

EFFECT OF EXCISE RATES, PER CAPITA INCOME, AND EDUCATION LEVEL ON NON-CHILD SMOKER RATES

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ABSTRACT

According to research by Tobacco Atlas in 2015, Indonesia has the third largest number of smokers in the world after China and India, with an estimated number of smokers at around 53.7 million. Smoking is a habit that harms health. Smoking causes heart disease, lung, oral, stomach, skin, and other conditions. This study aims to empirically examine the relationship between the excise rate, per capita income, and education level on the level of non-child group smokers in Indonesia for the 2015-2020 period. This period was chosen following Presidential Decree No. 28 of 2008 and Permenperin No.117/M-IND/PER/10/2009, which discusses the Tobacco Products Industry (IHT) roadmap and states that from 2015 to 2020, the priority is on the health aspect. This research was conducted with a quantitative approach using the panel data regression method. The results of this study conclude that the independent variables in this study simultaneously affect the dependent variable. In addition, it is known that the variable excise tax rate and education level partially have a significant effect on the dependent variable with a positive coefficient. In contrast, the income per capita variable partially has a substantial impact on the dependent variable with a negative coefficient.

Keywords: Non-Children, Per Capita Income, Smokers, Excise Rates, Education Level

INTRODUCTION

Based on data from the World Health Organization (WHO), heart disease is the leading cause of death in the world, killing more than 17 million people per year worldwide, with a percentage approaching 80% of deaths occurring in low and middle-

class income countries. It is estimated that around 10% of the total cases of heart disease are caused by cigarette consumption, either directly or indirectly (active and passive smokers). Smoking is one of the biggest threats to public health. According to WHO records, it is estimated that globally, cigarettes have killed more than 8 million people per year. More than 7 million of that number came from active smokers, while around 1.2 million people were passive smokers. During the 20th century, it is estimated that smoking killed more than 100 million people. In addition to heart disease, smoking can cause various other diseases, such as lung, lung disorders, mouth cancer, stomach disorders, skin cancer, etc.

Our World in Data research shows that smoking is the highest risk factor for death after high blood pressure. The harmful impact of smoking is not only on public health but also on the environment. Based on research by Jambeck et al. (2015) stated that in 2010 Indonesia was the second largest contributor to marine debris in the world after China. Based on the explanation of the International Coastal Cleanup presented to The Ocean Conservancy in beach cleaning activities, each year, cigarette waste is the largest, exceeding bottle caps, plastic bags, and plastic straws. In Indonesia, it is estimated that it produces 148,705 tons of waste in the form of cigarette butts and packs.

