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The effect of cigarette prices and income on cigarettes consumption and state revenue: Case study of 33 provinces in Indonesia

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A R T I C L E I N F O

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A B S T R A K

Konsumsi sigaret selain berdampak buruk bagi perokok juga menimbulkan eksternalitas negatif bagi perokok pasif sehingga pemerintah menerapkan cukai rokok untuk mengontrol konsumsi sigaret sekaligus meningkatkan penerimaan negara. Penelitian ini bertujuan untuk mengetahui pengaruh harga sigaret dan pendapatan per kapita terhadap tingkat konsumsi sigaret serta pengaruh kenaikan tarif cukai terhadap konsumsi sigaret dan penerimaan negara. Data yang digunakan dalam penelitian ini adalah data 33 provinsi di Indonesia dalam kurun waktu tahun 2013-2018. Metode yang digunakan pada penelitian ini adalah regresi panel data menggunakan fixed effect dengan GLS untuk model satu dan random effect untuk model dua. Hasil penelitian menunjukkan bahwa elastisitas harga sigaret dan pendapatan perkapita terhadap permintaan sebesar -0,317 dan 0,635 secara berurutan sehingga dapat disimpulkan bahwa konsumsi sigaret adalah inelastis. Hasil simulasi kenaikan tarif cukai sebesar 10%, 25%, dan 50% secara berturut-turut menyebabkan penurunan konsumsi sigaret sebesar 1,55%, 3,86%, dan 7,73% dan kenaikan penerimaan negara dari cukai sebesar 8,3%, 20,17%, dan 38,41%. Berdasarkan simulasi tersebut dapat disimpulkan bahwa kenaikan tarif cukai rokok menyebabkan kenaikan harga sigaret yang pada akhirnya mendorong penurunan konsumsi sigaret. Selanjutnya, penurunan konsumsi sigaret tersebut meningkatkan penerimaan negara dari cukai.

A B S T R A C T

Besides having a destructive impact on smokers, cigarette consumption also creates a negative externality for passive smokers. Thus, the government implements cigarette excise to control cigarette consumption while increasing state revenue. This study aims to determine the effect of cigarette prices and income on cigarette consumption and the impact of excise tariffs on cigarette consumption and excise tax revenue. The data used

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are 33 provincial data in Indonesia from 2013 to 2018. The methods in this research are panel data regression using fixed-effect with GLS for model one and a random effect for model two. The results indicated that the cigarette price elasticity and income elasticity of demand were -0.317 and 0.635, respectively, showing that cigarette consumption is inelastic. In the simulation, an increase in excise tariffs by 10%, 25%, and 50%, respectively, led to a decrease in cigarette consumption by 1.55%, 3.86%, and 7.73%, and an increase in state revenue from excise by 8.3%, 20.17%, and 38.41%. It can be concluded that an increase in cigarette excise rates causes an increase in cigarette prices, leading to a decrease in cigarette consumption. Furthermore, the decline in cigarette consumption increased state revenues from excise.

INTRODUCTION

Cigarette consumption harms active and passive smokers. Half of the long-run smokers will die from tobacco, and nearly 50 percent of them die in their productive age, wasting 20-25 years of their lives (Chaloupka & The World Bank, 1999). Diseases caused by cigarettes kill more than 225.700 Indonesian. Meanwhile, more than 64.02 million adults and more than 469 thousand children (10-14 years old) still consume cigarettes every day (Drope *et al.*, 2018).

Threats of cigarette consumption to health, economy, and society are becoming real. The high prevalence of smokers in Indonesia is very concerning. Based on Riskesdas (*Riset Kesehatan Dasar*/Basic Health Research) by Kementerian Kesehatan Republik Indonesia/Kemenkes RI (2019), in 2017, more than 5.159.627 cases of cigarette-related diseases were outpatient and inpatient. BPJS funded those diseases' treatment with about Rp 5.9 trillion.

