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The Relationship Between Cigarette Consumption And Poverty: Analysing The Role Of Price

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ABSTRACT
Poverty has been a global concern today. The poverty rate in Indonesia reached 9.57 per cent in 2023 or at least 26 million people below the poverty line. A phenomenon occurs in Indonesia where half of poor households spend money on cigarettes. Cigarette consumption burdens households through consumption costs, health costs and reduced household productivity, which can affect the welfare of smokers households. Conversely, environmental/society factors, especially in poor communities, also influence cigarette consumption habits. This study aims to examine the relationship between cigarette consumption and poverty. The instrumental variable method is used to avoid endogeneity bias due to reverse causality when analysing the relationship between cigarette consumption and poverty with cigarette price as the instrument variable. The data used in this study is pooled cross section data from National Socio-Economic Survey (SUSENAS) 2014 to 2021. The results show a significant negative relationship of cigarette prices to household cigarette consumption and cigarette consumption increases the probability of households being poor.

INTRODUCTION

Poverty is a global problem that occurs in almost all countries. Poverty is a condition of limitation in fulfilling basic needs. Poverty conditions can lead to a decrease in the quality of human resources, productivity and welfare of the poor. In addition, poverty have an impact on the surrounding environment/society where illegal activities and crime risks can arise due to inequality and disparities in society (Banerjee & Duflo, 2011).

The current poverty rate in Indonesia is 9.57 percent or at least 26.4 million people are below the poverty line (BPS, 2023). Related to poverty in Indonesia, there is a phenomenon where the poor in Indonesia choose to consume cigarettes which should not be a priority for basic needs and can even have negative impacts on health. The portion of cigarette consumption among the poor in Indonesia is even greater than other basic needs. Based on BPS data (2023), filtered clove cigarettes rank second in terms of household expenditure on food commodities

that contribute to the poverty line. This is in accordance with socio-economic survey (SUSENAS) data where half of the number of poor households have cigarette consumption expenditure (BPS, 2022).The choice of cigarette consumption among the poor in Indonesia needs to be further investigated because one of the factors causing poverty is inappropriate consumption choices (World Bank, 2023). Cigarette consumption at least burdens household expenses and has a negative impact on health and risks reducing the quality of life, productivity, and welfare of smokers, especially the poor, so there is an assumption that cigarette consumption is related to welfare or poverty. This is supported by previous studies showing that cigarette consumption has an impact on poverty (Alkadri et al., 2023; Lubis et al., 2021; Neli & Hardius, 2020; Liu et al., 2006). Thus, it can be said that smoking habits have an impact on poverty. On the other hand, the phenomenon of smoking among the poor is also influenced by environmental/society factors. Desmond (2003) stated that smoking habits are influenced by environmental factors. Smoking habits are identical to poor or poverty-stricken communities. This has been proven by several studies, one of which is Cambron et al. (2019) which states that poor environments influence people's smoking habits. In addition, the results of Afif & Sasana's (2019) study also showed that poverty has a significant positive relationship to the amount of cigarette consumption in Indonesia. Thus, it can be said that poverty and poor environments influence a person's cigarette consumption habits. There are several empirical studies that show the relationship between cigarette consumption and poverty, both research on the impact of cigarette consumption on poverty (Alkadri et al., 2023; Lubis et al., 2021; Margareth et al., 2021; Neli & Hardius, 2020; Liu et al., 2006) and the relationship between poor communities or poverty with smoking consumption or habits (Afif & Sasana, 2019; Cambron et al., 2019; Watel et al., 2009, Hu et al., 2005; Flint & Novotny; 1997) so that there is an alleged two-way relationship (reverse causality) or potential endogenous bias between cigarette consumption and poverty. Several previous studies related to cigarette consumption and poverty are still limited and have not accommodated the resolution of this endogeneity.

Therefore, this study uses the instrumental variable method to eliminate endogenous bias. In addition, research related to the relationship between cigarette consumption and welfare, especially in Indonesia, is mostly still limited to using observation units at the provincial and national levels. This does not describe the influence of household or individual cigarette consumption behavior/habits on poverty. As for research that uses household or individual observation units, the scope of the study is very narrow, namely to a certain area or region in Indonesia. Therefore, researchers consider it important to analyze the relationship between cigarette consumption and household poverty by considering the use of household observation units and expanding the scope of the study, namely all households in Indonesia. To overcome the endogenous bias of the main variable, researchers use the instrument variable of cigarette prices with the assumption that cigarette prices affect poverty (dependent variable) only through cigarette consumption (independent variable).

LITERATURE REVIEW

Poverty

Poverty is a condition of deficiency that can be measured by how much calorie intake or the minimum nominal that a person should fulfill in their daily lives to meet basic needs properly (World Bank, 2014). In Indonesia, the poverty line to meet basic food and non-food needs is an average of IDR 550,548 per capita per month (BPS, 2023). The determination of the poverty line varies depending on price conditions in each region or country. The standard welfare value limit or poverty line is used to measure how much poverty occurs in a region or country and to overcome poverty problems (Greve, 2020).

Poverty can be caused by many factors. Leiser & Shemesh (2018) state that the factors causing poverty are individual factors (lack of individual effort and motivation to escape from

conditions of deficiency and poor financial management and individual consumption choices), structural factors (lack of education, opportunities and economic systems that only benefit prosperous groups of society) and other factors. Meanwhile, the World Bank (2014) states that the factors causing poverty are poor characteristics such as region, community, demographics, economy and social.

