International Journal of Economics, Business and Innovation Research
https://e-journal.citakonsultindo.or.id/index.php/IJEBIR
E-ISSN : 2964-0865
IJEBIR

The Effect Of Per Capita Income, Cigarette Prices, And The Percentage Of The Population Smoking On Cigarette Consumption In Lampung Province 2020 – 2023

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Abstract

One consumption behaviour that has a significant impact on the economy and health is cigarette consumption. Lampung occupies the top position of cigarette consumption in Indonesia with a very significant increase in consumption of 13.6% over the past 3 years. This research is a descriptive and quantitative research. This study uses 3 independent variables, namely income per capita, cigarette prices, and percentage of the population smoking, and the dependent variable used in this study is cigarette consumption. The scope of this study covers 15 districts/cities in Lampung Province using 4 years of data from 2020-2023. Based on the tests that have been carried out, it is known that the variables of income per capita and the percentage of the population smoking have a positive and significant influence on cigarette consumption in Lampung Province in 2020-2023.

Keywords: Cigarette Consumption, Income, Price, Percentage of Smokers

INTRODUCTION

A country's economic development cannot be separated from the various social aspects that influence it, including people's consumption behaviour (World Bank, 2021). One consumption behaviour that has a significant impact on the economy and health is cigarette consumption, according to the World Health Organization (WHO, 2022), tobacco use not only creates a heavy health burden, but also has a significant impact on economic productivity and household expenditure. In developing countries such as Indonesia,

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cigarette consumption patterns have their own complexities, which are influenced by social, cultural and economic factors (Kosen et al., 2017).

The World Health Organisation (2021) notes that tobacco is the leading cause of more than 8 million deaths each year worldwide. More than 7 million of these deaths are a direct result of tobacco use, while around 1,2 million people die from indirect exposure to secondhand smoke (WHO, 2021). Cigarette consumption not only affects health, but also has a significant economic impact. High cigarette consumption is often associated with increased economic burden on individuals, families and countries (Goodchild et al., 2018).

The lack of public awareness of the dangers of consuming cigarettes and the habit of consuming cigarettes from an early age makes the level of cigarette consumption in Indonesia very high. There are even certain groups of Indonesian people who are willing to sacrifice their daily household needs as long as they can enjoy cigarettes (Afif & Sasana, 2019).

Table 1. Changes in the Highest Cigarette Consumption in Indonesia in 2021 - 2023

No	Region	2021	2022	Δ 2021-2022	2023	Δ 2022-2023	Δ 2021-2023
1	La mpung	1 9,36	2 0,10	3 ,8%	2 1,98	9 ,4%	1 3,6%
2	Jambi	22,07	24,24	↑ 9,8%	24,65	↑ 1,7%	↑ 11,7%
3	NTB	12,33	11,97	↓ -3,0%	12,91	↑ 7,9%	↑ 4,7%
4	DIY	9,52	9,63	↑ 1,2%	9,95	↑ 3,3%	↑ 4,5%
5	Sumatera Selatan	19,44	20,40	↑ 4,9%	20,19	↓ -1,0%	↑ 3,8%
6	Jawa Tengah	12,16	12,83	↑ 5,5%	12,59	↓ -1,8%	↑ 3,6%
7	Jawa Barat	16,28	16,19	↓ -0,6%	16,81	↑ 3,9%	↑ 3,3%
8	NTT	8,40	8,44	↑ 0,6%	8,65	↑ 2,5%	↑ 3,0%
9	Sumatera Barat	21,95	22,66	↑ 3,2%	22,51	↓ -0,6%	↑ 2,6%
10	Sulawesi Barat	20,22	20,09	↓ -0,6%	20,57	↑ 2,4%	↑ 1,7%

Source: Badan Pusat Statistik

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Table 1. above highlights the 10 provinces in Indonesia with the highest increase in cigarette consumption between 2021 and 2023. Lampung takes the top spot with a very significant increase in consumption of 13.6% over the period. This shows a consistent upward trend, especially between 2022 and 2023, where cigarette consumption increased by 9.4%.

Overall, these 10 provinces reflect a significant upward trend in cigarette consumption in Indonesia, with Lampung and Jambi recording the most notable increases, while West Sulawesi showed a more moderate increase. These increases show that despite fluctuations in some provinces, the general trend of cigarette consumption continues to increase in these regions.