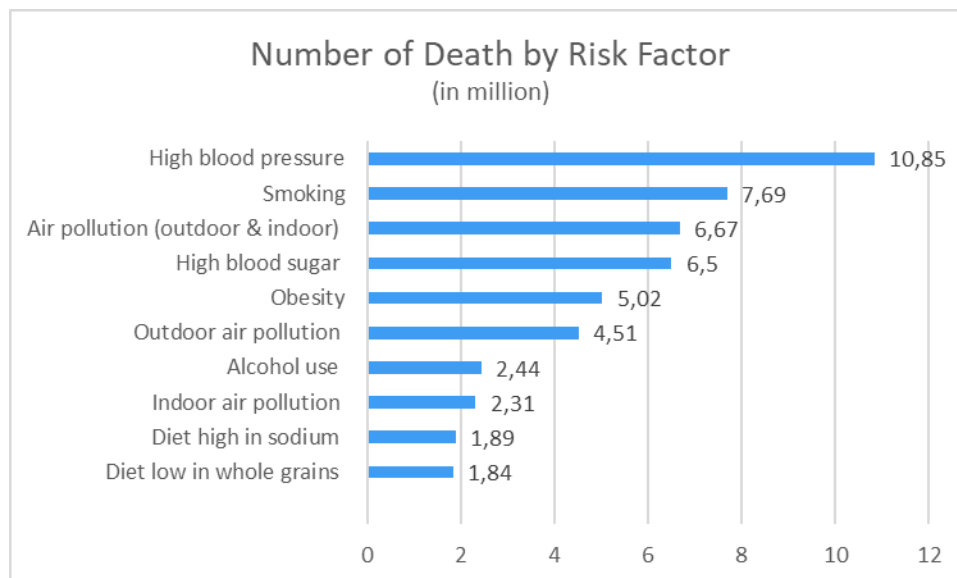


Figure 1. Number of Death by Risk Factors in The World in Year 2019

Source: Our World in Data, 2019

Based on Tobacco Atlas research, in 2015, Indonesia became the third country with the highest number of smokers in the world. It is estimated that there are around 53.7 million smokers in Indonesia, of which 49.8 million are male and 3.9 million are female. The average cigarette consumption based on the 2011 Global Adult Tobacco Survey (GATS) is 13 cigarettes per day for men and 8.1 cigarettes for women. Among male smokers, the mode in the data is 10-14 cigarettes per day; for women, it is 5-9 cigarettes per day. It is estimated that around 225,700 people die yearly from smoking-induced diseases. The number of smokers is expected to continue to increase. It is predicted that in 2025 the number of smokers will increase by 24 million people compared to 2015. Therefore, the role of the government is needed to suppress the level of smokers in Indonesia.

There are two ways the government can use to control the consumption of tobacco products in the community. The first way is through non-fiscal policies, such as providing images and warning labels on cigarette packs, limiting the age of cigarette

consumers, enactment of no smoking areas in public facilities, restrictions on advertising and sponsorship of tobacco products, et cetera. The second way is fiscal policy in the form of excise duty on tobacco products.

Excise is a state levy imposed on goods subject to excise. Excise collection in Indonesia started in the Dutch colonial era, precisely in 1886, which at that time was set on kerosene based on the Dutch rule, namely *Ordonnantie van 27 December 1886*, Stbl. 1886 No. 249. In the following years, levies were also applied to other commodities, namely: a) Distilled alcohol, based on *Ordonnantie Van 27 February 1898*, Stbl. 1898 No. 90 en 92; b) Beer, based on *Bieraccijns Ordonnantie*, Stbl. 1931 No. 488 en 489; c) Tobacco, based on *Tabsaccijns Ordonnantie*, Stbl. 1932 No. 517; and d) Sugar, based on *Suikeraccijns Ordonnantie*, Stbl. 1933 No. 351.

That Ordinance, over time, is deemed no longer suitable for use due to several reasons, including: a) For kerosene, sugar, and tobacco products, discriminatory applications are subject to excise duty on imported products. In contrast, beer and distilled alcohol on imported products are not subject to excise; and b) The object is limited because it is only limited to the five things that have been determined without allowing the opportunity to impose excise on other objects. It closes the potential for state revenues that can still be increased.

Based on that, the government enacted Law No. 11 of 1995 concerning excise, which came into force on 1 April 1996, to replace the Dutch excise ordinance. In the regulation, the goods subject to excise duty are changed consisting of 5 objects into three objects: ethyl alcohol, beverages containing ethyl alcohol, and tobacco products. Based on this rule, the object of excise duty is reduced, but the regulation allows adding types of excisable goods with government regulations.

Excise is imposed on goods that have specific characteristics. Namely, the consumption of these goods needs to be controlled, the circulation needs to be monitored, and the consumption of these goods can harm society and the environment. Also, their use needs to be imposed through state levies for justice and balance. Therefore, it is appropriate for tobacco products to be subject to excise taxes because, as previously explained, tobacco products, especially cigarettes, have a genuinely negative impact. Excise is the government's primary tool in controlling the consumption of tobacco products and the adverse effects it has.

Research on the excise rate on tobacco products has been carried out quite a lot. The differences between this study and previous studies are as follows: a) The focus of the study this study focuses on the rate of non-child smokers. In general, research in Indonesia on the topic of excise and cigarettes focuses more on cigarette consumption, not on the level of smokers; b) The independent variables of excise rate, per capita income, and level of education are based on the literature review conducted by the author. In Indonesia, no one has investigated these variables' impact on the smokers group; b) The research period focuses on 2015-2020, following the IHT roadmap, which prioritizes the health aspect. The research data consists of data per province throughout Indonesia; c) The data in this study are categorized by province, so the method used in this study is panel data.

