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DEMAND PRICE ELASTICITY OF SUGAR SWEETENED BEVERAGES IN INDONESIA

Demand Price Elasticity of Sugar Sweetened Beverages in Indonesia

Agus Widarjono
Rifai Afin
Gita Kusnadi
Muhammad Zulfiqar Firdaus

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EXECUTIVE SUMMARY

Background

Excessive consumption of sugar sweetened beverages (SSBs) has long been investigated as one major risk factor of obesity and non-communicable diseases (NCDs). Despite the high prevalence of obesity and NCDs in the country, Indonesia has not yet executed its plan to implement SSB tax as one strategic policy to control people's consumption of SSBs. Scientific evidence is needed to support the government in developing regulatory processes of SSB tax implementation in Indonesia, especially in projecting the effectiveness of the tax in reducing people's consumption of SSB products.

Approach

This study uses three models of calculating demand elasticities to measure the elasticity of SSB product prices and income in Indonesia using data from the National Socioeconomic Survey 2021: Almost Ideal Demand System (AIDS), Quadratic Almost Ideal Demand System (QUAIDS), and Deaton Model with Spatial Variations. The study also simulates the government's expected tax collections from the established SSB tax. The findings of this study are aimed to support the formulation of SSB tax policy in Indonesia, particularly by providing information on the tax's possible effects on demand shifts and tax income.

Key Findings

1. The demand for SSBs in Indonesia is price elastic, which means that a decrease in demand is expected when SSB price changes. The elasticity coefficient of SSB products ranges from −0.3 to −1.3.

2. Mineral water can be a substitute for SSB products. When SSBs prices significantly increase, consumers may substitute SSBs with mineral water since the cross-price elasticity magnitude of mineral water are positive.

3. The change in demand estimation suggests that a 20% increase in SSB prices due to the tax implementation would result in an average of 17.5% decrease in SSBs consumption.

4. The scenario III tax rate suggested by the MoF is expected to give the government an additional revenue of IDR 3.7 billion per year.

Policy recommendation:

1. The imposition of a tax on SSB products will raise the cost of SSBs and, as a result, decrease consumer demand for SSBs. When the government imposes a 20% SSB tax, our analysis estimates that SSB consumption will drop by 17.5%. This suggests the effectiveness of the SSB tax's implementation, particularly in preventing future catastrophic health effects and medical costs related to non-communicable diseases and obesity.

2. The SSB tax must be implemented by the government, at least by 20%. According to the WHO's recommendations, in order to effectively accomplish the public health goals of reducing impacts on non-communicable illnesses, SSB tax must be introduced to result in a 20% price rise for SSB. According to our study, the MoF should impose the scenario III tax rate (highest rate) in order to achieve the optimum reduction of people's consumption on SSBs.

3. The volume and/or sugar content of SSB products can be used to determine the tax rate. This strategy will allow the government to apply the tax to all SSB products that contain both sugar and artificial sweeteners. The tax can also be applied to all SSB products, including those in liquid and concentrate forms. This approach is crucial to maximize the tax's ability to lower people's consumption of SSBs and to foresee any potential responses from SSBs manufacturers, such as switching from sugar to artificial sweeteners. SSBs having more volume and/or sugar content may be subject to a higher tax rate under a progressive system.

4. SSB tax must be fully applied at all corporate scales. The implementation of SSB tax must be carried out thoroughly throughout all business scales, including manufactured SSBs and ready-to-drink SSB products, in order to avoid the chance that people's consumption behavior may shift to those SSBs that are not subject to the excise tax.

5. Prioritizing the imposition of a SSB tax in 2023 is something the government must consider. Government commitment in promoting public health must be formally expressed through laws and rules. The Government must prioritize the drafting and ratifying process of SSB tax implementation, such as Government Regulations (PP) and Minister of Finance Regulations (PMK).

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LIST OF ABBREVIATIONS

AIDADS	An Implicitly, Directly Additive Demand System
AIDS	Almost Ideal Demand System
CDF	Cumulative Distribution Function
GEF	General Exponential Form
IMR	Inverse Mill Ration
LES	Linear Expenditure System
MoF	Ministry of Finance
NCDs	Non-Communicable Diseases
PDF	Probability Distribution Function
QUAIDS	Quadratic Almost Ideal Demand System
SSB	Sugar Sweetened Beverages
SUSENAS	National Household Socio-economic Survey

1 INTRODUCTION

The epidemic of obesity has been of global concern as its prevalence has nearly tripled in the last four decades. (WHO, 2021). This health issue has not only impacted developed countries but also developing countries (Ng et al., 2014), including Indonesia. In the last decade, one out of ten people in Indonesia were obese, but now the number has doubled to 21.8% of the total population. (Kemenkes, 2008, 2019). This figure is concerning since obesity is highly correlated with the incidence of non-communicable diseases (NCDs) such as diabetes, stroke, and coronary heart disease (Guh et al., 2009). Based on the results of the Global Burden of Disease Study, it is revealed that NCDs are responsible for 80% of the causes of death in the country. (GBD 2019 Diseases and Injuries Collaborators, 2020).

An unhealthy diet, particularly high consumption of sugar-sweetened beverages (SSBs), has long been investigated as clearly associated with a higher risk of obesity and NCDs, because consuming SSBs increases a person's caloric intake and may cause weight gain (Malik et al., 2018; Vartanian et al., 2007). A strong body of evidence has demonstrated that SSBs consumption increases the likelihood of obesity, type 2 diabetes, cardiovascular diseases, cancers, and even mortality (Ferretti & Mariani, 2019; Malik & Hu, 2022; Singh et al., 2015). Consumption of SSBs has increased worldwide since 1997 (Basu et al., 2013) and is estimated to continue increasing in parallel with economic development (Ferretti & Mariani, 2019). In Indonesia, the increasing rate of obesity and NCDs is occurring alongside the increase in SSBs consumption (Ardiansyah, 2017). Data from Indonesia's National Economic Survey reveals that consumption of SSBs in Indonesia has increased 15 times in the last two decades (Ardiansyah, 2017).

This alarming rate of SSBs consumption has prompted Indonesian policymakers to identify strategic initiatives to prevent further health risks relevant to obesity and NCDs. Among other preventive measures, global evidence has shown that taxing sugary drinks effectively decreases consumption of SSBs (WHO, 2016). Today, more than 50 countries globally have implemented this fiscal measure as one strategic policy to tackle obesity and NCDs (World Bank, 2020). Empirically, an evaluation study in Thailand has revealed that the implementation of an SSB tax has effectively reduced consumption of carbonated drinks by 17.7% two years after the tax was implemented (Phulkerd et al., 2020). Additionally, a systematic review of several taxes in effect at the national and local level has shown that a 20% increase in SSBs prices due to the SSB tax implementation is effective in reducing SSB consumption by 24%. (Powell et al., 2013).

Notwithstanding the fact that SSB tax has been widely implemented worldwide (UNC, 2021), Indonesia has not yet executed its plan to tax SSBs. Although studies have been extensively conducted about SSB tax implementation, both empirical and modelling studies, no study investigates the potential impacts of SSB tax implementation in Indonesia. In fact, this scientific evidence is urgently needed to support the establishment of SSB tax regulatory processes in the country, especially to project the effectiveness of the implemented tax on people's consumption of SSB products.

Using the data from the National Socioeconomic Survey 2021, this study aims to project the elasticity of SSB products' prices and income in Indonesia by employing several different demand elasticity methods. Additionally, this study also simulates the estimated government revenue from the implemented SSB tax. The result of this study is aimed at supporting the policymaking process of SSB tax in Indonesia, especially informing the potential impacts of SSB tax on demand changes and government revenue.

2
METHODS

2.1 Sugar Sweetened Beverage (SSB) Definition

According to the World Health Organization (WHO), "sugar-sweetened beverages (SSB) are beverages containing added caloric sweeteners, such as sucrose, high-fructose corn syrup, or fruit-juice concentrates" (WHO, 2016). In this report, we define SSBs as 1) all beverages that are sweetened with either sugar or other types of sweeteners such as saccharin, sucralose, aspartame, etc; 2) all sweetened beverages including those in the form of liquid, concentrate, or powder. This definition may include, but is not limited to, carbonated drinks, energy drinks, packaged fruit juices, isotonic drinks, herbal and vitamin drinks, flavored milk, tea and coffee drinks, sweetened condensed milks, and syrups (CISDI, 2022).

2.2 Data

This study uses the National Household Socio-economic Survey (SUSENAS) 2021 data to estimate the price and income elasticity of SSBs. The data consists of cross-sectional survey covering nationally representative households in Indonesia and records a total of 188 different types of food and beverage expenditures and consumption. Based on the data availability in the SUSENAS, we include six categories of beverages in our study: (1) bottled liquid milk (2) sweetened condensed milk, (3) instant coffee (sachets), (4) tea drinks, fizzy drinks with CO2, (5) fruit juices, health drinks, and energy drinks, and (6) mineral water. In addition, this study also employs the 2021 forecasted sales data of SSBs obtained from Global Data[1], which we integrate with the SUSENAS to simulates the government revenue

2.3 Estimation of Elasticity

2.3.1. Almost Ideal Demand System (AIDS) Model

The first method that is used to estimate the price elasticity of demand in this study is the Almost Ideal Demand System (AIDS) (Deaton & Muellbauer, 1980). The model assumes that the relationship between income and consumption is linear. In other words, demand for particular goods always increases when income increases. The model is expressed as follows:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij}\, lnp_j + \beta_i ln\left(\frac{X}{a(P)}\right) + u_i \quad (1)$$

[1]Global Data is an institution that collects data about beverage sales and predictions around the world. The data collection method uses a variety of primary and secondary sources, all of which have been rigorously reviewed, cleaned, and analyzed by experts.

where i and j are the types of drink, w_i is the budget share allocated to buy the drink i, p_j is the price of the drink j, X is the total household expenditure for the drink, and $a(P)$ is the price index calculated using the following formula:

$$\ln[a(P)] = \alpha_0 + \sum_{i=1}^{n} \alpha_i \, lnp_i + 0.5 \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \, lnp_i lnp_j \quad (2)$$

Since SUSENAS data does not report the price of any beverage products, we calculate the price by regressing the unit value with household income and a regional dummy (Jensen & Manrique, 1998). A unit value is obtained by dividing the consumption value (IDR) by the quantity consumed. For household income, we use household total expenditure as a proxy.