From Riskesdas (Kemenkes RI, 2019), the smoking consumption behavior of Indonesian in 2018 was higher than that of Sakernas (Survei Indikator Kesehatan Nasional/National Health Indicator Survey) in 2016 (Kemenkes RI, 2016). The prevalence value of tobacco consumption in 2016 and 2018 was 32.8 percent and 33.8 percent, respectively. A surprising finding from the Riskesdas 2018 (Kemenkes RI, 2019) is a significant increase in smoking prevalence in the population aged 10-18 years by 9.1 percent compared to the Riskesdas 2013 of 7.2 percent (Kemenkes RI, 2013). Meanwhile, the RPJMN (*Rencana Pembangunan Jangka Menengah Nasional*/ National Mid-Term Development Plan) 2015-2019 by Kementerian Perencanaan Pembangunan Nasional Republik Indonesia (2014) targeted to reduce smoking prevalence in the population aged 10-8 years in 2019 by 5.4 percent. However, the addictiveness of cigarettes is a challenge in realizing the RPJMN target.

Some studies found that regulation and constitution are practical tools to reduce the smoking prevalence (Ekpu & Brown, 2015). Some countries have proven that reducing the consumption level of cigarettes through government

intervention/regulation is effective and efficient in prioritizing health (United Nations, 2015). Two reasons underlie a government policy on excise tariffs and retail prices for cigarettes: reducing the cigarette consumption level and increasing the state revenue. The excise can be used as a significant source of income to fund various government expenditures (*budget air function*). However, the efforts to obtain state revenue from the excise affect the effectiveness of regulating the consumption of products (*regulerend function*) that are the excise's object.

In recent years, the Tobacco Excise Tariff has increased, while the consumption of cigarettes in Indonesia has not shown a significant decline (Badan Pusat Statistik, 2019a), as shown in Figure 1.

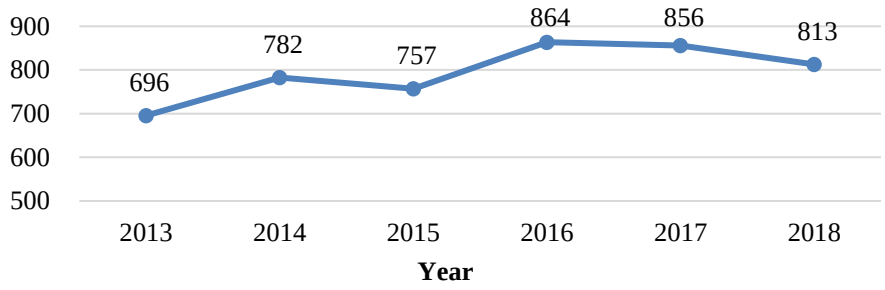

Figure 1
The Average Cigarette Consumption Volume per Capita (stems)
Source: Badan Pusat Statistik (2019a)

Tax on tobacco to reduce the consumption of cigarettes has a role in maintaining public health (Jha & Peto, 2014). A decrease in cigarette consumption is equivalent to a lower risk of getting cigarette-related diseases, which raises people's quality of life. On the other hand, if the households' cigarette consumption is allocated to other productive economic sectors, the sectors will have faster growth in output, income, and sector-related job vacancy (Barber et al., 2008).

Tobacco Products Industry Policy is related to many sectors, such as health, agriculture, employment, and trade. For obtaining synergy and systematic policy, the government of Indonesia compiled a Roadmap of The Tobacco Products Industry and Excise Policy (Direktorat Jenderal Bea dan Cukai, 2018). From 2010 to 2016, it prioritized state revenue aspects, public health, and employment. Meanwhile, from 2016 to 2020, public health became the main priority, followed by jobs and state revenue.

Some studies in low- and middle-income countries in the Asia Pacific (Ho et al., 2018) found that the consumption of cigarettes and excise revenue is affected by the price of cigarettes, while cigarette consumption in Argentina (Rodríguez-Iglesias et al., 2017), South Korea (Yoo, 2016) is affected by cigarette price and people's income. Three types of cigarettes are most widely consumed in Indonesia, SKM (Sigaret Kretek Mesin), SKT (Sigaret Kretek Tangan), and SPM (Sigaret Putih Mesin).

This study tries to fill the existing gap by using a weighted average, which considers the weights of the three types of cigarettes from each type's consumption proportion. Therefore, the analysis will be more realistic than previous studies that used arithmetic mean data.

This study helps evaluate Government policy on the Roadmap of The Tobacco Products Industry and Excise for 2016-2020, prioritizing public health using data from 33 provinces in Indonesia from 2013 to 2018. In addition, this study will simulate the effect of increasing excise tariff on cigarette consumption and revenue from cigarette excise for showing the effect of increasing cigarette price on public demand for cigarettes and state revenue from the excise, following the study of Djutaharta et al., (2005). Hence, this study aims to know the effect of cigarette price and income per capita on cigarette consumption and state revenue from the excise.

