Alcohol policies, consumption and government revenue: Indonesia

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Abstract

Research on alcoholic beverage consumption and related policies in Indonesia is minimal. Therefore, this study examines how policies affect alcohol consumption and government revenue, specifically excise tax revenue. First, this paper discusses the effect of alcohol tax policies and finds that an increase in the excise tax leads to increased product consumption. The implication is that the government must consider reform of the unrecorded alcohol market and alcohol tax. Subsequently, this paper discusses the effects of alcohol policy change and shows that tax changes lead to short-term reductions on alcohol consumption; thus, the government may perform frequent policy changes to reduce consumption. This paper also shows that a total ban negatively affects consumption; however, the reduction only affects the recorded alcohol supply, which is taxed and within government control.

Keywords: alcohol; consumption; tax; policies.

1. Introduction

Alcohol is a substance that has adverse consequences and inherent risks associated with its consumption, such as intoxication and dependency (Babor et al., 2010). Globally, the harmful consumption of alcohol has led to the deaths of around three million people and created 132.6 million disability-adjusted lives in 2016 alone (World Health Organization [WHO], 2018). Indonesia also suffers from these damaging effects, especially due to illicit home-produced alcohol (Uddarojat, 2016). From 2013 to 2018, a total of 648 people died due to 'oplosan' (counterfeit alcohol with dangerous substances) consumption alone (Respatiadi & Tandra, 2018). This illicit alcohol has also harmed foreign visitors to the country through methanol poisoning (Giovanetti, 2013). In fact, harmful cases of alcohol consumption in Indonesia may be much higher if data were available on alcohol-related accidents, diseases and misconduct. In handling these problems, the Indonesian House of Representatives (DPR) tries to restrict alcohol production, consumption and distribution despite the lack of accurate data and studies. Currently, Indonesia imposes taxes on alcoholic beverages, thereby increasing prices. This remains one of the most widely used and cost-effective policy measures employed by governments throughout the world to reduce the harmful use of alcohol (WHO, 2018).

The alcohol consumption level in Indonesia is relatively low but is increasing. Surveys have found that the amount of alcohol (defined as pure alcohol) consumed per capita by people aged 15 years and over has increased slightly from 0.6 litres in 2010 (WHO, 2011) to 0.8 litres in 2016 (WHO, 2018). These levels are still lower than those of neighbouring countries such as Malaysia (0.9 litres), Papua New Guinea (1.2 litres), Singapore (2.0 litres) and Timor-Leste (2.1 litres). The low consumption may relate to the fact that 231 million of the 267 million total Indonesian population follow the Islamic religion (Ministry of Religious Affairs, 2020). Most of the population believe that the consumption of alcoholic beverages is a sin even if it is committed by someone else. Therefore, the government, especially in the

regions, prohibits the sale of these beverages. In addition, the price of alcoholic products in Indonesia is extremely high. Compared to other ASEAN countries, which have a similar income per capita, the beverages in Indonesia are double to triple the price. The World Bank International Comparison Program (2017), as cited in The Global Economy (2022), shows that the price of alcoholic beverages in Indonesia is 183.2 index points (the world average is 100), more than twice that of countries like Vietnam and the Philippines. The price discourages people from consuming alcohol, especially recorded alcohol (i.e. alcohol that is taxed and under government control).

Further, the Indonesian consumption level may continue to witness an increasing trend, as is expected to happen across all Southeast Asian nations (Sornpaisarn et al., 2020). Figure 1 shows a gradual increase in the Indonesian excise tax revenue from alcoholic beverages, at various alcohol levels, during 2010–2019. The tax revenue was IDR2.7 trillion (USD300 million) in 2010 and grew gradually, with a slight decrease in 2015, to almost triple the amount at IDR7.3 trillion (USD528 million) in 2019. The growth occurred despite the lack of change in tariffs, indicating that the consumption level in Indonesia had risen.

This revenue was derived from only recorded alcoholic products and not from home – or informally produced, smuggled, or surrogate alcohol, or alcohol obtained through cross-border shopping. The recorded alcohol levels in Indonesia constitute a small portion of its consumption (WHO, 2018). The WHO found that consumption of recorded levels in 2016 was only 0.3 litres per capita, compared to the unrecorded consumption of 0.5 litres per capita. The recorded number had increased from 0.05 litres per capita in 2010 (WHO, 2011). Despite the increase, it remains inferior to the unrecorded, an accurate measure of which is unattainable due to its illicit nature. Thus, the real total consumption of alcohol in Indonesia is unpredictable.