Furthermore, because demographic also affects beverage consumption, the demographic variables are added to the equation (2). These demographic variables are included in the intercept and take form as follows:

$$\alpha_i = \rho_{i0} + \sum_{k=1}^{m} \rho_{ik} \, d_k \quad (3)$$

Where d_k represents the demographic variable of k. In this study, the demographic variables added are household size, the age of the household head, the marriage status of household head, and the education level of the household head.

Next, the theory of demand is incorporated into the equation (1) by restricting the estimated parameters with a few restrictions which are : $\sum_{i=1}^{n} \rho_{i0} = 1 \sum_{i=1}^{n} \rho_{ik} = 0 \sum_{i=1}^{n} \gamma_{ij} = 0 \sum_{i=1}^{n} \beta_i = 0$; and $\sum_{i=1}^{n} l_i = 0$; homogeneity $\sum_{=1}^{n} \gamma_{ij} = 0$ for each i ; and Slutsky symmetry $\gamma_{ij} = \gamma_{ji}$, $i \neq j$.

Therefore, the price and income elasticity of the AIDS model can be obtained by solving the following equations, respectively:

$$e_{ij} = \frac{1}{w_i} \{\gamma_{ij} - \beta_i (\alpha_{ih} + \sum_{j=1}^{n} \gamma_{ij} \, lnp_j)\} - \delta_{ij} \quad (4)$$

$$e_i = 1 + \frac{1}{w_i} [\, \beta_i] \quad (5)$$

In this study, we infer the AIDS model's price and income elasticity using the censoring approach to accommodate the possibly of households consuming SSBs in other occasions outside the survey (SUSENAS) period. This is particularly important to accommodate the limitation that SUSENAS only captures the household consumption of SSB products one week before the survey is conducted.

2.3.2. QUAIDS Model

The second model that is used in this study is the Quadratic Almost Ideal Demand System (QUAIDS) which was proposed by Banks et al., (1997). In contrast with the AIDS model, the model assumes that the relationship between consumption and income is not linear. This is theoretically important since a rise in income does not always lead to an increase in the consumption of particular goods. In this case, for example, when goods are considered as normal goods, the consumption of those goods will rise with an increase in income. Conversely, when goods are considered inferior goods, consumption of those goods will fall with an increase in income.

The model extends the AIDS model and is expressed as follows:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{X}{a(P)}\right) + \frac{l_i}{b(P)} \left(\ln\left[\frac{X}{a(P)}\right]\right)^2 + u_i \quad (6)$$

where $b(P)$ is the Cobb-Douglas price aggregator calculated using the formula $b(P) = \prod_{i=1}^{n} p_i^{\beta_i}$

By solving the equation (6), the price and income elasticity of the QUAIDS model are expressed by the following equation, respectively:

$$e_{ij} = \frac{1}{W_i}\left\{\gamma_{ij} - \left(\beta_i + \frac{2l_i}{b(P)}\left[\ln\left(\frac{X}{a(P)}\right)\right]\right)\left(\alpha_{ih} + \sum_{j=1}^{n} \gamma_{ij} \ln p_j\right) - \frac{l_i \beta_j}{b(\boldsymbol{P})}\left(\ln\left[\frac{X}{a(P)}\right]\right)^2\right\} - d_{ij} \quad (7)$$

$$e_i = 1 + \frac{1}{W_i}\left[\beta_i + \frac{2l_i}{b(\boldsymbol{P})} \ln\left(\frac{X}{a(\boldsymbol{P})}\right)\right] \quad (8)$$

Similar to the AIDS model, we also infer the QUAIDS model's price and income elasticity using the censoring approach in order to account for the likelihood that households consume SSBs outside the SUSENAS survey period.

2.3.3. Deaton Model

Estimating price and income elasticity using demand equation is not easy because it requires knowledge of household spending at various price levels. In this case, accurate price data is difficult to obtain because prices may vary in terms of location and time. For this reason, the adoption of unit value as a measure of market price is one of the solutions (McKelvey, 2011).

Deaton (1988) develops a model to estimate price and income elasticity using unit root values and a model which allows for quality effect compensation. In this study, we use Deaton model as the third alternative in estimating the price and income elasticity of SSBs.

The model starts with equation (9), which represents a given set of expenditures (E_A) that is made up by predetermined group of items A, where p_A and q_A represent the vector of prices and quantities of the items, respectively.

$$E_A = p_A q_A \quad (9)$$

λ_A is proxied as the unique price of commodities A and v_A indicates the quality of purchased goods such that:

$$E_A = \lambda_A v_A Q_A \tag{10}$$

For the same level of expenditures E_A, the aggregated quantity within the group A (Q_A) will be determined by the quality of purchased goods. More importantly, the estimated unit value $V_A = \frac{E_A}{Q_A} = \lambda_A v_A$ will be determined by the product of proxy unique price and quality. The price elasticity is then expressed by the following equation:

$$e_A = \frac{\partial Q_A}{\partial \lambda_A} = \frac{\partial lnQ_A}{\partial lnV_A}\left(1 + \frac{\partial lnv_A}{\partial ln\lambda_A}\right) \tag{11}$$

Deaton (1988) argues using the weak separable utility function with the following demand equation:

$$q_A = f_c\left(\frac{E_A}{\lambda_A}, p*_A\right) \tag{12}$$

The consumer chooses in the first step the –normalized- budget $\frac{E_A}{\lambda_A}$ that is dedicated to the group A. Following that, and depending on the vector of the prevalent prices based on quality $(p*_A)$, the consumer will choose the levels of spending on the various items in group A. Furthermore, the assumption of weak separability results in:

$$\frac{\partial lnv_A}{\partial ln\lambda_A} = \frac{\frac{\partial lnv_A}{\partial lnx}\frac{\partial lnQ_A}{\partial \lambda_A}}{\frac{\partial lnQ_A}{\partial lnx}} \tag{13}$$

Using standard unit value model and assuming that quality influence is zero or can be ignored, the simple model with weak separability can be written as the following:

$$w_{A,i} = \alpha_0 + \beta_0 x_i + \gamma_0 z_i + \Phi_0 ln(V_{A,i}) + u_{0,i} \tag{14}$$

Where w is the budget share, x is household income, z denotes household characteristics, and V is unit value of group A.

$$\frac{\partial lnQ_A}{\partial lnV_A} = \frac{\frac{\partial lnw_A}{\partial lnV_A}}{w_A} - 1$$
$$e_A = \frac{\partial Q_A}{\partial \lambda_A} = \left(\frac{\frac{\partial lnw_A}{\partial lnV_A}}{w_A} - 1\right)\left(1 + \frac{\partial lnv_A}{\partial \lambda_A}\right) \tag{15}$$

In the standard unit value model and by employing assumption of no correlation between quality and price changes ($\frac{\partial lnv_A}{\partial ln\lambda_A}$=0), the elasticity of price can be re-written as:

$$\widehat{e_A} = \left(\frac{\widehat{\phi_0}}{w_A} - 1\right) \tag{16}$$

In the case when price changes are not zero and the assumption of weak separability is employed, then the elasticity of price can be formulated as the following:

$$e_A = \frac{\partial Q_A}{\partial \lambda_A} = \left(\frac{\frac{\partial lnw_A}{\partial lnV_A}}{w_A} - 1\right)\left(1 + \frac{\frac{\partial lnv_A}{\partial lnx}\frac{\partial lnQ_A}{\partial \lambda_A}}{\frac{\partial lnQ_A}{\partial lnx}}\right) \tag{17}$$

The empirical model of Deaton Unit Value Model with spatial variations can be written as follows:

$$w_{A,i} = \alpha_1 + \beta_1 x_i + \gamma_1 z_i + f_c + u_{1,i,} \tag{18}$$

$$ln(V_{A,i}) = \alpha_2 + \beta_2 x_i + \gamma_2 z_i + f_c + u_{2,i} \tag{19}$$

where f_c is the fixed effect of the group A, in which the estimation of both models is considered as the first step of the Deaton Model with spatial variations. The second step is the estimation of the following equation:

$$\widehat{w}_A = \alpha_3 + \phi_3 ln(\widehat{V_{A,i}}) + u_3 \tag{20}$$

It should be noted that the estimation at this second stage is not usual least squares estimators. Deaton (1988) uses the correlation between the first stage residuals to estimate the seriousness of the problem in measuring error. This is employed to adjust the estimation and correction for the structural correlation between quantity and unit value. As the third step, which is the calculation of elasticity of group A, solving the equation (11) for the argument $\frac{\partial Q_A}{\partial \lambda_A}$

All models of Deaton with spatial variations in terms of quality and corrections and symmetry restrictions are estimated in total observations and subgroups of Java Island and Non-Java Island, and urban and rural areas.

