

Formulating Policies to Control Cigarette Consumption in Various Countries: A Literature Review

Leni Ratnasari^{1*}, Supriyanto¹

¹ Magister Management Program, Faculty of Economics and Business, Universitas Pelita Bangsa, INDONESIA.

*Corresponding Author: leni.harumia@gmail.com

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Abstract

The purpose of this study is to understand the implementation of the analysis of the elasticity of cigarette price demand in various countries in relation to policy efforts to control it. The study was conducted by literature review. The articles studied are limited between 2016 and 2024. It was found that there were 312 articles and there were 8 articles that were suitable for review. The results of this study provide an understanding that the elasticity of cigarette price demand in the world has important implications for cigarette consumption control policies. The policy of increasing cigarette prices will cause high elasticity of cigarette prices, increasing cigarette prices can be an effective strategy to reduce cigarette consumption.

1. Introduction

Cigarettes are one of the tobacco products that are widely consumed around the world. Cigarette consumption has a significant impact on the health of individuals and communities, as well as causing a large economic burden. The 2018 National Health Research shows that the prevalence of adult smokers in Indonesia reaches 33.8%, with the highest proportion in the age group of 35-44 years (Audrine, 2020). This smoking habit contributes to various chronic diseases such as lung cancer, coronary heart, stroke, and chronic obstructive pulmonary disease (COPD) (Kosen *et al.*, 2017).

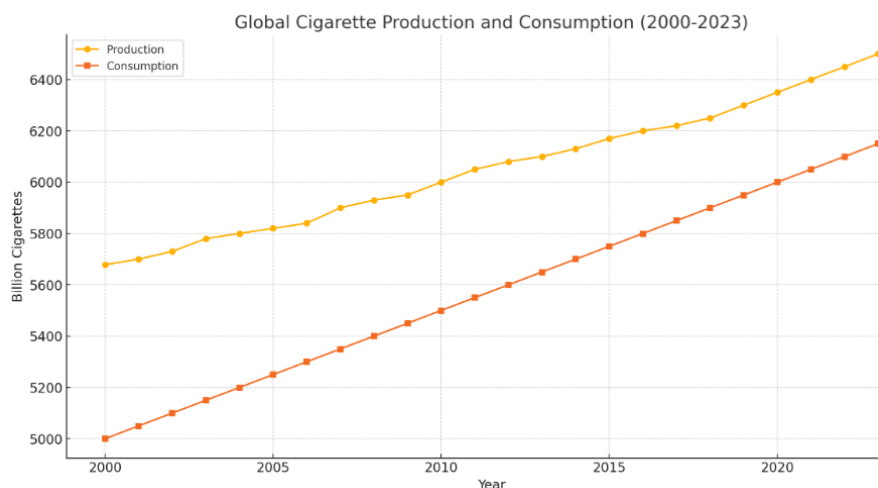


Fig. 1 World Cigarette Production and Consumption (2000-2023)
(WHO, 2019)

From 2000 to 2023, cigarette production and consumption in the world showed an increasing trend. WHO (2019) explains the production and consumption of cigarettes in the world as explained below. Cigarette production in 2000: 5.678 billion cigarettes, in 2023: 6.500 billion cigarettes, annual average: 6.055 billion cigarettes, and production increased by about 14% from 2000 to 2023. Cigarette consumption in 2000: 5.000 billion cigarettes, in 2023: 6.150 billion cigarettes, annual average: 5.575 billion cigarettes and consumption increased by about 23% from 2000 to 2023. Graph 1 above shows an increasing trend in both cigarette production and consumption globally. This increase can be attributed to several factors, including population growth and tobacco control policies that vary across countries.

On the other hand, the cigarette industry also has a complex economic impact. On the one hand, the industry generates tax revenue and jobs. On the other hand, health costs associated with cigarette consumption and loss of productivity due to cigarette-related diseases also provide a significant economic burden (WHO, 2020).