Demand And Price Elasticity

In microeconomic theory, demand for a good is influenced by the price of the good, income, and the price and availability of substitute and complementary goods (Pindyck & Rubinfeld, 2018). Consumer responses to changes in the price of goods also vary according to the consumer's willingness to buy and the nature of the goods consumed. The price elasticity of a good is influenced by the availability of goods and the price of substitute goods (cross price elasticity) or complements, the addictive nature of a good that affects demand to become inelastic, and a person's income (Pindyck & Rubinfeld, 2018). In the context of control policies related to prices or fiscal policies, price elasticity affects the effectiveness of tariff regulation. The more inelastic a good is, the higher the tariff that must be imposed to reduce demand or control the good.

Cigarettes and Negative Externalities

Tobacco has been recognised by Indonesian people for centuries, one of which is through clove cigarette products which are an original Indonesian cultural product (Sunaryo, 2013). This is one of the reasons for the large number of smokers and the amount of cigarette consumption in Indonesia. Behind the large number of smokers and cigarette consumption in Indonesia, the negative impacts are also very large. Based on data from the Ministry of Health, there are several chronic diseases and premature deaths caused by smoking activities (Ministry of Health, 2018).

Cigarette Excise Policy

Excise is a fiscal policy that can be used to control the consumption of goods through a tariff/price mechanism and compensate for the negative externalities caused by cigarette (WHO, 2003; Screpanti & Zamagni, 2005; Kaplow, 2008). In Indonesia, based on the Excise Law, tobacco products are one of the objects of excise which can be in the form of machine-made clove cigarettes (filtered clove cigarettes), machine-made and hand-made white cigarettes (white cigarettes), hand-made clove cigarettes (clove cigarettes without filters) and other tobacco products. Excise rates and retail selling prices of tobacco products that apply in Indonesia differ according to the type of cigarette and the tobacco production class. The difference in excise rates and retail selling prices is determined based on the production capacity of the cigarette company and the type of cigarette produced. The determination of the retail selling price of cigarettes functions to control the price of cigarettes in the market. The difference in determining the tariff and selling price of tobacco products causes the complexity of the excise tariff system in Indonesia. This makes consumption control less effective because there are cheaper cigarette options available. The results of research conducted by Prasetyo & Adrison (2019) stated that the increase in excise rates was less effective in reducing the affordability of cigarettes in the community as a result of the complexity of prices and excise rates so that there is an option for consumers to switch to cheaper cigarettes. This can be seen in table 1 where the lowest retail selling price of cigarettes for each type of cigarette is almost half of the highest retail selling price. In addition, of the 3 types of cigarettes in table 1, hand-rolled clove cigarettes are the type of cigarette with the lowest range of tariffs and retail selling prices, making it an option for smokers to switch to cheaper cigarettes. The complex excise policy is a policy consideration because the government is maintaining the sustainability of small industries and workers and maintaining business competition. However, on the demand side, the increase in excise rates and increasingly cigarette prices, the existence of cigarette options with lower rates and prices

will provide incentives for consumers to switch to cheaper cigarettes, thereby reducing the effectiveness of cigarette control (Widoyoko et al., 2022). In addition, the Indonesian government is also considering a prudent cigarette excise policy considering that the increase in cigarette prices, especially clove cigarettes, affects the national inflation rate (BPS, 2024). Price increases or inflation can cause a decrease in people's purchasing power so that it can affect economic growth and job creation (Blanchard, 2021).

Table 1 Excise Rates and Retail Selling Price Limits for Filtered Clove Cigarettes, Unfiltered Clove Cigarettes and White Cigarettes From 2014 to 2021 (Rupiah/Stick)

Types of cigarettes	Tiers	2014		2015		2016		2017	
		HJE	Rate	HJE	Rate	HJE	Rate	HJE	Rate
Machine-made clove cigarettes/ Filtered clove cigarettes	Ia	>669	375	>800	415	>1000	480	>1120	530
	Ib	631-669	355						
	IIa	>549	285	>588	305	>740	340	>820	365
	IIb	440-549	245	511-588	255	590-740	300	655-820	335
Hand-rolled clove cigarettes/ Unfiltered clove cigarettes	Ia	>749	275	>825	290	>1115	320	>1215	345
	Ib	550-749	205	606-825	220	775-1115	245	860-1215	265
	IIa	>379	130	>417	140	>605	155	>730	165
	IIb	349-379	120	385-417	125	430-605	140	470-730	155
	IIc	336-349	110						
	IIIa	>250	80	>286	85	>400	90	>465	100
	IIIb			>286	80	370-400	80	400-465	80
White Machine Cigarettes/ White Cigarettes	Ia	>680	380	>820	425	>930	495	>1030	555
	IIa	444-680	245	520-820	270	800-930	305	900-1030	330
	IIb	345-444	195	425-520	220	505-800	255	585-900	290
Types of cigarettes	**Tiers**	**2018**		**2019**		**2020**		**2021**	
		HJE	**Tarif**	**HJE**	**Tarif**	**HJE**	**Tarif**	**HJE**	**Tarif**
Machine-made clove cigarettes/ Filtered clove cigarettes	Ia	>1120	590	>1120	590	>1700	740	>1700	865
	Ib								
	IIa	>895	385	>895	385	>1275	470	>1275	535
	IIb	715-895	370	715-895	370	1020-1275	455	1020-1275	525
Hand-rolled clove cigarettes/ Unfiltered clove cigarettes	Ia	>1260	365	>1260	365	>1460	425	>1460	425
	Ib	890-1260	290	890-1260	290	1015-1460	330	1015-1460	330
	IIa	>470	180	>470	180	>535	200	>535	200
	IIb								
	IIc								
	IIIa	>400	100	>400	100	>450	110	>450	110
	IIIb								
White Machine Cigarettes/ White Cigarettes	Ia	>1130	625	>1130	625	>1790	790	>1790	935
	IIa	935-1130	370	935-1130	370	1485-1790	485	1485-1790	565
	IIb	640-935	355	640-935	355	1015-1485	470	1015-1485	555