2.4 Estimation of Changes in Demand

In investigating the effects of price changes on SSB consumption, we use the price elasticities of SSB by assuming the interdependent demand relationship among SSBs and no changes in income. Any SSB consumed is affected by changes in a particular SSB's price both the own-price elasticity and cross-price elasticity. The changes in demand for SSB due to price changes can calculated as follows:

$$\Delta SSB_j = \%\Delta price * own\ price\ elasticity + \%\Delta price * cross\ price\ elasticity$$

2.5 Simulation of Government Revenue

In estimating the government revenue from the tax imposed on SSBs, we integrate the price elasticities calculated from the SUSENAS data with the 2021 forecasted yearly gross volume sales data of SSBs obtained from Global Data. We integrate the SUSENAS data with the forecasted sales data for the following types of SSBs: 1) manufactured liquid milk, 2) sweetened condensed milk, 3) tea drink, 4) fizzy drinks with CO2, 5) fruit juice, 6) health drink, and 7) energy drink. However, since a few beverages are categorized in one particular group in the SUSENAS data (e.g., fruit juice, health drinks, and energy drinks) we assumed that the price elasticity of each beverage is similar to the price elasticity of the group. In addition, we exclude instant coffee from the estimation of government revenue analysis since the forecasted sales data for instant coffee is not available.

We used two different tax designs to estimate the tax revenue: 1) 20% ad valorem tax recommended by the WHO[2], 2) specific volumetric tax (consisted of 3 scenarios) proposed by the Ministry of Finance (MoF)[3]. The three tax rate scenarios proposed by the government are as follow:

Tabel 1. Tax Scenario proposed by the MoF

Types of SSB	Sugar content	Lumpsum tax (Rupiah per liter)		
		Scenario I	Scenario II	Scenario III
Ready to drink SSBs	<5 gr/240 ml	0	0	0
	5-20 gr/240 ml	1500/L	2000/L	4200/L
	>20 gr/240 ml	2500/L	2771/L	4200/L
Concentrated SSBs	<5 gr/240 ml	0	0	0
	5-20 gr/240 ml	1500/L	2000/L	4200/L
	>20 gr/240 ml	2500/L	2771/L	4200/L

Tax revenue of ad valorem tax is calculated as the forecasted volume of sales times the ad valorem tax, employing an average price per liter and assuming complete pass through for each SSB. Revenue from Ad valorem tax is calculated as:

$$Tax\ revenue_i = Forecasted\ Sales * advalorem\ tax\ rate * price\ of\ SSB$$

In addition to ad valorem tax, the volumetric tax is calculated as:

$$Tax\ revenue_i = Forecasted\ Sales * lumpsum\ tax\ rate$$

[2]WHO. *Taxes on sugary drinks: Why Do It?* 2017

[3]MoF's socialization on December 17 2021 entitled "Undang-Undang Harmonisasi Peraturan Perpajakan (Klaster Cukai) & Rencana Kebijakan Ekstensifikasi Cukai"

3
RESULTS

3.1 Descriptive Statistics

Table 2 describes the descriptive statistics of the household consumption of SSB and mineral water. Instant coffee was the most consumed SSB, with 29.4% of households consuming it, and manufactured liquid milk was the least consumed SSB, with only 5.7% of households consuming it. Mineral water, the only unsweetened beverage included, was consumed by 20.5% of households, with an average expenditure of IDR 44,129 per household for a one-month period. While manufactured milk was the least consumed beverage, it was the one on which households spent the most money (IDR 84,285). In contrast, households spent the least amount of money on tea drinks and fizzy drinks with CO2 at IDR 35,999 on average. In terms of the quantity of servings, on average, instant coffee was the type of beverage that households consumed the most (29 servings per month), while sweetened condensed milk was the least that they consumed (5 servings per month). The table also shows that the most expensive beverage was sweetened condensed milk, and the cheapest beverage was instant coffee.

Tabel 2. Descriptive statistics on household consumption of SSB and mineral water

Beverages	Proportion of Household Consuming (%)	Average Household Monthly expenditure (IDR)	Average Household Monthly consumption (serving)	Average Price (IDR)
Manufactured liquid milk (± 250 ml)	5.67	84,285	19	4,436
Sweetened condensed milk (397 gr)	22.17	51,119	5	10,224
Instant coffee (20 gr)	29.43	40,577	29	1,399
Tea drink, fizzy drinks with CO2 (± 250 ml)	19.60	35,999	12	2,999
Fruit juice, health drink, energy drink	17.89	42,370	13	3,259
Mineral water (± 200 ml)	20.46	44,129	9	4,903

Note: Total households are 340,032 in SUSENAS 2021

3.2 Price Elasticities

3.2.1. AIDS Model

3.2.1.1. Own Price Elasticity using AIDS Model

Table 3. Panel (a) presents the estimated own-price elasticities using the AIDS model. Overall, the own-price elasticities of manufactured liquid milk, sweetened condensed milk, tea drinks, and fizzy drinks with CO2 indicate that demand for these types of beverages is price elastic (absolute value of elasticity is greater than 1). In other words, the quantity consumed of these beverages decreases when their prices increase. In contrast, the demand for instant coffee; and fruit juice, health drinks, and energy drinks is inelastic (the absolute value of elasticity is less than 1), which means the quantity consumed of these beverages remains relatively unchanged when their prices change.

In addition, the table also shows the estimated elasticities across different household income levels. In this case, the demand among poorer households (bottom 25 quartile) for manufactured liquid milk; instant coffee; tea drinks, and fizzy drinks is slightly more elastic compared to richer households as their elasticities for these types of beverages are higher. Furthermore, the table also compares the elasticities of households that reside in urban and rural areas. In this regard, the demand for manufactured liquid milk; and fruit juices, health drinks, and energy drinks is slightly more elastic among households that reside in rural areas compared to urban areas. Meanwhile, the demand for sweetened condensed milk; instant coffee; as well as tea drinks, and fizzy beverages among households that reside in urban areas is slightly more elastic as opposed to households that reside in rural areas.

The elasticities also vary by the household head's age and years of schooling. In this case, the demand among more mature households (household heads aged more than 50 years old) is slightly more elastic in comparison to less mature households, as their elasticities are slightly higher. The demand among more educated households (household heads have more than 12 years of schooling), especially for sweetened condensed milk; tea drinks and fizzy drinks; as well as fruit juices, health drinks, and energy drinks, is also slightly more elastic compared to less educated households.

Tabel 3. Own-price elasticity of the demand for SSB

(a) AIDS model

Beverages	Income levels				Regions		Age of household head		Household's years of schooling	
	All	25%	50%	75%	Urban	Rural	≤50	>50	≤12	>12
Manufactured liquid milk	-1.43	-1.70	-1.59	-1.52	-1.32	-1.63	-1.38	-1.59	-1.44	-1.22
Sweetened condensed milk	-1.01	-1.01	-1.01	-1.01	-1.02	-1.01	-1.01	-1.01	-1.01	-1.02
Instant coffee	-0.93	-0.94	-0.93	-0.93	-0.93	-0.93	-0.93	-0.93	-0.93	-0.92
Tea drink, fizzy drinks with CO2	-1.07	-1.08	-1.08	-1.07	-1.08	-1.07	-1.07	-1.08	-1.07	-1.09
Fruit juice, health drink, energy drink	-0.98	-0.98	-0.98	-0.98	-0.98	-0.98	-0.98	-0.98	-0.98	-0.98

(b) QUAIDS model

Beverages	Income levels				Regions		Age of household head		Household's years of schooling	
	All	25%	50%	75%	Urban	Rural	≤50	>50	≤12	>12
Manufactured liquid milk	-0.69	-0.77	-0.75	-0.73	-0.60	-0.74	-0.66	-0.73	-0.70	-0.12
Sweetened condensed milk	-0.33	-0.38	-0.36	-0.35	-0.35	-0.32	-0.33	-0.35	-0.33	-0.33
Instant coffee	-1.38	-1.36	-1.37	-1.38	-1.37	-1.39	-1.39	-1.37	-1.38	-1.41
Tea drink, fizzy drinks with CO2	-1.18	-1.17	-1.17	-1.17	-1.18	-1.17	-1.17	-1.18	-1.17	-1.19
Fruit juice, health drink, energy drink	-1.11	-1.11	-1.11	-1.11	-1.11	-1.11	-1.11	-1.11	-1.11	-1.11

(c) Deaton model with quality correction and symmetry restriction

Beverages	Income levels				Regions		Age of household head		Household's years of schooling	
	All	25%	50%	75%	Urban	Rural	≤50	>50	≤12	>12
Manufactured liquid milk	-2.27	-1.18	-1.61	-2.22	-1.29	-2.95	-1.69	-1.46	-1.76	-1.02
Sweetened condensed milk	-0.72	-0.46	-0.38	-0.23	-0.63	-1.05	-0.49	-0.75	-0.54	-0.16
Instant coffee	-1.26	-0.62	-0.60	-0.56	-2.05	-1.18	-0.80	-0.62	-0.79	-0.64
Tea drink, fizzy drinks with CO2	-1.98	-1.76	-2.10	-1.87	-2.02	-2.09	-1.55	-1.52	-1.55	-1.08
Fruit juice, health drink, energy drink	-1.95	-2.46	-2.29	-1.75	-1.82	-2.06	-1.56	-1.52	-1.54	-1.48

3.2.1.2. Cross Price Elasticity using AIDS model

Table 4. Panel (a) presents the estimated cross-price elasticity, which measures the change in consumption of a particular beverage in relation to a change in the price of another beverage. When the cross-price elasticity is positive, it indicates that a price increase in another beverage increases the demand for that beverage. In other words, both beverages are considered substitutable. In contrast, when the cross-price elasticity is negative, it indicates that a price increase in another beverage decreases the demand for that beverage, indicating both beverages are considered complementary. The table shows that a few beverages are substitutable for other types of beverages but not for others. For example, sweetened condensed milk is the substitute for manufactured liquid milk; instant coffee; and tea drinks and fizzy drinks, but not for fruit juices, health drinks, energy drinks; and mineral water. Interestingly, the table shows that mineral water, the only non-SSB included in this study, is only substitutable for instant coffee, tea drinks, fizzy drinks, fruit juices, health drinks, and energy drinks, but not for the other SSBs.