Figure 1: Target and revenue for Indonesian excise tax on alcoholic beverages 2010–2019[a]
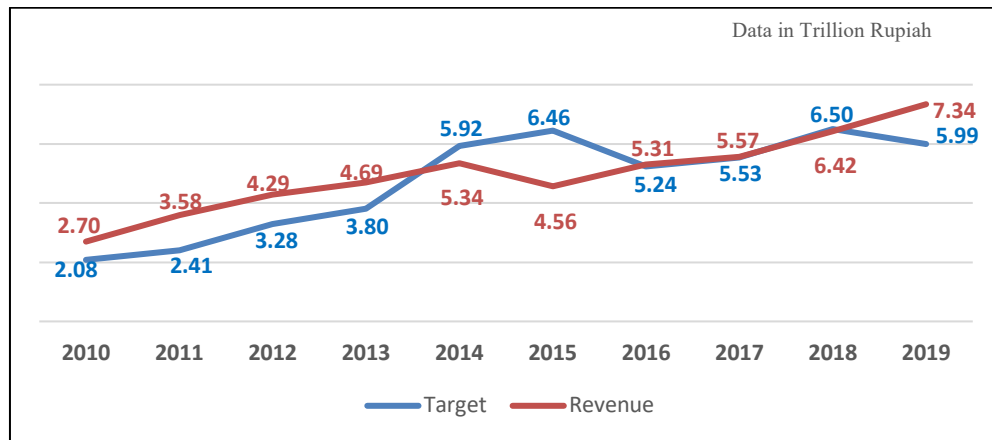
[a] The Indonesian House of Representatives sets a revenue target for the Directorate General of Customs and Excise (DGCE) on customs and excise, including alcohol excise, every year. Data are in IDR.

Source: Data processed from Indonesian Central Government Financial Statements 2010–2020.

Studies on alcoholic beverage consumption, policies or health effects in Indonesia are rather limited. Al-Ansari et al. (2016) found that Muslim majority countries (MMC) such as Indonesia lack literature on how policies affect national alcohol consumption. The available national-level

studies in Indonesia are working papers from Laksmana (2008) and Hulwah et al. (2021) on alcohol production and traffic accidents, respectively. The rest of the alcohol-related studies in Indonesia are at the regional or individual level. Notably, some studies that used multiple countries' data (Clements et al. 2020; Holmes & Anderson, 2017; Sornpaisarn et al., 2020) did not include Indonesia in their analyses. This is understandable because there is very limited data on alcohol to review; there is no public price or consumption data available, and most of the alcohol produced is unrecorded. Further, surveys on alcohol consumption conducted by the WHO and the Ministry of Health are infrequent. Additionally, the government agencies that regulate and control alcohol distribution are reluctant to provide complete data to researchers. The agencies' available historical data is limited and restricted due to confidentiality regulations. Nevertheless, research on how government policies affect alcohol consumption is essential when evaluating the past and preparing new policies. Therefore, this study attempts to add new knowledge to the subject by examining how policies may affect alcohol consumption in Indonesia. Moreover, this study also discusses how the policies may affect government revenue, specifically excise tax revenue.

This study is structured as follows. First, this introduction has presented an overview of alcohol in Indonesia. Next, the literature review contains empirical evidence that forms the groundwork of this research. The third section describes the data and methodology used for estimating the results. The fourth section discusses the outcomes, and finally, the conclusions and policy implications based on the previous sections are presented.

2. Literature review

As alcohol consumption causes both short-term and long-term negative consequences (Babor et al., 2010; Cnossen, 2005), governments have imposed policies for its control. Babor et al. (2010) considers all the policies that govern alcohol, health and social welfare as alcohol policies. The policies can be classified into two categories based on whether they provide funds or resources to specific groups (allocative) or direct control to individuals or organisations for particular outcomes (regulatory) (Longest, 2009). In this paper, the policies discussed are regulatory ones, including economic policies such as alcohol excise tax or price control and legal policies such as bans or sales control. In addition to the policies, the purchasing power of consumers may also affect the alcohol consumption level (Babor et al., 2010). Thus, regulatory policies and income tend to be the defining factors of alcohol consumption (Room et al., 2009).

The excise tax, which increases the price of alcohol, fulfils dual objectives: it discourages consumption and increases government revenue (Cnossen, 2005). Several previous studies have provided mixed results on the effect of tax policies on alcohol consumption. Numerous studies conducted in developed countries have found that increasing the excise tax reduces alcohol consumption (Byrnes et al., 2016; Cerdá et al., 2011; Doran et al., 2013; Gruenewald et al., 1993; Nelson & Mcnall, 2016; Neufeld et al., 2020; Paschall et al., 2009; Vandenberg et al., 2019; Wagenaar et al., 2009; Wette et al., 1993; Wicki et al., 2020). Vice versa, it was also found that decreasing the excise tax increases alcohol consumption (Andreasson et al., 2006). Another study found that the consumption patterns in low – and medium-income countries (LMIC) are similar (Sornpaisarn et al., 2013), but this study did not include Indonesia. Further, tax increases were also found to generate more government revenue (Vandenberg et al., 2019). Muller (2010) found that the opposite vectors of tax and consumption create a substitution effect, with the consumption trend moving from high-priced alcohol to low-priced goods.

In contrast, some studies found unique outcomes. Grittner et al. (2009) found that tax changes had no significant effect on alcohol consumption levels in Denmark. Additionally, Laksmana (2008) found that the increase of the excise tax in Indonesia caused higher production in a certain alcohol category,

that is, the B2 category, which has 15–20 per cent more alcohol by volume (abv); the increased tax had no significant effect on other categories. Despite the fact that the result is in contrast to other studies in various countries, it may be indicative of a unique alcohol consumption pattern in Indonesia, offering a stepping stone for further research with broader variables (alcohol consumption) and more recent data.