Source: Kementerian Keuangan (2014-2021)

Empirical Study

Relationship between Cigarette Consumption and Poverty

A number of studies have been conducted on the impact of cigarette consumption on poverty. The results of previous studies show that cigarette consumption increases poverty. Research conducted by Alkadri et al. (2023) shows that people in Pohuwato Village, Gorontalo who consume cigarettes have a higher probability of 68 percent of falling into poverty. The results of research by Lubis et al. (2021) also show that cigarette consumption increases regional poverty in Indonesia where cigarette consumption increases household costs and shifts other

basic needs. In addition, Neli & Hardius (2020) also studied the change in cigarette consumption expenditure on consumption of other goods in which a decrease in cigarette consumption expenditure increase household welfare status in Bangka Belitung. Research on cigarette consumption and poverty was also conducted by Liu et al. (2006) where the results of their study showed that cigarette consumption expenditure and health costs due to cigarettes increase the poverty rate in China. In contrast to previous studies, Margareth et al. (2021) found negative results between the number of smokers and poverty, which means that an increase in smoking prevalence reduces poverty rates in 18 provinces in Indonesia from 2015 to 2019.

Relationship between poverty and smoking habits

Several studies have shown that poverty and the environment/society influence smoking habits. Most studies show significant positive results where poor environments/communities influence a person's smoking habits. Research by Afif & Sasana (2019) shows that poor environments increases cigarette consumption in Indonesia. Research by Cambron et al. (2019) shows that demographic factors and poor environments influence smoking habits in people aged 30 to 39 years. Research conducted by Watel et al. (2009) also showed similar result where households in densely populated poor neighborhoods were significantly related to a person's smoking habits. The results of research conducted by Flint & Novotny (1997) showed that poor communities were less likely to quit smoking than prosperous communities in America. In contrast to the results of research by Hu et al. (2005) stated that poverty is negatively related to cigarette consumption in China, where poor households spend less on cigarette consumption to improve welfare.

Relationship between price and cigarette consumption

Several studies have shown a negative relationship between cigarette prices and taxes on cigarette consumption. Research by Lesmana & Khoirunurrofik (2022) shows that increasing cigarette prices reduces cigarette consumption by considering the addictive and rational nature of consumers. Research by Djutaharta (2020) also shows similar results where cigarette prices reduce the probability of smoking and household cigarette consumption. In addition, Kim & Jung (2019) studied the increase in cigarette tax rates and the number of smokers where the results of the study showed that increasing cigarette taxes reduced the number of smokers and the demand for cigarettes in Korea. In contrast to previous studies, research conducted by Sarosa & Purwanti (2019) showed insignificant results between cigarette prices and the amount of cigarette consumption in Semarang City.

Factors Affecting Poverty

Several literatures stated that variables which affect welfare are the type of residential area, population density, gender of the head of the family, education, number of family members, labor force participation rate, and the year of covid (Tirtana, 2023; Yunianto, 2021; Lukluli & Cahyono, 2022; Deneve & Subramanian, 2018; Ukaj, 2023; Adhitya et al., 2022; Andrianto et al., 2016; Damanik & Sidauruk, 2017; Rizqullah, 2021; Suryahadi, 2020). Several factors are used in this study as control variables for the analysis of the relationship between cigarette consumption and poverty. These control variables are used to eliminate the bias in error term when analysing the relationship between cigarette consumption and poverty.

Research novelty

According to the empirical research on the relationship between cigarette consumption and poverty and the relationship between poverty and cigarette consumption, it can be said that cigarette consumption and poverty are related in two ways direction (reverse causality) which causes endogenous bias. From several previous studies on the relationship between cigarette consumption and poverty, research that accommodates or resolves the problem of endogenous

reverse causality bias between cigarette consumption and poverty is still limited. The existence of endogeneity between cigarette consumption and poverty can be a potential bias in the analysis results so that endogeneity is overcome with the instrumental variable model in this study. Previous studies, especially in Indonesia, are also still limited to analyzing the impact of cigarette consumption on poverty where the observation units used are provincial and national research. This does not describe the influence of household cigarette consumption behavior/habits on poverty. As for previous studies that use household or individual observation units, the scope of the research or analysis is very narrow, namely only carried out on a certain area in Indonesia. Therefore, this study considers a more specific observation unit at the household level by expanding the scope of the research analysis to see the relationship between cigarette consumption and household poverty that occurs in all regions in Indonesia more precisely. Research related to the relationship between price and cigarette consumption is supporting literature in using cigarette prices as a research instrument variable, while research related to other factors that cause poverty can be used as control variables in the research.