Tabel 4. Cross-price elasticities of the demand for SSB

(a) AIDS model

Beverages	Manufactured liquid milk	Sweetened condensed milk	Instant coffee	Tea drink, fizzy drinks with CO2	Fruit juice, health drink, energy drink	Mineral water
Manufactured liquid milk	-	0.06	-0.25	-0.04	0.32	-0.05
Sweetened condensed milk	0.03	-	0.12	0.04	-0.04	-0.12
Instant coffee	-0.02	0.11	-	-0.01	-0.08	0.00
Tea drink, fizzy drinks with CO2	0.01	0.08	-0.01	-	0.02	0.06
Fruit juice, health drink, energy drink	0.13	-0.07	-0.18	0.01	-	0.09
Mineral water	-0.01	-0.24	-0.07	0.03	0.07	-

(b) QUAIDS model

Beverages	Manufactured liquid milk	Sweetened condensed milk	Instant coffee	Tea drink, fizzy drinks with CO2	Fruit juice, health drink, energy drink	Mineral water
Manufactured liquid milk	-	0.77	-0.57	-0.29	-0.39	0.46
Sweetened condensed milk	0.10	-	-0.63	-0.26	-0.19	0.42
Instant coffee	0.06	0.46	-	-0.17	-0.15	0.26
Tea drink, fizzy drinks with CO2	0.07	0.43	-0.37	-	-0.12	0.25
Fruit juice, health drink, energy drink	0.10	0.37	-0.40	-0.15	-	0.26
Mineral water	0.11	0.76	-0.60	-0.27	-0.22	-

(c) Deaton model with quality correction and symmetry restriction

Beverages	Manufactured liquid milk	Sweetened condensed milk	Instant coffee	Tea drink, fizzy drinks with CO2	Fruit juice, health drink, energy drink	Mineral water
Manufactured liquid milk	-	1.18	-1.91	-0.17	-0.05	0.81
Sweetened condensed milk	0.22	-	0.56	-0.14	-0.06	0
Instant coffee	-0.24	0.57	-	0.35	-0.05	0.30
Tea drink, fizzy drinks with CO2	-0.02	-0.18	0.80	-	0.33	-0.07
Fruit juice, health drink, energy drink	0.02	-0.05	-0.16	0.34	-1.95	0.11
Mineral water	0.30	0.02	0.60	-0.12	0.08	-

3.2.2. QUAIDS Model

3.2.2.1. Own Price Elasticity using QUAIDS Model

Table 3. Panel (b) shows the estimated own price elasticities calculated using the QUAIDS model. Overall, the price elasticities indicate that the demand for manufactured liquid milk and sweetened condensed milk is inelastic while the demand for other types of SSB is price elastic. The elasticities across different households' income levels indicate that poorer households' elasticities are slightly higher compared to richer households, especially for manufactured liquid milk; sweetened condensed milk; and fruit juices, health drinks, and energy drinks. The comparison of elasticities between urban and rural households shows that urban households' demand for sweetened condensed milk; tea and fizzy drinks; as well as fruit juices, health drinks, and energy drinks is slightly more elastic, as their elasticities are higher for these types of drinks. On the other hand, rural households' demand for these types of drinks is less elastic and more elastic for manufactured liquid milk and instant coffee, as opposed to urban households.

In terms of the comparison of elasticities between more mature and less mature households, generally, more mature households' demand for SSBs is more elastic compared to less mature households', except for instant coffee, as their elasticities are higher. Meanwhile, the comparison of elasticities between more educated and less educated households indicates that more educated households' demand is more elastic for instant coffee, tea drinks, and fizzy drinks, but less elastic for manufactured liquid milk, sweetened condensed milk, fruit juices, health drinks, and energy drinks compared to less educated households.

3.2.2.2. Cross Price Elasticity using QUAIDS Model

The results of cross-price elasticities using the QUAIDS model presented In Table 4. Panel (b). The mineral water's cross-price elasticities Indicate that mineral water is a substitute for all SSBs since the cross-price elasticities between mineral water and all SSBs are positive in magnitude. However, a few SSBs such as instant coffee, fruit juices, health drinks, and energy drinks are not necessarily substitutes for mineral water as their cross-price elasticity is negative. As before, one type of SSB is not necessarily substitutable for other SSBs. For example, manufactured liquid milk is substitutable for other SSBs, while instant coffee is complementary to other SSBs.

3.2.3. Deaton Model

3.2.3.1. Own Price Elasticity using Deaton Model

The estimated own-price elasticities using the Deaton Model (based on the model with quality correction and symmetry restriction) are presented in Table 3. Panel (c). The overall results show that the demand for SSBs is price elastic, except for sweetened condensed milk. The elasticities across different households' income levels show that poorer households' demand for sweetened condensed milk, instant coffee, fruit juices, health drinks, and energy drinks is slightly more elastic compared to richer households' demand. In contrast, the demand for manufactured liquid milk, tea drinks, fizzy drinks, and mineral water among poorer households is less elastic compared to richer households.

The comparison between urban and rural households indicates that the demand for all SSBs is more elastic among rural households, except for instant coffee, which is more elastic among urban households. Furthermore, the comparison between more mature and less mature households shows that more mature households have slightly higher elasticities for all SSBs except sweetened condensed milk compared to their less mature counterparts. Meanwhile, based on the comparison between the two groups of households, more educated households have larger elasticities for all SSBs than less educated households.

3.2.3.2. Cross Price Elasticity using Deaton Model

The cross-price elasticities using the Deaton Model are presented in Table 4. Panel (c). The cross-price elasticities of mineral water show that mineral water is substitutable for all SSBs except for tea drinks and fizzy drinks. Meanwhile, as before, the cross-price elasticities between SSBs again show that one SSB is not necessarily substitutable for another.

3.3 Income Elasticity

3.3.1. Income Elasticity using AIDS Model

Table 5. Panel (a) exhibits the income elasticities of the five categories of SSB using AIDS model. All income elasticities are positive in magnitude, indicating that all SSBs are normal goods. When goods are considered as normal goods, the increase in total income increases the quantity consumed of those particular goods. In addition, all of the elasticities are less than 1, except for manufactured liquid milk (1.391). When the income elasticity of a good is less than 1, it indicates that particular good is a necessity good. A necessity good is a good that people consume regardless of the changes in their income. In contrast, when the income elasticity of a good is greater than 1, it indicates that particular good is a superior good. A superior good is a good which makes up a larger proportion of consumption as income increases. In this case, manufactured liquid milk is considered a superior good as opposed to other SSBs, which are considered necessity goods.

The table also shows the income elasticities of households with different level of income. While, the income elasticity for manufactured liquid milk is slightly higher among poorer households compared to richer households, the income elasticity for other SSBs is relatively similar. This indicates that, when the income of poorer households rises by the same amount as the richer households' income rises, the poorer households' consumption of manufactured liquid milk increases more than the richer households' consumption does.

In addition, the table also presents the comparison of income elasticity between the households that reside in urban areas and rural areas. Overall, the income elasticities of manufactured liquid milk, sweetened condensed milk, tea drinks, and fizzy drinks among households that reside in urban areas are slightly lower compared to the elasticities of households that reside in rural areas. Furthermore, the table also shows the comparison between more mature and less mature households, as well as more educated and less educated households. In this regard, income elasticities among more mature households are slightly higher compared to less mature households, except for tea and fizzy drinks. Meanwhile, income elasticities among more educated households are generally lower compared to less educated households.

Tabel 5. Income elasticity of the demand for SSB

(a) AIDS model

Beverages	Income levels				Regions		Age of household head		Household's years of schooling	
	All	25%	50%	75%	Urban	Rural	<=50	>50	≤12	>12
Manufactured liquid milk	1.39	1.64	1.54	1.48	1.28	1.58	1.34	1.54	1.40	1.19
Sweetened condensed milk	0.98	0.98	0.98	0.98	0.97	0.98	0.98	0.98	0.98	0.97
Instant coffee	0.93	0.94	0.94	0.93	0.93	0.92	0.92	0.93	0.93	0.91
Tea drink, fizzy drinks with CO2	0.92	0.91	0.91	0.92	0.91	0.92	0.92	0.91	0.92	0.90
Fruit juice, health drink, energy drink	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(b) QUAIDS model

Beverages	Income levels				Regions		Age of household head		Household's years of schooling	
	All	25%	50%	75%	Urban	Rural	<=50	>50	≤12	>12
Manufactured liquid milk	0.72	0.79	0.77	0.75	0.64	0.76	0.69	0.75	0.72	0.22
Sweetened condensed milk	0.89	0.91	0.90	0.90	0.89	0.90	0.89	0.90	0.89	0.89
Instant coffee	0.92	0.93	0.92	0.92	0.91	0.92	0.92	0.92	0.92	0.91
Tea drink, fizzy drinks with CO2	0.92	0.92	0.92	0.92	0.91	0.92	0.92	0.92	0.92	0.90
Fruit juice, health drink, energy drink	0.93	0.94	0.94	0.93	0.93	0.94	0.93	0.93	0.93	0.93

(c) Deaton model with quality correction and symmetry restriction

Beverages	Income levels				Regions		Age of household head		Household's years of schooling	
	All	25%	50%	75%	Urban	Rural	<=50	>50	≤12	>12
Manufactured liquid milk	1.88	2.00	1.87	1.86	0.15	0.13	1.16	1.20	1.18	0.80
Sweetened condensed milk	1.31	2.48	1.80	1.38	0.08	0.09	1.09	1.03	1.06	1.05
Instant coffee	0.55	0.80	0.70	0.64	0.08	0.07	0.67	0.71	0.69	0.50
Tea drink, fizzy drinks with CO2	0.47	-0.05	0.36	0.55	0.20	0.19	0.60	0.56	0.59	0.73
Fruit juice, health drink, energy drink	0.65	0.12	0.42	0.70	0.26	0.21	0.69	0.70	0.68	0.93

3.3.2. Income Elasticity using QUAIDS Model

The income elasticities calculated using the QUAIDS model presented in Table 5. Panel (b) are also positive in magnitude, which indicates that all SSBs are normal goods. Furthermore, all of the elasticities are less than 1, which indicates that all SSBs are necessity goods. As before, the income elasticities of poorer and richer households are relatively similar, except for manufactured liquid milk, which is higher among poorer households.