Another form of regulatory policies for alcohol (other than tax) involves controlling the physical availability of alcohol by restricting the time, place and density of outlets (Babor et al., 2010; Room et al., 2009). Previous studies in Russia (Kolosnitsyna et al., 2014; Neufeld et al., 2020), Switzerland (Wicki et al., 2020), the United States (Stout et al., 2000), and 26 other countries (Paschall et al., 2009) have found that these policies generally contribute to a decrease in the consumption level. However, certain situations, such as consumers' segmentation, can lead to an unchanged – or even higher – consumption, regardless of the policies (Kolosnitsyna et al., 2014; Stout et al., 2000). This is due to a substitution effect that is similar to the tax effect on alcohol consumption – the consumers simply go to areas with fewer control policies, causing the consumption level to remain stable (Williams et al., 2005).

An increase in people's incomes, which happens in many developed and middle-income countries, makes the alcohol tax and control policies less effective (Room et al., 2009) and creates easier opportunities to consume alcohol. A study by Cerdá et al. (2011) in the United States found that an increase in income level had a significant positive impact on alcohol consumption. However, a more recent study using global data by Holmes and Anderson (2017) found that, while the previous result was right at that time, the consumption pattern in high income countries fell after the average income achieved certain levels.

In conclusion, the excise tax, physical control and income levels are all related to the rate of alcohol consumption. Most existing studies found that consumption levels are negatively impacted by both taxation and control and positively impacted by income. Others found these factors to be insignificant or having the opposite effect on the consumption level. Based on a previous study by Laksmana (2008), the alcohol tax-consumption pattern in Indonesia may be unique with insignificant or positive effects. Accordingly, the effects of control and income on the consumption level may follow the general outcomes, with more control decreasing consumption and higher income increasing it.

3. Methods

3.1. Data and sources

Data for measuring the consumption level of alcoholic beverages and tax revenue was obtained from the Indonesian DGCE, Ministry of Finance. The data consists of national-level monthly imports and local production numbers from January 2010 to December 2019 for the consumption level in litres of alcoholic beverage products (litre of product). This data only accounts for the recorded product consumption in Indonesia, which is a small portion of the total consumption (WHO, 2011; 2018). However, it is the only available and reliable data for a proxy of the consumption level, based on the International Guide for Monitoring Alcohol Consumption and Related Harm, 'consumption = production + import – export' (WHO, 2000; p. 22). This approach assumes that the alcohol product is consumed in the same month as its import and production. The data consist of monthly excise revenue from import and local production in the same period as the consumption level (IDR per litre of alcohol) for the tax revenue.

Following this, the tax change analysis uses four Indonesian Ministry of Finance decrees about alcohol. These are excise tariff numbers 90/PMK.04/2006, 62/PMK.011/2010, 207/PMK.011/2013

and 158/PMK.010/2018. The tariffs vary between domestic production and imported alcohol, each of which consists of three categories based on abv: category A (< 5% abv), category B (5–20% abv), and category C (> 20% abv). Table 1 shows the change in excise tariff per litre of alcoholic beverages from 2010 to 2019 (in IDR). The lack of change in tariff during the research period requires implementing a differentiation strategy with a weighted average (Davis & Kilian, 2011).

Table 1: Excise tax tariffs per litre of product 2010–2019[a]

Start date	Domestic production			Import		
	Category A (< 5% abv)	**Category B (5–20% abv)**	**Category C (> 20% abv)**	**Category A (< 5% abv)**	**Category B (5–20% abv)**	**Category C (> 20% abv)**
January 2010	3,500	5,000[b] & 10,000	26,000	5,000	20,000[b] & 30,000	50,000
April 2010	11,000	30,000	75,000	11,000	40,000	130,000
January 2014	13,000	33,000	80,000	13,000	44,000	139,000
January 2019	15,000	33,000	80,000	15,000	44,000	139,000

[a] Data in IDR. [b] Before April 2010, there were two tariffs for category B products. The smaller tariffs are for 5−15% abv and the larger are for 15−20% abv.

Source: Ministry of Finance Decrees.

Despite the limitations discussed above, this study was able to generate sufficient statistics data as seen in the summary statistics of dependent and independent variables, displayed in Table 2. The statistic consists of three variables: product consumption, weighted-average excise tariff and excise revenue; each of these has four disaggregations for the analysis: total, category A, category B and category C. Each category has 120 months of observation from 2010 to 2019. All data in the categories were transformed into natural logarithms.

This research uses the income per capita data calculated by Statistics Indonesia (2022) to control the analysis from 2010 to 2019; this organisation uses the quarterly gross national product (GNP) data divided by the total population to determine the income per capita.

Last, data for the policy change analysis is from six major alcohol-imposed policies during the research period. The study uses two excise tariff change policies, 207/PMK.011/2013 and 158/PMK.010/2018, which the government imposed in January 2014 and January 2019, respectively. Second, it uses two Ministry of Trade decrees, 20/M-DAG/PER/4/2014 and 06/M-DAG/PER/1/2015, which were imposed in March 2014 and May 2015, respectively. The first policy is about control and supervision of the availability, distribution and sale of alcoholic drinks, while the second is a modified version of the previous policy that involves a partial ban on alcohol from minimarkets and small retail stores. Further, a change in the import duty tariff system in 132/PMK.010/2015 was applied in July 2015, and a ban on alcohol for the Papua province imposed by the governor's decree number 22/2016 was effective from April 2016. Therefore, there are six events of policy implementations with the potential to affect product consumption and government revenue.