Realizing the negative impact of cigarettes, various countries in the world have implemented various policies to control cigarette consumption (Palali and van Ours, 2019). One of the commonly used policies is to increase the price of cigarettes through excise and taxes. This policy aims to reduce the demand for cigarettes by making cigarette prices more expensive and less affordable (Revanza Almaas, 2024).

The effectiveness of the policy of raising cigarette prices in reducing cigarette consumption depends on the elasticity of cigarette prices (Boachie *et al.*, 2022 & Audrine, 2020). Nguyen *et al.* (2021) and Gligorić *et al.* (2019) explained that the elasticity of cigarette prices shows how much the percentage change in cigarette demand is relative to the percentage change in cigarette prices. The high elasticity of cigarette prices indicates that cigarette demand is very sensitive to price changes (Cruces, 2022; Nguyen *et al.*, 2021). This means that when the price of cigarettes is increased, the demand for cigarettes will decrease significantly.

Shafiun *et al.* (2024) explained that the low elasticity of cigarette prices indicates that cigarette demand is not too sensitive to price changes. This means that even if the price of cigarettes is increased, the demand for cigarettes will not drop much. Understanding the elasticity of cigarette prices is important to formulate effective cigarette consumption control policies. Almeida (2016) explained that cigarette price policies in a country must consider the elasticity of cigarette prices and other factors that affect the demand for cigarettes appropriately.

The purpose of this study is to review the elasticity of cigarette demand prices (cigarettes) in the world, because it is considered to have an important role in efforts to control cigarette consumption and realize better public health. By understanding the elasticity of cigarette prices in various countries and the factors that affect them, it is hoped that it can help formulate more effective and targeted policies.

2. Theoretical Studies

2.1 Definition and Concept of Price Elasticity

Phillips (2021) and Andruszkiewicz *et al.* (2020) explained that price elasticity is a measure of how responsive the quantity requested or offered by a good is to changes in the price of the good. There are many definitions of price elasticity in several implementation contexts, but the most common are the elasticity of the price of demand and the elasticity of the price of supply.

Demand price elasticity is used to measure the percentage change in the quantity requested from a good or service due to the percentage change in the price of the good or service (Varian, 2019).

Demand Price Elasticity Formula.

$$PED = \frac{\% \text{ Change in Quantity Demanded}}{\% \text{ Change in Price}} \quad \text{or} \quad PED = \frac{\Delta Q/Q}{\Delta P/P}$$

Where:

- ΔQ is the change in quantity demanded
- Q is the original quantity demanded
- ΔP is the change in price
- P is the original price

Explanation:

- $Ed > 1$, $E_d > 1$: Elastic demand (quantity requested is highly responsive to price changes).
- $Ed < 1$, $E_d < 1$: Inelastic demand (quantity requested is less responsive to price changes).
- $Ed = 1$, $E_d = 1$: Elastic unit demand (the percentage change in the requested quantity is equal to the percentage change in price).

Offer price elasticity measures the percentage change in the quantity offered of a good or service due to the percentage change in the price of the good or service (Varian, 2019).

$$PES = \frac{\Delta Q_s / Q_s}{\Delta P / P}$$

Formulation of Offer Price Elasticity

Where:

- PES = Price Elasticity Supplied
- Qs: Quantity Supplied
- P: Price of the good
- ΔQs Change in Quantity Supplied
- ΔP Change in Price

Explanation:

1. Elastic Supply ($PES > 1$): Supply is elastic if the percentage change in quantity supplied is greater than the percentage change in price. This means producers can increase output easily when prices rise.
2. Inelastic Supply ($0 < PES < 1$): Supply is inelastic if the percentage change in quantity supplied is less than the percentage change in price. Producers may find it hard to change production levels quickly.
3. Unitary Elastic Supply ($PES = 1$): The percentage change in quantity supplied equals the percentage change in price.

Several factors influence the price elasticity of supply, including:

1. Production Flexibility: The ability to change production levels quickly.
2. Time Period: Supply tends to be more elastic in the long run, as producers have more time to adjust their production.