The comparison between urban and rural households indicates that, generally, the income elasticities of households that reside in urban areas are slightly lower compared to households that reside in rural areas. Meanwhile, in terms of the age of the household head, the income elasticities among more mature households are generally lower, especially for manufactured milk and sweetened condensed milk. Furthermore, in terms of education level, more educated households generally have lower income elasticities, except for fruit juices, health drinks, and energy drinks.

3.3.3. Income Elasticity using Deaton Model

Similarly, the income elasticities calculated using Deaton Model presented in Table 5. Panel (c) are also positive in magnitude, indicating that all SSBs are normal goods. The elasticity of liquid milk and sweetened condensed milk which is greater than 1 suggest that liquid milk and sweetened condensed milk are superior goods. The income elasticities of poorer households are lower than richer households, except for tea drink and fizzy drinks.

The income elasticities based on household maturity reveal that more mature households have higher income elasticity for manufactured liquid milk; instant coffee; and fruit juices, health drinks, and energy drinks compared to less mature households. Meanwhile, the comparison between more educated and less educated households shows that the income elasticity of tea drinks, fizzy drinks, fruit juices, health drinks, and energy drinks is higher among more educated households as opposed to less educated households.

3.4 Changes in demand for SSB

Table 6 presents changes in demand for SSB when their prices are increased by 20%, a tax rate recommended by the WHO (WHO, 2017). The estimation was performed by taking into account the result of own-price and cross-price elasticities of each SSB commodities using the QUAIDS model. Overall, the findings show that a 20% increase in SSB price is estimated to reduce people's consumption by 17.5% on average, ranging from 14.32-18.64% reduction in each SSB type. The largest decrease in consumption is predicted to occur within the fruit juice, health drink, and energy drink category, while the smallest decrease is estimated to be experienced in manufactured liquid milk. Based on income quartiles, the results show that when the SSB price rises, poorer households' consumption will be reduced more than that of richer households. Furthermore, the consumption of rural households, less mature households, and more educated households will be reduced more as opposed to their counterparts, i.e., urban households, more mature households, and less educated households, respectively

Tabel 6. Changes in demand for SSB (%) (QUAIDS model)

Beverages	Income levels				Regions		Age of household head		Household's years of schooling	
	All	25%	50%	75%	Urban	Rural	<=50	>50	≤12	>12
Manufactured liquid milk	-14.32	-15.78	-15.40	-15.04	-12.72	-15.24	-13.86	-15.04	-14.42	-4.36
sweetened condensed milk	-17.88	-18.10	-18.04	-17.96	-17.82	-17.92	-17.84	-17.94	-17.86	-17.72
Instant coffee	-18.30	-18.50	-18.46	-18.38	-18.30	-18.36	-18.30	-18.36	-18.34	-18.12
Tea drink, fizzy drinks with CO2	-18.30	-18.42	-18.40	-18.36	-18.20	-18.40	-18.32	-18.32	-18.28	-18.06
Fruit juice, health drink, energy drink	-18.64	-18.72	-18.72	-18.70	-18.56	-18.74	-18.64	-18.66	-18.64	-18.58
Average changes in demand	-17.50	-17.90	-17.80	-17.69	-17.12	-17.73	-17.66	-17.39	-15.37	-17.51

3.5 Estimation of Government Revenue

The estimated government revenues from SSB tax implementation using the QUAIDS model are shown in table 7. Based on the three scenarios tested, it is evident that highest decrease in SSB sales as well as highest government revenue is estimated to be obtained by the scenario III proposed by the MoF. By implementing the SSB tax using this rate (scenario III), the government is estimated to have a total additional revenue of IDR 3,628.33 billion per year. Comparing the result with the MoF's estimation, we can conclude that the estimated government revenue from scenario III is within the range of the MoF 's revenue estimation (IDR 2.7–6.25 billion), although our estimation is closer to the bottom range. This is mostly due to the fact that our research is limited to the SSBs that are included in SUSENAS, while in reality, there may be other SSBs that can increase the government's tax revenue even more.

Tabel 7. Estimated government revenue (QUAIDS model)

SSB	Sugar content (per lt)	Average price (per lt)	Projected sales	Sales after tax				Revenue (IDR billions)			
				Ad valorem 20%	Volumetric tax as per MoF Proposal			Ad valorem 20%	Volumetric tax as per MoF Proposal		
					Scenario I (%)	Scenario II (%)	Scenario III (%)		Scenario I	Scenario II	Scenario III
Manufactured liquid milk	20.16	19048	166.87	143.84 (-13.80)	151.8 (-9.06)	150.1 (-10.04)	142.7 (-14.49)	547.97	379.39	415.97	570.75
Sweetened condensed milk	12.7	28273	135.13	126.1 (-6.68)	132.7 (-1.77)	131.9 (-2.36)	128.7 (-4.73)	713.02	199.10	263.86	514.96
Tea drink	20.16	13896	478.1	365.75 (-23.50)	377 (-21.14)	366.1 (-23.43)	316.4 (-33.82)	1,016.48	942.58	1,014.40	1,265.58
Fizzy drinks with CO2	20.16	13896	225.3	172.35 (-23.50)	177.7 (-21.14)	172.5 (-23.43)	149.1 (-33.82)	479.01	444.18	478.03	596.39
Fruit juice	26.4	18760	48.91	38.06 (-22.20)	41.68 (-14.79)	40.9 (-16.40)	37.34 (-23.67)	142.79	104.20	113.32	149.35
Health drink	26.4	18760	72.96	56.76 (-22.20)	62.17 (-14.79)	61 (-16.40)	55.69 (-23.67)	212.97	155.41	169.02	222.76
Energy drink	26.4	18760	101.05	78.62 (-22.20)	86.1 (-14.79)	84.48 (-16.40)	77.13 (-23.67)	294.97	215.26	234.10	308.54
Total estimated revenue								3407.21	2440.12	2688.71	3628.33

4
DISCUSSIONS

Amidst the government's discourse in extending the excise tax implementation in Indonesia to SSB products, little is known about the projection of how SSB tax would be effective in affecting people's demand on these unhealthy products. This study is the first study in Indonesia that assesses the impact of SSB tax through an elasticity study and government revenue estimation by using a national representative data (SUSENAS 2021).

The results of this study highlight that demand for SSBs in Indonesia (instant coffee; tea drinks and fizzy drinks; fruit juices, health drinks, and energy drinks) is typically price elastic analyzed across three different methods (AIDS, QUAIDS and Deaton Models). This means that public consumption on SSBs can be expected to fall as the government puts tax on them. The change in demand analysis also confirms these results, where a 20% increase in SSB prices due to the tax implementation would lead to an average 17.5% reduction in people's consumption of SSB products. In addition, the results also show that mineral water, the only non-SSB included in this study, is a possible substitute for SSBs where the increase in price of SSBs would lead to greater demand for mineral water. Moreover, the estimation of government revenue analysis shows that putting a tax on SSBs would give significant additional revenue to the government, which can potentially be used for public health investments. The imposition of scenario III volumetric tax by the MoF, especially, would result in an additional revenue of IDR 3,7 billion annually for the government.

The results of this study are consistent with other studies in terms of the overall findings. In this case, the previous studies in other developing countries, such as in Mexico (Colchero et al., 2015), Columbia (Caro et al., 2017), Chile (Guerrero-López et al., 2017) and Thailand (Phonsuk et al., 2021), also find that SSBs are typically price elastic and an SSB tax would significantly reduce their demand. However, the results are not directly comparable since the specific SSB categories assessed are different in one study from another.

Even though this study uses three different methods in calculating elasticity of demand on SSBs, we select the Censored QUAIDS model as our benchmark in conducting change in demand analysis, government revenue analysis, and policy recommendation for two reasons. First, it accommodates different possible types of goods that are consumed by households (i.e., normal goods, inferior goods, and superior goods) and is more efficient and flexible than the AIDS (Banks et al., 1997). Second, the use of censoring approach in QUAIDS model makes it possible for us to capture the possibility of households consuming the SSB products outside the survey period. Third, the QUAIDS method is more practical than the Deaton method, which is more complex, difficult to implement, and more susceptible to bias. This is because the Deaton's elasticities can also be affected not only by price variation but also by other unexplained factors. (Vigani & Dudu, 2021).

Despite the strength of the national representative data used in this study, the combination of SSB commodities covered in one group (such as tea drinks and fizzy drinks as well as fruit juices, health drinks and energy drinks) in SUSENAS results in some weakness. This limitation poses a possibility of very large reduction in the number of observations and consequently will lead to bias in analyzing the findings of this study. In the estimation of government revenue, specifically, this limitation might lead to an underestimated result of analysis. The underestimation assumption in the study results could also be resulted from the fact that there could be some other SSB products that are not covered in the SUSENAS data, hence, our analysis is limited only for those SSBs covered in SUSENAS.