Table 2: Summary statistics of alcoholic product consumption, weighted-average excise tariff and excise revenue

		Total	Category A (< 5% abv)	Category B (5-20% abv)	Category C (> 20% abv)
Product consumption (in thousands of litres)	**Mean**	54,527.65	33,878.76	18,274.14	2,374.74
	SD	49,700.48	37,655.95	22,222.34	3,295.49
	Max.	367,678.95	350,945.02	94,172.78	13,081.89
	Min.	2,836.74	2,397.02	86.18	8.39
Weighted-average excise tariff (in IDR)	**Mean**	20,201.77	12,200.62	32,966.15	80,977.73
	SD	6,454.92	1,944.25	4,218.00	11,139.25
	Max.	38,399.63	15,000.00	38,967.21	126,493.88
	Min.	3,517.23	3,000.00	7,500.00	26,000.00
Excise revenue (in billion IDR)	**Mean**	1,256.72	442.43	616.31	197.97
	SD	1,253.14	554.83	748.96	278.24
	Max.	5,919.67	5,264.17	3,236.66	1,256.19
	Min.	19,341.56	14.70	2.58	0.21

SD, standard deviation; Max., maximum; Min., minimum; abv: alcohol by volume.

Source: Data processed from Indonesian DGCE.

3.2. Model specification

Previous studies suggest that policies will, *ceteris paribus*, change the demand for alcohol. The excise tax leads to a change in alcohol price and makes it less affordable, and the control policy reduces the availability of alcohol in the market (Babor et al., 2010; Room et al., 2009). Thus, Indonesia's excise tax and control policies may affect product consumption and government revenue.

Two different analyses were performed in the present study to understand the effect of the alcohol policies: autoregressive integrated moving average (ARIMA) analysis for the various tax policies and an interrupted time series (ITS) analysis for treating the policy changes from 2010 to 2019.

First, the ARIMA model captures the effect of alcohol tax policies on product consumption and government revenue. The standard Box–Jenkins method was followed using existing data for the model. The method includes a three-step cycle comprising model specification, estimation, and diagnostic checking to find the best possible fit and most parsimonious model (Box et al., 2015). For determining the optimal lag lengths on the model, this research uses the study of Vanbenberg et al. (2019) to suggest that the tax change has an immediate effect on price and product consumption. Thus, another assumption that the excise taxes are fully passed through to price is necessary (Mäkelä & Österberg, 2009). Also, to control for the macroeconomic conditions, the analysis includes monthly income per capita from Statistics Indonesia (2022). The general ARIMA model for this analysis is as follows:

$$Y_t = \beta_1 X_{1t} + \beta_2 X_{2t} + \emptyset_1 Y_{(t-1)} + \cdots + \emptyset_p Y_{(t-p)} - \theta_1 z_{(t-1)} - \ldots - \theta_q z_{(t-q)} + z_t$$

$$(1)$$

Where:

Y_t : Monthly product consumption or excise revenue

X_1 : Monthly weighted-average excise tax tariff for alcoholic beverage products

X_2 : Monthly national income per capita

β : Coefficient for autoregressive

$\emptyset$: Coefficient for moving average

p : The autoregressive parameter

q : The moving average parameter

z_t : White noise process.

Second, the ITS method was used for analysing the effect of policy changes on product consumption and government revenue. The ITS analysis is a quasi-experimental method that can find the effect of time-specific intervention on longitudinal data (Kontopantelis et al., 2015). Previous studies have used the ITS method to determine the effect of tax policy changes on consumption of alcohol (Nelson & Mcnall, 2016; Vandenberg et al., 2019). Thus, the ITS may be the most helpful method for this research, including the changes in tax and control policies. Furthermore, the ITS analysis can project the trends before, during and after the interventions (Kontopantelis et al., 2015). The period of observation is 120 months, with product consumption and government revenue – the total and the three categories – as primary variables. This research uses the six policy changes as interventions.

4. Results, analysis and discussion

4.1. Summary statistics

Table 2 shows an increasing trend for total product consumption, and that category A (< 5% abv) had the highest consumption level. The total consumption increased from a little more than 82 million litres in 2010 to 1.3 billion litres in 2019. The increase is consistent with WHO survey results, which found a per capita per year increase of recorded alcohol of 500 per cent from 0.06 litres in 2010 (WHO, 2011) to 0.3 litres in 2018 (WHO, 2018). The average monthly consumption in category A was 33 million litres (61% of total consumption), far higher than the average of categories B (5–20% abv) and C (> 20% abv), which were 18 and two million litres, respectively. Combined, the average total

consumption was 54 million litres each month. The lower price of alcohol in category A, which mostly consists of beer products –Indonesia has its famous local brands – caused by the lowest excise tax rate per litre, may be the reason for the high consumption level.

