



## EXCISE TAX, EDUCATION, AND INCOME FACTORS: IMPACT ON CIGARETTE CONSUMPTION

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### Abstract

Cigarettes remain a commodity with relatively high consumption, despite the numerous negative impacts they pose. Several studies have been conducted to examine the variables influencing cigarette consumption. In this study, the author attempts to test independent variables, namely excise tax rates, gross enrollment ratio in tertiary level, and per capita income. The dependent variable, of course, is cigarette consumption. This research utilizes secondary data obtained from the Central Statistics Agency (BPS) for cigarette consumption, gross enrollment ratio in tertiary level, and per capita income, as well as data from the Ministry of Finance Regulation (PMK) for excise tax rates. The study employs a quantitative method, using panel data regression for the 34 provinces in Indonesia over the period from 2018 to 2022. Based on the test results, excise tax rates and per capita income positively influence cigarette consumption. Meanwhile, the gross enrollment ratio in tertiary level is the only variable that negatively affects cigarette consumption. The hope is that this research can contribute to existing literature and serve as a foundation for future studies.

**Keywords:** Cigarette Consumption, Excise Tax Rates, Gross Tertiary Education Enrollment Rates, Per Capita Income

### Abstrak

Rokok masih menjadi barang yang konsumsinya cukup tinggi mengingat banyaknya dampak negatif yang ditimbulkannya. Beberapa penelitian telah dilakukan untuk melihat variabel apa saja yang mempengaruhi konsumsi rokok. Pada penelitian kali ini penulis mencoba menguji variabel independen berupa pengenaan tarif cukai, angka partisipasi kasar perguruan tinggi, dan pendapatan per kapita. Variabel dependennya tentu saja konsumsi rokok. Penelitian ini menggunakan data sekunder yang didapatkan dari Badan Penelitian Statistik (BPS) untuk data konsumsi rokok, angka partisipasi kasar perguruan tinggi, dan pendapatan per kapita dan Peraturan Menteri Keuangan (PMK) untuk data tarif cukai. Penelitian ini menggunakan metode kuantitatif dengan menggunakan regresi data panel pada 34 Provinsi di Indonesia dalam jangka waktu tahun 2018-2022. Berdasarkan hasil pengujian tarif cukai dan pendapatan per kapita berpengaruh positif terhadap konsumsi rokok. Sedangkan angka partisipasi kasar perguruan tinggi menjadi satu-satunya variabel yang berpengaruh negatif terhadap konsumsi rokok. Harapannya penelitian ini dapat menambahkan literatur penelitian sebelumnya dan mampu dikembangkan untuk penelitian berikutnya.

**Kata Kunci:** Konsumsi Rokok, Tarif Cukai, Angka Partisipasi Kasar Perguruan Tinggi, Pendapatan Per Kapita

## INTRODUCTION

Given the dangers of cigarette consumption, it is concerning that people do not cease their use. The World Health Organization (WHO) states in Tobacco (2023) that tobacco kills eight million people worldwide each year, both active and passive smokers. Tobacco also increases the risk of lung cancer, throat cancer, liver disease, and blood clots. The high number of casualties should serve as an early warning about the dangers of smoking. Additionally, half of smokers die due to their inability to quit the addiction, and 80% of smokers globally reside in middle and low-income countries. This highlights the potential negative effects and high medical costs for these countries.

As a middle-income country, Indonesia faces issues related to high cigarette consumption, with the trend showing an annual increase. According to the Global Adult Tobacco Survey (GATS) 2021 by the Ministry of Health, there is a 15% rise in the number of adult smokers over ten years (2011-2021) (Humas BKPK, 2022). Indonesia also has a smoking prevalence rate of 38.2% at 2022, ranking among the top thirty countries with high smoking percentages (*Smoking Rates by Country 2024, n.d.*). These statistics are not promising, considering the known negative impacts of smoking. World Health Organization (2012) data



suggests that individuals aged 30 and above who smoke have a higher risk of death, with 71% of deaths attributed to lung cancer and 36% to non-cancerous lung disorders. This serves as a warning to the government that without intervention, cigarette consumption will continue to rise, posing a threat. Hence, the author aims to examine the influence of several independent variables on cigarette consumption, with cigarette consumption being the dependent variable.