5
CONCLUSION

5.1. Using the three methods for estimating the demand elasticity, it is evident that SSB commodities has a negative sensitivity to demand due to price changes. This can be seen from the coefficient of elasticity of demand for each commodity which is negative, which means that an increase in price results in a decrease in demand for SSB commodities. The elasticity coefficients are varied for each SSB commodity group ranged from -0.3 to -1.3.

5.2. Mineral water, as hypothesized, is a substitute for mostly all SSB commodities analysed across the three methods. As seen from the positive magnitude of cross-price elasticity value, SSB consumers may switch their SSB consumption to mineral water when there is a significant increase in SSB prices.

5.3. The result of change in demand analysis indicates that a 20% increase in SSB price due to the tax implementation would lead to an average of 17.5% reduction in people's consumption of SSB products.

5.4. The government is expected to have an additional revenue up to IDR 3.7 billion by implementing the scenario III tax rate proposed by the MoF.

6
POLICY RECOMMENDATION

6.1. The implementation of a tax on SSB commodities will increase SSB prices and therefore will reduce people's consumption on SSB products. Our study results in an estimation of 17.5% reduction on SSB consumption when SSB tax is implemented by the government by 20%. This implies the effectiveness of SSB tax implementation especially to prevent further catastrophic health impacts and health expenditures due to obesity and non-communicable diseases.

6.2. The government needs to implement SSB tax at least by 20%. As recommended by the WHO, SSB tax needs to be implemented at least to lead the price increase of SSB by 20% to effectively achieve the public health purposes of preventing impacts on non-communicable diseases. Our study suggests that the imposition of scenario III tax rate (highest rate) by the MoF will result in the optimum consumption reduction and government revenue gain. Therefore, it can be concluded that optimum tax rate imposition by the government will yield in the optimum reduction of consumption rate as well.

6.3. The tax rate implemented for SSBs can be based on the products' volume and/or sugar content. This initiative allows the government to implement the tax comprehensively to all SSB products with both types of sweeteners, sugar and artificial sweeteners. Also, the government will be able to implement the tax to all types of SSB products, ranging from liquid to concentrates. This implementation method is mainly important to optimize the effectiveness of the tax imposition to reduce people's consumption of SSB products as well as to anticipate the possibility of SSB producers' response in shifting the ingredients of sweeteners in their products from sugar to artificial sweeteners. The tax rate can be applied progressively, where products with higher volume and/or sugar content can have higher tax rate.

6.4. SSB tax needs to be implemented comprehensively across business scales. In order to prevent the possibility of people's consumption behavior change to those SSBs that are not subject to the excise tax, the implementation of SSB tax needs to be carried out comprehensively to all business scales, both manufactured SSBs and ready-to-drink SSB products. The proliferation of ready-to-eat SSBs in Indonesia recently should be one major consideration for the government to impose the excise duties simultaneously to all business scales in order to encourage an optimal reduction in SSB consumption, considering that these products also contain high sugar.

6.5. The government needs to prioritize the implementation of tax on SSB products in 2023. Government's commitment to support public health must be concretely translated into policies and regulations. Policies and regulations supporting implementation, such as Government Regulations (PP) and Minister of Finance Regulations (PMK) need to be prioritized by the Government to be drafted and immediately ratified as soon as possible.

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6.1.1.1 Supplementary Tables of Deaton Model Results

Tabel 1. Total Observation Price Elasticities (Own and Cross Price Elasticities)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.892	0.475	0.355	0.032	0.019	-0.136
Fruit juice, health drinks, and energy drink	0.381	-1.862	0.004	0.128	-0.793	-0.173
Instant coffee (sachets)	0.569	-0.11	-1.658	-0.548	0.45	0.719
Manufactured liquid milk	-0.377	0.48	-0.373	-1.895	0.519	-0.763
Sweetened condensed milk	-0.239	0.025	0.749	0.315	-1.016	0
Mineral Water	-0.058	0.413	-0.079	0.808	-0.311	-1.894

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.984	0.337	0.799	-0.015	-0.181	-0.072
Fruit juice, health drinks, and energy drink	0.336	-1.947	-0.163	0.018	-0.051	0.108
Instant coffee (sachets)	0.423	-0.059	-1.523	-0.295	0.683	0.365
Manufactured liquid milk	-0.174	-0.049	-1.923	-2.289	1.190	0.821
Sweetened condensed milk	-0.189	-0.076	0.73	0.288	-0.939	0
Mineral Water	-0.133	0.084	0.663	0.332	0.023	-1.920

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.889	0.474	0.355	0.032	0.019	-0.136
Fruit juice, health drinks, and energy drink	0.381	-1.862	0.004	0.128	-0.793	-0.173
Instant coffee (sachets)	0.471	-0.091	-1.370	-0.453	0.372	0.595
Manufactured liquid milk	-0.374	0.476	-0.369	-1.877	0.514	-0.756
Sweetened condensed milk	-0.182	0.019	0.571	0.24	-0.774	0
Mineral Water	-0.053	0.375	-0.072	0.734	-0.282	-1.721

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.982	0.337	0.798	-0.015	-0.18	-0.072
Fruit juice, health drinks, and energy drink	0.336	-1.947	-0.163	0.018	-0.051	0.108
Instant coffee (sachets)	0.35	-0.049	-1.259	-0.244	0.565	0.302
Manufactured liquid milk	-0.172	-0.049	-1.905	-2.267	1.179	0.813
Sweetened condensed milk	-0.144	-0.058	0.557	0.219	-0.715	0
Mineral Water	-0.121	0.076	0.602	0.301	0.021	-1.744

Tabel 2. Own and Cross Price Elasticities (Quartile 1)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.565	0.687	0.106	0.143	0.359	-0.948
Fruit juice, health drinks, and energy drink	0.573	-2.372	-0.18	0.723	-1.965	0.29
Instant coffee (sachets)	0.402	-0.218	-1.100	-0.518	0.319	0.194
Manufactured liquid milk	-0.729	0.896	-1.072	-0.921	-0.229	-2.428
Sweetened condensed milk	-0.442	0.224	0.797	-0.069	-0.996	0.56
Mineral Water	-0.394	0.84	-0.876	1.007	0.873	-1.222

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.747	0.579	0.746	-0.05	-0.061	-0.482
Fruit juice, health drinks, and energy drink	0.615	-2.453	-0.328	0.155	0.027	0.579
Instant coffee (sachets)	0.225	-0.149	-1.041	-0.322	0.509	-0.057
Manufactured liquid milk	-0.369	0.582	-4.390	-1.195	-0.102	1.406
Sweetened condensed milk	-0.2	-0.12	0.626	-0.02	-0.911	0.545
Mineral Water	-0.741	0.769	-0.174	0.45	1.389	-1.150

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.579	0.693	0.107	0.144	0.362	-0.957
Fruit juice, health drinks, and energy drink	0.574	-2.376	-0.18	0.724	-1.969	0.291
Instant coffee (sachets)	0.227	-0.123	-0.62	-0.292	0.18	0.109
Manufactured liquid milk	-0.722	0.887	-1.062	-0.912	-0.227	-2.405
Sweetened condensed milk	-0.221	0.112	0.398	-0.034	-0.497	0.28
Mineral Water	-0.383	0.816	-0.85	0.978	0.848	-1.187

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.762	0.585	0.752	-0.051	-0.062	-0.487
Fruit juice, health drinks, and energy drink	0.616	-2.458	-0.329	0.155	0.027	0.58
Instant coffee (sachets)	0.127	-0.084	-0.587	-0.181	0.287	-0.032
Manufactured liquid milk	-0.365	0.577	-4.349	-1.184	-0.101	1.393
Sweetened condensed milk	-0.1	-0.06	0.313	-0.01	-0.455	0.272
Mineral Water	-0.72	0.747	-0.169	0.437	1.349	-1.117

Tabel 3. Own and Cross Price Elasticities (Quartile 2)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.079	0.643	0.283	0.208	-0.369	0.154
Fruit juice, health drinks, and energy drink	0.756	-2.310	0.028	0.225	-0.817	-0.321
Instant coffee (sachets)	0.256	0.035	-1.270	-0.508	0.499	0.303
Manufactured liquid milk	-0.515	0.255	-0.244	-1.239	-1.298	-0.917
Sweetened condensed milk	-0.106	0.132	0.385	0.174	-0.83	0.187
Mineral Water	0.247	0.276	-0.427	0.576	0.136	-1.753

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.138	0.585	0.486	0.011	0.073	0.198
Fruit juice, health drinks, and energy drink	0.638	-2.315	-0.01	-0.016	0.236	-0.001
Instant coffee (sachets)	0.22	-0.02	-1.197	-0.263	0.486	0.05
Manufactured liquid milk	-0.09	-0.178	-2.460	-1.645	1.046	0.499
Sweetened condensed milk	-0.082	0.028	0.407	0.159	-0.793	0.148
Mineral Water	0.241	-0.034	0.105	0.191	0.467	-1.810

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.039	0.631	0.277	0.204	-0.362	0.151
Fruit juice, health drinks, and energy drink	0.748	-2.285	0.028	0.222	-0.808	-0.317
Instant coffee (sachets)	0.129	0.018	-0.642	-0.257	0.252	0.153
Manufactured liquid milk	-0.504	0.25	-0.239	-1.213	-1.271	-0.898
Sweetened condensed milk	-0.051	0.063	0.184	0.083	-0.398	0.09
Mineral Water	0.202	0.226	-0.35	0.472	0.112	-1.437