METHODS

Based on the theory and literature discussed previously, cigarette consumption not only has an impact on poverty but conversely poverty or poor environment/society also affect a person's smoking habits. To find out the actual relationship between cigarette consumption and poverty, a method is needed to eliminate the problem of endogenous bias from the reverse causality relationship. In this study, the instrumental variable method is used to reduce the endogenous bias of reverse causality.

The relationship between cigarette consumption and poverty will be analyzed with the price instrument variable so that cigarette prices will be analyzed with cigarette consumption at the first stage and then from these results cigarette consumption will be reanalyzed with poverty at the second stage instrumental variable. The reason for choosing cigarette prices as an instrument variable is that it fulfills the criteria as a connecting variable in analyzing the relationship between cigarette consumption and poverty with the instrumental variable method where cigarette prices affect cigarette consumption (independent) but do not affect poverty (dependent) directly but only through the relationship between cigarette prices and poverty. The unit of analysis in this study is households throughout Indonesia that are included in SUSENAS in the period 2014 to 2021 so that this study is expected to be able to capture the relationship between household cigarette consumption and household poverty status throughout Indonesia during that period.

Independent Variable

The independent variable used in this research is the household cigarette consumption variable. The value of which is the amount of household cigarette consumption in a month. The cigarette consumption variable is used in the 1st stage analysis, namely the effect of cigarette prices on cigarette consumption, which is then used in the 2nd stage analysis, namely the relationship between cigarette consumption and poverty.

The types of cigarettes analyzed are limited to filtered clove cigarettes, unfiltered clove cigarettes, and white cigarettes. Household cigarette consumption data was obtained from SUSENAS consumption data in the form of the number of cigarettes consumed by households in a month for the period 2014 to 2021. The types of cigarettes analyzed in the study are machine-made clove cigarettes or clove cigarettes with filters which in this study are referred to as filtered clove cigarettes, unfiltered clove cigarettes or hand-made clove cigarettes which in this study are referred to as unfiltered clove cigarettes, and white cigarettes or machine-made/hand-made white cigarettes which in this study are referred to as white cigarettes. Types of cigarettes other than these cigarettes are not included in the study.

Dependent Variable

The dependent variable used in the study is a household poverty dummy (binary) with a value of 1 for poor households and a value of 0 for non-poor households. This variable is used to see whether cigarette consumption is related to poor households in Indonesia. Households categorized as poor households are households whose per capita expenditure is below the poverty line adjusted based on the annual poverty line of the household in each district/city which is different each year. Household per capita expenditure data is obtained from SUSENAS consumption data while poverty line data is obtained from data from the National Statistics Agency on district/city poverty lines in Indonesia for the period 2014 to 2021.

Instrument Variable

The instrument variable used in the study is the price of cigarettes consumed by households obtained from SUSENAS data. This variable is measured by dividing the value of household cigarette consumption by the number of cigarettes consumed. For households that do not consume cigarettes, the price variable is adjusted to the average cigarette price data in each district/city according to the observation year. This is done to change the price of 0 rupiah to the average price of cigarettes in the district/city with the assumption that even though households do not have expenditure on cigarettes, cigarette prices are still formed in the market and can influence household decisions to smoke.

Control Variables

Control variables that is used in this study, in order to avoid endogenous bias against error terms or omitted variable bias, are the number of household members, gender of the head of the household, average education of household members, ratio of working family members, GRDP per capita in the district/city, type of district/city, population density, and year of covid. The control variables in this study use relevant data and are considered to influence household poverty conditions and household cigarette consumption based on previous theories and research. The data sources for the control variables are household and individual SUSENAS data, BPS data, and other data at the district/city level.

Research Model and Methods

Based on previous theories and research on the relationship between cigarette consumption and poverty (Alkadri et al., 2023; Lubis et al., 2021; Margareth et al., 2021; Neli & Hardius, 2020; Liu et al., 2006), the relationship between poverty environment and cigarette consumption (Afif & Sasana, 2019; Cambron et al., 2019; Watel et al., 2009; Hu et al., 2005; Flint & Novotny, 1997) and the relationship between price and cigarette consumption (Lesmana & Khoirunurrofik, 2022; Djutaharta, 2020; Kim & Jung, 2019; Sarosa & Purwanti, 2019), the relationship between cigarette consumption and poverty has the potential to influence each other (reverse causality) so that the cigarette price variable is used as an instrument variable. Thus, this study uses the instrumental variable method with the instrument variable of cigarette prices to analyze the relationship between cigarette consumption and household poverty. The data used in this study are pooled cross-section data while the dependent variable in this study uses a dummy variable (binary) so that the model chosen to analyze the dependent variable is the probit model with the consideration that probit uses a normal distribution function to estimate the probability response on continuous variables that follow a normal distribution (Gujarati & Porter, 2009). The analysis in this study uses the Instrumental Variable Probit Model method with pooled cross-section data. The model equation used in this research is:

First stage

$Lnquantity_{ijt} = \alpha_0 + \alpha_1 Lnprice_{ijt} + \alpha_2 Jeniskabkot_{ijt} + \alpha_3 Jart_{it} + \alpha_4 Jkkart_{it} + \alpha_5 Avgyos_{it} + \alpha_6 Rasio\_kerja_{it} + \alpha_7 Crowd_{ijt} + \alpha_8 Lnpdrb_{ijt} + \alpha_9 Covid_t + Ɛijt$

Second stage

$Poverty_{ijt} = ß_0 + ß_1 \widehat{Lnquantity}_{ijt} + Ɛ_{ijt}$

Description:

$Poverty_{ijt}$ = Dummy poverty status (1= poor; 0= non-poor) of household i in district/city j in year t;

$Lnquantity_{ijt}$ = Logarithm of the number of cigarettes consumed in a month by household i in district/city j in year t;

$\widehat{Lnquantity}_{ijt}$ = $Lnquantity_{ijt}$ estimated at the first stage;

$Lnprice_{ijt}$ = Logarithm of cigarette price paid by household i in district/city j in year t (market price for 1 cigarette);

$Jeniskabkot_{ijt}$ = Dummy type of area where household i lives in district/city j in year t (1=City; 0=Regency);

$Jart_{it}$ = Number of household members family i in year t;

$Jkkart_{it}$ = Dummy gender of head of household i in year t (1=Male; 0=Female);

$Avgyos_{it}$ = Average length of education of household members i in year t;

$Rasio\_kerja_{it}$ = Number of working family members compared to the number of household members i in year t;

$Crowd_{ijt}$ = Population density of district/city where household i lives in district/city j in year t;

$Lnpdrb_{ijt}$ = Logarithm of gross regional domestic product of the district/city where household i lives in district/city j in year t;

$Covid_t$ = Dummy year of the covid-19 pandemic (1=Pandemic year; 0=normal year) in year t;

$\alpha_1 - \alpha_9$ & $ß_1$ = Variable coefficient (α_1 describes the value of cigarette price elasticity & $ß_1$ describes the probability value of poverty due to cigarette consumption)

α_0 & $ß_0$ = Intercept

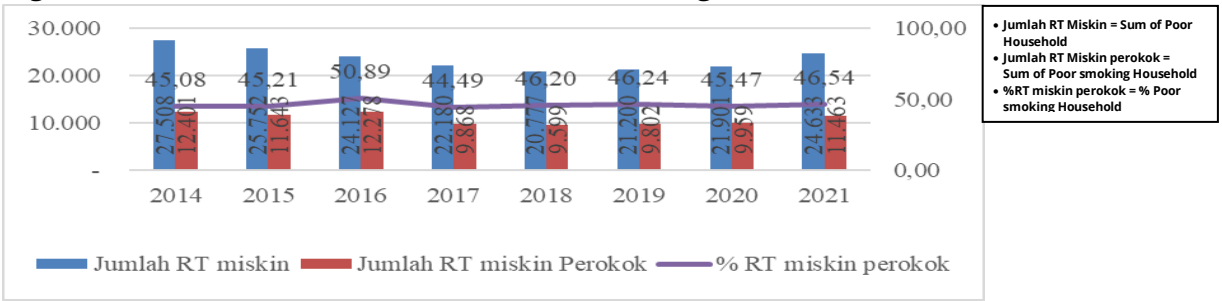
$Ɛijt$ = Error term

RESULTS AND DISCUSSION

Variable Description

This study uses household data in Indonesia based on SUSENAS in 2014 to 2021 (pooled cross section) with a total of 2,405,058 observations. This pooled cross section data model is used to obtain different behavioral conditions among various household characteristics in Indonesia within that period (Das, 2019). Based on the SUSENAS data, the percentage of poor households is 8 percent. From these data, we know that around half of poor households are smoking households or have a burden of cigarette consumption expenditure (see Figure 1).

Figure 1 Number of Poor Households & Poor Smoking Households in 2014 to 2021



Source: BPS, processed (2014-2021)

DISCUSSION

The type of cigarette that is widely consumed by both poor and non-poor households is filtered clove cigarettes (Table 2). The household choice of filtered clove cigarette consumption is in line with data on community food commodity choices where filtered clove cigarettes are in 2nd place for the most expenditure share consumed by households.

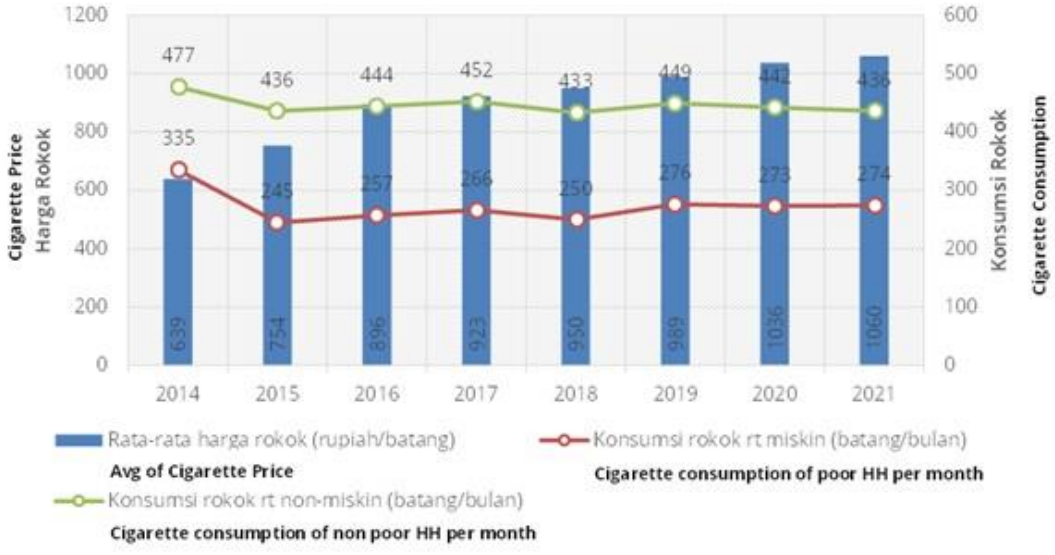
Table 2 Percentage of Types of Cigarettes Consumed by Poor and Non-Poor Households in All Observations From 2014 to 2021