Behaviorism theory is a theory that explains human behavior. This theory argues that the learning process is a person's behavior change. It is caused by a stimulus and a response to that stimulus. The theory also states that a person's behavior is entirely determined by rules so that it can be predicted and determined (Amalia & Fadholi, 2018). Behaviorism theory explains that a stimulus influences a person's behavior. The process is explained by the classical conditioning theory, initiated by Ivan Pavlov and

later developed by B. F. Skinner. According to Skinner (2014), behavior can be formed with a stimulus or reinforcement. The trigger is in the form of a reward, removing the reward or giving punishment. Skinner's operant conditioning theory aligns with the smoking motivation theory that a person smokes because it can provide pleasure or suppress unpleasant emotions.

In their research, Koning et al. (2015) attempted to analyze the effect of education on starting and quitting smoking. The analysis uses longitudinal data in Australia and estimates duration models for smoking and non-smoking duration. The results of this study indicate that a person's education can influence a person's smoking habit. The study concluded that education does not prevent a person from becoming a smoker. Still, the level of education of a person increases the chances of smokers quitting smoking. The level of education that is successful in raising awareness of the dangers of smoking will be able to improve the level of public health through an increase in smoking cessation.

Blecher et al. (2013) studied the impact of increasing cigarette excise in Greece in 2011 on the economic and health sectors. Increased cigarette excise duty of €2.00 per pack is expected to increase state revenues and public health. The increase in cigarette excise tax increased state revenue from the tax sector by €558 million. A 16% decrease followed it in cigarette consumption compared to the previous year. So it can be concluded that increasing cigarette excise tax can increase income and improve the quality of public health by reducing cigarette consumption.

Martinez et al. (2013) studied the impact of changes in cigarette prices and people's income on cigarette consumption in Argentina. The research was performed using the time series method from 1994 to 2010. The sample used was a group of people aged over 14 years. There are two conclusions from this research. First, an increase in income has a significant impact on cigarette consumption. An estimated 2.5% increase will follow every 10% increase in revenue in cigarette consumption. Second, an increase in cigarette prices results in a decrease in cigarette consumption. The study also estimates that a 110% increase in cigarette prices will result in the most optimal state revenue and a reduction in cigarette consumption.

Sharbaugh et al. (2018) studied the relationship between cigarette excise and smoking rates. Sharbaugh et al. (2018) conducted research in America from 2001 to 2015. The method used in this study was linear mixed-effects models. There are several findings in this research. First, the increase in cigarette excise tax is followed by a decrease in the level of smokers. The most significant decline occurred mainly in the group of smokers at 18-24 years old. Based on income group, cigarette excise tax has the least impact on low-income groups. The effect of excise tax on smoking rates by gender and race tends to be identical. Second, the cigarette excise tax increases the desire of smokers to quit smoking. Attempts to stop smoking by age group were most significant in the age group 25-44 years, while based on race, attempts to quit smoking were in the white and Hispanic groups.

In Indonesia, Afif & Sasana (2019) researched the impact of poverty, per capita income, cigarette prices, and cigarette production on cigarette consumption. Afif and Sasana conducted the research in Indonesia from 1986 to 2016. The analysis was performed using the ordinary least square method. The results of this study indicate that the variables of poverty, per capita income, and cigarette production have a positive and significant effect on cigarette consumption. In contrast, the price of cigarettes has no significant effect on cigarette consumption. The study also concluded that poverty, per

capita income, cigarette prices, and cigarette production simultaneously significantly affect cigarette consumption.

Law No. 11 of 1995 concerning Excise defines excise as a state levy imposed on goods subject to excise duty, namely goods with specific characteristics. Their consumption needs to be controlled, their circulation needs to be monitored, their use can have a negative impact, or their use needs to be charged. The excise rate affects the price of tobacco products in the community, so changes to the excise rate can affect the behavior of consumers of tobacco products. The increase in cigarette taxes results in a decrease in the level of smokers (Alpert et al., 2014).