2.2 Factors Affecting Elasticity

In a literature review, there are 5 main factors that can affect demand elasticity, namely the availability of substitutes, need vs. desire, proportion of income spent, time, storage capacity. (1) Availability of Substitutes, where the more substitutes are available, the more elastic the demand (Helmold, 2020; Best *et al.*, 2020; Phillips, 2021). (2) Needs vs. Desire, because necessities tend to have inelastic demands, while desireful goods are more elastic (Vargas-Lopez, 2022 and Ansah *et al.* (2020)); (3) Proportion of Income Spent, as goods that absorb most of consumer income are usually more elastic (Vargas-Lopez, 2022); (4) Time, where demand tends to be more elastic in the long term because consumers have time to adjust to price changes (Phillips, 2021); and (5) Storage Capability, as items that can be stored for a long time tend to be more elastic (Vargas-Lopez, 2022; Ansah *et al.*, 2020).

2.3 Cigarette Price Elasticity

Cigarette price elasticity is defined as the percentage change in cigarette demand due to the percentage change in cigarette prices (Corrigan *et al.*, 2020). Mathematically, the elasticity of cigarette prices can be formulated as: Cigarette price elasticity = (Percentage change in cigarette demand) / (Percentage change in cigarette prices)

The value of cigarette price elasticity can be interpreted as follows: (1) Positive price elasticity: The demand for cigarettes increases when prices fall. This is rare in cigarettes due to their addictive nature (DeCicca *et al.*, 2022); (2) Zero price elasticity: The demand for cigarettes does not change when the price changes; and (3) Negative price elasticity: Demand for cigarettes decreases when prices rise (Almeida *et al.*, 2020).

The high price elasticity (which is absolutely large) indicates that the demand for cigarettes is very sensitive to price changes. This means that an increase in cigarette prices will cause a significant decrease in cigarette demand. In contrast, low price elasticity (small in absolute terms) suggests that cigarette demand is less affected by price changes (Corrigan *et al.*, 2021).

Cigarette price elasticity is an important concept in understanding smoker behavior and formulating effective cigarette consumption control policies. By understanding the factors that affect cigarette price elasticity and relevant theories, policymakers and public health experts can devise appropriate strategies to reduce the prevalence of smoking and improve public health.

Several economic theories can help explain the elasticity of cigarette prices, between consumer theory, demand theory, and elasticity theory.

- a. Consumer Theory. Ceyda Tanrikulu (2021) explained that in this consumer theory, it is explained how consumers make purchase decisions based on the utilities they obtain from goods and services. In the case of cigarettes, consumers consider the sense of pleasure, addictive effects, and health risks when deciding to buy cigarettes.
- b. Demand Theory. According to Gorbunov (2021), demand theory explains the relationship between price and quantity of goods requested. In the case of cigarettes, demand theory suggests that when the price of cigarettes rises, consumers will buy fewer cigarettes (Kjeld *et al.*, 2021)
- c. Elasticity Theory. Gilroy *et al.* (2020) explained that this elasticity theory measures how sensitive economic variables (such as demand) are to changes in other variables (such as prices). Cigarette price elasticity helps to understand how much change in cigarette demand will occur in response to price changes.

2.4 Factors Affecting Cigarette Price Elasticity

There are five factors that affect the elasticity of cigarette prices, namely income structure, access to alternative tobacco products, other cigarette control policies, smoking habits and dependence, and availability of information.

