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The Effect of Cigarette Excise Increase and Consumption Behavior on the Prevalence of Smokers in Indonesia: The Role of Household Expenditure as an Intervening

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ABSTRACT

Objective: *This study examines the effect of cigarette excise increase and consumption behavior on the prevalence of smokers in Indonesia, with household expenditure as an intervening variable. Indonesia has one of the highest prevalence rates of smokers in the world, which has a significant impact on public health and household economic conditions.* ***Method:*** *Using a quantitative approach and survey-based data collection, the number of samples was determined through the stratified random sampling method with the number of samples obtained as many as 100 respondents with smokers over the age of 17 years in East Java Province.* ***Results:*** *The results of the study show that the increase in cigarette excise does not directly affect household spending on cigarettes. Cigarette consumption behavior is the main factor that determines the amount of household spending. Household expenditure plays an intervening variable that links the increase in cigarette excise with the prevalence of smokers. The increase in cigarette excise has a direct impact on the prevalence of smokers, but the impact is partly mediated by household spending.* ***Novelty:*** *To support the Government's steps in increasing cigarette excise, it should be accompanied by additional policies, such as health campaigns and restrictions on access to cigarettes. As well as additional regulations such as the ban on cigarette advertising and the smoker rehabilitation program can strengthen the effect of the excise increase.*

INTRODUCTION

Based on the article, Indonesia faces serious challenges with the high prevalence of smokers. Data from the 2021 Global Adult Tobacco Survey (GATS) shows that the number of adult smokers increased by 8.8 million in the last decade, reaching 69.1 million in 2021. In particular, the percentage of male smokers in Indonesia is the highest in the world. According to data from the Ministry of Health of the Republic of Indonesia, the prevalence of adult smokers reached 74.3% in 2021, making Indonesia one of the countries with the highest number of smokers in the world ([1] *Ministry of Health of the Republic of Indonesia, 2021*). If reviewed in more detail, these figures show a great challenge as well as a threat to the health of the Indonesian people, considering the impact and influence obtained from the habit of smoking.

Research shows that cigarette consumption has a significant impact on household spending. According to the data, the percentage of cigarette consumption expenditure to the total expenditure of the Indonesian population was 5.94% in 2015, an increase from 5.25% in 2010. Cigarette consumption is the third largest percentage of expenditure in the household expenditure group [2]. In addition, smoking behavior is closely related to poverty levels. Every 1% increase in cigarette spending increases the chances of poverty, indicating that cigarette consumption can worsen household economic conditions [3].

The increase in cigarette excise is one of the effective interventions to reduce the number of smokers. Research shows that a 10% increase in cigarette prices will reduce the prevalence of smoking by about 4% in high-income countries and about 8% in low- and middle-income countries [4].

However, in Indonesia, the increase in excise rates on tobacco products is not always effective in reducing cigarette consumption. Research shows that a 1% increase in excise rates only reduces cigarette consumption by 1.056%, while enforcement has not proven significant [5]. In addition, cigarette consumption behavior can affect household spending, which in turn has an impact on the prevalence of smoking. High cigarette consumption in households can reduce budget allocation for other needs, thereby strengthening the cycle of dependence and prevalence of smoking [6].

In the results of another study, where the increase in cigarette excise is one of the government's strategies to suppress consumption. However, its effectiveness in reducing the prevalence of smokers is still debated. The results of the study show that the increase in cigarette excise is not always directly proportional to the decrease in the number of smokers. For example, despite the increase in excise, the prevalence of smokers remains high [7].

Other factors that influence smoking behavior include the emotional aspect and dependence on the chemicals in cigarettes, such as nicotine, that cause addiction [8]. Nicotine addiction can cause symptoms such as discomfort, irritability, and difficulty concentrating, which makes it difficult for smokers to quit even though the price of cigarettes is increasing.

According to the Central Statistics Agency (BPS), in 2023, 28.62% of the population aged 15 years and older are smokers, with a higher prevalence in males (56.36%) than females (1.06%) [8]. In addition, the average per capita expenditure for cigarettes and tobacco reached IDR 91,003 per month in March 2023, showing an increase compared to the previous period. Research shows that cigarette consumption behavior has a direct impact on household spending. A study in Jambi found that 65% of smokers allocate 10-20% of their income to buy cigarettes [9].

Despite various efforts that have been made, including an increase in cigarette excise, the prevalence of smokers in Indonesia remains high. This indicates that there are other factors that affect smoking behavior, such as social, cultural, and physical dependence, which have not been fully addressed in tobacco control policies. In addition, there is a need for a more comprehensive approach to tobacco control, including interventions that take into account emotional factors and chemical dependence, to achieve a more effective reduction in the prevalence of smokers.

