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# The determinant of individual smoking consumption in Central Java province

S Subanti<sup>1,4,\*</sup>, A R Hakim<sup>2,4</sup>, H S J N Sriwiyanto<sup>3</sup>, and I M Hakim<sup>5</sup>

<sup>1</sup> Department of Statistics, Faculty of Mathematics and Natural Science, Universitas Sebelas Maret

<sup>2</sup> Graduate Program in Economics, Faculty of Economics and Business, Universitas Indonesia

<sup>3</sup> Department of Economic Development, Faculty of Economics and Business, Universitas Sebelas Maret

<sup>4</sup> Institute for Research and Social Services, Universitas Sebelas Maret

<sup>5</sup> Department of Industrial Engineering, Faculty of Engineering, Universitas Indonesia

\*Corresponding author : sri\_subanti@yahoo.co.id

**Abstract.** The paper aims to determine the socio-economic factors that significantly affect the individual smoking consumption and to make smoker profile in Central Java Province. This paper uses national economy social survey (Susenas) based on individual analytical units. The estimation technique with ordinary least squares regression. The findings of the paper is the factors that significantly influence the individual smoking consumption are cigarette prices, income, marriage status, urban-rural, education level, poor status, and living condition. This study suggests that to reduce cigarette consumption, the government needs to increase the price of cigarettes. In addition, the government needs to promote anti-smoking campaigns and smoking bans at work.

## 1. Introduction

Indonesia is the fifth largest country in the world of cigarette consumers from 2001 - 2003. Indonesian cigarette consumption from 1960 to 2003 increased by 3.8 times, from 35 billion cigarettes to 171 billion cigarettes per year [1,4,9]. The smoking prevalence of adults (aged 15 years or over), the percentage of adults who smoked in 2001 was 31.5%. Whereas according to sex the prevalence is 62.2% for men and 1.3% for women. In addition, the Indonesian people are also very familiar with cigarettes, especially the poor. Some studies shows that based on the income group, the richest 20% population has the lowest prevalence compared to the population in the income group below it [4].

According to some economics literatures, consumer sovereignty is rational about their consumption decisions so it makes an impact on consumer knowledge about what products can provide the greatest satisfaction and risk from consuming these products. In addition, consumers must be willing to bear all costs and benefits arising from their consumption [6]. But it does not easy to apply on cigarettes because there are three market failures, namely: (1) failure of information about the health risks of smoking. The cause of this is the action of the cigarette industry that distorts information about the risk of smoking through various misleading advertisements and the difference in time between smoking and the onset of smoking-related diseases; (2) failure of information about the nature of addiction in cigarette consumption both from the psychological side, habits that are difficult to eliminate, and



physical addiction to the need for nicotine from smokers; (3) smoking causes external costs to be borne by non-smokers consisting of physical costs and financial costs [6,7].

Socioeconomic background is been related as factor that affected to smoking prevalence of not only gender based but also all adult age groups [9]. Most of studies have agreed that socioeconomic background determined smoking behavior; however, the impacts of socioeconomic backgrounds varied across countries [10]. Although many variables related to socioeconomic background used to estimate the impacts of socioeconomic background on smoking behavior, most of the studies indicated the association of the level socioeconomic background with current smoking status [2].

Based on the background above, this paper tries to look at factors that influence smoking consumption. These factors can be grouped into two, namely economic factors and non-economic factors. Economic factors consist of the price of cigarettes, income, and employment. While non-economic factors consist of location of residence, gender, level of education, and living conditions.

## 2. Methods

### 2.1. Data

The data used in this paper are National Socio-Economic Survey data year 2012 for modules and cor. Module surveys are a subset of the core survey where some respondents from the core survey were re-interviewed to find out more about information on housing and health.

Because this paper uses information from core data and modules, data is combined between the two results of the survey data. In core data, there are two analysis units, namely households and individuals, while the data module has an analysis unit for selected individuals. After having the desired information, the first step is to combine the data between the individual core data and the module data. At this stage the combined information consists of the province, district / city, sub-district, village, location classification (urban or rural), sample code number, household serial number, and household member serial number.

The next stage, the results of combining individual-level data are combined with household core data. The information combined in stage two is almost the same as the first stage but does not incorporate the serial number of household members.