	Type of Cigarette Consumed (%)		
	Filtered clove cigarettes	Unfiltered Clove Cigarette	White Cigarette
Poor Households	62,33	33,07	4,60
Non-poor households	68,99	23,74	7,27

Source: BPS, processed (2014-2021)

Based on Figure 2, the average number of household cigarette consumption fluctuates both in the range of 2014 to 2021. The decline in cigarette consumption in 2015, 2018, 2020, and 2021 can generally be caused by the increase in cigarette prices. This is in accordance with the results of research conducted by Lesmana & Khoirunurrofik (2022), Djutaharta (2020), and Kim & Jung, (2019) which show a negative relationship between cigarette prices and cigarette consumption. The increase in cigarette prices followed by an increase in the number of cigarette consumption in 2016, 2017, and 2019 can be caused by an increase in the number of smokers and rational expectations of consumption choices due to the absence of an increase in excise (see Table 1) and a shift in consumption to cigarettes with cheaper prices. This condition is possible because of the gap between excise rates and cigarette selling prices so that consumers choose cheaper cigarettes when there is an increase in excise tariff (Barber & Ahsan, 2009). The increase in household income that is relatively greater than the increase in cigarette prices can also be a reason for the increase in cigarette consumption when there is an increase in cigarette prices. This is in accordance with the theory of demand where the demand for a good is influenced by the price of the good, the price of substitute and complementary goods, and income (Pindyck & Rubinfeld, 2018).

Figure 2 Average Cigarette Price and Cigarette Consumption of Smoking Households From 2014 to 2021



Source: BPS, processed (2014-2021)

Empirical Analysis Results

The estimation procedure used in this research (instrumental variable probit regression) uses the IV-Probit procedure in Stata. The estimation results of this study are as follows:

First Stage Analysis Results

The first stage analysis in this study estimates the impact of cigarette prices on household cigarette consumption. Based on the results of the first stage analysis in table 3, cigarette prices have a significant negative relationship to cigarette consumption. It shows that an increase in cigarette prices will reduce household cigarette consumption. The coefficient value between cigarette prices and cigarette consumption shows the value of cigarette price elasticity where a percent increase in cigarette prices will reduce cigarette consumption by 0.77 percent of household cigarette consumption in a month. The relationship between price and cigarette consumption is in accordance with the theory of demand where price negatively affects the demand for a good (Pindyck & Rubinfeld, 2018). The value of cigarette price elasticity in the model is in accordance with the average cigarette price elasticity in developing countries, which is around -0.4 to -0.8 (Ja & Chaloupka in Lesmana & Khoirunurrofik, 2022). Thus, it can be said that the results of this estimation are in accordance with the cigarette price elasticity in developing countries.

Table 3 Results of Estimating The Relationship Between Cigarette Prices and Cigarette Consumption (First Stage) and Cigarette Consumption and Poverty (Second Stage)

	1st stage Lnquantity	*2nd stage* Poverty Status	*1st stage* Lnquantity	*2nd stage* Poverty Status	Avg. Marginal Effect (dy/dx)
	(1)		(2)		(3)
Lnquantity		0.304*** (0.000)		0.318*** (0.000)	0,128
Lnprice	-0.962*** (0.000)		-0.776*** (0.000)		
Jeniskabkot			-0.136*** (0.000)	0.047*** (0.000)	0,019
Jkkart			1.581*** (0.000)	-0.569*** (0.000)	-0,229
Avgyos			-0.025*** (0.000)	-0.034*** (0.000)	-0,013
Jart			0.331*** (0.000)	-0.045*** (0.000)	-0,018
Rasio_kerja			0.611*** (0.000)	-0.242*** (0.000)	-0,098
Crowd			-0.000*** (0.000)	0.000*** (0.000)	0,000
Lnpdrb			0.058*** (0.000)	-0.062*** (0.000)	-0,025
Covid			0.040*** (0.000)	0.123*** (0.000)	0,049
Constant	9.977*** (0.002)	-1.534*** (0.000)	5.336*** (0.003)	0.057*** (0.001)	
Kleibergen Fstat	$8.8x10^6$	$8.8x10^6$	$5.4x10^6$	$5.4x10^6$	
Wald test Exo. (P value)	0.000	0.000	0.0000	0.0000	
N	$5.52x10^8$	$5.52x10^8$	$5.52x10^8$	$5.52x10^8$	
R^2	0.0124	0.0124	0.1246	0.1246	

Standard errors in parentheses (p<0.10, ** p<0.05, *** p<0.01).*

Second Stage Analysis Results

The second stage analysis in this study estimates the relationship between household cigarette consumption that has been estimated in the first stage with household poverty. From the results of the instrumental variable probit analysis, the direction of the coefficient of the relationship between cigarette consumption and household poverty can be seen in table 3 while

the magnitude of the probability or marginal effect of the relationship between cigarette consumption and poverty can be seen in the average marginal effect in table 3.