There are several factors suspected to affect cigarette consumption. One of them is the imposition of additional levies, better known as excise taxes. According to the Excise Law, excise is an additional levy for goods whose consumption and distribution need to be restricted due to negative externalities. Until now, excise taxes have only been imposed on three types of goods: tobacco products, ethyl alcohol, and alcoholic beverages. This limitation is imposed because of their negative impact on consumers and the environment. There is research examining the effect of excise tax rates on cigarette consumption. One of the studies conducted by Makarim & Purwana (2022) concluded that an increase in excise tax rates significantly reduces cigarette consumption. Thus, this underpins the authors' use of excise tax rates as an independent variable.

One important factor influencing cigarette consumption is the level of education. The consumption rate of cigarettes or smoking prevalence is higher among groups with lower education levels (Tomioka *et al.*, 2020). Furthermore, Tahlil *et al.* (2013) found that smoking prevention programs conducted in schools increase students' knowledge about smoking and its harmful effects, as well as shaping anti-smoking behavior. Additionally, Silles (2015) stated through his research that an additional year of education reduces the likelihood of smoking by 1.7 percentage points. There are two consistent findings that with higher education levels, individuals tend to smoke less or even not smoke at all (Justus *et al.*, 2018; Özmen, 2023). Fallahi *et al.* (2015) tested the Human Development Index indicators on cigarette consumption in Malaysia. One of the indicators of the Human Development Index used is the tertiary education level. The research results showed that tertiary education levels negatively influence cigarette consumption in Malaysia. The authors chose the gross enrollment ratio in higher education (GER HE) because it has similarities with the tertiary education level.

The third independent variable used to test what influences cigarette consumption is per capita income. The per capita income used is Gross Regional Domestic Product (GRDP) per capita, this is in line with research conducted by Adam dan Purwana (2022); Adioetomo *et al.* (2005); Al Fadilah *et al.* (2021); Makarim dan Purwana (2022); Tirtana dan Ariutama (2022). All the above studies yielded a positive effect between per capita income and cigarette consumption. Thus, the authors use the last independent variable in the form of per capita income.

In this study, the authors will conduct research to determine the effect of excise tax rates, gross enrollment ratio in higher education, and per capita income on cigarette consumption in 34 provinces in Indonesia from 2018 to 2022. The novelty offered by the authors is in the period of the data used, namely from 2018 to 2022. Furthermore, the use of the gross enrollment ratio in higher education variable has never been used in previous research. This research is expected to fill the research gap and add to the literature review for further research.

## **LITERATURE REVIEW**

### **Sin Tax**

Sin tax is a levy imposed on guilty pleasures or human indulgence (Lorenzi, 2004). According to (Haavio & Kotakorpi (2011), the government requires the imposition of sin taxes to restrain the irrational consumption of goods by the public that have negative externalities on other rational members of society. Cigarettes are one of the goods that impose negative



externalities, to mitigate the health and social impacts it causes, hence there is an imposition of additional levies.

The concept of sin tax emphasizes that additional levies on goods that have negative impacts if consumed continuously. The additional levies will result in an increase in selling prices, thus it is expected that with higher selling prices, it will reduce the public's interest in consuming them. This has been proven in the research conducted by Gruber & Kőszegi (2004) that an increase in sin tax rates can influence consumer decisions and reduce the consumption of harmful products.

### **Correlation between Education and Health**

Individuals with higher levels of education tend to have broader knowledge about the dangers and negative effects of smoking behavior. Higher education can provide greater access to health information, scientific research, and other educational resources that can shape individuals' perceptions of the risks of smoking.

Individuals with higher levels of education also tend to have the ability to better understand health information and critically evaluate the risks and benefits of health. Higher education is often associated with better health literacy, enabling individuals to understand information about the health consequences of smoking more deeply.

Empirical research supports the relationship between education and health behavior. Studies such as those conducted by Cutler & Lleras-Muney (2010) and Kenkel (1991) indicate that higher levels of education significantly correlate with better health behavior. In the context of smoking, individuals with higher levels of education tend to have lower smoking prevalence rates compared to those with lower education levels.