LITERATURE REVIEW AND HYPOTHESES

Excise levies in Indonesia are regulated in Law Number 39 of 2007 concerning Amendments to Law Number 11 of 1995 concerning Excise (Republik Indonesia, 2007). Excise is a state levy imposed on certain goods that have characteristics stipulated in Article 2 of the Excise Law, as follows: 1. The consumption needs to be controlled; 2. The distribution needs to be monitored; 3. The use harms the community or the environment; 4. The use requires the imposition of state levies for justice and equality

In politics, excise is used for state revenue (revenue collector). On the other hand, an excise is a government tool regulating health, public safety, and environmental protection. From a motivation perspective, excise levy is distinguished into three major groups: firstly, sin tax, a tax levy that compensates consumptive actions on an object which violates social norms. Secondly, the Pigouvian tax is a tax levy that imposes consumptive actions, resulting in negative externality for other economic activities. Lastly, consumption tax is a tax levy for state revenue purposes. It can be a goods and services tax for luxury goods, not necessities.

Many studies in Indonesia and other countries examine cigarette demand and cigarette consumption. Rodríguez-Iglesias *et al.* (2017), by using monthly data on cigarette consumption and price from January 1996 to February 2004, stated that the price elasticity of cigarette demand in Argentina was -0.279. It indicates that an increase in the real price of cigarettes by 10 percent will decrease cigarette consumption by 2.79 percent. Furthermore, the income elasticity was 0.411; if people's income increases by 10 percent, cigarette consumption will increase by 4.11 percent. The simulation in this study showed that an increase in cigarette price maximized the state revenue because of an increase in excise tariff. In Korea, by using monthly data on real cigarette price, income, education level, unemployment rate (independent variable), and cigarette consumption (dependent variable), the

relationship between price and the decrease in consumption is strong (Yoo, 2016). Rising cigarette prices and a drastic increase in tax rates are the Korean government's alternative policies. Santoso & Erlando (2020) shows that when a cigarette price is above IDR 1,000, the percentage of family members to smoke is 58 percent. However, with the retail price per stem, the demand curve is nearly perfectly inelastic, which means that an increase in the price of cigarettes will not significantly reduce the demand for cigarettes.

In Indonesia, Djutaharta *et al.* (2005) found that the real price and income elasticity were -0.345 and 0.473, respectively. From their simulation, a price increase will reduce cigarette consumption and raise the state revenue. In addition, Adioetomo *et al.* (2005), by using a cross-section of households, examined the impact of increasing in price/tax on the smoking decision, cigarette consumption level, and state revenue. From their study, an increase in tariff by 10 percent rises price by about 5 percent, reducing cigarette consumption and increasing the state revenue by 3 and 6.7 percent, respectively.

From a microeconomics perspective, a smoker's utility is determined by the number of cigarettes consumed, income, price of cigarettes, and other goods. Some studies show that a rising tax on tobacco effectively reduces tobacco consumption (World Health Organization, 2015). The increase in excise tariff increases the price of cigarettes, which significantly reduces consumption (Goodchild *et al.*, 2016).

Some previous studies show that an increase in excise tariff will increase state revenue, even though the cigarette consumption level decline (Djutaharta *et al.*, 2005; Goodchild *et al.*, 2016; Ho *et al*., 2018). Based on the theory and research results, the hypotheses in this study are as follows:

H1: The price of cigarettes has a significant negative effect on the level of cigarette consumption.

H2: Income per capita has a significant positive effect on the level of cigarette consumption.

H3: Increase in excise tariff has a significant positive effect on the price of cigarettes.

RESEARCH METHOD

Data for this study is secondary data obtained in the period 2013 to 2018 from Badan Pusat Statistik (2019b); Direktorat Jenderal Bea dan Cukai (2018); Kementerian Kesehatan Republik Indonesia (2019). The dependent variable is cigarette consumption (in Rupiahs) in 33 provinces of Indonesia from 2013 to 2018

(Badan Pusat Statistik, 2019a). The consumption data is taken from one of the BPS publications, Expenditure for Indonesian Public Consumption, which uses data from SUSENAS from 2013 to 2018.

