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The Influence of Income, Cigarette Price and Dependency Ratio on Cigarette Consumption in Indonesia

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Abstract

This research is motivated by the high level of cigarette consumption in Indonesia, which negatively impacts the economy and public health. The study aims to examine the influence of income, cigarette prices, and dependency ratio on cigarette consumption in Indonesia. This study uses a quantitative approach with panel data covering the period 2019-2023 for 34 provinces in Indonesia.. The Random Effect Model (REM) was employed to analyze the influence of income, cigarette prices, and dependency ratio variables. The data were analyzed using Eviews 12.The findings indicate that income, cigarette prices, and dependency ratio simultaneously have a significant effect on cigarette consumption in Indonesia. The income and dependency ratio variables negatively but insignificantly affect cigarette consumption, whereas cigarette prices positively and significantly influence it. This study concludes that cigarette consumption in Indonesia is influenced by economic and social factors, necessitating comprehensive policy strategies and education to reduce cigarette consumption in the country.

Keywords: Income; Cigarette Prices; Dependency Ratio; Cigarette Consumption

1. Introduction

Cigarette consumption in Indonesia is a significant health and economic problem, with high prevalence in many provinces. According to [1], smoking prevalence in Indonesia reached around 34% for the population aged 15 years and above, showing a high rate compared to other countries. Based on a report from the Central Statistics Agency (BPS) in 2023, smoking prevalence in several provinces such as Lampung, West Nusa Tenggara and West Java showed high rates. In Lampung for example, smoking prevalence reached 34.08%, while in West Java it was 32.79% and in West Nusa Tenggara it was 32.79%. Meanwhile, provinces with high levels of poverty such as West Papua and Maluku also have high smoking prevalence, with smoking prevalence for West Papua reaching 25.30%, and Maluku reaching 28.04%. This certainly reflects a significant consumption problem despite the smaller population which certainly indicates a significant consumption problem across the country.

This smoking habit can have a negative effect on the human body. According to [2], smoking is one of the habits that can pose a high risk to health. WHO states that smoking is one of the biggest causes of death in the world. According to WHO, as many as 5 million people each year experience premature death due to diseases associated with smoking habits such as cancer, liver disease, heart disease and stroke. Consumption is related to households, and consumption is one of the most important variables in the macroeconomic concept, where when a household carries out consumption activities, the household provides input to national income. The average smoker in Indonesia must spend 8.25% of their average income as measured by GDP per capita to buy 10 cigarettes per day [3].

In theory, the amount of spending on consumption can be influenced by income. According to [4] explains that income has a positive and significant effect on cigarette consumption. The increase in per capita income will increase per capita cigarette consumption. Research conducted by [5] also says that there is a positive relationship between income and cigarette consumption, which means that increasing income will increase cigarette consumption. Likewise, research conducted by [6] shows that income levels have a positive and significant effect on consumption. An increase in income will increase a person's cigarette consumption.

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Table 1.1 Indonesia's Per Capita Income 2019-2023 (in million rupiah)

Year	Rate
2019	59,1
2020	57,73
2021	62,2
2022	71
2023	75

Source : Badan Pusat Statistik

According to table 1.1 Indonesia's per capita income decreased in the 2020 period, which amounted to 57.73 million rupiah and increased again in 2021. Indonesia's per capita income then continued to increase until in 2023 Indonesia's per capita income amounted to 75 million rupiah.

Table 1.2 Average Monthly Per Capita Expenditure by Cigarette Commodity in Indonesia (IDR), 2019 - 2023

Year	Average per capita expenditure
2019	70,537
2020	73,442
2021	76,583
2022	82,183
2023	91,003

Source : Badan Pusat Statistik

According to table 1.2 the average per capita expenditure on cigarette consumption always increases every year despite a decrease in the level of per capita income. Although according to previous research, income has a positive effect on per capita income, in reality, when per capita income fell in 2020 it did not necessarily reduce spending on cigarette consumption.

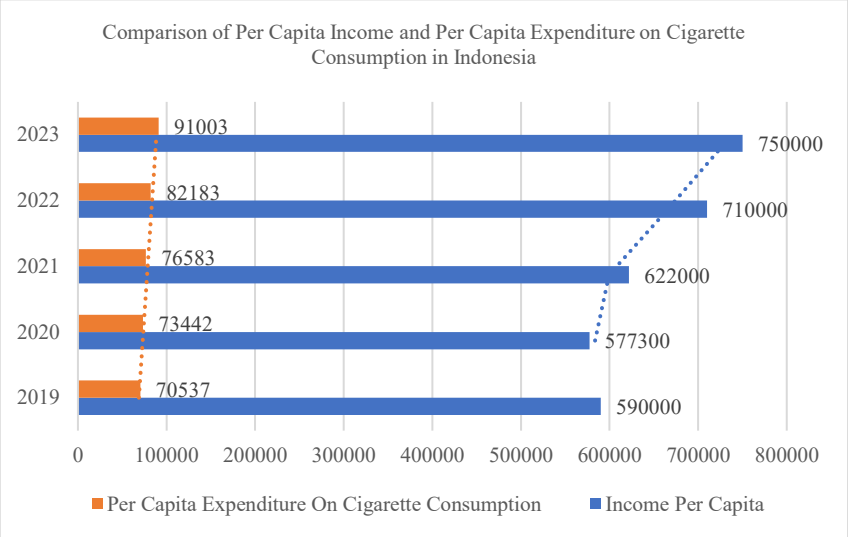

Figure 1.1 Comparison of Per Capita Income and Per Capita Expenditure on Cigarette Consumption in Indonesia