H_{1.1} : The excise tax rate affects non-child smoker rates.

According to Masniadi (2012), per capita income can be calculated by dividing the gross domestic income (GDI) in one year by the total population in the region. GDI is the total value of goods and services within a region produced by all regional economic units, usually for one year (Dama et al., 2016). The community's level of per capita income influences cigarette consumption (Martinez et al., 2013).

H_{1.2} : Per capita income affects non-child smoker rates.

According to Rahman (2012), what is meant by education is a process in the course of human life that takes place starting from birth to becoming a perfect human (adult). The level of education taken by a person can affect a person's chances of stopping being a smoker. (Koning et al., 2015).

H_{1.3} : Education affects non-child smoker rates.

H_{1.4} : Excise rates, per capita income, and education level simultaneously affect non-child smoker rates.

METHOD

The object of research is something that becomes the center of attention in a study. The object becomes the research focus because it can answer the problems posed in formulating the problem (Sujadijaya, 2017). The object of research in this study is the group of non-child smokers, namely the group of smokers with an age of more than or equal to 15 years (Bappenas, 2018). These criteria were chosen because residents under 15 years of age are still in school and do not have a steady income. The period in this study covers the years 2015 to 2020. The time range was chosen considering that during that period, there was an increasing trend in excise rates. Following Presidential Decree No. 28 of 2008 and Minister of Industry Regulation No.117/M-IND/PER/10/2009, which discusses the roadmap for the Tobacco Products Industry (IHT) from 2015 to 2020, the priority is on the health aspect. The data in the study are grouped by province.

This study uses a quantitative approach. Quantitative research is a method used to examine the object of research, the data collection uses research instruments, and the data analysis is statistical. Quantitative research is based on the philosophy of positivism (Sugiyono, 2013). The type of research data used in this study is panel data. According to Silalahi et al. (2014), panel data regression is a regression obtained from a combination of cross-section data and time series data so that more critical data is obtained and can increase the precision of the regression model. This study's data meets

the panel data category because the research object is divided by province observations from 2015 to 2020.

Types of data based on the source can be classified into primary and secondary data. Primary data is obtained directly by researchers, while secondary data is obtained from other parties (Sekaran & Bougie, 2016). The type of data in this study is categorized as secondary data because the data used in this study were obtained indirectly. The data in this study were obtained from 2 primary sources, BPS and DJBC. Other information used in this study was obtained from various sources through journals, books, and other literature.

Table 1. Operational Variables

Variables	Data Type	Unit	Period	Data Source
Excise Rates	Ratio data, in the form of excise rates	Rupiah	2015-2020	DJBC
Per Capita Income	Ratio data, in the form of GDP divided by the total population	Rupiah	2015-2020	BPS
Education level	Ordinal data, in the form of education level numbers	Year	2015-2020	BPS
Non-child smoker rates	Ratio data, the rate of smokers with age more than or equal to 15 years	Percentage	2015-2020	BPS

Source: Data processed

The independent variable affects the dependent variable positively or negatively (Sekaran & Bougie, 2016). When there is a change in the independent variable, it will cause a change in the dependent variable. The independent variables in this study are:

- a. **Excise Rates**
The excise tariff variables are excise duty on machine-made kretek, machine-made white cigarettes, hand-rolled kretek, and hand-white cigarettes. The value of the excise rate is calculated using the average excise rate for that type of cigarette, with the presentation in rupiah. Excise rates from 2015 to 2020 always increase. The exception is only for 2019. That year, the excise rates did not increase for the three types of cigarettes.
- b. **Per Capita Income**
The income per capita variable is proxied by dividing the gross domestic product (GRDP) by the region's total population. Data for this variable was obtained from BPS. There are two types of per capita income per capita data, namely current prices and constant prices. The per capita income data used in this study is the current price presented in rupiah per province.
- c. **Level of Education**
The education level variable is ordinal data based on the average education level in an area. This variable data is obtained from BPS in units of years.