The results of the second stage analysis show a significant positive relationship between household cigarette consumption in a month and household poverty status. Based on the results of the estimation, it is concluded that an increase in cigarette consumption increases the probability of a household being poor. Based on the marginal effect, the estimation results show that 1 percent increase in household cigarette consumption in a month increases the household poor status by 0.12 percentage points. These results indicate that the more household cigarette consumption will potentially increase the probability of a household being poor. This is in accordance with the theory of poverty which states that economic characteristics in the form of food choices consumed by households are one of the factors causing household poverty (World Bank, 2014). In line with the results of this analysis, the research of Alkadri et al. (2023) and Neli & Hardius (2020) showed similar results that cigarette consumption has a positive effect on changes in the status of poor households. The regression analysis in this study produced a p-value that rejected exogeneity with a Wald anderson of exogeneity p-value of less than 0.05 or rejected H_0. This can be interpreted that the regression equation does require an instrumental variable because the relationship between cigarette consumption and poverty is endogenous. Furthermore, the Kleibergen Fstat value at all stages of the regression shows a value above the Stock Yogo critical value, which means that the instrumental variable is strong and appropriate for use in all models.

Regression Analysis Of The Relationship Between Cigarette Prices, Cigarette Consumption, And Poverty Based On Cigarette Type

Based on the results of the regression analysis according to the type of cigarette, namely filtered clove cigarettes, unfiltered clove cigarettes, and white cigarettes, the relationship between cigarette prices and household cigarette consumption (first stage) is significantly negative for all three types of cigarettes. The elasticity of cigarette prices reflected by the relationship between cigarette prices and cigarette consumption in the model shows an inelastic value for all three types of cigarettes. The most inelastic cigarette price elasticity is white cigarettes with a value of -0.24, followed by filtered clove cigarettes with a value of -0.74 and unfiltered clovecigarettes with a value of -0.97. Thus, it can be said that the demand for unfiltered clove cigarettes is the most elastic type of cigarette among the three types of cigarettes, while white cigarettes are the most inelastic type of cigarette compared to other cigarettes. The demand for white cigarettes is the lowest compared to clove cigarettes (see table 2), indicating that consumers and market segments for white cigarettes are different from clove cigarettes. In addition, the absence of substitution options for white cigarettes makes white cigarettes more inelastic. This can be the reason why white cigarette consumers are less sensitive to price changes, making white cigarettes more inelastic. Unfiltered clove cigarettes are the most elastic type of cigarette compared to the other two types of cigarettes. This can be that unfiltered clove cigarettes have the lowest tariff structure and class compared to the other two types of cigarettes. The lower price and tariff of unfiltered clove cigarettes will target consumers with lower incomes so that when the price is increased, consumers with limited income will be more sensitive to price changes and unfiltered cigarettes will be more elastic than other cigarettes. This is in accordance with economic theory where elasticity is influenced by one of them, a person's income (Pindyck & Rubinfeld, 2018). The results of the second stage analysis in table 4 show that cigarette consumption is positively related to increasing the probability of poor household status in types of filtered clove cigarettes, unfiltered clove cigarettes, and white cigarettes. Based on the marginal effect, 1 percent increase in cigarette consumption increases the probability of poor household status by 0.13 percentage points in filtered clove cigarettes, 0.06 percentage points in unfiltered clove cigarettes, and 0.085 percent in white cigarettes. This

can be interpreted that the impact of increasing consumption of filtered clove cigarettes on the probability of poor household status is greater than other types of cigarettes. The high value can be associated with the large number of households that consume filtered clove cigarettes and the inelasticity of the price of filtered clove cigarettes. The relationship between cigarette consumption and poverty can be caused by the cost of consuming cigarettes or health costs due to the negative impacts of cigarettes (Liu et al., 2006). In addition, the negative impacts of cigarettes on health will reduce the quality and productivity of smokers which risks reducing family income and welfare. This makes cigarette consumption to be positively related to poverty. The relationship between cigarette consumption and poverty in this study is in accordance with the theory of poverty where one of the factors causing poverty is inappropriate consumption choices (World Bank, 2014). From the results of the estimation comparing the three types of cigarettes, it was concluded that the robustness test carried out according to the type of filtered clove cigarettes, unfiltered clove cigarettes, and white cigarettes produced the same direction and significance on the main variables but with different magnitudes. The three types of cigarettes showed a significant negative relationship between cigarette prices and the quantity of cigarettes consumed, while the relationship between cigarette consumption and poverty had a significant positive value so that it was similar to the initial model/main model. Thus, it can be concluded that this model is robust to clustering analysis according to cigarette type.

Table 4 Results Of Estimating The Relationship Between Cigarette Prices And Cigarette Consumption (First Stage) And The Relationship Between Cigarette Consumption And Poverty (Second Stage) Based On Type Of Cigarette