In addition, another factor that can affect cigarette consumption is the price of cigarettes themselves. Price is one of the factors that consumers consider in making purchasing decisions. Price is one of the most important attributes that consumers evaluate. Marketers and companies alike must realize the role of price in shaping consumer attitudes. Research conducted by [7] contains the conclusion that the price variable has a negative and significant effect on cigarette consumption. Meanwhile, research conducted by [8] explains that cigarette prices have a negative and significant effect on total expenditure on cigarette consumption. The higher the retail price of cigarettes will make consumers rethink buying cigarettes or may reduce the number of cigarettes purchased to choose to stop consuming cigarettes.

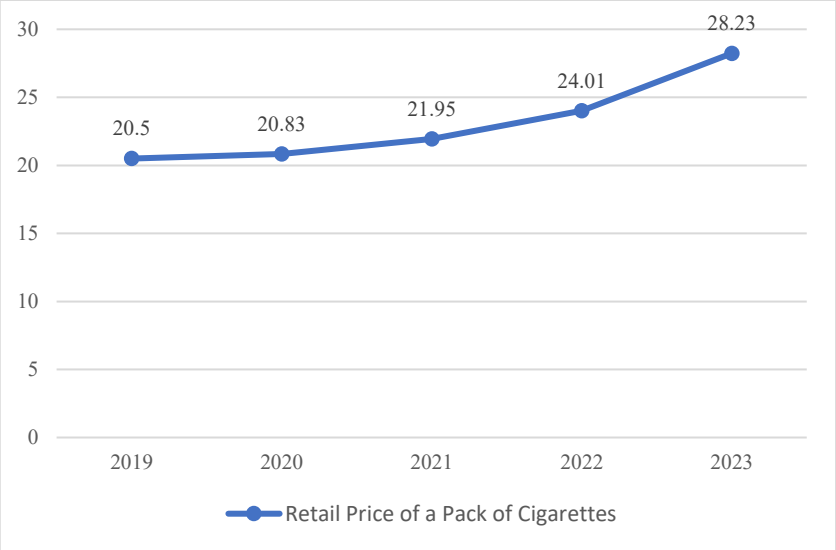

Figure 1.2 Average Retail Price of a Pack of Cigarettes in Indonesia (In Thousand Rupiahs)

According to the data above, the retail price of a pack of cigarettes always increases every year. The increase in cigarette prices itself is influenced by several factors such as the level of cigarette consumption, excise tax rates on tobacco products, government policies or regulations related to cigarettes and tobacco, the cigarette industry, and other factors related to the interests of the state. However, it can be seen that although the price of cigarettes is increasing every year, it does not reduce the consumption of Indonesian people. This is in accordance with the government's goal of increasing the level of cigarette excise tax to control cigarette consumption, which has a negative impact. This can certainly be a problem because it is not in line with the government's goal of increasing cigarette excise rates, which is to reduce the level of cigarette consumption considering that cigarettes are goods that have a negative effect on health.

The problem of cigarette consumption in Indonesia has certainly become a complex problem. In addition to income and cigarette prices, dependency ratio can also be a factor that affects cigarette consumption. Dependency ratio measures the ratio between the unproductive population (children and elderly) and the productive population (working age). This high dependency ratio has a direct impact on the economic burden of families, who often have to support more family members who do not generate income. In this context, cigarette consumption can be an additional burden for families, especially in provinces with a high dependency ratio. Research by [9] shows that in provinces with high dependency ratios, such as NTT and Papua, families facing economic pressures often allocate a significant proportion of their income to cigarettes, at the expense of spending on basic needs such as education and health. For example, in Papua, spending on cigarettes absorbs up to 12% of the total household budget among low-income families, demonstrating the direct impact of a high dependency ratio on cigarette consumption patterns.

High economic dependency in provinces with a high dependency ratio has the potential to exacerbate public health problems, as cigarette consumption can worsen health conditions and increase the burden of medical expenses, which in turn worsens the economic welfare of families. According to research by Nizamie and Kautsar (2021)[5], there is a significant relationship between age and cigarette consumption. Cigarette consumption. Consumption of cigarettes will increase up to a certain age and will decrease with age. According to [10] there is a negative and significant relationship between age and cigarette consumption. Therefore, the increasing age of individuals will reduce their consumption of cigarettes.

Table 1.3 Rasio Ketergantungan di Indonesia

Year	Rate
2019	48,27%
2020	48%
2021	47,61%
2022	47,19%
2023	46,65%

Source : Trading Economics

If we look at the table above, it can be seen that the level of dependency ratio in Indonesia is experiencing a downward trend, which means that there is an increase in Indonesia's productive age population from 2019 to 2023. Therefore, if we refer to the studies, we should get an increase in cigarette consumption in Indonesia in the period 2019 to 2023. Cigarette consumption in Indonesia is a complex issue with far-reaching health and economic implications. With the latest data and in-depth analysis, this study aims to deeply analyze the influence of income, cigarette price, and dependency ratio on cigarette consumption in Indonesia. By understanding how these factors interact in different provinces, it is hoped to provide more effective policy recommendations to reduce smoking prevalence and improve public welfare.