The dependent variable is the variable that is the main interest of the researcher because by understanding and measuring the dependent variable, the objectives of the

research can be achieved (Sekaran & Bougie, 2016). Sugiyono (2013) defines the dependent variable as a variable influenced by the independent variable. The dependent variable in this study is the rate of non-child smokers in Indonesia. The child population is someone under the age of 15 years (Bappenas, 2018), so the level of smokers used in this study is a group of smokers with an age of equal to or more than 15 years.

The selection of smokers at this age is because consumers under 15 years of age are considered not to have their per capita income and have not finished their education yet. The dependent variable is presented in percentage per province.

To determine the effect of the excise tax rate, per capita income, and education level on the level of non-child smokers, this study uses the following model:

$$\gamma_i = \alpha + \beta_1 \text{Taxt} + \beta_2 \text{Inci} + \beta_3 \text{Edui} + \varepsilon_1$$

Information:

- $i,$ = Smoking rate in area i and year t
- α = Constant Value
- β_1 = Excise Rate Coefficient Value
- Taxt = Excise Rate in year t
- β_2 = Value Coefficient of per capita Income
- Inci = Per Capita Income in area i and year t
- β_3 = Coefficient Value Education level
- Edui = Education level in area i and year t
- ε_1 = Residual Factor

Three approaches can be used in research using panel data regression analysis, namely pooled least square (PLS), fixed effect (FE), and random effect (RE). To choose which estimation model is most appropriate to use, several tests are carried out:

- a. The Chow test is carried out to test between the PLS and FE models;
- b. The Langrange Multiplier test was carried out to determine between the PLS model and random effects;
- c. The last test carried out is the Hausman test. It is done to determine which one is more suitable to use between the random and fixed effect models.

RESULTS

Determination of Regression Model

Three approaches can be used in research using panel data regression analysis, namely pooled least square (PLS), fixed effect (FE), and random effect (RE). To determine the most appropriate model used in this study, the Chow test, Langrange Multiplier test, and Hausman test was used. In the regression analysis in this study, the alpha value to be used is 5%.

Chow Test

The chow test is the first test to determine the regression model in this research. This test determines which model is more appropriate to use between pooled least squares and fixed effects. The regression results using pooled least squares show the following results:

Table 2. Pooled Least Square Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	52.11149	10.12483	5.146902	0.0000
LNTAX	-0.823863	1.346470	-0.611869	0.5413
LNINC	-0.937823	0.458554	-2.045178	0.0421
EDU	-0.193924	0.273428	-0.709234	0.4790
R-squared	0.044276	Mean dependent var	29.10377	
Adjusted R-squared	0.029940	S.D. dependent var	3.186261	
S.E. of regression	3.138201	Akaike info criterion	5.144589	
Sum squared resid	1969.661	Schwarz criterion	5.209650	
Log likelihood	-520.7481	Hannan-Quinn criter.	5.170908	

Source: Data processed

The regression results using the pooled least square model show the value of Prob (F-statistic) < alpha, so it can be concluded that the independent variables in the study simultaneously have a significant effect on the dependent variable. The coefficient of determinant on the model is about 4.43%. In table 2, we can see that only the LNINC variable has a Prob value. < alpha, so it can be concluded that only the income per capita variable has a significant effect on the dependent variable, while the excise tariff and education level variables partially have no significant effect on the dependent variable. After knowing the regression results using the pooled least square model, the next step is to do regression using the fixed effect model. The results of the regression using the fixed effect model are as follows:

Table 3. Fixed Effect Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-46.69148	29.17194	-1.600562	0.1114
LNTAX	-3.787312	1.261161	-3.003035	0.0031
LNINC	5.840351	1.975333	2.956642	0.0036
EDU	-0.626236	0.393159	-1.592832	0.1131
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.799614	Mean dependent var	29.10377	
Adjusted R-squared	0.756416	S.D. dependent var	3.186261	
S.E. of regression	1.572553	Akaike info criterion	3.905897	
Sum squared resid	412.9782	Schwarz criterion	4.507713	
Log likelihood	-361.4015	Hannan-Quinn criter.	4.149343	
F-statistic	18.51082	Durbin-Watson stat	2.735202	
Prob(F-statistic)	0.000000			