	Filtered Clove cigarette			Unfiltered Clove Cigarette			White Cigarette		
	(1st stage)	(2nd stage)	Margin 2nd stage	(1st stage)	(2nd stage)	Margin 2nd stage	(1st stage)	(2nd stage)	Margin 2nd stage
	Lnquantity	Poverty	dy/dx	Lnquantity	Poverty	dy/dx	Lnquantity	Poverty	dy/dx
Lnquantity		0.318***	0.134***		0.340***	0,063***		0.511***	0.085***
		(0.000)			(0.000)			(0.001)	
Lnprice	-0.743***			-0.972***			-0.236***		
	(0.001)			(0.001)			(0.000)		
Jeniskabkot	0.030***	-0.006***	-0.003***	-0.191***	0.074***	0,014***	0.039***	-0.017***	-0.003***
	(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)	
Jkkart	0.867***	-0.332***	-0.140***	0.698***	-0.337***	-0,062***	0.060***	-0.140***	-0.023***
	(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)	
Avgyos	0.005***	-0.043***	-0.018***	-0.037***	-0.088***	-0,016***	0.015***	-0.122***	-0.020***
	(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)	
Jart	0.274***	-0.029***	-0.012***	0.100***	0.106***	0,020***	0.044***	0.133***	0.022***
	(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)	
Rasio_kerja	0.851***	-0.324***	-0.137***	-0.332***	0.006***	0,001***	0.034***	-0.124***	-0.021***
	(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)	
Crowd	-0.000***	0.000***	0.000***	0.000***	0.000***	0,000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)	
Lnpdrb	0.276***	-0.133***	-0.056***	-0.254***	-0.020***	-0,004***	0.051***	-0.161***	-0.027***
	(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)	
Covid	0.349***	-0.000***	-0.000***	-0.097***	0.253***	0,047***	-0.077***	0.243***	0.040***
	(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)	
Constant	2.082***	1.078***		9.768***	-0.800***		0.950***	0.906***	
	(0.004)	(0.001)		(0.004)	(0.002)		(0.002)	(0.001)	

Kleibergen Fstat	2.1 x 10^6	2.1 x10^6	2.1 x 10^6	2.2 x 10^6	2.2 x 10^6	2.2 x 10^6	1.6 x 10^6	1.6 x 10^6	1.6 x 10^6
Wald test - P value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	5.52 x 10^8	5.52 x 10^8	5.52 x 10^8	5.52 x 10^8	5.52 x 10^8	5.52 x 10^8	5.52 x 10^8	5.52 x 10^8	5.52 x 10^8
r2	0.0842	0.0842	0.0842	0.0633	0.0633	0.0633	0.0133	0.0133	0.0133

Standard errors in parentheses (* p<0.10, ** p<0.05, *** p<0.01).

CONCLUSION

This study aims to examine the relationship between household cigarette consumption and poverty as measured by poor household status. The endogenous bias caused by the two-way relationship (reverse causality) between cigarette consumption and household poverty is overcome by using the instrumental variable method. The instrumental variable used in this study is the price of cigarettes which is believed to meet the requirements as an instrumental variable with the assumption that the price of cigarettes is related to household poverty only through cigarette consumption. The results of empirical analysis using the instrumental variable probit model show that cigarette consumption has a positive effect on poor household status. This can be interpreted that an increase in the amount of cigarette consumption increases the probability of poor household status. This relationship can be explained by the negative impact of cigarette consumption on smokers and their families or people around smokers. Cigarette consumption could reduce the health quality of a person and productivity, thereby reducing household income. The costs incurred from cigarette consumption and health costs incurred due to the negative impact of cigarette consumption will also burden the household economy. This condition increase the probability of a person falling into a poverty trap.

The results of the research analysis also show a negative relationship between cigarette prices and cigarette consumption. This is in accordance with the law of demand where an increase in the price of a good will reduce the amount of demand for the good. The relationship between cigarette prices and cigarette consumption in this study also reflects the value of cigarette price elasticity, which is -0.77. This figure shows that the demand for cigarettes is inelastic or not sensitive to increases in cigarette prices. The elasticity in this study is within the range of the average of cigarette price elasticity in developing countries. The results of the analysis by clustering between the types of cigarettes consumed are that the increase in cigarette prices causes a decrease in household cigarette consumption while cigarette consumption increases the probability of households being poor. The elasticity value of demand for filtered clove cigarettes is -0.74, unfiltered clove cigarettes -0.97, and white cigarettes -0.24. Thus, it can be said that the demand for unfiltered clove cigarettes is the most elastic and the demand for white cigarettes is the most inelastic compared to the other two types of cigarettes. The more inelastic demand for white cigarettes can be due to consumers or market segments of white cigarettes being different from clove cigarettes and in a limited scope of smokers (seen from the small share of household white cigarette consumption) and the absence of similar cigarette type substitution options so that white cigarette consumers are not sensitive to price changes. The demand for unfiltered clove cigarettes that is more elastic compared to other types of cigarettes can be linked to the low price and excise rates of unfiltered clove cigarettes so that these cigarettes target consumers with low incomes. When prices are raised, consumers with limited income will be more sensitive to price changes, causing unfiltered clove cigarettes to be more elastic compared to the other two types of cigarettes. So that government must take excise tariff policy considering the price elasticities of each type of cigarettes. Government should also consider reducing the gap of excise tariff and retail selling price among the types of cigarettes to decrease cheaper cigarette options and increase the effectiveness of excise in controlling cigarette consumption.

SUGGESTION

This study was conducted at the household level with pooled cross-section data. With this model, it is realized that researchers cannot see changes in the impact or changes in consumer behavior on cigarette consumption in the same household in the following year as can be captured by panel data. Therefore, if panel data on consumption at the household level is available, further research can be developed to see changes in the impact or behavior of the same individual unit. This study does not include data on illegal cigarettes that can affect household cigarette demand or consumption. This is important because illegal cigarettes can be a choice for people's consumption and affect people's purchasing power for cigarettes. The information on illegal cigarettes currently available is only at the national level every two years so it is not relevant to be included in this research model. Due to these limitations, researchers suggest using a proxy for the number of illegal cigarettes that describe the level of illegal cigarettes according to the level of the research observation unit.

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