Thus, this study aims to analyze the influence of consumption behavior and increase in cigarette excise on household expenditure and the prevalence of smokers in Indonesia, as well as the role of household expenditure as an intervening variable. A deeper understanding of this relationship is expected to provide more effective policy recommendations in tobacco control efforts in Indonesia.

RESEARCH METHOD

1. Research Methods

This study uses a quantitative design with an explanatory research approach. This approach was chosen to identify and explain the causal relationship between the independent variable PKR (Cigarette Consumption Behavior) and the Increase in Cigarette Excise (KCR), the intervening variable of domestic workers (Household Expenditure), and the bound variable of Smoker Prevalence (PPR). This design is suitable for exploring direct and indirect influences between variables through structured statistical analysis [10].

Quantitative methods are used to collect and analyze numerical data. This study will measure the relationship between variables through hypothesis testing using statistical analysis, such as Structural Equation Modeling (SEM). This approach is ideal for understanding complex relationships with multiple variables [11].

Explanatory research aims to explain the cause-and-effect relationship between variables. In the context of this study, the design was used to understand how the increase in cigarette excise and consumption behavior affects the prevalence of smokers both directly and through household expenditure as an intervening variable [10].

In this study, primary data collection was carried out using a questionnaire-based survey. The questionnaire was designed with the Likert scale to measure the level of perception, attitude, and behavior of respondents towards the variables studied, namely cigarette consumption behavior, household spending, cigarette excise increase, and smoker prevalence.

The following Likert *scale* and measurement criteria are seen in Table 1 as follows:

Table 1. Likert *scale* and measurement criteria.

Likert Scale on Questions	Score
Strongly Agree	5
Agree	4
Simply Agree	3
Disagree	2
Strongly disagree	1

Source: Mofokeng, 2021

2. Population

In the context of this study, the population used is all households in Indonesia that have smoker family members. This population was selected by considering the focus of the study, namely understanding the influence of cigarette consumption behavior and the increase in cigarette excise on household spending and the prevalence of smokers.

Population data was obtained from the National Socio-Economic Survey (SUSENAS) and the Central Statistics Agency (BPS), the population number was obtained from data from the Indonesian Central Statistics Agency for East Java Province in 2024, the percentage of the population aged 15 years and over who smoke in East Java

Province is 28.72%. According to BPS data, the population of East Java in 2024 will reach around 41.15 million people. Assuming that the proportion of the population aged 15 years and over is about 70% of the total population, then the estimated number of people aged 15 years and over is around 28.8 million people. Thus, the estimated number of smokers aged 15 years and older in East Java in 2024 is around 8.27 million people.

Population Characteristics:

a. Households with members ≥15 years old who smoke
b. Domiciled in urban and rural areas in Indonesia

3. Sample

According to [12] the sample is the part of the population that is selected using a specific technique to represent the characteristics of the population as a whole. The sample in this study consists of households that meet the following criteria:

a. Households with smoking family members with an age range of over 17 years.
b. Representation from various provinces in Indonesia, both urban and rural.
c. Household groups with various income levels, namely low, middle, and high.

Furthermore, the total number of samples can be calculated using the Slovin formula as follows:

$$n = \frac{N}{1 + N \times e^2}$$

Where:

- n : Number of samples
- N : Number of population
- e : Error rate (margin of error, usually 10% or 0.1)

So that the number of samples taken based on the formula is n = (8,270,000/(1+8,270,000x0.1²) = 99.99 = 100 samples.

4. Data Analysis

Data analysis method is a method used for the research of process results to obtain conclusions. By looking at the theoretical framework, the data analysis technique used in this study is the analysis path (track) using the SEM (Structural Equation Modeling) model or the Structural Equation Model with the PLS 5.0 warp program. SEM is a set of statistical techniques that allow testing relatively complex series connections simultaneously [13], [14], [15].

RESULTS AND DISCUSSION

Result

Reliability Test

Table 2. Cronbach's table- α and its distribution.

Statements and subscales	Cronbach-α	% Distribution
PKR (Cigarette Consumption Behavior)	0.78	100%
KCR (Cigarette Excise Increase)	0.82	100%

Domestic Worker (Domestic Expenses)	0.85	100%
PPR (Smoker Prevalence)	0.80	100%

Source: Processed data, in 2025

The data in Table 2 above explains that the Cronbach-α value for each variable is more than 0.7. So it can be said that the data passed the reliability test.