2. Literature Review

2.1 Definition of Consumption

According to Greg Mankiw in Afif and Sasana (2019)[4], consumption is household spending on goods and services. Households spend on durable goods such as cars, household appliances, and non-durable goods such as food and clothing, while spending on services for intangible goods such as educational services, and health services. Consumption will increase if there is an increase in income by a smaller proportion than the increase in income itself.

2.2 Consumption Theory

1. Keynes' Consumption Theory

Keynes' consumption theory explains that the consumption of a person or society is absolutely determined by the level of income. There is a basic principle or hypothesis that states that individuals as consumers will determine the part of their current income that is allocated for consumption based on their absolute income level. Thus, the consumption level of an individual depends on his absolute income level. There are several main features of Keynes' consumption theory which are described as follows:

- Marginal propensity to consume = MPC = (Marginal Propensity to Consume) is between zero and one, where the magnitude of change in consumption is always above 50% of the magnitude of change in income. That is, the change in consumption is above 50%, but will not reach 100% ($0.5 > MPC < 1$).
- The average propensity to consume = APC = (Average Propensity to Consume) will decrease if income increases, because the increase in income will always be greater than the increase in consumption, then in each income will be able to increase savings. So it can be concluded that every time there is an increase in income, the average propensity to save will definitely be higher.
- The marginal propensity to consume (MPC) is less than the average propensity to consume (APC), which means that the marginal propensity to consume (MPC) decreases as income increases, which means that the marginal income proportion of consumption continues to decrease.

The core idea of Keynes' consumption theory is to outline the relationship between the current level of consumption and the income available at the moment, otherwise known as disposable income. In simple terms, this theory implies that the amount of current income affects the extent to which individuals will spend their money at that time. In other words, if income increases, the level of consumption is also likely to increase, while if income decreases, the level of consumption is likely to decrease [10].

2. Life Cycle Theory

According to Franco Modigliani, the pattern of people's consumption expenditure is based on the fact that the pattern of acceptance and the pattern of consumption expenditure are generally influenced by the period in their life cycle. This theory divides a person's consumption pattern into three parts based on a person's age. The first is age 0 to a certain age where the person has not generated his own income, then he experiences dissaving, he consumes but has not generated his own income which is greater than his consumption expenditure. The second starts from working age (already working) until the age where the person is approaching old age. He will experience saving, the last is at the stage when a person is in old age where the person is no longer able to generate his own income, he experiences dissaving again [11].

The life cycle hypothesis has made an important contribution to understanding people's consumption behavior. This hypothesis shows that consumption is determined not only by present income, but also by the income that is expected to be received in the future. It further shows the role of wealth in influencing consumption. This hypothesis also explains people's motivation to save. At a young age, people tend to save and this savings will continue to increase until retirement with the aim of financing consumption in old age. However, Modigliani's consumption theory has a weakness in its analysis, which ignores the desire of parents to leave wealth to their children and grandchildren and other family members. According to Ando-Brumberg-Modigliani, the model assumes that consumers are rational. This means that the consumer seeks to maximize the satisfaction of the income stream that he estimates to be applicable to him. Regarding the source of income, Ando-Brumberg-Modigliani distinguishes two sources of income: labor as the source of labor income and wealth as the source of property income.

3. Friedman's Theory

According to Friedman's theory on consumption theory with permanent income as contained in his book: A Theory of Consumption Function defines permanent income as the average long-term income expected to be received from "Human and non-Human Wealth". Permanent income will increase if individuals assess their quality (human wealth) is getting better, able to compete in the market. With this belief, his expectations about wage or salary income (expected labor income) are more optimistic. Expectations about permanent income will also increase if individuals assess their wealth (non-human wealth) to increase. This is because under such conditions, non-wage income (non-labor income) is also expected to increase.[12]

According to the permanent income hypothesis, a person's consumption level at a certain time is not determined by the income actually received at that time but by the permanent income at that time. According to the permanent income hypothesis, there are two factors that determine permanent income in a certain period, namely permanent income in the previous period and a percentage of the difference between current income and permanent income in the previous period. Current income is not quite the same as permanent income, sometimes current income is greater than permanent income and vice versa. What causes this is the existence of non-permanent income, the amount of which changes. This income is called transitory income, which is the difference between income received in the present and permanent income in the previous period. One of the important purposes of the permanent income hypothesis is to explain why in cross-section data the APC value decreases as income increases, while in time-series data the APC value is fixed. According to Friedman, this situation occurs as a result of transitional income.

4. Concept of Family Economics

The economic concept developed by Gary Becker offers an in-depth perspective on how family decisions can be understood through economic principles. Becker considers the family as an economic unit that functions on the principle of resource allocation to maximize the utility or satisfaction of its members. In his view, families allocate time and resources to activities that are considered to provide the greatest benefits, both in the form of consumption of goods and services and in production activities. The concept of human capital is also very important in Becker's theory. Becker introduced the idea that investment in human capital, such as education and training, can increase individual productivity and family welfare. In the context of the family, investment in children's education and the health of family members is considered a long-term strategy to increase the family's economic capacity and potential. This has implications for family decisions regarding resource allocation for education and health. [13]

The concept also highlights the role of preferences and values in economic decisions. Becker argues that family preferences on various aspects of life such as the number of children, education, and gender roles affect the way resources are allocated. Families seek to maximize their satisfaction by considering individual preferences and constraints in decision-making. Division of labor within the family is another area that is explained in detail in Becker's theory. Becker analyzes how the division of labor in families is based on comparative advantage, where family members choose tasks that best suit their skills and opportunities. This division of labor allows families to achieve higher efficiency and improve overall well-being.[13]

Overall, Gary Becker's concept of family economics provides a comprehensive analytical framework for understanding the dynamics of family decisions and resource allocation. By applying economic principles to the study of families, it provides insights into how families can maximize well-being and deal with economic challenges in a broader social context.