- a. Revenue structure. Nguyen & Nguyen (2022) explained that the proportion of expenditure on cigarettes in low-income countries to income tends to be higher, so the demand for cigarettes in these countries is more elastic to price changes.
- b. Access to alternative tobacco products. Hampsher-Monk *et al.* (2020) explained that countries with easy access to alternative tobacco products such as vapes, cigarette demand may be more elastic to price changes.
- c. Other cigarette control policies. Hiilamo & Glantz (2022) explained that countries with strict cigarette control policies, such as bans on cigarette advertising and smoking places, cigarette demand may be more elastic to price changes.
- d. Smoking habits and dependence. Explained by González-Roz *et al.* (2019), that smokers who have strong smoking habits and high dependence on nicotine tend to have lower price elasticity.
- e. Availability of information, Levy *et al.* (2018) explained that consumers who have more complete information about the dangers of cigarettes and the benefits of quitting smoking may have higher price elasticity.

3. Methodology

This study is carried out through a literature review approach, often referred to as a literature review or literature review, as explained by Dan Chitu Okoli (2015) that literature review is a systematic process to find, evaluate, and analyze written sources that are relevant to a certain research topic or discussion. These sources can be in the form of scientific articles, books, research reports, theses, dissertations, and so on (Okoli & Schabram, 2010).

The main objectives of the literature review are to (1) understand and map the various perspectives, theories, and findings of existing research related to the topic discussed; (2) identifying research gaps that are still untapped and potential for new research (Galvan & Galvan, 2017); (3) strengthen arguments in a scientific work, such as a thesis, thesis, dissertation, or scientific article; and (4) provide a solid theoretical context and foundation for research or discussion (Ernel *et al.*, 2021).

The steps that have been taken in this Literature review are outlined below.

1. Determining the Topic and Focus, namely finding various concepts, theories and implementations from various literature that are related to the elasticity of permit prices for cigarette products in various countries.
2. Search for Literature Sources using the help of Google Scholar and Harzing Publish or Perish (POP). The search is limited to Scopus indexed publications or others at the publication limit from 2016 to 2024. The keywords used are Demand Price Elasticity and Cigarette.
3. Evaluating Literature Sources. From POP, 312 articles were found, then evaluated based on the most relevant theme and the accuracy of the research results, so 8 articles were selected to be analyzed.
4. Conducting Literature Analysis and Synthesis, with the working steps below.
 - a. Identify the title, research objectives, theories used, methods, and findings with the help of elicita.i
 - b. Compare the content of the article so that the similarities, differences and advantages of each among cigarette producers/consumers can be understood.
 - c. Certifying the meaning and making conclusions of the study to evaluate the achievement of research objectives.

4. Results and Discussion

The results of the literature review are shown in Table 1 below. There are 8 (eight) articles analyzed, namely a study on the elasticity of cigarette price demand in Spain, Europe, Bosnia and Herzegovina, Bangladesh, and other countries.

