the domestic sugar prices rise about 20-30%, the welfare of farm households would decrease 0.17%, non-farm households in the rural and in the urban dropped from 0.18 to 0.19%, but the welfare of the firm rise 2.14 to 29.30 %.

Thus, the higher the price of sugar, the lower is the household welfare and the higher the welfare of producers. According to the concept EV (Varian, 1992), said that Indonesian households do not experience the difference indirect utility when sugar prices rise 10-30%. If anything, the difference was relatively small.

Table 5. The Change of Households Welfare

No	Welfare Classification	Baseline (Trillion IDR)	Percentage Change since the Rise in Domestic Sugar Price at		
			10%	20%	30%
1	Farm-worker households	571	0	0	-0.17
2	Agricultural-entrepreneur households	579	0	-0,17	-0.17
3	Low-income rural households	569	0	-0,18	-0.18
4	Non-labor force rural households	535	0	-0,19	-0.19
5	High-income rural households	528	0	-0,19	-0.19
6	Low-Income urban households	562	0	0	-0.18
7	Non-labor force urban households	534	0	-0,19	-0.19
8	High-income urban households	532	0	-0.19	-0.19
9	Firms	869	-2,02	29,30	2,14

Source: own calculations using GAMS/MPSGE

5. Conclusions and Recommendations

This study uses a computable general equilibrium to estimate the effects of sugar price changes to some variables of economic indicators in Indonesia has several following conclusions. The rise of domestic sugar prices at 10% would increase domestic output of sugar industry and sugarcane, the quantity of exports and imports of food and other agricultural crops, but domestic output of other sectors would decrease. Real income households, firms and government, as well as the welfare of the firms would decline, while household welfare unchanged. But, If the domestic price of sugar rise at 20%, the domestic output of sugar industry and sugarcane, the export quantity of the food and beverage industry, as well as other industries, and the imports quantity of several sectors would increase, but the domestic output of other sectors, exports of other agricultural and services will reduce. The real income of households, firms and government, as well as the welfare of households declined, while the welfare of the firm would rise until 29.30%.

The rise of domestic sugar prices at 30% would increase the output of sugar and sugarcane sectors as well as the export of food and beverages and others sectors. However, the welfare and the income of households, as well as the income of producers and governments declined, but only the welfare of firms increased as much as 2.14%

This study recommend that the sugar price policy should maintain the increase of sugar price between 10% to 20% since if the rise less than 10% would not effect to the increase of sugar production but if the sugar price increase more than 20% would hurt not only to consumers but also to government.

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