3. Research Method

The type of research used in this research is quantitative research, where the data used in this research activity is secondary data, namely data obtained from other parties or indirectly in the form of reports from the Central Statistics Agency (BPS). The dependent variable or dependent variable is the variable that is influenced by other variables. The dependent variable used in this study is the level of cigarette consumption (Y) which is indicated by the Average Monthly Per Capita Expenditure for the cigarette commodity group for each province in Indonesia which is expressed in rupiah units. Independent variables or independent variables are variables that affect the dependent variable. The independent variables in this study are income ($X1$) indicated by Gross Regional Domestic Product per capita at current prices of each province in Indonesia expressed in units of million rupiah, cigarette prices (X2) indicated by the Average Retail Price of a Pack of Cigarettes for each province in Indonesia expressed in units of thousand rupiah and dependency ratio ($X3$) indicated by data on the dependency ratio level of each province in Indonesia expressed in percentage. The data is quantitative, namely data in the form of time series data in the period 2019 - 2024. The data collection technique used in this study is data related to the subject matter of researchers quoted from books, websites and BPS Indonesia.

The data analysis technique in this study is regression analysis. Regression analysis studies the dependence of a variable on other variables with the aim of estimating the population of known variables based on certain values (Gujarati, 2012)[14]. This study uses the panel data regression analysis method. Panel data is a combination of cross section data (between places or spaces) and time series. According to [15] time series data is a collection of observations within a certain time span collected in continuous time intervals, such as weekly, monthly, quarterly, and annual data. Data between places or spaces is data collected within a certain

period of time from samples in an area. In panel data, research is carried out on a region or individual and analyzes data coherently over time.

3.1. Panel Data Regresion Model

Panel data regression is a combination of cross section and time series data. In addition to observing the behavior of the same economic unit, panel data also observes behavior at a certain time period. Panel data has several advantages, namely because it is a combination of cross section and time series data, the resulting degree of freedom is greater due to the increase in data collected. Panel data is able to solve the problem of missing data (ommited variables) which is a situation where in a model does not include explanatory variables that are relevant to explain the response variable [15].

This study uses panel data with 34 cross section data in Indonesia and time series data for 5 years from 2019-2023. The total panel data used is 170 data. In analyzing when using statistical data it is better to use a research sample size with a minimum sample size of 30 (Sugiyono, 2018). The use of panel data regression models in this study, namely:

$KRit = \beta 0 + \beta 1Pdit + \beta 2HRit + \beta 3DRit + \varepsilon it$

Where:
KR : Cigarette Consumption
Pd : Income
HR : Cigarette Price
DR : Dependency Ratio
$\beta 0$: Constant
$\beta 1$ - $\beta 3$: Coefficient of lnPd, lnKH, lnDR
ε : error term
i : cross section
t : time series

According to [15] there are three estimation models used in panel regression, namely:

3.1.1. Common Effect Model

CEM is the simplest model because it only combines cross section and time series data. This model does not see differences between individuals and periods, so it can use the Ordinary Least Square (OLS) method or the least squares method to estimate panel data.

3.1.2. Fixed Effect Least Square Dummy Variable (LSDV) Model

FEM is a model with the assumption that there are differences in intercepts in an equation. This model uses the help of dummy variables to determine different intercepts. This model explains that there are different individuals but the slope between individuals remains the same. It is also called Least Squares Dummy Variable (LSDV) which is used to explain the difference in intercepts.

3.1.3. Random Effect Model

REM is a model that shows the relationship that may occur between individuals and between time which is put into disturbance variables (error terms). The disturbance variables have differences between individuals but are fixed between times. This model is often referred to as the Error Component Model (ECM). The use of this model method is Generalized Least Squares (GLS).

3.2. Estimation Model Approach

The best model test is carried out to determine which model is appropriate in a study. There are three tests in determining the model according to [15], namely:

3.2.1. Chow Test

The Chow test aims to test or determine the best model between the common effect model and the fixed effect. The provisions are $H0$ is common effect and $H1$ is fixed effect. If the probability result is smaller than 0.05, then rejection of $H0$ is rejected and acceptance of $H1$. So that the fixed effect model was chosen.

3.2.2. Hausman Test

The Hausman test is useful for testing or determining the best model between the fixed effect model and random effect. The method is with the data that has been collected, regressed with random effects, after which the data will be compared. The provisions are $H0$ is random effect and $H1$ is fixed effect. If the resulting probability is less than 0.05, rejection of $H0$ is rejected and acceptance of $H1$. So that the fixed effect model is chosen.

3.2.3. Langrangge Multiplier (LM) Test

The LM test is useful for testing or determining the best model between the common effect model and random effect. The provisions are $H0$ is common effect and $H1$ is random effect. If the resulting probability is smaller than 0.05, rejection of $H0$ and acceptance of $H1$. So that the random effect model was chosen.