Table 1 Results of literature review

No.	Literature Source	Methods and Results
1	Almeida, A., Golpe, A.A., Iglesias, J., Jesús, & J.M.M. (2020).	<p>Methods: Dynamic spatial panel data model, cigarette demand in Spain</p> <p>Findings:</p> <ol style="list-style-type: none"> 1. Tobacco consumption in an area is influenced by consumption in neighboring areas, indicating spatial dependence. 2. The long-term price elasticity of cigarettes often exceeds the absolute value of -1, which is a novelty because tobacco has historically been treated as an inelastic commodity. 3. The most price-sensitive regions are those bordering France and Gibraltar or tourist areas, which indicate the impact of smuggling on regional behavior.
2.	Kohler, A., Vinci, L., & Mattli, R. (2023)	<p>Methods: Panel data regression, cigarette demand in Europe</p> <p>Findings:</p> <ol style="list-style-type: none"> 1. Analyzing the annual cross-section, the price elasticity of cigarette demand in Europe has not become elastic over the past decade. 2. Combining cross-annual data, the price elasticity of cigarette demand in high-income countries in Europe is around -0.4. 3. Estimates of price elasticity based on country-level aggregate data are similar to estimates of individual-level survey data, if country-level data is weighted based on the number of population. 4. Estimates based on retail sales including illicit trading are lower than estimates based on retail sales alone.
3.	Gligorić D, Pepić A, Petković S, Ateljević, J., & Vukojevi, B.(2019).	<p>Method:</p> <p>Observational microdata of the Household Budget Survey in Bosnia and Herzegovina in 2011 and 2015, applied the Deaton demand model to estimate the elasticity of demand prices</p> <p>Findings:</p> <ol style="list-style-type: none"> 1. The price elasticity of cigarette demand in Bosnia and Herzegovina is -1,366, meaning that a 10% increase in cigarette prices will lead to a decrease in demand by 13.66%. 2. This price elasticity is more elastic than the range of -0.2 to -0.8 found in similar studies in low- and middle-income countries, which shows that cigarette demand in Bosnia and Herzegovina is highly responsive to price changes. <p>Raising the price of cigarettes, which is most likely due to higher excise rates, can be an effective tobacco control policy in Bosnia and Herzegovina.</p>
4	Martín Alvarez, J.M., Golpe, A.A., Iglesias, J., & Ingelmo R. (2020).	<p>Metode: Implementation of model non-linear autoregressive distribution lag (NARDL) (di Spain)</p> <p>Respondents: Race/ethnicity: percent Hispanic, Non-Hispanic White, Non-Hispanic Black, non-Hispanic Native or Alaska Native, other non-Hispanic races/ethnicities</p> <p>Findings:</p> <ol style="list-style-type: none"> 1. Cigarette consumption has an asymmetrical relationship with economic conditions, increasing by 4.05% with economic growth of 10% but decreasing by 58.16% with an economic decline of 10%. 1. Price elasticity is in line with previous research, where a 10% increase in prices was associated with a 2% decrease in cigarette consumption.

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5. Tauras, J.A., Pesko, M.F., Jidong Huang, Frank J. Chaloupka, and Matthew C. Farrelly (2016) Method: Generalized Linear Model (GLM) two-way fixed effect (in the United States)
Findings:
1. The absolute value of the price elasticity of cigarette demand increases monotonously along with the increase in cigarette prices.
 2. At a price of \$2 per pack, the average price elasticity is -0.34, while at a price of \$10 per pack, the average price elasticity is -1.70.
 3. This means that a 10% increase in cigarette prices will have a greater impact on reducing consumption in countries with higher cigarette prices compared to countries with lower cigarette prices, but countries with higher cigarette prices will generate less additional revenue from the tax increase.
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6. Tarantilis, F., Athanasakis, K., Zavras, D., Vozikis, A., & Kyriopoulos, I. (2015) Methods: Retrospective economic metric analysis of regression (in Greece)
Findings:
1. The price elasticity of short-term cigarette demand in Greece is estimated at -0.441.
 2. The short-term income elasticity against cigarette demand is estimated at 1,040, which suggests that cigarettes are considered a luxury item in Greece.
 3. Raising cigarette taxes can lead to a significant decrease in consumption, an increase in tax revenue, and a decrease in the number of smokers and deaths due to smoking.
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7. Kjeld, S. G., Jørgensen, M.B., Aundal, M. & Sofie, L. (2023) Methods: Combined longitudinal and cross-sectional data regression (youth smokers <30 years in high-income countries)
Findings:
1. Rising tobacco prices are affecting tobacco use among adolescents, with impacts varying by gender and age.
 2. Adolescent girls are more price-sensitive when it comes to starting smoking, while adolescent men are more price-sensitive when it comes to cigarette prevalence and consumption.
 3. Younger age is associated with higher price elasticity.
 4. Estimates of price elasticity vary across different studies, likely due to differences in data sources, methods, and countries of origin.
 5. Most studies have been around for a long time, so further examination of current and locally applied measures is needed to make reliable predictions.
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8. Rumana Huque, R. & Nargis, N. (2024) Methods: Probit regression and log-linear regression (Bangladesh)
Findings:
1. Demand for cigarettes in Bangladesh is inelastic to price, with price elasticity ranging between -0.51 and -0.73.
 2. People in wealthy communities are twice as responsive to price changes as those in wealthy communities.
 3. A significant increase in the price of lower-end cigarettes will effectively reduce overall cigarette consumption in Bangladesh.
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Study 1: Spain

Cigarette consumption in an area is influenced by consumption in neighboring areas (spatial dependence). The long-term price elasticity of cigarettes exceeds -1, indicating high sensitivity to price changes. Border and tourist areas are more sensitive to prices, likely due to smuggling.