Further, despite having the lowest tariff (Table 1), product category A still generated excise revenues with a monthly average of IDR442 billion, or around 34 per cent of the average of the total revenue. The amount is less than the monthly average revenue from category B, IDR616 billion (47% of the average total revenue). The reason is that category B also has a high consumption level, even with a tariff of more than twice that of category A. In contrast, category C generated the lowest revenue with IDR197 billion (19% of the average total revenue). The low recorded consumption and high price due to excise tariffs may be the reason for the low revenue. Also, the import tax for category C is the highest at around 150 per cent, making the price almost three times the original. In total, alcoholic beverages generated an average monthly revenue of IDR1.3 trillion.

4.2. The effect of tariffs and income on alcohol product consumption

This study analyses the effects of the weighted-average excise tariff and income per capita on product consumption, in all categories. The results of the analysis answered the first research question about alcohol tax-consumption patterns in Indonesia. The analysis uses the ARIMA model, for which we need to perform correlogram (ac) and partial correlogram (pac) tests. The test results at the national level in Table 3 showed the expected effects on the tariff variable and the income variable, almost all of which are statistically significant at a 99.9 per cent level of confidence.

First, the tariff has significant positive effects on total consumption as well as consumption in category B and category C, but it has no significant effect on category A. The result shows that an increase in the total tariff by one per cent will increase total consumption by 0.35 per cent. For category B, a one per cent rise in the excise tariff increases consumption by 0.48 per cent. The category C shows a higher coefficient where an increase in tariff by one per cent in this category will increase consumption by 1.42 per cent. The results show that an increase in the excise tax, which increases the price of the goods, leads to increased alcoholic beverage consumption. Therefore, these results disagree with the law of demand, which states that consumption will be lower if the price is higher, and almost all previous studies in different countries found results consistent with this law (Ornstein, 1980; Vandenberg et al., 2019; Wette et al., 1993). Despite this, the unique results obtained here are close to a previous study by Laksmana (2008), which found that alcoholic beverage production in category B increased with an increase in the excise tariff.

Category A estimation has an unexpected negative sign, which follows the law of demand, but it does not have a significant effect on product consumption. This result contrasts with that of Room et al. (2009), which states that consumers will choose cheaper goods as substitutes whenever there are changes in the alcohol price.

Table 3: Estimated consumption and revenue effects after tax changes

Product consumption			Government revenue		
Total					
	Coef.	**S.E.**	**p-value**	**Coef.**	**S.E.**	**p-value**

	Coef.	S.E.	p-value	Coef.	S.E.	p-value
Excise tariff: Total	0.354	0.102	0.001	1.312	0.088	0.000
Income per capita	0.923	0.065	0.000	0.949	0.058	0.000
ARIMA term	(1,0,3)			(3,0,1)		
Category A < 5% abv						
	Coef.	**S.E.**	**p-value**	**Coef.**	**S.E.**	**p-value**
Excise tariff: Category A	-0.036	0.315	0.907	0.963	0.312	0.002
Income per capita	1.145	0.191	0.000	1.145	0.190	0.000
ARIMA term	(3,0,3)			(3,0,3)		
Category B 5−20% abv						
	Coef.	**S.E.**	**p-value**	**Coef.**	**S.E.**	**p-value**
Excise tariff: Category B	0.480	0.048	0.006	1.208	0.317	0.000
Income per capita	0.726	0.035	0.000	0.905	0.925	0.000
ARIMA term	(2,0,2)			(3,0,3)		
Category C > 20% abv						
	Coef.	**S.E.**	**p-value**	**Coef.**	**S.E.**	**p-value**
Excise tariff: Category C	1.422	0.318	0.000	2.446	0.332	0.000
Income per capita	-0.166	0.240	0.487	-0.183	0.246	0.457
ARIMA term	(3,0,3)			(3,0,3)		

Coef., coefficient; S.E., standard error of the mean; ARIMA, autoregressive integrated moving average; abv, alcohol by volume. All variables are expressed as natural logarithms.

Source: The author

Alcoholic beverage consumption in Indonesia does not follow the consumption pattern of standard goods, so it is highly likely to fall under the category of 'Veblen goods' or luxury goods. Alcohol, according to Veblen (1899), is not a basic requirement of existence; intoxication and all other pathological manifestations of liquor reflect the status of those who can buy it. The Indonesian government was considering categorising alcohol as a luxury good until early 2010 (Ministry of Finance Decree 620/2004). Since then, the government has imposed higher excise taxes and import duties to keep the price high. The price may serve to render alcoholic beverages as exclusive as if they were luxury goods. This exclusivity of alcohol in Indonesia might create a segmentation of people who drink. In Indonesia, those who have high income and have no religious concerns are the main consumers of the recorded product.

Second, the income per capita has significant positive effects on product consumption in all categories, except category C. The results show that an increase in income by one per cent will increase the total consumption by 1.31 per cent. This is in line with the theory of Room et al. (2009) and the finding of Cerdá et al. (2011), both of which describe the positive effect of income on product consumption. Additionally, the increase in one per cent of income positively affects category A and B by 1.14 per cent and 0.72 per cent, respectively. Thus, a rise in income is strongly related to an increase in the recorded product consumption level and, possibly, a decrease in the unrecorded consumption of illegal product. Notably, an increase in income does not significantly change consumption of category C, which consists of very expensive alcohol groups, meaning that the rise in the per capita income is still minimal.