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.098	0.574	0.477	0.011	0.072	0.195
Fruit juice, health drinks, and energy drink	0.631	-2.289	-0.01	-0.016	0.234	-0.001
Instant coffee (sachets)	0.111	-0.01	-0.604	-0.133	0.245	0.025
Manufactured liquid milk	-0.088	-0.175	-2.409	-1.611	1.024	0.488
Sweetened condensed milk	-0.039	0.013	0.195	0.076	-0.38	0.071
Mineral Water	0.197	-0.028	0.086	0.156	0.383	-1.483

Tabel 4. Own and Cross Price Elasticities (Quartile 3)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.869	0.45	0.422	0.039	-0.319	0.105
Fruit juice, health drinks, and energy drink	0.318	-1.748	-0.186	0.384	-1.035	0.106
Instant coffee (sachets)	0.584	-0.187	-1.281	-0.854	0.816	0.38
Manufactured liquid milk	-0.511	0.304	-0.265	-1.745	-0.641	-0.539
Sweetened condensed milk	-0.16	0.128	0.369	0.297	-0.444	-0.283
Mineral Water	-0.046	0.306	-0.278	0.983	-1.030	-1.290

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.929	0.349	0.755	-0.027	-0.123	-0.014
Fruit juice, health drinks, and energy drink	0.362	-1.791	-0.348	0.113	0.12	0.145
Instant coffee (sachets)	0.44	-0.165	-1.103	-0.481	0.569	0.1
Manufactured liquid milk	-0.229	0.261	-3.176	-2.179	1.503	1.430
sweetened condensed milk	-0.157	0.016	0.486	0.288	-0.466	-0.359
Mineral Water	-0.061	0.134	0.121	0.503	-0.608	-1.324

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.809	0.436	0.408	0.038	-0.309	0.102
Fruit juice, health drinks, and energy drink	0.31	-1.704	-0.181	0.375	-1.009	0.103
Instant coffee (sachets)	0.296	-0.095	-0.649	-0.433	0.413	0.192
Manufactured liquid milk	-0.498	0.297	-0.259	-1.702	-0.625	-0.526
sweetened condensed milk	-0.08	0.064	0.184	0.149	-0.222	-0.142
Mineral Water	-0.034	0.224	-0.204	0.72	-0.755	-0.945

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.868	0.338	0.731	-0.026	-0.119	-0.014
Fruit juice, health drinks, and energy drink	0.353	-1.746	-0.339	0.11	0.117	0.141
Instant coffee (sachets)	0.223	-0.084	-0.559	-0.244	0.288	0.051
Manufactured liquid milk	-0.223	0.255	-3.098	-2.125	1.466	1.394
Sweetened condensed milk	-0.078	0.008	0.243	0.144	-0.233	-0.179
Mineral Water	-0.045	0.098	0.089	0.368	-0.445	-0.97

Tabel 5. Own and Cross Price Elasticities (Quartile 4)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.442	0.342	0.499	-0.019	0.008	-0.215
Fruit juice, health drinks, and energy drink	0.24	-1.354	-0.112	0.119	-1.192	-0.028
Instant coffee (sachets)	0.561	-0.292	-1.308	-0.819	1.344	0.289
Manufactured liquid milk	-0.529	0.533	-0.188	-1.282	0.188	-0.853
Sweetened condensed milk	-0.28	-0.113	0.515	0.383	-0.741	0.094
Mineral Water	0.005	0.24	-0.393	0.641	-1.125	-0.841

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.469	0.254	0.631	-0.041	-0.307	-0.037
Fruit juice, health drinks, and energy drink	0.216	-1.379	-0.452	0.122	-0.377	0.091
Instant coffee (sachets)	0.45	-0.225	-1.079	-0.44	0.81	0.093
Manufactured liquid milk	-0.187	0.153	-1.488	-1.368	0.603	0.224
Sweetened condensed milk	-0.236	-0.258	0.824	0.291	-0.659	-0.161
Mineral Water	-0.069	0.07	-0.009	0.137	-0.214	-1.120

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.377	0.326	0.477	-0.019	0.008	-0.206
Fruit juice, health drinks, and energy drink	0.23	-1.299	-0.108	0.114	-1.143	-0.027
Instant coffee (sachets)	0.423	-0.221	-0.988	-0.618	1.015	0.218
Manufactured liquid milk	-0.5	0.504	-0.177	-1.213	0.178	-0.806
Sweetened condensed milk	-0.184	-0.075	0.339	0.253	-0.488	0.062
Mineral Water	0.003	0.14	-0.23	0.374	-0.657	-0.491

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.403	0.243	0.602	-0.039	-0.293	-0.036
Fruit juice, health drinks, and energy drink	0.207	-1.324	-0.433	0.118	-0.361	0.088
Instant coffee (sachets)	0.34	-0.17	-0.815	-0.332	0.612	0.07
Manufactured liquid milk	-0.177	0.145	-1.407	-1.294	0.57	0.212
Sweetened condensed milk	-0.156	-0.17	0.543	0.192	-0.434	-0.106
Mineral Water	-0.04	0.041	-0.005	0.08	-0.125	-0.654

Tabel 6. Own and Cross Elasticities by Region (Rural)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.021	0.64	0.438	0.004	-0.003	-0.298
Fruit juice, health drinks, and energy drink	0.414	-1.945	-0.047	0.214	-1.055	-0.109
Instant coffee (sachets)	0.67	-0.18	-1.621	-0.682	0.92	0.692
Manufactured liquid milk	-0.253	0.186	-0.371	-2.483	1.309	-0.523
Sweetened condensed milk	-0.137	0.065	0.425	0.474	-1.459	-0.037
Mineral Water	-0.279	0.558	0.087	0.679	-0.177	-1.816

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.090	0.429	0.872	-0.011	-0.051	-0.238
Fruit juice, health drinks, and energy drink	0.463	-2.054	-0.252	-0.03	0.07	0.157
Instant coffee (sachets)	0.508	-0.148	-1.446	-0.301	0.642	0.407
Manufactured liquid milk	-0.183	-0.254	-2.831	-2.952	3.627	1.185
Sweetened condensed milk	-0.127	-0.04	0.539	0.439	-1.469	-0.041
Mineral Water	-0.386	0.162	0.898	0.331	-0.019	-1.794

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.023	0.64	0.439	0.004	-0.003	-0.298
Fruit juice, health drinks, and energy drink	0.416	-1.953	-0.047	0.215	-1.060	-0.11
Instant coffee (sachets)	0.547	-0.147	-1.324	-0.557	0.751	0.565
Manufactured liquid milk	-0.252	0.185	-0.37	-2.478	1.306	-0.522
Sweetened condensed milk	-0.098	0.046	0.305	0.34	-1.046	-0.027
Mineral Water	-0.263	0.527	0.082	0.641	-0.167	-1.714

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.092	0.43	0.873	-0.011	-0.051	-0.238
Fruit juice, health drinks, and energy drink	0.465	-2.063	-0.253	-0.031	0.071	0.158
Instant coffee (sachets)	0.415	-0.121	-1.181	-0.246	0.525	0.333
Manufactured liquid milk	-0.183	-0.254	-2.824	-2.945	3.619	1.182
Sweetened condensed milk	-0.091	-0.029	0.386	0.315	-1.053	-0.029
Mineral Water	-0.365	0.153	0.847	0.313	-0.018	-1.694

Tabel 7. Own and Cross Elasticities by Region (Urban)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.084	0.676	0.453	0.248	-0.044	0.165
Fruit juice, health drinks, and energy drink	0.434	-1.761	0.593	0.287	-0.787	-0.513
Instant coffee (sachets)	0.319	-0.023	-1.712	-0.649	-0.071	0.461
Manufactured liquid milk	-0.45	0.322	-0.434	-1.269	-0.176	-0.561
Sweetened condensed milk	0.046	-0.046	0.772	0.056	-0.762	-0.278
Mineral Water	0.107	-0.008	-0.199	0.862	0.587	-0.961

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.032	0.581	0.484	-0.001	0.19	0.255
Fruit juice, health drinks, and energy drink	0.556	-1.831	0.076	0.141	-0.166	-0.18
Instant coffee (sachets)	0.237	0.085	-1.727	-0.437	0.39	0.202
Manufactured liquid milk	-0.116	0.18	-2.106	-1.319	-0.034	0.801
Sweetened condensed milk	0.1	-0.123	0.504	0.029	-0.769	-0.02
Mineral Water	0.17	-0.166	0.236	0.406	-0.037	-0.834

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.072	0.672	0.451	0.246	-0.043	0.164
Fruit juice, health drinks, and energy drink	0.431	-1.749	0.59	0.286	-0.782	-0.51
Instant coffee (sachets)	0.258	-0.019	-1.388	-0.526	-0.058	0.374
Manufactured liquid milk	-0.439	0.314	-0.423	-1.237	-0.172	-0.547
Sweetened condensed milk	0.037	-0.038	0.627	0.046	-0.619	-0.226
Mineral Water	0.092	-0.007	-0.171	0.74	0.504	-0.825

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-2.021	0.578	0.482	-0.001	0.189	0.253
Fruit juice, health drinks, and energy drink	0.552	-1.819	0.076	0.14	-0.165	-0.179
Instant coffee (sachets)	0.192	0.069	-1.400	-0.355	0.316	0.164
Manufactured liquid milk	-0.113	0.175	-2.052	-1.285	-0.033	0.78
Sweetened condensed milk	0.081	-0.1	0.41	0.024	-0.625	-0.016
Mineral Water	0.146	-0.142	0.202	0.348	-0.032	-0.716