Furthermore, the independent variables are Cigarette Price (Pri), Income per Capita (Inc), and Excise Tariff (Tax). The Cigarette Price (Rupiahs per stem) is the real price obtained from Expenditure for Indonesian Population Consumption, based on SUSENAS data from BPS. The price is from the Expenditure on Cigarette divided by the number of cigarettes. The cigarette price data in 33 provinces is estimated using the Consumer Price Index (CPI) from BPS. There is no specific CPI for a cigarette. Hence, we use CPI for Food, Beverage, Cigarettes, and Tobacco.

The Income per Capita (Rupiahs per person per month) is based on Nominal Regional Gross Domestic Product (PDRB) data from BPS. The PDRB per Capita is from dividing the PDRB by the population for each province from 2013 to 2018. Then, the Excise Tariff is from Excise Tariff per stem of each type of cigarette; SKM, SKT, and SPM. The tariff will differ for each cigarette manufacturer according to the factory class and the limit on the retail selling price. Changes in Excise Tariff are regulated in the Minister of Finance Regulation (PMK). Therefore, we use Excise Tariff data from PMK to determine the Basic Price and Excise Tariff of Tobacco Products according to the type of tobacco product.

The method of this study is Panel Data Regression Analysis. The benefits of using this method are (1) being able of controlling individual heterogeneity, (2) giving information, variability, degree of freedom, and reducing the collinearity of each variable, (3) being able to observe the dynamics of adjustment, and (4) being able to identify and measure the undetected impact in time series and cross-section (Gujarati & Porter, 2009). The steps of processing data are identifying the research model, evaluating the model, hypothesis testing, result, and discussion.

In this study, there will be two models. The first model depicts cigarette price and income per capita to cigarette consumption. The second model will describe the relationship between excise tariff and cigarette price to obtain the elasticity of cigarette price to excise tariff. Therefore, the variables in the second model should be transformed into logarithms to get and interpret the elasticity. We also form the first model into a log-log model to obtain and analyze the price and income elasticity. Here is the model:

$$\ln Cons = \beta_0 + \beta_1 \ln Pri + \beta_2 \ln Inc + \varepsilon \quad (1)$$

$$\ln Pri = \gamma_0 + \gamma_1 \ln Tax + \gamma_2 \ln Inc + \mu \quad (2)$$

where β_0 and γ_0 are the constant for each model, β_i and γ_i (i = 1, 2) are coefficient, ε and μ are the residual/error, ln is the natural logarithm, *Cons* is the cigarette consumption, *Pri* is the cigarette price, *Inc* is the income per capita, and *Tax* is the excise tariff.

To see the effect of change in excise tariff on cigarette price, cigarette consumption, and excise revenue, we conduct a simulation with three levels of increase in excise tariff of 10 percent, 25 percent, and 50 percent. For the simulation, the elasticity of cigarette price to excise tariff (from the second model results) shows the percentage change of cigarette price in response to a change in excise tariff. The shift in cigarette price is calculated by multiplying the difference of excise tariff with the excise tariff elasticity. In contrast, the change in cigarette consumption is calculated by multiplying the percentage change in cigarette price with the price elasticity of cigarette demand. The shift in excise revenue is computed by using the formula: (new tariff × new cigarette consumption) – 100%.

RESULTS AND DISCUSSION

Based on the classical assumption test, the models are normally distributed and have no multicollinearity and autocorrelation, but heteroskedasticity exists. The normality test aims to detect whether the residual has a normal distribution. Figure 2 shows that the residual of the first model is normally distributed since its *Jarque-Bera* Probability of 0.10 is less than the significant level (α) of 5 percent.