3.3. Hypothesis Test

Hypothesis testing is carried out to understand the relationship between the independent variable and the dependent variable. In the Hypothesis test, there are three tests carried out, namely:

3.3.1. Determination Coefficient Test (Adjusted R^2)

The coefficient of determination ($R2$) is carried out to describe the extent to which the dependent variable in a model can be described by the independent variable. The coefficient of determination has a value range of 0-1. If the value is close to 1, then the model can see and explain the variation in the independent variable on the dependent variable. This means that the model is correct. However, if the value obtained from the coefficient of determination is away from the value of 1, then the model is less able to see and explain the variation of the independent variable on the dependent variable [16].

3.3.2. F Test (Simultaneous Significance)

Simultaneous F test is a test conducted to determine whether all independent variables together or simultaneously have the same influence on the dependent variable. The criteria used in rejecting or accepting the hypothesis are:
H_0 : All independent variables have no significant effect simultaneously (together) on the dependent variable.
H_1 : All independent variables have a significant effect simultaneously (together) on the dependent variable.
The level of confidence used in the f test is 95% or 5% significance level ($\alpha = 0.05$) and 90% or 10% significant level ($\alpha = 0.10$) can be concluded as follows:
- H_1 is accepted and H_0 is rejected if F count > F table, which means that there is a significant effect of each independent variable on the dependent variable.
- H_1 is rejected and H_0 is accepted if F count < F table, which means that there is no significant effect of each independent variable on the dependent variable.

3.3.3. T-Statistic Test (Partial Significance)

The t-statistic test is conducted to see the effect of the independent variable partially (individually) in explaining the dependent variable. The criteria used in accepting or rejecting the hypothesis are
H_0 : There is no significant effect between the independent variable and the dependent variable partially (individually).
H_1 : There is a significant influence between the independent variables on the dependent variable partially (individually).
Tin The confidence level used in the t test is 95% or 5% significance level ($\alpha = 0.05$) and 90% or 10% significant level ($\alpha = 0.10$) can be concluded as follows:
- H_1 is accepted and H_0 is rejected if t count> t table which means that there is a significant effect of each independent variable on the dependent variable.
- H_1 is rejected and H_0 is accepted if t count < t table, which means that there is no significant effect of each independent variable on the variable.

4. Results and Discussion

4.1. Descriptive Statistical Analysis

Descriptive statistical analysis is seen from the results of descriptive statistics, namely the average value, middle value, highest value, lowest value, and standard deviation.Tabel 4.1

Table 4.1. Statistik Deskriptif

Indicator	Income	Cigarette Price	Dependency Ratio	Cigarette Consumption
Rata-rata	71,87	23,10	46,18	79,49
Nilai Tengah	54,04	21,95	45,46	79,16
Nilai Tertinggi	322,62	28,23	64,89	127,48
Nilai Terendah	19,63	20,50	38,93	41,79
Std. Deviasi	57,43	2,85	4,33	16,62

Source : Eviews Data Processing Results

- The average per capita income for each province in Indonesia is 71.87 million rupiah. The middle value of per capita income is 54.04 million rupiah, which is found in North Sulawesi province in 2021. The province with the highest per capita income

is DKI Jakarta in 2023 with a value of 322.62 million rupiah, while the province with the lowest per capita income is East Nusa Tenggara in 2019 at 19.63 million rupiah. Income inequality amounted to 57.43 million rupiah, which indicates the existence of uneven economic welfare between provinces. This inequality is caused by the concentration of the economy and infrastructure in urban areas, such as Jakarta, compared to remote areas such as NTT that still lack access to economic resources.

- The average price of cigarettes in Indonesia is 23.10 thousand rupiah per pack. The median value for cigarette prices is 21.95 thousand rupiah, which is found in the province of Aceh in 2021. The province with the highest cigarette price is Papua province at 28.23 thousand rupiah in 2023, while the province with the lowest cigarette price is DKI Jakarta at 20.50 thousand rupiah in 2019. The spread of cigarette price data is relatively small, with a standard deviation of 2.85 thousand rupiah, which shows a fairly low price difference between provinces. This can be caused by the cost of transportation and infrastructure between different regions in each province.
- The average dependency ratio across all provinces in Indonesia is 46%. The median value for the dependency ratio is 45.46%, which is found in West Sulawesi province in 2021. The highest value of 64% is found in East Nusa Tenggara province in 2020 and the lowest value of 38% is found in DKI Jakarta province in 2021. The inequality of the dependency ratio in provinces in Indonesia of 4.33 which can be caused by differences in the distribution of productive and non-productive populations between regions, as well as access to jobs and economic resources that are concentrated in urban areas makes people of productive age tend to choose to urbanize to urban areas.
- The average cigarette consumption across all provinces in Indonesia is 79.49 thousand. The median value for cigarette consumption expenditure is 70.16 thousand rupiah. Expenditure on cigarette consumption was highest in Bangka Belitung province in 2023 at 127.48 thousand rupiah and the province with the lowest expenditure on cigarette consumption was Yogyakarta province in 2019 at 41.79 thousand rupiah. Inequality in cigarette consumption expenditure in each province in Indonesia amounted to 16.62 thousand rupiah which could be influenced by income factors, cigarette prices and different dependency ratio levels in each province.