These results illustrates several issues associated with the excise tax on alcohol. First, the excise tax in Indonesia has no controlling effect on alcoholic beverage consumption. The tax increases consumption of the two high-alcohol content groups, category B and category C, and lowers consumption of category A, the low-alcohol content group. This situation is not ideal because the tax should reduce alcohol consumption, or at least reduce the consumption of high-alcohol drinks and shift it to those with low-alcohol content. It is common knowledge that high alcohol content is correlated with many harmful effects. Therefore, in addition to the tax not controlling the consumption of alcoholic beverages, it also plays a role in increasing the potential negative impacts due to alcohol consumption. Second, changes in excise rates are not able to counteract changes in income. The effect of income is greater and more significant than the effect of the tariff. As a fiscal control for consumption, the tariff should be adjusted to match changes in income. Therefore, the government needs to implement a more effective tariff system for alcoholic beverages in Indonesia.

4.3. The effect of excise tariff and income per capita on government revenue

Table 3 illustrates that both the tariff and income significantly affect government revenue from excise tax. The increase in excise tariff in all groups leads to higher revenue. The smallest positive effect was found in category A, in which a one per cent rise in the tax only increases the revenue by 0.98 per cent. In contrast, category C shows the highest positive effect with an increase of 2.58 per cent in revenue resulting from a one per cent increase in its tariff. The results agree with the study of Vandenberg (2019), which found that the tax has a significant positive effect on government revenue in Australia. Further, income also contributes to revenue through its support of recorded alcohol consumption, which generates tax. Similar to the excise tariff effect, category A has the smallest positive effect (3.3% increase) and category C the highest (5.8% increase) from a one per cent increase in income.

Table 4: Substitution effects of alcohol product categories

	Category A < 5% abv			Category B 5−20% abv			Category C > 20% abv		
	Coef.	**S.E.**	**p-value**	**Coef.**	**S.E.**	**p-value**	**Coef.**	**S.E.**	**p-value**
Category A ARIMA (3,0,3)	–	–	–	-0.146	0.049	0.003	0.053	0.042	0.208
Category B ARIMA (2,0,2)	-0.253	0.118	0.033	–	–	–	0.599	0.053	0.000
Category C ARIMA (3,0,3)	0.024	0.143	0.864	0.684	0.073	0.000	–	–	–

Coef., coefficient; S.E., standard error of the mean; ARIMA, autoregressive integrated moving average; abv, alcohol by volume. All variables are expressed as natural logarithms.

Source: The author

4.4. Substitution effect between each alcohol product categories

Table 4 shows the substitution effect in product consumption for categories A, B and C. First, only categories A and B involve a substitution effect. Using the ARIMA model, the results obtained are significant: an increase in category B by one per cent reduces category A consumption by 0.25 per cent. Vice versa, an increase of consumption in category A by one per cent reduces the consumption of category B by 0.14 per cent. The results indicate that people may substitute low alcohol-level products such as beer for medium-level alcohol products such as wine. In contrast, consumption of category C has positive effects on categories A and B, but this effect is statistically insignificant for category A. This means that whenever people consume high alcohol-level products such as spirits, they might also drink low and medium alcohol-level products . Thus, alcoholic beverage categories A and B are complementary to category C in terms of alcoholic beverage consumption.

4.5. The effect of alcohol policies on total alcohol product consumption

The present analysis studies the effects of various policies on monthly total product consumption. An ITS analysis using the Stata 'itsa' command and the policies as the interrupters, positioned at the exact months of their implementation, was performed to study the effects. The points of the interrupters are as follows:

- 2014m1 refers to Ministry of Finance Decree 207/2013 regarding the excise tariff for alcohol, effectively implemented in January 2014.

- 2014m4 refers to Ministry of Trade Decree 20/2014 regarding the control and supervision of the procurement, distribution and sale of alcoholic drinks, effectively implemented in April 2014.

- 2015m5 refers to Ministry of Trade Decree 6/2015 regarding the ban on alcohol in minimarkets, effectively implemented in May 2015.

- 2015m7 refers to Ministry of Finance Decree 132/2015 regarding the import tariff for alcohol, effectively implemented in July 2015.

- 2016m4 refers to the Papua Regional Regulation 22/2016 regarding the ban on alcohol in Papua Province, effectively implemented in April 2016.

- 2019m1 refers to Ministry of Finance Decree 158/2018 regarding the excise tariff for alcohol, effectively implemented in January 2019.

Table 5 shows that not every policy that tries to control product consumption has a significant and negative effect on consumption. Four of the six policies have significant effects on consumption, of which three are negative and one is positive.

Total consumption increased by 0.03 per cent each month before the first interrupter, 2014m1. From the beginning of 2010 to the end of 2013, Indonesia witnessed a growing trend in alcohol consumption, which was consistent with the prediction of Sornpaisarn et al. (2020).

The first and fourth interrupters, 2014m1 and 2015m7, respectively, negatively affected consumption only in the month of implementation. The new alcohol excise tax and import tariffs led to a drop in consumption by 0.37 per cent and 0.70 per cent, respectively. This means that the changes had short-term shock effects on consumption before the consumers adjusted to the new price. Despite the short-term influence, the results agree with previous findings that a tax increase reduces consumption (Byrnes et al., 2016; Cerdá et al., 2011; Doran et al., 2013; Gruenewald et al., 1993; Nelson & Mcnall, 2016; Neufeld et al., 2020; Paschall et al., 2009; Sornpaisarn et al., 2013; Vandenberg et al., 2019; Wagenaar et al., 2009; Wette et al., 1993; Wicki et al., 2020).