Validity test

	PKR	KCR	PRT	PPR	Type (as defined)	SE	P value
X1.1	(0.399)	1.125	-1.434	1.228	Reflective	0.090	<0.001
X1.2	(0.899)	0.320	0.058	-0.333	Reflective	0.078	<0.001
X1.3	(0.866)	-0.469	0.189	0.256	Reflective	0.079	<0.001
X1.4	(0.921)	0.267	-0.041	-0.415	Reflective	0.078	<0.001
X1.5	(0.797)	-0.724	0.496	-0.038	Reflective	0.081	<0.001
X2.1	-0.181	(0.822)	-0.673	0.232	Reflective	0.080	<0.001
X2.2	0.056	(0.925)	-0.034	-0.097	Reflective	0.078	<0.001
X2.3	-0.087	(0.800)	0.204	-0.075	Reflective	0.080	<0.001
X2.4	0.154	(0.764)	0.323	-0.151	Reflective	0.081	<0.001
X2.5	0.053	(0.914)	0.191	0.082	Reflective	0.078	<0.001
Z1	-0.266	0.402	(0.883)	-0.074	Reflective	0.079	<0.001
Z2	-0.215	0.171	(0.888)	0.080	Reflective	0.079	<0.001
Z3	0.080	-0.204	(0.747)	0.377	Reflective	0.082	<0.001
Z4	0.479	-0.384	(0.824)	-0.059	Reflective	0.080	<0.001
Z5	-0.033	-0.043	(0.895)	-0.267	Reflective	0.078	<0.001
Y1	-0.701	0.627	-1.073	(0.694)	Reflective	0.083	<0.001
Y2	0.764	-0.448	0.729	(0.802)	Reflective	0.080	<0.001
Y3	-0.871	0.775	-0.783	(0.710)	Reflective	0.082	<0.001
Y4	0.051	-0.439	0.485	(0.858)	Reflective	0.079	<0.001
Y5	0.560	-0.312	0.376	(0.802)	Reflective	0.080	<0.001

Source: Processed data, in 2025

Figure 1. Validity test.

The results of the WarpPLS 8.0 calculation in Figure 1 show that each value in the cross-loading factor has reached a value above 0.7 with a p-value below 0.001. Thus, the criteria for the validity of the convergence test have been met

From the results of the Warp-PLS test that has been analyzed previously, the following are the P values of each relationship between variables:

Hipotesis	Hubungan	Koefisien (β)	P-Value	Kesimpulan
H1	PKR → PRT	0.07	0.34	Tidak signifikan
H2	KCR → PRT	0.80	<0.01	Sangat signifikan
H3	PRT → PPR	0.43	<0.01	Sangat signifikan
H4	PKR → PPR	0.30	<0.01	Sangat signifikan
H5	PRT → PPR	0.26	<0.01	Sangat signifikan

Source: Processed data, in 2025

Figure 2. P-grade test.

Based on Figure 2 above, the results can be drawn that:

a. H1: PKR → PRT (P = 0.34, Insignificant)

Cigarette consumption behavior (PKR) does not have a significant relationship with household expenditure (PRT). This means that individual cigarette consumption does not directly determine how much of the household allocates budget for cigarettes.

b. H2: KCR → Domestic Workers (P < 0.01, Very Significant)

The increase in cigarette excise (KCR) has a very strong influence on household expenditure (PRT). This shows that the increase in excise duty makes household spending increase significantly, perhaps due to rising cigarette prices or changes in consumption patterns.

c. H3: Domestic Workers → PPR (P < 0.01, Very Significant)

Household expenditure (PRT) has a strong effect on the prevalence of smokers (PPR). This means that the larger the household budget for cigarettes, the higher the level of smokers in society.

d. H4: PKR → PPR (P < 0.01, Very significant)

Cigarette consumption behavior (PKR) also has a direct effect on the prevalence of smokers (PPR). The higher the smoking habit, the greater the number of smokers in the population.

e. H5: Domestic Workers → PPR (P < 0.01, Very Significant)

Household expenditure on cigarettes also plays an intervening variable in the relationship between the increase in cigarette excise and the prevalence of smokers. This means that even though excise increases, if household spending remains high, the prevalence of smokers will not decrease.

P values of indirect effects for paths with 2 segments

	PKR	KCR	PRT	PPR
PKR				
KCR				
PRT				
PPR	0.403	<0.001		

Source: Processed data, in 2025

Figure 3. P indirect effect value test for a path with 2 segments.

The Figure 3 shows the P-Value of the indirect effects for the variables PKR (Cigarette Consumption Behavior) and KCR (Increase in Cigarette Excise) on PPR (Prevalence of Smokers) through intermediate variables such as PRT (Household Expenditure on Cigarettes).

Data Interpretation:

a. **PKR → PPR (P = 0.403)**

The indirect effect of PKR to PPR has a P-Value of 0.403, which means it is not significant because the value is much greater than 0.05. This shows that cigarette

consumption behavior does not have a significant impact on the prevalence of smokers through other variables.

a. **KCR → PPR (P < 0.001)**

The indirect effect of KCR to PPR has a P-Value of less than 0.001, which means it is very significant. This shows that the increase in cigarette excise has a strong effect on the prevalence of smokers through intermediaries such as household spending.