Cigarette consumption in Indonesia, including in Lampung Province, is inseparable from various social and economic factors that influence people's behaviour. For example, per capita income can reflect people's purchasing power for tobacco products (John, R. M., et al., 2012). On the other hand, the increasing price of cigarettes, especially due to excise tax policies, is often a factor in controlling consumption, although the effect is not always significant due to the addictive nature of cigarettes (Goodchild et al., 2018). In addition, the high prevalence of smoking among the productive-age population may magnify the negative economic impact of cigarette consumption, both in terms of increased household expenditure and decreased labour productivity (Chen et al., 2019).

LITERATURE REVIEW

An increase in per capita income not only reflects a country's economic capabilities, but also has a direct effect on people's consumption patterns. Research conducted by Afif & Sasana (2019) found that per capita income has a positive effect on cigarette consumption.

Price is one of the main variables in microeconomic theory that influences individual consumption decisions. A study by Marianti & Prayitno (2020) shows that cigarette prices have no significant effect on cigarette consumption, while a study conducted by alvarez et al. (2020) explains that cigarette prices have a negative effect on cigarette consumption.

Research by Ng et al. (2014) found that a high percentage of the smoking population can reinforce the smoking culture in a population.

METHODOLOGY

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This research is descriptive and quantitative research. The data used in this study is secondary data, namely data published by the Central Statistics Agency (BPS). This study uses 3 independent variables, namely income per capita, cigarette prices, and the percentage of the population smoking, and the dependent variable used in this study is cigarette consumption. The scope of this study covers 15 districts / cities in Lampung Province using 4 years of data from 2020-2023.

This study uses an analytical tool, Eviews 10, using a panel data regression model. The research model selection was carried out by conducting the Chow test, Hausman test, and Lagrange Multiplier test to select the best model to be used between the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). After that, classical assumption testing is carried out which consists of normality test, multicollinearity test, and heteroscedasticity test. Next, hypothesis testing is carried out which consists of t-statistic test, F-statistic test, and coefficient of determination test (R^2).

The model used in this study is as follows:

$$CON_{it} = \beta_0 + \beta_1 INC_{it} + \beta_2 PRC_{it} + \beta_3 SMOKE_{it} + \varepsilon_{it}$$

To obtain better estimation results in this study, it is necessary to transform the data to a double log (ln-ln) model. Transformation of the regression model into a double log (ln-ln) model is often done to overcome the problem of heteroscedasticity, where the error variance is not constant, and to produce a more linear relationship between the independent and dependent variables. In this double log model, the transformation is performed on the dependent variable and the independent variable (Nachrowi & Usman, 2006).

The following is a transformation of the research model into a double log model.

$$LnCON_{it} = \beta_0 + \beta 1\ LnINC_{it} + \beta 2\ LnPRC_{it} + \beta_3 LnSMOKE_{it} + \varepsilon_{it}$$

Description:

CON	: Cigarette Consumption (cigarettes)
INC	: Income per Capita (million rupiah)
PRC	: Cigarette Price (thousand rupiah)
SMOKE	: Percentage of Population Smoking (percent)
β0	: Constant
β1	: Income per Capita Coefficient

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β2 : Coefficient of Cigarette Price
β3 : Coefficient of Percentage of Smoking Population
ε : Error term
i : 15 districts / cities in Lampung Province
t : Research Period (2020, 2021, 2022, 2023)

RESULTS AND DISCUSSION

Research Model Specifications

Chow Test

The chow test is conducted to select a better model to use in research between the Common Effect Model and the Fixed Effect Model.

Table 1. Chow Test Results

Effects Test	*Statistic*	*d.f.*	*Prob.*
Cross-section F	6,624662	(14,42)	0,0000
Cross-section Chi-square	69,942986	14	0,0000

Source: Results of Data Processing with Eviews 10

Based on the test results in table 2, the probability value on the Cross-section Chi-square is 0,0000 where this value is smaller than the α = 5% or 0,05 value so that the test results reject H0, which means that the Fixed Effect Model is better than the Common Effect Model. Based on the selected FEM model, the test proceeds to the Hausman test.

Hausman Test

The Hausman test is conducted to select a better model to use in research between the Random Effect Model and the Fixed Effect Model.