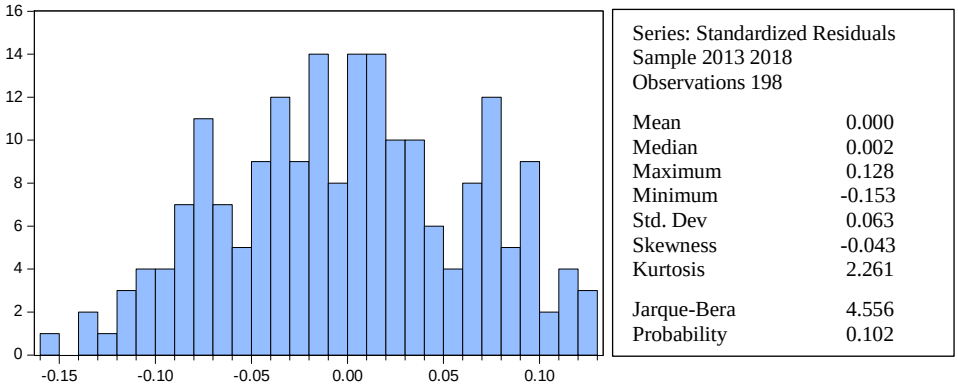

Figure 2
Normality Test for Model 1

The multicollinearity test aims to detect whether there is a perfect or linear relationship between all or some explanatory variables in the regression model. Gujarati & Porter (2009) said that the limit of correlation between explanatory variables is 0.8. A high correlation indicates a strong relationship between the explanatory variables. Based on Group Statistics-Correlations of 0.413 in Table 1, there is no multicollinearity in Model 1 since the correlation is less than 0.8.

Table 1
Multicollinearity Test Result

	INC	PRI
INC	1.000	0.413
PRI	0.413	1.000

The heteroscedasticity test aims to identify whether there is heteroscedasticity

in which the variance in the model is not constant (Gujarati & Porter, 2009). Table 2 shows that Model 1 has a heteroscedasticity problem since its *Breusch-Pagan Test* probability of 0.000 is less than the significant level of 0.05. Therefore, we use Generalised Least Square (GLS) to solve the heteroscedasticity problem. Gujarati and Porter (2009) said that GLS could change the heteroscedasticity model into a homoscedasticity model, in which the residuals from the regression model have a constant variance. The heteroscedasticity problem will be corrected without changing the Breusch-Pagan probability value. In addition, there will be automatic adjustments for the value of the variable coefficient, standard error, t-test, and probability of t-value.

Table 2
Heteroscedasticity Test Result for Model 1

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	1229.675	529	0.000
Pesaran scaled LM	21.593		0.000
Bias-corrected scaled LM	18.293		0.000
Pesaran CD	30.076		0.000

Hereafter, Chow Test and Hausman Test are used to choose the best model for explaining the relationship between Cigarette Price, Income per Capita, and Cigarette Consumption. If the Chi-Square probability of the Chow Test and the Cross-section probability of the Hausman Test are less than the significant level of 0.05, then Fixed Effect is the best model. The Fixed Effect model explores the relationship between independent and dependent variables in an entity (country, person, company, etc.). Each entity has its characteristics that may or may not affect the independent variables (Bell & Jones, 2015). The Chow Test and Hausman Test in Table 3 shows that Fixed Effect Model is the best model for Model 1.

Table 3
Chow Test and Hausman Test Results for Model 1

	Effects Test/ Test Summary	Statistic/ Chi-Sq. Statistic	d.f./ Chi-Sq. d.f.	Prob.
Chow Test	Cross-section F	22.988	(32,163)	0.000
	Cross-section Chi-square	338.005	32	0.000
Hausman Test	Cross-section random	32.995	2	0.000

The regression result of Model 1 in Table 4 constructs a linear equation as follows:

$$\ln Cons = -2.309 - 0.318 \ln Pri + 0.636 \ln Inc \quad \ldots\ldots 3$$

The first model can predict the dependent variable as indicated by a significant F-statistic p-value p<0.05). The cigarette price variable has a significant negative effect on cigarette consumption (p=0.000<0.05). Every 1 percent increase in the price of cigarettes will decrease cigarette consumption by 0.317 percent, other things being

equal. Meanwhile, people's income per capita has a significant positive effect on cigarette consumption (p=0.014<0.05), if the people's income per capita increases by 1 percent, then cigarette consumption will rise by 0.635 percent. Therefore, the first hypothesis (cigarette prices and cigarette consumption are negatively related) and the second hypothesis (income per capita and level of cigarette consumption are positively related) cannot be rejected.

Table 4
Regression Result for Model 1

Variable	Coefficients (Standard error)	p
Ln Pri	-0.318 ***	0.000
	(0.108)	
Ln Inc	0.636 ***	0.014
	(0.070)	
Constant	-2.309	
Number of Obs	198	
R-squared	0.913	
Adjusted R-squared	0.894	
Durbin Watson Stat	2.198	
Prob (F-Statistic)	0.000	

Notes: Standard errors are in parenthesis. p is the p-value. *** p<0.01 ** p<0.05 * p<0.1

On the other hand, the second model predicts the effect of the Excise Tariff (independent variable) on the Price of Cigarettes (dependent variable). The model passed the classical assumption tests as we did for the first model. The second model will simulate the increase in Excise Tariffs to test the third hypothesis. For choosing the best model, the Probability of Cross-section random of the Hausman test, which is more than 0.05, indicates that Random Effect Model is the best model. The Random Effect Model can accommodate variables that vary or not from one period to another (Gujarati & Porter, 2009). In addition, the Random Effect Model by using GLS will have a more minor variance than Fixed Effect Model using OLS. Hence, it tends to be more efficient.