4.2. Estimation Model Selection

Before testing panel data regression, several model specification tests are carried out in order to get the most appropriate model estimation to use. In the model selection test, there are three tests, namely the Chow test, the Hausman test and the Langrange Multiplier (LM) test.

4.2.1. Chow Test

The Chow test is conducted to determine the best model between the Common Effect Model or the Fixed Effect Model. If the results show the cross-section F probability value is smaller than the significance level α = 5% (0.05), then the fixed effect model is used. However, if it shows the cross-section F probability value is greater than the significance level α = 5% (0.05), then the common effect model is used.

Tabel 4.2. Chow Test

Test Tools	Statistik	d.f.	Prob.
Cross-section F	55,41	(33,133)	0,00
Cross-section Chi-square	457,49	33	0,00

Source: Eviews Data Processing Results

Based on Table 4.2, the Chow Test results show that the Prob. value of the Cross-section F and Cross-section Chi-square is 0.00 <0.05, which means it can be concluded that the fixed effect model is more appropriate to use. Furthermore, the Hausman Test is conducted to determine whether the fixed effect model or random effect model is the most appropriate model to use in this study.

4.2.2. Hausman Test

The Hausman test is used to select the best model between the Fixed Effect Model and the Random Effect Model. If the results show a probability value smaller than the significance level α = 5% (0.05), then the Fixed Effect Model is used. However, if the Hausman Test results show a random cross-section probability value greater than the significance level α = 5% (0.05), then the Random Effect Model is used.

Tabel 4.3. Hausman Test

Alat Uji	Nilai Chi-Sq.	Chi-Sq. d.f.	Prob.
Cross-section random	4,19	3	0,24

Source: Eviews Data Processing Results

Based on Table 4.3, the results of the Hausman Test on the model show that the Prob. value of Cross-section random is 0.24> 0.05, which means it can be concluded that the Random effect model will be used. Because the Hausman test selected the REM estimation model, the Random Effect Model (REM) regression model will be used in this study.

Based on the results of the previous model selection, the Chow test obtained the best model, namely the Fix Effect Model (FEM) compared to the Common Effect Model (FEM). Meanwhile, the Hausman test found the best model, namely FEM compared to REM. Therefore, there is no need to do the Lagrange Multiplier test again because the recommended model is the Random Effect Model..

4.3. Random Effect Model Estimation

Random Effect Model (REM) is a model that shows the relationship that occurs between individuals and between time which is put into disturbance variables (error terms). Disturbance variables have differences between individuals but are fixed between times. This model is often referred to as the Error Component Model (ECM) or Generalised Least Squares (GLS).

Table 4.4. Model Regresi Data Panel Random Effect Model

Variable	Coeffisien	Prob.
C	44,49	0,00
Pd	-0,02	0,09
HR	2,06	0,00
DR	-0,23	0,07

Source: Eviews Data Processing Results

Based on the results of the Random Effect Model regression model, it can be explained about testing each independent variable on the dependent variable. The conclusion can be described through the following equation:

KR = 44,49 – 0,02*Pd + 2,06*HR – 0,23*DR+ e

- The variable Constanta (C) with a coefficient value of 44.49 with a prob. value of 0.00 < 0.05 indicates that if the variables (Income, Cigarette Price, and Dependency Ratio) are considered unchanged, then the level of cigarette consumption in Indonesia will be at 44.49 thousand rupiah and significant at the 5% significance level.
- Variable Income (Pd) with a coefficient value of -0.02 with a prob value. 0.09 > 0.05 so that the income of all provinces in Indonesia has a negative effect on cigarette consumption but is not significant at the 5% significance level. This shows that every increase in income of 1 million rupiah will cause cigarette consumption to decrease by 0.02 thousand rupiah (20 rupiah). However, the effect of income on cigarette consumption is not statistically significant.
- Cigarette Price Variable (HR) with a coefficient value of 2.06 with a prob value. 0.00 < 0.05 so that the price of cigarettes throughout the province in Indonesia has a positive and significant effect on cigarette consumption at a significance level of 5%. This indicates that any increase in the price of cigarettes by 1 thousand rupiah will increase cigarette consumption by 2.06 thousand rupiah and significant at the 5% significance level which means that statistically cigarette prices have a relationship with cigarette consumption.
- Dependency Ratio (DR) variable with a coefficient value of -0.23 with a prob. value of 0.07 > 0.05 so that the Dependency Ratio of all provinces in Indonesia has a negative effect on cigarette consumption but is not significant at the 5% significance level. This shows that any increase in dependency ratio by 1 per cent will reduce cigarette consumption by 0.23 thousand rupiah. However, the effect of dependency ratio on cigarette consumption is not statistically significant.

4.4. Hypothesis Test

Hypothesis testing is used to assess the significance of the influence of the independent variable on the dependent variable through the regression coefficient obtained. This means that if the regression coefficient is statistically different from zero, then there is evidence that the independent variable has an influence on the dependent variable.

4.4.1. Determination Coefficient Test (R^2)

The coefficient of determination is denoted by R squares (R^2) which is an important measure in regression because it can inform whether or not the estimated regression model is good. The value of the coefficient of determination reflects how much the ability of the independent variables to explain the dependent variable.