### **Consumption Theory**

One of the consumption theories is proposed by Keynes in Mankiw (2016), according to Keynes, an increase in income will tend to increase consumption. There is an equation that describes the consumption function based on Keynesian theory as follows:

$$C=a+bY_d$$

Based on this equation, there are two assumptions. First, the marginal propensity to consume (MPC) is the additional amount of consumption due to an additional one dollar of income. Furthermore, the second assumption is that the consumption-to-income ratio or average propensity to consume (APC) will tend to flatten or decrease as income increases. This occurs because when income increases, people tend to save more. However, this argument is contradicted by Simon Kuznets, who, according to Kuznets in Mankiw (2016), states that the higher someone's income, the APC will also continue to rise steadily. This is influenced by the factor that income increases along with an increase in lifestyle, so consumption will continue to increase. From this consumption theory, we can conclude that any increase in income will increase consumption. Because cigarettes are a consumption good, there is a tendency for cigarette consumption to increase with increasing income. One of the factors underlying cigarette consumption is its addictive nature, which makes users reluctant to quit.

### **Hypotheses**

H1: An increase in cigarette excise tax rates will have a negative effect on cigarette consumption.

H2: An increase in gross enrollment ratio in higher education will have a negative effect on cigarette consumption.

H3: An increase in per capita income will have a positive effect on cigarette consumption.

### **METHOD**

This research employs a quantitative approach utilizing numerical data and will be analyzed using statistical methods. The author utilizes secondary data in the form of panel data



for each province in Indonesia spanning from 2018 to 2022. The secondary data used in this research includes: (1) cigarette consumption data per province is derived from the findings of the National Socio-Economic Survey (SUSENAS), a report released annually in March by the Central Statistics Agency (BPS) via the Book of Expenditure for Indonesian Population Consumption. These data illustrate the average per capita spending on cigarettes and tobacco within households in each province on a monthly basis, measured in Indonesian Rupiah. (2) excise tax rate data obtained from the excise tax rates established through the Ministry of Finance Regulations on Tobacco Excise Tariffs from 2017 to 2021. The excise tax rates apply uniformly across all provinces in Indonesia and are measured in Indonesian Rupiah. The excise tax rates used in this research are limited to the rates for the highest category of cigarette production in Indonesia, namely Machine-Made Clove Cigarettes (SKM) (TCSC-IAKMI, 2020). (3) Gross Enrollment Ratio in Higher Education (GER HE) data per province obtained from BPS publications. GER is defined as the ratio between students at a certain educational level and the school-aged population at a certain level (Sistem Informasi APK-APM, n.d.). The data are expressed in percentages. (4) Per capita income data per province obtained from the Gross Regional Domestic Product (GRDP) per capita constant price publication by BPS. The data are measured in Indonesian Rupiah.

In this research, the dependent variable is the cigarette and tobacco consumption data, while the excise tax rate data, GER HE data, and per capita income data are the independent variables. The author employs multiple linear regression analysis to determine the effect of independent variables on the dependent variable. The analysis is conducted using STATA 18 software. For regression analysis using panel data, three commonly used models are the Pooled Model (PM), Fixed Effect Model (FEM), and Random Effect Model (REM). Additional tests are required to determine the appropriate model selection for the available data. The tests used include the Chow Test, Hausman Test, and Lagrange Multiplier Test. Furthermore, classical assumption tests are conducted, including tests for normality, multicollinearity, heteroskedasticity, and autocorrelation. Lastly, to complete the testing, a model reliability test is conducted using simultaneous significance tests (F-statistic test), t-statistic tests, and R-squared tests. In this research, the author employs a significance level ( $\alpha$ ) of 10% or 0.1.

To ensure data uniformity and facilitate interpretation, the author transforms the cigarette consumption data, excise tax rate data, and per capita income data into natural logarithm (ln) form. This also helps to ascertain the elasticity of independent variables to the dependent variable. Below is the multiple linear regression model with panel data utilized in this research:

$$\ln(CIG)_{it} = \beta_0 + \beta_1 \ln(EXC)_{it} + \beta_2 GER_{it} + \beta_3 \ln(INC)_{it} + \varepsilon_{it}$$

explanation:

CIG = cigarette consumption data (in Indonesian Rupiah)

EXC = excise tax rate data (in Indonesian Rupiah)

GER = Gross Enrollment Ratio in Higher Education (percentages)

INC = per capita income (in Indonesian Rupiah)

## RESULTS

### Descriptive Analysis

Descriptive analysis provides an overview to identify patterns of the variables used in the research. Generally, descriptive analysis is conducted using mean, maximum value (max), minimum value (min), and standard deviation. The results of the descriptive analysis are presented in Table 1.