Source: Data processed

Based on the table, we can see that the regression results using fixed effects show the Prob (F-statistic) value below alpha, so it can be concluded that the independent variables in this study simultaneously have a significant effect on the dependent variable. Based on the table, it can also be seen that two variables have a Prob value. < alpha, namely the LNTAX and LNINC variables. Therefore, it can be concluded that the two variables partially have a significant effect on the dependent variable. Only the EDU variable partially has no significant effect on the dependent variable.

The next test that was carried out after knowing the results of the regression using the fixed effect model was the Chow test. In EViews 9, the chow test is done by

selecting the view menu and then, in the fixed/random effect testing sub-menu, selecting the redundant fixed effect – likelihood ratio. The hypothesis used in the Chow test is as follows:

H_0 = Pooled least square model;

H_1 = Fixed effect model.

Table 4. Chow Test Results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	19.075474	(33,167)	0.0000
Cross-section Chi-square	318.693202	33	0.0000

Source: Data processed

Based on the test results, it can be seen that the value of the Chi-square Cross-section is less than alpha. Therefore, it can be concluded that based on the test, H_0 is rejected, and the fixed effects model is preferred over pooled least squares.

Hausman Test

The next test to do after it is known that the fixed effects model is more suitable to be used than the pooled least square model is a test to determine which model is more appropriate to use between fixed effects or random effects. The test carried out to determine between the fixed effect model, and the random effect model is to do the Hausman test. The results of the regression using random effects can be seen in the following table.

Table 5. Random Effect Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	32.73386	13.06431	2.505594	0.0130
LNTAX	-1.099362	0.826773	-1.329703	0.1851
LNINC	0.415243	0.858912	0.483452	0.6293
EDU	-0.546634	0.336223	-1.625809	0.1056
Effects Specification				
			S.D.	Rho
Cross-section random			2.790602	0.7590
Idiosyncratic random			1.572553	0.2410
Weighted Statistics				
R-squared	0.037472	Mean dependent var		6.525027
Adjusted R-squared	0.023034	S.D. dependent var		1.620753
S.E. of regression	1.601978	Sum squared resid		513.2665
F-statistic	2.595380	Durbin-Watson stat		2.119026
Prob(F-statistic)	0.053649			

Source: Data processed

Based on the table, it can be seen that the value of Prob (F-statistic) > alpha, so it can be concluded that the independent variables in the study simultaneously have no significant effect on the dependent variable. The coefficient of determinant in the random effect model is around 3.75%, which means that only 3.75% of the dependent variable is explained by the research model using random effects. In comparison, 96.25% is explained by models outside the study. Regression results using random effects show that all independent variables have a Prob value. > alpha, so it can be

concluded that there is no independent variable that partially has a significant effect on the level of smoking in the non-child group.

The next test that was carried out after knowing the results of the regression using the fixed effect model was the Hausman test. In this test, the hypothesis used is as follows:

H_0 = Random effect model;

H_1 = Fixed effect model.

The results of the Hausman test on EViews can be seen in the random cross-section value. Cross-section random value α can be concluded that H_0 cannot be rejected. Cross-section random value $< \alpha$, it can be concluded that H_0 is rejected. The results of the Hausman test are as follows:

Table 6. Hausman Test Results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	9.554539	3	0.0228

Source: Data processed

The Hausman test results show that the random cross-section's value is less than α . Therefore, it can be concluded that based on the test, H_0 is rejected, and the fixed effects model is preferred over pooled least squares. Based on the results of the Hausman test, which states that the fixed effect is more appropriate to use. It is no longer necessary to carry out the Langrange-multiplier test, and it can be concluded that the most appropriate test to be used in this study is the fixed effect model.