Tabel 8. Own and Cross Elasticities by Demographic Characteristics (Age of Household Head > 50 Years)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.499	0.279	0.219	0.003	-0.076	-0.012
Fruit juice, health drinks, and energy drink	0.323	-1.509	-0.158	0.430	-0.795	-0.163
Instant coffee (sachets)	0.232	-0.083	-1.202	-0.607	0.6	0.321
Manufactured liquid milk	-0.281	0.369	-0.265	-1.303	-0.498	-0.457
Sweetened condensed milk	-0.034	-0.025	0.439	0.212	-1.202	0.022
Mineral Water	-0.159	0.319	-0.137	0.137	-0.100	-1.424

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.558	0.255	0.371	0.009	0.060	-0.064
Fruit juice, health drinks, and energy drink	0.255	-1.543	-0.238	0.173	-0.104	0.143
Instant coffee (sachets)	0.167	-0.081	-1.123	-0.307	0.465	0.114
Manufactured liquid milk	-0.102	0.3625	-2.930	-1.474	1.190	1.323
Sweetened condensed milk	-0.030	-0.105	0.533	0.221	-1.246	-0.028
Mineral Water	-0.110	0.105	0.142	0.347	-0.005	-1.368

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.465	0.273	0.214	0.003	-0.074	-0.012
Fruit juice, health drinks, and energy drink	0.319	-1.489	-0.156	0.425	-0.785	-0.161
Instant coffee (sachets)	0.128	-0.046	-0.662	-0.334	0.33	0.177
Manufactured liquid milk	-0.279	0.365	-0.263	-1.291	-0.493	-0.452
Sweetened condensed milk	-0.021	-0.015	0.266	0.129	-0.727	0.014
Mineral Water	-0.125	0.251	-0.108	0.532	-0.079	-1.120

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.523	0.25	0.363	0.009	0.059	-0.063
Fruit juice, health drinks, and energy drink	0.175	-1.522	-0.235	0.171	-0.102	0.141
Instant coffee (sachets)	0.092	-0.044	-0.618	-0.169	-0.102	0.063
Manufactured liquid milk	-0.101	0.517	-2.902	-1.460	1.179	1.311
Sweetened condensed milk	-0.018	-0.063	0.323	0.134	-0.754	-0.017
Mineral Water	-0.086	0.083	0.111	0.273	-0.004	-1.076

Tabel 9. Own and Cross Elasticities by Demographic Characteristics (Age of Household Head ≤ 50 Years)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.560	0.344	0.189	0.022	0.048	-0.095
Fruit juice, health drinks, and energy drink	0.215	-1.544	0.000	-0.013	-0.396	0.006
Instant coffee (sachets)	0.407	-0.086	-1.359	-0.278	0.178	0.425
Manufactured liquid milk	-0.278	0.33	-0.198	-1.561	0.358	-0.526
Sweetened condensed milk	-0.142	0.023	0.438	0.209	-0.915	-0.053
Mineral Water	-0.018	0.247	-0.123	0.469	-0.283	-1.446

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.615	0.288	0.49	-0.006	-0.067	-0.038
Fruit juice, health drinks, and energy drink	0.219	-1.606	-0.104	0.001	0.015	0.103
Instant coffee (sachets)	0.285	-0.034	-1.289	-0.150	0.445	0.205
Manufactured liquid milk	-0.138	-0.096	-0.926	-1.744	0.693	0.312
Sweetened condensed milk	-0.111	-0.036	0.389	0.197	-0.852	-0.038
Mineral Water	-0.101	0.085	0.325	0.17	-0.051	-1.451

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.497	0.33	0.181	0.021	0.046	-0.091
Fruit juice, health drinks, and energy drink	0.208	-1.500	0.000	-0.013	-0.385	0.005
Instant coffee (sachets)	0.253	-0.053	-0.845	-0.173	0.111	0.264
Manufactured liquid milk	-0.271	0.32	-0.192	-1.517	0.348	-0.511
Sweetened condensed milk	-0.082	0.013	0.253	0.121	-0.529	-0.031
Mineral Water	-0.015	0.203	-0.101	0.384	-0.232	-1.185

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.551	0.219	0.47	-0.005	-0.064	-0.036
Fruit juice, health drinks, and energy drink	0.213	-1.561	-0.101	0.001	0.014	0.1
Instant coffee (sachets)	0.177	-0.021	-0.801	-0.093	0.267	0.128
Manufactured liquid milk	-0.134	-0.094	-0.899	-1.694	0.637	0.303
Sweetened condensed milk	-0.064	-0.021	0.225	0.114	-0.492	-0.022
Mineral Water	-0.083	0.070	0.267	0.139	-0.042	-1.189

Tabel 10. Own & Cross Elasticities by Demographic Characteristics (Years of Schooling of Household Head > 12 Years)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-0.883	-0.057	-0.278	-0.443	-0.709	0.7
Fruit juice, health drinks, and energy drink	0.833	-1.743	-0.371	-0.049	-1.462	-0.145
Instant coffee (sachets)	0.569	-0.401	-1.132	-1.162	0.765	0.564
Manufactured liquid milk	-0.520	0.538	-0.107	-0.501	0.838	-1.152
Sweetened condensed milk	-1.156	0.204	0.884	0.182	-0.023	0.010
Mineral Water	-0.087	0.018	-0.185	0.348	-1.145	-0.434

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.120	0.374	0.384	-0.051	-1.313	0.123
Fruit juice, health drinks, and energy drink	0.267	-1.566	-0.340	0.186	0.018	-0.240
Instant coffee (sachets)	0.271	-0.168	-0.819	-0.350	0.812	-0.096
Manufactured liquid milk	-0.131	0.175	-0.797	-1.137	0.340	-0.185
Sweetened condensed milk	-0.985	0.061	0.97	0.343	0.205	-0.437
Mineral Water	0.046	-0.162	-0.201	-0.046	-0.363	-0.485

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-0.852	-0.055	-0.268	-0.428	-0.684	0.675
Fruit juice, health drinks, and energy drink	0.787	-1.646	-0.350	-0.047	-1.380	-0.137
Instant coffee (sachets)	0.448	-0.315	-0.891	-0.914	0.602	0.444
Manufactured liquid milk	-0.465	0.334027778	-0.096	-0.448	0.749	-1.029
sweetened condensed milk	-0.896	0.158	0.475	0.141	-0.018	0.007
Mineral Water	-0.048	0.010	-0.102	0.191	-0.629	-0.238

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.081	0.361	0.371	-0.049	-1.267	0.118
Fruit juice, health drinks, and energy drink	0.252	-1.479	-0.321	0.176	0.017	-0.226
Instant coffee (sachets)	0.213	-0.132	-0.644	-0.275	0.639	-0.075
Manufactured liquid milk	-0.117	0.156	-0.713	-1.016	0.304	-0.165
sweetened condensed milk	-0.763	0.047	0.751	0.266	0.159	-0.339
Mineral Water	0.025	-0.089	-0.110	-0.025	-0.199	-0.266

Tabel 11. Own & Cross Elasticities by Demographic Characteristics (Years of Schooling of Household Head ≤ 12 Years)

Price elasticities: without quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.542	0.298	0.23	0.029	0.016	-0.094
Fruit juice, health drinks, and energy drink	0.238	-1.520	0.009	0.076	-0.477	-0.105
Instant coffee (sachets)	0.355	-0.069	-1.401	-0.324	0.249	0.442
Manufactured liquid milk	-0.229	0.302	-0.250	-1.587	0.343	-0.478
Sweetened condensed milk	-0.143	0.020	0.461	0.172	-0.977	0.004
Mineral Water	-0.049	0.262	-0.042	0.518	-0.195	-1.565

Price elasticities: without quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.607	212	0.49	0.005	-0.066	-0.045
Fruit juice, health drinks, and energy drink	0.208	-1.574	-0.111	0.015	0.007	0.078
Instant coffee (sachets)	0.259	-0.035	-1.332	-0.173	0.448	0.299
Manufactured liquid milk	-0.110	-0.054	-1.280	-1.797	0.683	0.574
sweetened condensed milk	-0.114	-0.042	0.43	0.164	-0.922	0.007
Mineral Water	-0.103	0.053	0.391	0.233	0.039	-1.571

Price elasticities: with quality correction | without symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.490	0.288	0.222	0.028	0.016	-0.090
Fruit juice, health drinks, and energy drink	0.232	-1.486	0.009	0.074	-0.467	-0.103
Instant coffee (sachets)	0.21	-0.041	-0.828	-0.191	0.147	0.261
Manufactured liquid milk	-0.225	0.296	-0.245	-1.557	0.336	-0.469
sweetened condensed milk	-0.084	0.011	0.27	0.101	-0.571	0.002
Mineral Water	-0.040	0.213	-0.034	0.423	-0.159	-1.277

Price elasticities: with quality correction | with symmetry restricted estimators

	Tea drinks, fizzy drinks with CO2	Fruit juice, health drinks, and energy drink	Instant coffee (sachets)	Manufactured liquid milk	Sweetened condensed milk	Mineral Water
Tea drinks, fizzy drinks with CO2	-1.552	0.205	0.473	0.005	-0.064	-0.043
Fruit juice, health drinks, and energy drink	0.203	-1.539	-0.108	0.015	0.007	0.076
Instant coffee (sachets)	0.153	-0.021	-0.787	-0.102	0.265	0.135
Manufactured liquid milk	-0.108	-0.053	-1.256	-1.763	0.670	0.563
Sweetened condensed milk	-0.066	-0.024	0.252	0.096	-0.539	0.004
Mineral Water	-0.084	0.044	0.319	0.19	0.032	-1.281