Table 4.5. Determination Coefficient Test

Tools Test	Rate
R-squared	0,63
Adjusted R-squared	0,62

Source: Eviews Data Processing Results

In table 4.5, the R Square value of 0.62 indicates that all research variables consisting of income, Cigarette Price and Dependency Ratio are able to describe the dependent variable, namely Cigarette Consumption in all provinces in Indonesia by 62% while the remaining 38% is explained by other variables that are not included in this research model.

4.4.2. Simultan Test

Simultan Test (F Test) aims to determine whether each independent variable affects the dependent variable together or simultaneously. This can be seen by comparing the probability value of F statistics with a significance value of α = 5%. If the probability value is smaller than α = 5%, it means that simultaneously the independent variables simultaneously affect the dependent variable. Conversely, if the probability value is greater than α = 5% then the independent variables simultaneously have no effect on the dependent variable.

Table 4.6. Simultan Test

Tools Test	Nilai
F-statistic	95,54
Prob (F-statistic)	0,00

Source: Eviews Data Processing Results

The F-statistic value of 95.54 with a probability of 0.00 is smaller than 0.05, so it can be concluded that all independent variables consisting of Income, Cigarette Price and Dependency Ratio have a significant effect at the 5% significance level simultaneously (simultaneously) on the dependent variable, namely Cigarette Consumption.

4.4.3. Partial Test

Partial Test is a test used to determine whether the independent variables partially (T test) have a real effect or not on the dependent variable. The t statistical test basically shows how far the influence of an independent variable partially explains the dependent variable.

Table 4.7. Parsial Test

Variable	t-statistic	Prob.
C	5,87	0,00
Pd	-1,70	0,09
HR	15,30	0,00
DR	-1,78	0,07

Source: Eviews Data Processing Results

Based on the partial test results obtained from table 4.7, it can be concluded about the test results of each independent variable on the dependent variable.

- The estimation results of the Income variable show a prob value. 0.09 > 0.05. So this shows that partially income has an insignificant effect at the 5% significance level on cigarette consumption in all provinces in Indonesia.
- The estimation results of the Cigarette Price variable show a prob. value of 0.00 < 0.05. So this shows that partially the price of cigarettes has a significant effect at a significance level of 5% on cigarette consumption in all provinces in Indonesia
- The Dependency Ratio variable (X3) shows a prob. value of 0.07 > 0.05. So this shows that partially the Dependency Ratio has a positive and insignificant effect at the 5% significance level on cigarette consumption in all provinces in Indonesia.

4.5.Random Effect Value

The random effect value shows the extent to which each cross-section unit (province) differs from the average in terms of the dependent variable (cigarette consumption). If this value is positive, it means that the province tends to have cigarette consumption that increases from the average after accounting for all other variables in the model. Conversely, if the value is negative, the province tends to have cigarette consumption that is decreasing from the average.

Table 4.8. Cross Section Random Effect

No	Province	Rate Effect
1	Aceh	6,94
2	North Sumatra	5,04
3	West Sumatra	16,24
4	South Sumatra	-0,80
5	Bengkulu	12,72
6	Riau	16,71
7	Kepulauan Riau	-1,96
8	Jambi	7,03
9	Lampung	12,57
10	Bangka Belitung	33,85
11	Dki Jakarta	0,55
12	West Java	9,23
13	Central Java	-14,31
14	East Java	-10,96
15	Yogyakarta	-26,84
16	Bali	-29,28
17	West Kalimantan	-0,94
18	East Kalimantan	6,73
19	Central Kalimantan	11,99
20	South Kalimantan	-7,76
21	North Kalimantan	9,79
22	Banten	26,61
23	East Nusa Tenggara	-27,99
24	West Nusa Tenggara	-10,41
25	Gorontalo	-12,38
26	West Sulawesi	-10,63
27	Central Sulawesi	4,97
28	North Sulawesi	-8,19
29	Southeast Sulawesi	-12,78
30	South Sulawesi	-11,35
31	North Maluku	7,81
32	Maluku	-17,13
33	Papua	-3,09
34	West Papua	18,03

Source: Eviews Data Processing Results

Based on the results of Cross Section Random Effect analysis related to the influence of factors on cigarette consumption in various provinces in Indonesia, there are several provinces that have positive effect values and negative effect values. Provinces with a positive effect value indicate that there is an increase in cigarettes in the province. The province with the largest positive effect value is Bangka Belitung province with an effect value of 33.85 while the province with the lowest positive effect value is DKI Jakarta province with an effect value of 0.55.

Furthermore, provinces with a negative effect value indicate that there is a decrease in cigarette consumption in the province. The province with the largest negative effect value is Bali province with an effect value of -29.08. Meanwhile, the province with the lowest negative effect value is South Sumatra province with an effect value of -0.80.

4.6. Discussion

4.6.1. Effect of Income on Cigarette Consumption

The results of this study indicate that the regression coefficient of the Income Variable (X1) is negative but insignificant, which means that Income (X1) has a negative effect on cigarette consumption, and this shows that the higher the income, the lower the level of cigarette consumption, so H0 is accepted. So it can be concluded that Income has a negative and insignificant effect on cigarette consumption in Indonesia in 2019-2023.

The results of the analysis that contradict this initial hypothesis can be explained through the phenomenon of socioeconomic inequality that occurs in Indonesian society. When observed more deeply, the structure of Indonesian society is dominated by low to middle income groups where this group actually shows a higher tendency to consume cigarettes.