### 2.2. Model and Estimation Method

The smoking consumption is influenced by several economic factors and non-economic factors. Economic factors that theoretically affect individual smoking consumption are the price of cigarettes, income and employment. Non-economic factors are age, location of residence, gender, level of education, and living conditions.

In this paper, cigarette consumption is defined by the consumption of filtered clove cigarettes, unfiltered clove cigarettes, and white cigarettes. The price of cigarettes is proxied by the number of cigarettes consumed per day (in rupiah) divided by the number of cigarettes consumed per day. This paper assumes that 1 pack of cigarettes contains 12 unit. According to Ahsan, this approach is still overestimate because it does not pay attention to the number of smokers in the house [1]. Nevertheless, the price of this proxy is the best choice that can be done with these available data.

Ordinary least square (OLS) regression is applied to estimate smoking consumption for individuals [3,5,8]. This can be written into the following equation.

$$\ln \text{cigarday}_i = \delta_0 + \delta_1 \ln \text{cigarprice}_i + \alpha X_i + u_i \quad (1)$$

Where  $\ln \text{cigarday}_i$  is the consumption of individual cigarettes per day in the form of logarithms;  $\ln \text{cigarprice}_i$  is the price of cigarettes in the form of logarithms; dan  $X_i$  is an explanatory variable other than the price of cigarettes consisting of income, occupation, location of residence, gender, condition of residence, marital status, and the poor status of the household. The description of the variables involved in the model is as follows.

**Table 1.** Variable description for regression estimation

Variable	Description
Lconscigrday	the cigarettes consumption per day in rod units (in the logarithms form)
lcigarprice	the price of cigarettes per rod unit in rupiah (in the logarithms form)
male	1=if male and 0=others
urban	type of place of residence, 1=urban and 0=rural
work	most activities in the past week, 1=work and 0=others
educ_basic	1=if the individual finished primary school or below and 0=others
educ_intermediate	1=if the individual finished junior high school or senior high school then 0=others
educ_high	1=if the individual finished university and 0=others
bad_living	living condition, 1=bad condition and 0=others
lincome	household income where measured by household expenditure in average per capita (in the logarithms form)
marriage	marriage status, 1=married and 0=others
poorstatus	household poverty status, 1=poor (household expenditure per capita below the poverty line) and 0=others

### 3. Results and Discussions

Table 2 shows the consumption of cigarettes per month based on individual and gender characteristics. Overall, the average consumption of cigarettes is 23 packs (1 pack equals 12 unit of cigarettes) per month. By gender, the average male consumption is higher than that of 23 packs per month compared to 22 packs per month. Meanwhile, according to location of residence and gender, it is seen that the average consumption of cigarettes for women and men in urban is stay the same, which is equal to 24 packs per month. Conversely, the average consumption for men is higher than that of women in rural areas, namely 22 packs per month compared to 21 packs per month.

**Table 2.** Cigarette Consumption per Month Based on Individual Characteristics and Sex (1 pack = 12 unit)

Characteristics	Sex		Characteristics	Sex	
Location Classification	Male	Female	Living Condition	Male	Female
Urban	24	24	Good	24	23
Rural	22	21	Bad	21	21
Income Group (Rp)	Male	Female	Marriage Status	Male	Female
<=233.769	16	17	Married	23	23
>233.769 - 864.330	18	19	Others	25	22
>864.330 - 1098.099	20	19	Age	Male	Female
>1098.099	25	23	15 - 24	25	24
Education	Male	Female	25 - 34	24	22
Basic	23	22	35 - 44	22	22
Intermediate	24	23	45 - 54	24	23
High	24	23	54 +	22	21

Source : calculated by authors from Susenas Data

Next, the higher of the income group tends to be the higher consumption of cigarettes. The same pattern is found for both men and women. For male groups, the lowest average cigarette consumption per month is 16 packs while the highest is 25 packs. For female groups, the lowest average monthly

cigarette consumption is 17 packs per month, while the highest average cigarette consumption is 23 packs per month. According to the education level category, the average consumption pattern of cigarettes for male and female respondents both secondary and high education tends to be the same even though the male group is higher than the female group. For the male group, the average consumption is 24 packs per month, while the female group has an average consumption of 23 packs per month. Basic education category, the average consumption of cigarettes is 23 packs per month for the male group, while the female group consume 22 packs per month.