Table 2. Hausman Test Results

Test Summary	*Chi-Sq. Statistic*	*Chi-Sq. d.f.*	*Prob.*
Cross-section random	8,922973	3	0,0303

Source: Results of Data Processing with Eviews 10

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The hausman test results show that the cross-section random probability value is 0,0303 where this value is smaller than the α = 5% or 0,05 value according to the table above (0,0303 < 0,05) which means that the test accepts Ha. Thus, the Fixed Effect Model is the model chosen in the Hausman test. Based on the tests that have been carried out, the Fixed Effect Model is the most effective panel data model to use in this study.

Table 3. Fixed Effect Model Regression Results

Dependent Variable: LN(CON)				
Variable	*Coefficient*	*Std, Error*	*t-Statistic*	*Prob,*
C	0,217074	1,251782	0,173412	0,8632
LN(INC)	0,911267	0,253652	3,592591	0,0009
LN(PRC)	-0,119498	0,215297	-0,555040	0,5818
LN(SMOKE)	1,061341	0,356992	2,973008	0,0049
R-squared	0,798204			
Adjusted R-squared	0,716524			
F-statistic	9,772386			
Prob(F-statistic)	0,000000			

Source: Results of Data Processing with Eviews 10

Ln(CON) = 1,2424 + 0,9112 Ln(INC) – 0,1194 Ln(PRC) + 1,061 Ln(SMOKE) + ε

Explanation:

1. The constant value is 1,2424 (anti-ln of 0,217074), which means that if the value of income per capita (INC), the price of cigarettes (PRC), and the percentage of the population smoking (SMOKE) is equal to zero then cigarette consumption in Lampung province is 1,2424.
2. The coefficient of per capita income Ln(INC) is 0,911267, meaning that if per capita income increases by 1 unit and other variables are constant or ceteris paribus, cigarette consumption will increase by 0,911267 units.

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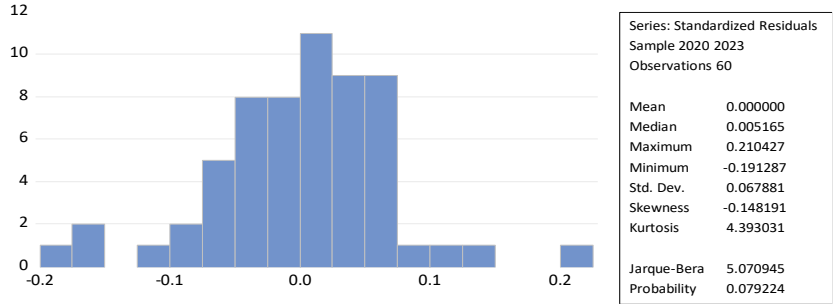
3. The coefficient of cigarette price (PRC) is -0,119498, meaning that if the price of cigarettes increases by 1 unit and other variables are constant or ceteris paribus, cigarette consumption will decrease by 0,119498 units.
4. The coefficient of the percentage of the population smoking (SMOKE) is 1,061341, meaning that if the percentage of smokers increases by 1 unit and other variables are constant or ceteris paribus then cigarette consumption will increase by 1,061341 units.

Classical Assumption Test

Normality Test

The normality test aims to test whether the cross-section regression model variables are normally distributed or not. The normality test in this study was tested using the normal probability plot graph analysis method, by paying attention to the probability value of Jarque-Bera.

Figure 1. Normality Test Results



Source: Results of Data Processing with Eviews 10

Based on the test results in Figure 1, the probability value of this test is greater than α = 5% or 0,05 according to the figure (0,079224> 0,05), based on the test results that the data used in this study are normally distributed.

Multicollinearity Test

Multicollinearity test is a test conducted to determine the relationship between independent variables in one regression equation. If the correlation coefficient is above 0,80, it can be concluded that there is a multicollinearity problem in the model.

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Table 4. Multicollinearity Test Results

	LN(INC)	LN(PRC)	SMOKE
LN(INC)	1,000000	0,240574	-0,480889
LN(PRC)	0,240574	1,000000	-0,022004
SMOKE	-0,480889	-0,022004	1,000000

Source: Results of Data Processing with Eviews 10

From the multicollinearity test results in the table above, it is known that there is no multicollinearity problem in the regression model, this is indicated by the multicollinearity test findings which show that the correlation number between the independent variables in the study is less than 0,8.

Hateroscedasticity Test

The heteroscedasticity test aims to test whether in the regression model there is an inequality of variance from the residuals of one observation to another. If the p value> 0,05 then there is no heteroscedasticity problem.