Low-income people who often work in the informal sector or in high-stress jobs tend to use cigarettes as an escape from the pressures of daily life. Limited access to healthier means of entertainment and recreation such as exercising at fitness centres, taking vacations, or participating in self-development activities makes cigarettes an affordable alternative to relieve stress and fatigue.

On the other hand, higher-income groups, which are fewer in number, generally have better health awareness and greater access to activities to manage stress. They tend to reduce or even avoid cigarette consumption as their income increases. However, as this group is relatively small in the structure of Indonesian society, its influence on overall cigarette consumption patterns is not statistically significant.

This income-inelastic pattern of cigarette consumption also reflects the strong socio-cultural factors in Indonesian society, where smoking has become part of a social ritual and is seen as a symbol of masculinity or maturity, especially among the lower middle class. This condition causes cigarette consumption to remain high regardless of one's income level.

4.6.2. Effect of Cigarette Price on Cigarette Consumption

The results of this study indicate that the regression coefficient of the Cigarette Price Variable (X2) is positive at 2.06 and the Prob. value is 0.00 < 0.05, which means that the Cigarette Price (X2) has a positive effect on cigarette consumption, and this shows that the higher the cigarette price, the higher the level of cigarette consumption, so H0 is accepted. So it can be concluded that Cigarette Price has a positive and significant effect on cigarette consumption in Indonesia in 2019-2023.

This phenomenon can be explained because cigarettes are addictive goods, where the demand for cigarettes tends to be inelastic to price changes. Consumers continue to buy cigarettes even though prices rise because they experience dependence on cigarette products. In addition, the characteristics of the cigarette market in Indonesia, which offers a wide variety of prices and types of cigarettes, allows consumers to switch to more affordable cigarette products when facing economic pressure, instead of significantly reducing consumption or even switching to illegal cigarette brands that do not have excise taxes when cigarette prices rise so that overall cigarette consumption does not decline.

This condition is in line with Chaloupka's findings in Prasetia and Woyanti [7], which explain that increasing cigarette excise tax rates is not effective as a way to reduce cigarette consumption. Chaloupka continued, this situation can occur, one of which is due to consumer tastes. So, when the price of cigarettes increases, consumers still consume them.
This is also in line with [17] which shows that cigarette prices have a positive effect on cigarette consumption. In addition, [18] also stated the same thing, namely that there is a positive relationship between cigarette prices and cigarette consumption.

4.6.3. Effect of Dependency Ratio on Cigarette Consumption

The results of this study indicate that the Dependency Ratio (X3) is negative but not significant, which means that the Dependency Ratio (X3) has a negative effect on cigarette consumption, and this shows that the higher the dependency ratio, the lower the level of cigarette consumption, so H1 is accepted.

The results of the analysis that show insignificance can be caused by the fact that the lower middle class in Indonesia generally have more dependents or family members than the high-income group. Logically, a higher dependency ratio should encourage the head of the family to reduce non-essential expenditure such as cigarettes and divert income to the family's basic needs. However, this insignificant effect can be explained by several social aspects that are deeply rooted in society.

Firstly, the high dependency ratio in lower-middle class families can actually increase the psychological pressure of the head of the family due to the large responsibility of supporting their family. This pressure often encourages them to continue to consume cigarettes as a way to cope with stress, even though this has the potential to reduce income allocation for family needs. This phenomenon shows that psychological factors and nicotine dependence are more dominant than rational economic considerations.

Secondly, in communities with a high dependency ratio, there is often a pattern where family members who have entered productive age contribute to family income, either through formal or informal employment. These income contributions from various family members can maintain or even increase the head of the family's cigarette consumption ability, thereby reducing the negative impact of a high dependency ratio on cigarette consumption.

Third, cultural factors also play an important role in explaining this phenomenon. In Indonesian society, especially the lower middle class, smoking is often considered the prerogative of the head of the family, which is difficult for other family members to intervene in. Even in conditions of limited family finances and a high number of dependents, the habit of smoking is maintained because it has become part of the daily routine that is difficult to change.

5. Conclusions

1. The Income variable (X1) has a negative and insignificant effect on cigarette consumption in Indonesia during the period 2019-2023. In other words, changes in income levels do not significantly affect the level of cigarette consumption.
2. The Cigarette Price Variable (X2) shows that cigarette prices have a positive and significant influence on cigarette consumption. Thus, an increase in cigarette prices will lead to an increase in cigarette consumption.
3. The Dependency Ratio Variable (X3) shows that the dependency ratio has an insignificant negative effect on cigarette consumption. This means that although the population dependency ratio increases or decreases, it does not significantly affect the level of cigarette consumption in Indonesia.
4. Random effect cross section test results state that the majority of provinces in Indonesia, namely as many as eighteen provinces in Indonesia, have a negative effect value, which means there is a downward trend in cigarette consumption, while the remaining sixteen provinces have positive effect value results, which means there is an increase in cigarette consumption.

Based on the results obtained from research on poverty factors in the provinces of West Java, Central Java, East Java, and DIY in 2009-2016 using panel data regression and classical assumptions, it can be concluded as follows: The unemployment variable is not significant to poverty in the provinces of West Java, Central Java, East Java, and DIY, this is because people who fall into the unemployment category are not necessarily classified as poor people if in their households there are family members who work with high income so that it will be enough to support the unemployed.

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