Discussion

1. **Hypothesis 1 (H1): The increase in cigarette excise (KCR) affects household expenditure on cigarettes (PRT)**

The results of the Warp-PLS analysis show that the increase in cigarette excise (KCR) has a significant relationship with household expenditure on cigarettes (PRT) with a coefficient of $\beta = 0.80$ and a P-Value < 0.01. This indicates that every increase in cigarette excise rates tends to increase the burden of household expenditure in buying cigarettes. These findings are in line with the economic theory that an increase in the price of an item, especially goods with inelastic demand such as cigarettes, will have a direct impact on household budgets. However, these impacts can also vary depending on the level of individual dependence on cigarettes and the elasticity of demand across different economic groups of society.

2. **Hypothesis 2 (H2): Cigarette consumption behavior (PKR) affects household expenditure on cigarettes (PRT)**

Based on the results of the analysis, it was found that the influence of cigarette consumption behavior (PKR) on household expenditure for cigarettes (PRT) was not significant with $\beta = 0.07$ and P-Value = 0.34. This means that changes in individual cigarette consumption patterns do not necessarily have an impact on the amount of household spending on cigarettes. One possible cause is that smokers tend to maintain their smoking habits even as the price of cigarettes increases, so they allocate budgets from other needs to keep buying cigarettes. These results confirm that cigarette consumption behavior has strong psychological and social factors, so price or excise changes alone are not enough to directly change smoking habits without additional interventions such as advertising restrictions and health campaigns.

3. **Hypothesis 3 (H3): Household expenditure on cigarettes (PRT) affects the prevalence of smokers (PPR)**

The analysis shows that household expenditure on cigarettes (PRT) has a significant relationship with the prevalence of smokers (PPR) with $\beta = 0.43$ and P-Value < 0.01. This shows that the greater the household expenditure on cigarettes, the higher the prevalence of smokers in the community. These results reflect that greater spending on cigarettes correlates with a higher number of individuals who smoke in a particular household or community. Therefore, controlling cigarette consumption can not only be done with a price policy (excise), but also needs to consider how household spending patterns on cigarettes can be controlled through financial education and awareness of the health impacts of smoking.

4. Hypothesis 4 (H4): The increase in cigarette excise (KCR) affects the prevalence of smokers (PPR) through household expenditure on cigarettes (PRT) as a mediating variable

The findings show that the indirect effect between the increase in cigarette excise (KCR) on the prevalence of smokers (PPR) through household expenditure on cigarettes (PRT) is very significant, with a P-Value < 0.001. This suggests that the increase in cigarette excise can reduce the prevalence of smokers, but the effect occurs indirectly through changes in the household budget allocated for cigarettes. In other words, a higher excise policy may reduce the number of smokers in the long run, but the impact depends on how households adjust their spending. If the excise increase is high enough to reduce the purchasing power of cigarettes, then the impact on the prevalence of smokers can be more effective. However, if the community continues to allocate a significant budget for cigarettes at the expense of other needs, then the effect of reducing the number of smokers may occur more slowly.

CONCLUSION

Fundamental Finding : This study analyzes the effect of cigarette excise increases and consumption behavior on smoker prevalence in Indonesia, considering household expenditure as an intervening variable. The findings indicate that higher excise rates significantly increase household spending on cigarettes ($\beta = 0.80$, P-Value < 0.01). However, cigarette consumption behavior does not significantly affect household expenditure ($\beta = 0.07$, P-Value = 0.34). Household expenditure has a significant effect on smoker prevalence ($\beta = 0.43$, P-Value < 0.01). Additionally, excise increases impact smoker prevalence indirectly through household expenditure (P-Value < 0.001). **Implication :** The findings suggest several key implications. Policy-wise, excise increases should continue gradually while restricting cigarette access for young people and monitoring illegal cigarette circulation. Economically, excise revenue can support the health sector, while the cigarette industry should adapt to lower-risk alternatives. Socially and health-wise, public campaigns on smoking hazards and community-based cessation programs should be strengthened. **Limitation :** This study has limitations, including a small sample size (100 respondents), limiting generalizability. It only considers household expenditure as an intervening variable, excluding factors like advertising and nicotine dependence. Additionally, the short-term study period may not capture long-term excise effects, which are influenced by macroeconomic conditions. **Future Research :** Future studies should expand samples and adopt longitudinal approaches. Additional variables such as cigarette demand elasticity, social influences, and psychological factors should be included. A multidisciplinary approach integrating economic, psychological, and health policy perspectives, along with qualitative methods like interviews, can enhance understanding of cigarette excise policy effects.

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