The fifth interrupter, 2016m4, was found to have a significant negative effect on the months during and after implementation, by 0.69 per cent and 0.21 per cent, respectively. The ban on alcohol in the Papua province effectively reduced the national product consumption level, at least for recorded product, and it was noticeable because the province has the highest level of consumption. Despite the ban in 2016, Basic Health Research (Rikesda) in 2018 showed that the province had the highest alcohol consumption at an average of 9.9 litres per month, which was higher than the national average of 5.4 litres (Ministry of Health, 2019).

Table 5: Estimated total consumption and revenue effects after the policy changes, January 2010–December 2019

	Total monthly product consumption			Total monthly government revenue		
	Coef.	S.E.	p-value	Coef.	S.E.	p-value
Before 2014m01	0.038	0.006	0.000	0.045	0.010	0.000
2014m1	-0.376	0.134	0.006	-0.464	0.205	0.026
After 2014m1	-0.039	0.029	0.191	-0.083	0.045	0.854
2014m4	-0.034	0.132	0.796	-0.117	0.132	0.374
After 2014m4	-0.028	0.036	0.435	-0.073	0.048	0.132
2015m5	-0.066	0.225	0.770	-0.073	0.198	0.771
After 2015m5	0.298	0.022	0.000	0.316	0.019	0.000
2015m7	-0.702	0.086	0.000	-0.813	0.092	0.000
After 2015m7	-0.037	0.021	0.085	-0.039	0.021	0.071
2016m4	-0.691	0.166	0.000	-0.617	0.191	0.002
After 2016m4	-0.211	0.023	0.000	-0.233	0.022	0.000
2019m1	-0.228	0.334	0.496	-0.572	0.288	0.050
After 2019m1	-0.037	0.038	0.342	-0.014	0.033	0.671

Coef., coefficient; S.E., standard error of the mean. All variables are expressed as natural logarithms.

Source: The author

Notably, 2015m5 revealed a unique result. The ban of alcoholic beverages in minimarkets had a significant positive effect after the implementation month. This result indicates that people consumed more product after the ban. The partial ban allowed other off-premise sellers, such as supermarkets and liquor stores, and on-premise places, such as restaurants and bars, to remain open. The remaining alcohol providers might have encouraged the consumers to buy or drink more product than they did prior to the implementation. William et al. (2005) attributes the high level of substitution activities to the policymakers' inability to handle other alcoholic sources.

Lastly, Table 5 shows that the implementation of 2014m4 and 2019m1 had no significant effect on consumption. 2014m1 is a control variable and supervision decree that regulated alcohol sales without altering the availability of alcohol in the market. 2019m1 was the last change in the excise tariff in the period of analysis. A difference was only seen for category A's tariff, going from IDR13,000 (USD0.91) to IDR15,000 (USD1.05). Thus, this minor change may not have been significant enough for consumers to change their consumption patterns (Grittner et al., 2009).

4.6. The effect of alcohol policies on total government revenue

To determine the effect of alcohol policies on revenue, the same method and interrupters were used. Almost identical results were obtained as those from the analysis of consumption. The consumption level is significantly correlated with government revenue from excise tax. The results showed that five of the six policies had a significant effect on revenue, and one policy positively impacted revenue. Excise revenue had an upward trend of 0.04 per cent each month before the first interrupter, 2014m1.

As can be seen in Table 5, all the tariff policies (2014m1, 2015m7, and 2019m1) had a significant negative effect on consumption during the first month of their implementation. Similar to the previous discussion, the 2014m1 and 2015m7 policies may have exerted a short-term shock on consumption, lowering the revenue by 0.46 per cent and 0.83 per cent, respectively. Further, 2019m1 also lowered revenue by 0.57 per cent, despite not having a significant impact on consumption.

The outcomes of the other policies were similar to that of the consumption analysis. The 2015m5 policy had a negative effect after the implementation month, and 2016m4 had a negative impact on the revenue during and after the implementation month. Following this, the other policies had no significant effect on revenue. In conclusion, when the policies affect consumption, government revenue is likely to be similarly affected.

Overall, the results of the ARIMA and ITS analysis can be explained by policy changes directed at recorded alcohol products. The ARIMA analysis showed that alcohol products in Indonesia fall into the category of luxury goods, where despite rising prices, consumption continues to climb. The ITS analysis showed that the most effective way to reduce alcohol consumption in Indonesia is via a total ban. However, these results apply to the recorded alcohol group alone, the consumption of which covers only 37.5 per cent of the total consumption (WHO, 2018). The results cannot explain whether the increase in consumption of the recorded alcohol group is associated with a decrease in consumption of the unrecorded group, or whether the two groups increase together. Further data and research are needed to elucidate this.