Table 5
Hausman Test for Model 2

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000	2	1.000

The regression result of Model 2 in Table 6 constructs a linear equation as follows:

$$\ln Pri = 3.125 + 0.487 \ln Tax + 0.047 \ln Inc \quad \ldots\ldots 4$$

F-statistics significant p-value (<0.05) shows that the second model can predict the dependent variable. Excise Tariff and Income per Capita significantly have a positive coefficient on the Price of Cigarettes per stem of 0.487 and 0.047, respectively (p=0.000<0.05 and p=0.001<0.05). A ten percent increase in Excise Tariff will

increase the Price of Cigarettes by 4.87 percent, while a 10 percent increase in Income per Capita will raise the Price of Cigarettes by 0.47 percent. Hence, the third hypothesis (Excise Tariff positively determines the Price of Cigarette) cannot be rejected. Furthermore, the coefficients, especially the Excise Tariff (tax elasticity), will be used to simulate the impact of the increase in Excise Tariff on the Price of Cigarette, Consumption of Cigarettes, and Excise Revenue.

Table 6
Regression Result for Model 2

Variable	Coefficients (Standard error)	p
Ln Tax	0.487 *** (0.021)	0.000
Ln Inc	0.047 *** (0.016)	0.001
Constant	3.125	
Number of Obs	198	
R-squared	0.838	
Adjusted R-squared	0.837	
Durbin Watson Stat	1.099	
Prob (F-Statistic)	0.000	

Notes: Standard errors are in parenthesis. p is the p-value. *** p<0.01 ** p<0.05 * p<0.1

For the simulation, we follow Djutaharta et al. (2005) by using three levels of increase in Excise Tariffs 10, 25, and 50 percent, the others being equal. Keep one thing in mind: excise tariffs to reduce cigarette consumption can drop state revenue from excise. The simulation results are shown in Table 7; an increase in Excise Tariff of 10 percent will cause a price increase of 4.87 percent. The price increase has the effect of reducing consumption by 1.55 percent. After that, the state revenue from tobacco excise tax increased by 8.30 percent. On the other hand, an increase in Excise Tariff by 25 percent and 50 percent will decrease cigarette consumption by 3.86 percent and 7.73 percent, respectively. Meanwhile, the state revenue from the excise will rise by 20.17 percent and 38.41 percent, respectively.

Table 7
Simulation Result of Increase in Excise Tariff

Increase in Excise Tariff (A)	Change in Price of Cigarette (B)	Change in Consumption of Cigarettes (C)	Change in Excise Revenue (D)
10%	4.87%	-1.55%	8.30%
25%	12.16%	-3.86%	20.17%
50%	24.33%	-7.73%	38.41%
Tax Elasticity			0.487
Price Elasticity of Cigarette Demand			-0.318

Notes:
Cigarette Price = tariff increase percentage (A) x tax elasticity (0.486529)
Cigarette Consumption = Cigarette price percentage (B) x Price Elasticity of Cigarette Demand (0.317)
Excise Revenue = (new tariff x new cigarette consumption) – 100%. E.g., (110% x 98.45) – 100%= 8.3%

Based on the first model regression, the price of cigarettes has a significant negative effect on cigarette consumption. The result is in line with the demand law in which the price of cigarettes and the demand have the opposite direction (Lillard *et al.*, 2013). The result also strengthens the findings of several previous studies in Argentina (Rodríguez-Iglesias *et al.*, 2017), South Korea (Yoo, 2016), Asia Pacific Countries (Ho *et al.*, 2018, and Indonesia (Djutaharta *et al.*, 2005) which states that the price of cigarette has a negative effect on cigarette consumption.