Data Quality Test Results

The next step after determining the most appropriate model is testing the data. Testing the data to be carried out is the classical assumption. The test aims to ensure that the OLS model has met the BLUE criteria (blue, linear unbiased estimator). Tests in this study include the normality test, multicollinearity test, and heteroscedasticity test.

Normality Test

The first classical assumption test that is performed is the normality test. Testing for normality is carried out to ensure whether the data collected in the study are taken from a normally distributed population so that the data used can display the real problem (Baharum, Affandi, Yacob, & Ali, 2020). In this study, the Jarque-Bera test using EViews 9 will be used to perform the normality test.

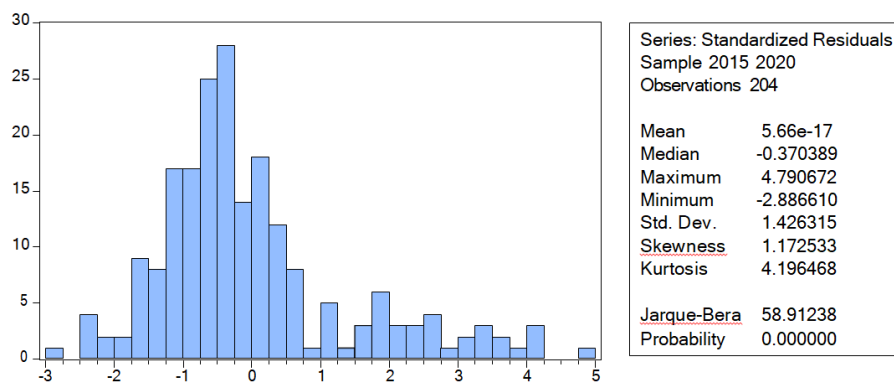


Figure 2. Jarque-Bera Normality Test Results

Source: Data processed

Based on the picture above, it is known that the Jarque-Bera probability value is 0.00. Because the probability is less than alpha, it can be concluded that the residuals in this study are not normally distributed. According to Gujarati (2015), if the sample size is large enough (more than 100), it can be assumed that the residuals tend to be normally distributed using the central limit theorem (CLT). The central limit theorem states that whether it is normally distributed or not, if a large enough sample is taken, an average distribution with normality will be obtained (Sekaran & Bougie, 2016).

The number of observations in this study was 204, so it can be assumed that the residuals in the study are normally distributed.

Multicollinearity Test

The next test carried out after the normality test was the multicollinearity test. The test was carried out to ascertain whether the independent variables in the study had a perfect linear relationship (Wakhyuni & Andika, 2019). The multicollinearity test in this study will be carried out using a correlation coefficient if there is a coefficient value of more than 0.8. Then it is considered that there is multicollinearity in the study. Multicollinearity testing was carried out on all the study's independent variables: LNTAX, LNINC, and EDU. The results of the multicollinearity test are as follows:

Table 7. Multicollinearity Test Results

	LNTAX	LNINC	EDU
LNTAX	1,000000	0,155137	0,211699
LNINC	0,155137	1,000000	0,496439
EDU	0,211699	0,496439	1,000000

Source: Data processed

Based on the test results above, we can see that the relationship with the largest coefficient value is between the variables of education level and income per capita, with a value of 0.496439. The relationship with the smallest coefficient value is between the variable income per capita and excise rates with a value of 0.155137. Because the results of the test did not find a coefficient value of more than 0.8, it can be concluded that there is no multicollinearity problem in this study.