5. Conclusion and recommendation

5.1. Conclusion

This study investigated alcohol product consumption and government revenue from January 2010 to December 2019 using ARIMA and ITS analyses. The ARIMA analysis found significant effects of weighted-average excise tariff and income per capita on consumption and revenue. The result shows that both the tariff and income had positive effects on the dependent variables during the period under consideration. In contrast to past findings, this study's results indicate that alcoholic beverages in Indonesia may be Veblen (luxury) goods, which have increased consumption despite higher prices, resulting in a segmentation of consumers. Additionally, the ITS analysis showed that the implementation of alcohol policies had mixed results on consumption and revenue. The results

show that changes in the excise tax tariff and import duty had significant negative impacts only in the first month of implementation, indicating that a short-term shock occurred before consumers adjusted to the changes. Further, the partial ban of alcohol through 2015m5 had a positive effect after the implementation months, while the total ban through 2016m4 had an ongoing negative effect on both dependent variables, indicating that a substitution effect in alcohol consumption prevented any reduction in its consumption.

This study faced several limitations during the research period due to the following reasons. First, there is a lack of data available from government sources on alcoholic beverage consumption. The best data available was the excise data from the DGCE, which recorded alcohol production and import. Surveys were conducted by foreign agencies such as the WHO and RAND Corp. (for the Indonesia Family Life Survey [IFLS]) but with long gaps between them. Although the respondents to the surveys were the same before and after, many government policies occured during the gaps, thereby causing difficulties in their interpretation. In addition, surveys conducted by local agencies such as Statistics Indonesia and the Ministry of Health have inconsistencies in the questions involved, especially those regarding alcohol consumption. On the other hand, the probability of survey participants lying when answering surveys regarding alcohol consumption is high, due to it being perceived as sinful. Finally, although this study considers fiscal policies such as tax rates, excise rates rarely change, import duty rates cannot be connected to excise rates, and there is no data on the prices of alcoholic goods. The excise rate changed only three times between 2010 and 2019, causing slight variations in the tax. Additionally, the categorisation of alcoholic beverages between excise and customs is very different in Indonesia to other parts of the world. Alcoholic beverages are divided into three categories with regards to excise tax, but are divided into 33 categories under the 2017 Harmonised System classification for import-related taxes. In addition, the government does not have price data for alcoholic beverages. This data would be very useful for finding the degree of tax pass-through on the beverages, enriching the analysis of tax changes.

There are some insights to be gained for future research on Indonesia's alcohol consumption. The present study used 10 years of data and three major groups of alcohol based on the excise tax classification. Future research should be broader, over longer periods or with more specific data, such as pure alcohol levels. Using such data will give more conclusive results, which will be beneficial for more advanced studies on the harmful effects of alcohol. In addition, this study indicates uniquely the segmentation of alcohol consumers, which may explain why the increase in tariff elevates consumption. Research on this phenomenon of segmentation will improve knowledge on alcohol consumption in Indonesia. Lastly, further research is required on unrecorded alcohol consumption in Indonesia. Consumption in this category is soaring; therefore research on this category will be useful in explaining patterns and behaviours involved in national alcohol consumption.

5.2. Recommendation

This study determined how government policies affect alcohol product consumption and government revenue. Fiscal policy, in the form of excise taxes, has a positive effect on consumption and revenue. However, the implementation of other government policies has had mixed results. Limitations in the existing data limited this study. Despite this, the following are some policy implications that could be considered by the government when creating policies regarding alcoholic beverages.

The ARIMA analysis found that an increase in excise tax has a positive effect on alcohol consumption, which demonstrates flaws in the current Indonesian excise policy. In fact, an increase in tax increases government revenue, but eliminates the controlling effect of the tax. The government needs to revise alcohol policies so that they have more power in controlling consumption.

The Indonesian government must consider reform of the unrecorded alcohol market and alcohol tax. First, research on the correlation between the high price of recorded alcohol and the entry-exit process of unrecorded alcohol consumers is required. The consumption of unrecorded alcohol, either illicit or not, remains the highest among alcoholic beverages in Indonesia. With a better understanding of the market, the government can impose more effective control policies regarding unrecorded consumption. The government might also then include the traditional alcohol industry in the recorded alcohol group. It could start with providing smaller taxes or tax exemptions to the industry in exchange for recorded data. In this way, the government could increase the proportion of recorded alcohol. Lastly, the government could impose another policy reform of a single tax rate for pure alcohol. This method matches the tax to the harmful effect of the beverages, which is not the current situation. For example, the excise tax for products with 20 per cent abv is identical to products with 40 per cent abv, despite the latter being twice as harmful. The government could continue to differentiate the rates between locally produced and imported alcohol to protect local industry. These considerations may help in eliminating the flaws of the current excise policy.

The ITS analysis adds to the knowledge on policymaking for future use. First, since the change in tax tariffs resulted in short-term reductions on alcohol product consumption, the government may perform more frequent tariff changes if the preferred outcome is to maintain consumption. The changes may keep consumption low and nullify the positive effect from the effects of the weighted-average tariff. However, the reduction in consumption will also reduce government revenue. Second, since a total ban negatively affects consumption (compared to a partial ban, which has a positive effect), the government could impose a total ban on alcohol if needed. The total ban in Papua province significantly reduced national alcohol consumption. However, the reduction only affects recorded alcohol, so the government must consider the unrecorded group before imposing a total ban.

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