Based on living conditions, for male and female, the average consumption of cigarettes per month is no different for those who live in bad locations, which is 21 packs per month. Whereas for those who live in a good location, the average consumption of cigarettes in the male group is higher than the female group. According to marital status, the average consumption of cigarettes for male is no different from female especially for married status. While other status, there is a difference in consumption of cigarettes per month where the male group (25 packs per month) is higher than the female group (22 packs per month).

According to age groups, the lowest average consumption is in the oldest age group (54+), they consume 22 packs per month for male and 21 packs per month for female. The highest average consumption is in the youngest age group (15-24), namely 25 packs per month for male and 24 packs per month for female.

**Table 3.** Estimation results

<b>Dependent Variable : lconscigrday</b>						
<b>Independent Variable</b>	<b>Model 1</b>			<b>Model 2</b>		
	<b>Coef.</b>	<b>Std. Err.</b>	<b>Sign.</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>Sign.</b>
lcigarprice	-0.464	0.028	***	-0.462	0.028	***
Urban	0.095	0.015	***	0.100	0.015	***
Work	0.027	0.016	*	0.026	0.016	
educ_intermediate	0.021	0.015		0.020	0.015	
educ_high	-0.115	0.036	***	-0.109	0.036	***
bad_living	-0.067	0.019	***	-0.065	0.019	***
lincome	0.445	0.017	***	0.424	0.019	***
marriage	-0.029	0.017	*	-0.029	0.017	*
Male	0.004	0.015		0.004	0.015	
Poorstatus				-0.075	0.023	***
Cons	-0.834	0.164	***	-0.567	0.186	***
Number of obs		10081			10081	
F – Stat		89.080			85.520	
Prob > F		0.000			0.000	
R-squared		0.1016			0.1024	
* = sign. Alpha 10%      ** = sign. Alpha 5%      *** = sign. Alpha 1%						
Source : calculated by Authors from Susenas Data						

Table 3 shows that the relation between the price of cigarettes and the number of cigarettes are negative. This value also represents the price elasticity of demand of -0.46. In other words, every increase in the price of cigarettes by 10% the demand of cigarettes will decrease by 4.6%. Based on these results, we can do simple simulations where the effect of nominal cigarette price increases on demand. If the increase in nominal cigarette prices is 50% and 100%, it will reduce the demand for cigarettes by 23.2% and 46% respectively. Next, the income elasticity of demand is 0.4. In other words, each increase in income by 10% then the number of cigarettes demanded will increase by 4%.

For gender variable is 0.004, we can say that the male respondents tend to consume more cigarettes (0.4%) than female. Variable of marital status, married respondents tend to smoke less than

respondents with other status. The variables of residence location (urban) are 0.095 (model 1) and 0.10 (model 2), it means that the smoker who lived in urban tend to smoke higher (9.5% - 10%) than the smokers who lived in rural. In terms of education level, smokers with higher education have a tendency to smoke less than 11% compared to those with basic education.

Other variables, living conditions produce a parameter value of -0.06. In other words, smokers who live in bad conditions have a tendency to smoke less (6%) than those who live in a good conditions. Poor status variables indicate that smokers who belong to the category of poor households tend to consume fewer cigarettes (7.5%) than those who do not belong to that category. For constant parameters it can be interpreted that if the respondent has the characteristics of a woman, does not marry, lives in the rural, has basic education, lives in a good condition, the price of cigarettes is close to zero, income is close to zero, and not including poor status, the consumption of cigarettes tends to be lower than the category mentioned above.

#### 4. Conclusion

This study concludes that the factors that statistically significantly affect cigarette consumption are the price of cigarettes, income, education, location of residence, condition of residence, and marital status. The variables of residence and income are positively related to cigarette consumption, while the variable price of cigarettes, education, living conditions, and marital status are negatively related to cigarette consumption.

This study suggests that to reduce cigarette consumption, the government needs to increase the price of cigarettes. Study results show that cigarette prices significantly affect cigarette consumption negatively. If the government raises the price of cigarettes by 10%, the consumption of cigarettes will decrease by 4.6%. Related to the policy of raising the price of cigarettes, it will be more relevant because income factors are positively related to cigarette consumption. So if the price of cigarettes is increased it will have the effect of preventing those who have low income to buy cigarettes and reduce the purchasing power of those who have high income to buy cigarettes. In addition, the government needs to promote anti-smoking campaigns and smoking bans at work.

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