Heteroscedasticity Test

The heteroscedasticity test is the third classic assumption test after the normality test and multicollinearity test. Testing for heteroscedasticity is one of the mandatory tests that must be carried out in multiple regression analysis. This test aims to determine whether the residuals from one observation to another have variance inequality. Various types of tests can be performed to perform the heteroscedasticity test, such as the Glejser test, the White test, the Park test, and the Breusch-Pagan test. The type of test used for the heteroscedasticity test in this study is the Breusch-Pagan test. The heteroscedasticity test in this study was carried out using the EViews 9 application. The thing that needs to be considered in this test is the Prob value. The results of the heteroscedasticity test are as follows:

Table 8. Heteroscedasticity Test Results

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	2172.269	561	0.0000
Pesaran scaled LM	47.08790		0.0000
Bias-corrected scaled LM	43.68790		0.0000
Pesaran CD	43.28606		0.0000

Source: Data processed

Based on the test results, it can be seen that the value of Prob. For Breusch-Pagan, LM is 0, so the probability value is less than alpha. Based on this, it can be concluded that there is heteroscedasticity. The heteroscedasticity problem can be overcome using the generalized least square method (Setyawan, Hadijati, & Switrayni, 2019). In the EViews application, it can be done using generalized least square weights type cross-section weights to overcome heteroscedasticity with the number of cross sections more significant than the number of research periods (Religi & Purwanti, 2017). The results of the regression after using cross-section weights are as follows:

Table 9. Regression Results after Using Cross-Section Weights

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-33.95413	25.91094	-1.310417	0.1919
LNTAX	-3.662235	1.094119	-3.347201	0.0010
LNINC	5.101186	1.756564	2.904071	0.0042
EDU	-0.675977	0.341312	-1.980526	0.0493
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.855247	Mean dependent var		33.10243
Adjusted R-squared	0.824042	S.D. dependent var		11.12748
S.E. of regression	1.570168	Sum squared resid		411.7263
F-statistic	27.40795	Durbin-Watson stat		2.755887
Prob(F-statistic)	0.000000			

Source: Data processed

Based on the results of the comparison between before and after using cross-section weights (table 3 with table 9), it can be concluded that there is a difference because after using cross-section weights, the variable level of education partially has a significant effect. The use of regression results with cross-section weights is considered more valid because the problem of heteroscedasticity has been overcome.

Coefficient of Determination Test Results

The adjusted R-square value is considered more accurate than the R-square value because the R-square tends to slightly overestimate the model's success when applied in the real world (Deliormanlı, 2012). Therefore, the value used to analyze the coefficient of determination in this study is the adjusted R-square. It can be seen in table 8 that the adjusted R-square value in this study is 0.824042. Based on this, it can be concluded that the independent variables in this study can explain 82.4042% of the dependent variable, while variables outside the research model explain 17.5958%.

CONCLUSION

Based on the partial test results, it is known that the excise rate partially has a significant effect on the dependent variable. In this study, it is known that the income per capita partially affects the dependent variable. Based on the results of the partial

test, it is known that the education level partially has a significant effect on the rate of non-child smokers. This study was conducted to determine the effect of excise rates, income, education, and the production of tobacco products on the rate of non-young smokers in Indonesia.

This research still has some limitations because the education variable in this study only calculates the average formal education obtained. It was not taking into account informal education, especially education about health awareness and the dangers of smoking. In addition, this research is still limited to only using excise rates, education, and income variables. Even so, it is still considered sufficient to describe the behavior of cigarette consumers for this study.

Overall, this research indicates that excise rates and education levels can influence the rates of the non-smoking child. So, if the government wants to reduce the rates of non-smokers child in Indonesia, the thing that can be done is to increase the excise tax rate accompanied by an increase in education for the community. In addition, based on this research, it is known that low-income groups are more vulnerable to becoming smokers, so education about the dangers of smoking is primarily aimed at these groups first. Another way that the government can reduce the level of non-child smokers outside the variables in this study is to use a non-fiscal approach by utilizing government policies. It can limit smokers and increase public awareness by providing pictures and warning labels on cigarette packs, age restrictions for cigarette consumers, enforcement of no smoking areas in public facilities, or restrictions on advertising and sponsorship of tobacco products.

After researching the impact of excise rates, per capita income, and education level on non-child smoker rates, the authors could provide suggestions for further research. Firstly author suggests that future studies use other independent variables such as cigarette prices, poverty levels, and tobacco production rates, or add dependent variables such as consumption of tobacco products. In addition, further research can also use other research methods, such as qualitative methods, time series methods, or other research methods, so that different points of view can be obtained.

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