Based on the data in Table 1, it can be observed that the average cigarette and tobacco consumption across 34 provinces in Indonesia from 2018-2022 is 75,541.68 Indonesian Rupiah.



The standard deviation is 15,744.19 Indonesian Rupiah. The lowest cigarette and tobacco consumption is in East Nusa Tenggara Province in 2018, with a total of 36,780 Rupiah per month. Meanwhile, the highest cigarette and tobacco consumption per month is achieved by the Bangka Belitung Islands Province in 2022.

Next, the average excise tax rate from 2018-2022 is 754 Rupiah, with a standard deviation of 155.1632. The lowest tax rate is in 2018 and 2019 at Rp590. Meanwhile, the highest tax rate is in 2022 with Rp985.

Furthermore, the average gross enrollment ratio for higher education across 34 provinces is 33.97006 percent, with a standard deviation of 10.66408. The lowest value is obtained by the Bangka Belitung Islands Province in 2018 with 13.2%. The highest value is obtained by the Yogyakarta Special Region Province in 2022.

Lastly, the average per capita income from 170 observation data points is 43,412.18 Rupiah, with a standard deviation of 32,385.16. The province with the lowest per capita income is East Nusa Tenggara Province in 2018, which is 12,273.85 Rupiah. The province with the highest per capita income is DKI Jakarta in 2022.

Table 1-Descriptive Analysis Result

No	Variabel	Obs	Mean	Std. Deviation	Min	Max
1	CIG	170	74541.68	15744.19	36780	122986
2	EXC	170	754	155.1632	590	985
3	GER	170	33.97006	10.66408	13.2	75.59
4	INC	170	43412.18	32385.16	12273.85	182908.7

Source: processed by the author (2024)

### Model Selection Test

The model selection results were conducted using the Chow Test, the Lagrange Multiplier Test, and the Hausman Test. Based on the test results, the selected model is the Random Effects Model (REM). The test results are presented in Table 2.

Table 2-Model Selection Results

Testing Type	Test Results (Probability)	Selected Model
Chow Test	0.0000	Fixed Effect
Langrange Multiplier Test	0.0000	Random Effect
Hausman Test	0.5651	Random Effect

Source: processed by the author (2024)

### Classical Assumption Tests

In testing the classical assumptions, Skewness and Kurtosis tests were conducted to examine normality, multicollinearity tests, Breusch-Pagan tests were used to examine heteroskedasticity, and Wooldridge tests were employed to test autocorrelation. Based on the test results, it was found that the 170 data points were normally distributed. The multicollinearity test also met the criteria with  $VIF < 10$ , indicating no multicollinearity among the independent variables. Furthermore, the heteroskedasticity test results did not show any signs of heteroskedasticity. Lastly, autocorrelation was tested, and no signs of autocorrelation were found. The test results are presented in Table 3.

Table 3-Classical Assumption Test Results

Testing Type	Test Result (Probability)	VIF	Explanation
Normality Test	0.6751		The data is normally distributed
Multicollinearity Test		1.01	There is no multicollinearity



Heteroskedasticity Test	0.1369	There is no heteroskedasticity
Autocorrelation Test	0.1682	There is no autocorrelation

Source: processed by the author (2024)

### Regression Results

After finding the appropriate model selection, which is the Random Effects Model (REM), regression was conducted using this model. The regression results are presented in Table 4. Based on the information in Table 4, it can be observed that the F-statistic result is 0.000, indicating that all independent variables simultaneously have an impact on the dependent variable being tested. Furthermore, upon examining the t-test results for each individual independent variable, it can be found that each independent variable significantly influences the dependent variable at  $\alpha < 0.1$ . Additionally, the R-squared test indicates that this model is able to explain 56% of the variation in the dependent variable due to the independent variables used. The test results are presented in Table 5. Based on the information in Table 5, the equation in this study becomes:

$$\ln(CIG)_{it} = 8.00074 + 0.3022024 \ln(EXC)_{it} - 0.0049063 GER_{it} + 0.1300179 \ln(INC)_{it}$$