Study 2: Europe

Annual analysis shows inelastic price elasticity in the last decade. Combining cross-annual data, price elasticity in high-income European countries is around -0.4. The aggregate estimate is equivalent to the individual estimate if weighed based on population. Estimates that include black trade are lower than those that are not.

Study 3: Bosnia and Herzegovina

The price elasticity of cigarette demand is -1,366, indicating a high response to price changes. This elasticity is more elastic than other countries, indicating the potential for effective price policies. Increasing the price of cigarettes through excise can be an effective tobacco control tool.

Study 4: Bangladesh

Demand for inelastic cigarettes, with price elasticity between -0.51 and -0.73. Rich groups are more responsive to price changes than poor groups. The increase in the price of low-end cigarettes can be effective in reducing overall consumption.

Study 5: Other Countries

Studies in other countries show the elasticity of cigarette prices varies between -0.2 and -1.5. Factors such as income, culture, and access to alternative tobacco products influence demand. Effective tobacco control policies must take these factors into account.

The demand for cigarettes in different countries shows variations in price elasticity. Factors such as price, income, culture, and illicit trade affect demand. Raising cigarette prices through excise and other policies can be an effective tool to reduce cigarette consumption and improve public health. It is important to consider the local context and factors influencing demand when designing tobacco control policies.

4.1 Variations in Cigarette Price Elasticity in the World

The elasticity of cigarette prices in various countries in the world shows considerable variation. This is due to various factors, such as: (1) Income structure: In low-income countries, the proportion of expenditure on cigarettes to income tends to be higher. This causes the demand for cigarettes in these countries to be more elastic to price changes (Nguyen & Nguyen, 2022); (2) Access to alternative tobacco products: In countries with easy access to alternative tobacco products such as vapes, cigarette demand may be more elastic to price changes (Hampsher-Monk *et al.*, 2020); and (3) Other tobacco control policies: In countries with strict tobacco control policies, such as cigarette advertising bans and smoking places, cigarette demand may be more elastic to price changes (Hilamo & Glantz, 2022).

4.2 Cigarette Price Elasticity and Its Control Policy

Research on cigarette price elasticity in the world is very important to (1) evaluate the effectiveness of cigarette consumption control policies, according to the results of research by Kjeld *et al.* (2021) that cigarette price elasticity allows researchers and policymakers to predict the impact of policies to increase cigarette prices on cigarette consumption; (2) Formulate more effective policies, because according to Gjika *et al.* (2020) the results of cigarette price elasticity research can be used to formulate more appropriate and effective policies to control cigarette consumption, taking into account the characteristics and needs of each country; and (3) Increase public awareness, according to Rohde *et al.* (2020) The results of cigarette price elasticity research can be used to increase public awareness about the negative impact of cigarettes and the effectiveness of cigarette consumption control policies.

5. Conclusion

The results of this study provide an understanding that the elasticity of cigarette price demand in the world has important implications for cigarette consumption control policies. The policy of increasing cigarette prices will cause high elasticity of cigarette prices, increasing cigarette prices can be an effective strategy to reduce cigarette consumption. Cigarette price elasticity can also help in formulating policies to control other cigarette consumption, such as banning cigarette advertising and smoking places. Information about the dangers of

cigarettes and the benefits of quitting smoking can improve the elasticity of cigarette prices and encourage consumers to reduce cigarette consumption.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** L.R. and S.; **data collection:** L.R. and S.; **analysis and interpretation of results:** L.R. and S.; **draft manuscript preparation:** L.R. and S. All authors reviewed the results and approved the final version of the manuscript.

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