Table 5. Heteroscedasticity Test Results

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	-0,805794	0,599707	-1,343646	0,1863
LOG(INC)	0,002380	0,121520	0,019583	0,9845
LOG(PRC)	0,001392	0,103145	0,013491	0,9893
SMOKE	0,239275	0,171029	1,399032	0,1691

Source: Results of Data Processing with Eviews 10

Based on the results of heteroscedasticity testing, it is found that the p-value of each independent variable in this study is > 0,05, which means that there is no heteroscedasticity problem in the research model.

HYPOTHESIS TESTING

t-Test

The t-test is used to determine the effect of each independent variable which in this study consists of per capita income, cigarette prices, and the percentage of the population smoking on the dependent variable, namely cigarette consumption.

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Table 6. Results of the t-test

Variable	*t-Statistic*	*t-Table*	*Prob.*	Description
LN(INC)	3,592591	2,00	0,0009	Significant
LN(PRC)	-0,555040	2,00	0,5818	Not Significant
SMOKE	2,973008	2,00	0,0049	Significant

Source: Results of Data Processing with Eviews 10

Based on the results of the t test, it is known that the variables of income per capita and the percentage of the smoking population have a significant effect on the dependent variable because they have a probability value < 0,05. While the cigarette price variable has no significant effect on the dependent variable because it has a probability value > 0,05.

F-Test

The F-test is used to show whether all independent variables have an effect on the dependent variable using a 5% level of significance.

Table 7. F-Test Results

F-statistic	F-table (α = 5%)	Probability	Description
9,772386	2,769431	0,000000	H_0 Rejected

Source: Results of Data Processing with Eviews 10

In the table above, it is known that the value of F count is 9.772386 > F table which is 2,769431 and the significance value is 0,000000 < 0,05, meaning that the variables of income per capita (INC), cigarette prices (PRC), and the percentage of the population smoking (SMOKE) together have an effect on cigarette consumption in Lampung Province.

Determination Coefficient Test (R^2)

The coefficient of determination (R^2) analysis aims to see how much variation in the dependent variable is explained jointly by the independent variables and to see how well the model can explain the dependent variable.

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Table 8. Determination Coefficient Test Results (R^2)

R-squared	0,798204
Adjusted R-squared	0,716524

Source: Results of data processing with Eviews 10

The coefficient of determination shows that the independent variables consisting of income per capita, cigarette prices, and the percentage of the smoking population are able to explain the cigarette consumption variable in Lampung Province by 71,6524%, while the remaining 28,3476% is explained by other variables not included in the research model.

Effect of Income per Capita on Cigarette Consumption

Based on the regression estimation results, the income per capita variable has a coefficient of 0,9112, as well as a t-statistic value > t-table, and the probability of the income per capita variable < α: 0,05. These findings indicate that per capita income has a positive and significant effect on cigarette consumption in Lampung Province. The results of this study are in line with the results of research by Afif & Sasana (2019) that per capita income is positively and significantly related to the level of cigarette consumption.

Effect of Cigarette Price on Cigarette Consumption

The results of data analysis show that the cigarette price variable has a t-statistic value < t-table, and the probability of the cigarette price variable > α: 0,05, meaning that cigarette prices have no significant effect on cigarette consumption in Lampung Province in 2020-2023.

Effect of Percentage of Smoking Population on Cigarette Consumption

The results of data analysis show that the percentage of the smoking population has a coefficient value of 1,061341 and a t-statistic value > t-table, and the probability of the smoking population percentage variable < α: 0,05 has a positive and significant effect on cigarette consumption in Lampung Province. The results of this study are in line with the results of research by Ng et al. (2014) found that a high percentage of the smoking

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population can strengthen the smoking culture in a population, which in turn increases overall cigarette consumption.

CONCLUSIONS

Based on the tests that have been carried out, it is known that the variables of income per capita, cigarette prices, and the percentage of the population smoking have an influence on cigarette consumption in Lampung Province in 2020-2023, but the cigarette price variable does not have a significant influence.

Based on these results, the government is expected to consider the impact of increasing per capita income on cigarette consumption. In this case, an increase in income not only increases people's purchasing power for basic needs but also for goods that are detrimental to health such as cigarettes. In addition, given that the percentage of the population that smokes has a significant effect on the level of cigarette consumption, it is important for the government to continue to improve health education programmes that target smokers and potential smokers. Anti-smoking campaigns should be geared more towards groups with diverse income levels, and health messages should be tailored to the cultural and socio-economic background of the people of Lampung.

Further research could focus on other variables that may influence cigarette consumption but were not detected in this study.

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