Table 5-REM Regression Results

R-squared	0.5628			
Prob > chi2	0.0000			
CIG	Coefficient	Std. Error	T	P>t
EXC	0.3022024	0.0244248	12.37	0.000
GER	-0.0049063	0.0026448	-1.86	0.064
INC	0.1300179	0.0500181	2.60	0.009
CONS	8.000754	0.5246093	15.25	0.000

Source: processed by the author (2024)

### The Effect of Excise Tax on Cigarette Consumption

Based on the regression results, the excise tax variable has a significant positive effect on cigarette and tobacco consumption. This means that a 1% increase in the excise tax will increase cigarette and tobacco consumption by 0.3022024%, with other variables considered constant or *ceteris paribus*. This result rejects the first hypothesis (H1), which is consistent with previous studies by Adam & Purwana (2022); Ahsan et al. (2022), Makarim & Purwana (2022). These studies found a significant negative relationship between excise tax increases and cigarette consumption. However, this result aligns with the findings of Susilawati et al. (2022), which reported that 52% of respondents still choose to buy cigarettes of the same type despite price increases. This is because cigarette consumption is considered a necessity, and there is a preference for specific cigarette flavors, leading individuals to resist switching to other products despite price increases. Furthermore, according to Wandita (2020), annual increases in cigarette excise taxes do not necessarily reduce cigarette consumption. This is due to the addictive nature of cigarettes and the affordability of cigarette price increases for the general public. Despite these findings, this result contradicts the sin tax theory, which aims to reduce consumption of a particular item. Boonn (2018), as cited in Purnamasari et al. (2019), suggests that significant increases in cigarette taxes could be implemented to reduce cigarette consumption and prevent vulnerable populations, such as children, from consuming cigarettes.

### The Effect of Gross Enrollment Ratio in Higher Education on Cigarette Consumption

Next, for the gross enrollment ratio in higher education variable, the P-value is 0.064. This study uses  $\alpha < 0.1$ , so the result is still statistically significant. Additionally, because the coefficient is negative, it indicates a negative direction or decrease. This means that a 1%



increase in the gross enrollment ratio in higher education decreases cigarette and tobacco consumption by 0.0049063%, with other variables considered constant. This result is consistent with previous studies by Fallahi et al. (2015) and Tomioka et al. (2020), which found that individuals with higher education levels tend to have lower cigarette consumption. This also aligns with the correlation education with health, which imply that individuals with higher education levels tend to have better health knowledge and awareness. Given the negative health effects of smoking, individuals with higher education levels are more likely to reduce or avoid cigarette consumption, leading to a lower prevalence of smoking. Therefore, the second hypothesis (H2) is accepted.

### **The Effect of Per Capita Income on Cigarette Consumption**

Lastly, for the per capita income variable, the regression results show a significant positive effect on cigarette and tobacco consumption. This means that a 1% increase in per capita income will increase cigarette and tobacco consumption by 0.1300179%, with other variables held constant. This result is consistent with previous studies (Adam & Purwana, 2022; Adioetomo et al., 2005; Al Fadilah et al., 2021; Makarim & Purwana, 2022; Tirtana & Ariutama, 2022). Additionally, this result aligns with Keynesian consumption theory (Mankiw, 2016), which states that increases in income will lead to increases in consumption. Here, the increase in income represents the  $Y_d$  variable in the consumption function  $C = a + bY_d$ . Since  $Y_d$  and  $C$  are directly proportional, an increase in  $Y_d$  will increase  $C$ . Thus, the third hypothesis (H3) is accepted. This means that as individuals' incomes increase, their overall consumption will increase. Since cigarettes are among the goods with high consumption levels, an increase in cigarette consumption occurs. Therefore, this demonstrates the need for comprehensive and integrated cigarette consumption control programs across education, health, sin tax policies, economics, and social strategies (Tahlil et al., 2013).

## **CLOSING**

### **Conclusion**

From the above study, it can be concluded that the model used for testing is the Random Effect Model (REM). Based on the regression results, all independent variables collectively have a significant effect on the dependent variable. The excise tax and per capita income variables have a positive effect on cigarette consumption, while the gross enrollment ratio in higher education has a negative effect on cigarette consumption.

### **Recommendation**

For future research, other indicators of educational quality could be considered, or additional educational levels such as primary, junior high, and senior high school could be included. This would enrich research on cigarette consumption, as there are still relatively few studies in Indonesia that quantitatively examine the impact of education levels on cigarette consumption.

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