The first model regression result shows that the relationship between price and demand for cigarettes is -0.318. This value indicates that the cigarette demand is inelastic because of less than 1, the change in demand is smaller than a price change. Moreover, the coefficient of income per capita, which is 0.635, indicates that cigarette is a normal good. An increase in demand due to the rise in income increases people's willingness and ability to buy cigarettes (Adioetomo *et al.*, 2005). The publication of the Health Statistics Profile in 2017 (Badan Pusat Statistik, 2019b) shows that the proportion of smokers from the middle, upper-middle, and lower middle class was above 30 percent.

Table 8
Percentage of Smokers by Expenditure Quintile in 2017-2018

Expenditure Quintile	Percentage of Smokers		Number of cigarettes smoked per day per smoker	
	2017	2018	2017	2018
1st Quintile (lower)	27.63	32.57	9	9
2nd Quintile (lower middle)	30.26	33.52	11	10
3rd Quintile (middle)	31.22	33.41	12	10
4th Quintile (upper middle)	30.83	32.56	13	11
5th Quintile (upper)	26.44	28.96	13	11

Source: Badan Pusat Statistik (2019b), edited

The highest increase in the percentage of smokers was in the 1st quintile, which was about 5 percent. In Table 8, the number of cigarettes smoked per day tended to decrease from 2017 to 2018, except in the 1st quintile, which still 9 stems per day. Low-income societies tended to be more responsive to an increase in income.

Many governments, including Indonesia, are cautious in increasing excise tariffs (Adioetomo *et al.*, 2005). The main concern is the decline of state revenue from excise tariffs due to decreased cigarette consumption due to increasing prices. However, in this study, the price elasticity of cigarette demand is inelastic, in which the price change is larger than the change in quantity demanded. As a result, an increase in cigarette price (because of the rise in excise tariff) will still increase the state revenue even though the consumption of cigarettes drops. Thus, the government should not hesitate to increase the tariff for public health priorities because revenues have not been proven to fall.

The second model in this study shows that an increase in excise tariff by 10 percent will increase the cigarette price by 4.87 percent. Then, the simulation result

shows that increasing the price will decrease cigarette consumption, but it will increase the state revenue from the excise. An increase in excise tariff by 10, 25, and 50 percent leads to a decrease in consumption by 1.55, 3.86, and 7.73 percent, respectively, and an increase in state revenue by 8.3, 20.17, 38.41 percent, respectively.

Van Welbeck in Adioetomo *et al.* (2005) stated that the more sensitive the consumption to price, the smaller the increase in state revenue from excise on tobacco. The change in the state revenue in upper-income countries is more extensive than in lower-income countries. The increment of state revenue will depend on the price elasticity of cigarette demand, and the price increase results from an increase in excise tariff.

CONCLUSION, LIMITATIONS, AND SUGGESTIONS

Based on the first model, the price of cigarettes and income per capita (independent variables) can explain cigarette consumption by 89.43 percent. The price of cigarettes negatively affects consumption, while the income per capita positively affects consumption. An increase in the price of cigarettes by 1 percent will drop cigarette consumption by 0.317 percent. Meanwhile, increasing income per capita by 1 percent will raise cigarette consumption by 0.635 percent.

For the second model, excise tariffs on cigarettes and income per capita partially have a positive effect on the price of cigarettes. As a response to the rise in excise tariff, a price increase will reduce cigarette consumption, raising the state revenue from the excise tariff. An increase in excise tariff by 10, 25, and 50 percent leads to a decrease in consumption by 1.55, 3.86, and 7.73 percent, respectively, and an increase in state revenue by 8.3, 20.17, 38.41 percent, respectively.

Excise tariffs and the price of cigarettes in Indonesia are relatively low compared to the global benchmark. Thus, Indonesia has an opportunity to implement increasing in excise tariffs to reduce cigarette consumption and raise state revenue. However, there may be an increase in illegal cigarette production, smuggling, and counterfeit excise stamps in the long term. Therefore, the government should monitor any production and distribution of illicit cigarettes through authority institutions.

This study covers a period from 2013 to 2018. Consequently, it explains a condition in that period, and it may not be reliable to be used as a justification for Tobacco Products Industry Roadmap and Excise Policy (IHTKC). In the Roadmap, state revenue was the main priority for 2010-2015; then, public health became the main priority for 2016-2020. In addition, this study uses a linear equation model instead of non-linear relationships as depicted by the Laffer curve (Laffer, 2016). For further research, we suggest adding more period of time, 2010-2020, to comprehensively evaluate the IHTKC roadmap and accommodate a non-linear relationship.

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