

Impact of specific excise rate simplification on cigarette consumption and government revenue in Indonesia

Ade Hidayat and Nasruddin Djoko Surjono

Abstract

This study estimates the impact of excise tariff simplification on cigarette consumption and government revenue. In addition, the study compares the ‘simplification’ case with the ‘no simplification’ case. Several estimation models using unbalanced and sub-balanced panel data, random effect maximum likelihood estimation (MLE) and panel-corrected standard errors (PCSE) are explored to estimate the impact. The results indicate that tariff simplification has a greater impact on raising cigarette prices, reducing consumption, and increasing government revenue than regularly increased excise rates. The greatest impact can be seen in cigarettes produced by large companies and white cigarette machine-made product. The results also suggest that cigarette excise taxes are ‘under-shifted’ to consumers and that producers bear some of the tax burden.

1. Introduction

In recent decades, cigarette consumption has declined in developed countries but has increased significantly in developing countries. At the beginning of 2000, 80 per cent of the world’s 1.1 billion smokers lived in low and middle income countries (Jha & Chaloupka 2000). In 2002, the World Health Organization (WHO) stated that the problem had become an epidemic: cigarette smoking is not confined to certain demographics but extends to males and females, affluent and less affluent, as well as children.

In Indonesia, the National Socio-Economic Survey (SUSENAS) data shows that there were 25 million smokers in 1980. This figure increased to 32 million in 1986 and to 41 million in 1995. The ratio of men who smoked increased from 46 per cent to 51 per cent between 1980 and 1995. Recent data shows that in 2010, 35 per cent of people aged 15 years and over were smokers (of which 65 per cent were men and 35 per cent women).

Over a ten-year period (2001 to 2010) the number of child smokers (that is, children between 5 and 9 years of age) increased by 400 per cent, from 0.4 per cent (SUSENAS 2001) to 1.7 per cent (Ministry of Health [Indonesia] 2010), while the prevalence of adolescent smokers aged 13 to 15 years increased from 12.6 per cent in 2006 to 20.3 per cent in 2009. In 2007, Indonesia was the fifth largest consumer of cigarettes after China, the United States of America (US), Russia and Japan, and had the third highest number of smokers in the world (after China and India). In terms of the number of cigarettes consumed, De Beyer and Yürekli (2000) state that cigarette consumption in Indonesia rose by 159 per cent (from 33 billion to 84 billion) between 1970 and 1980; 67 per cent between 1980 and 1990 (from 84 billion to 141 billion); and 47 per cent (from 141 billion to 208 billion) from 1990 to 1999.

This phenomenon is very concerning considering the negative impact that smoking has on health. Kosen (2004) reported that in 2001 there were at least 200,000 Indonesians (of approximately 57 million smokers) who died from smoking-related diseases. Kosen (2004) adds that the cost incurred due to

cigarette consumption reached 127.4 trillion rupiah (Rp) (USD13.9 billion) in the same year. This figure includes the use of tobacco products, hospital bills due to illness, disability and death caused by smoking.

Pigou (1920) argued that the negative externalities generated by certain commodities need to be tackled by imposing taxes on these commodities so that externalities can be internalised earlier. This kind of tax is widely known as the ‘Pigouvian’ tax. The burden of Pigouvian tax on cigarettes is equated with the marginal external damage caused by tobacco consumption. In general, the term is equal to excise tax (‘excise’), and excise, besides being a tool for correcting externalities, is a potential source of government revenue. Cnossen (2005) argued that excise is preferable to income tax as a means of increasing revenue because the latter seriously distorts the supply and demand for labour.

In addition, the growing trend of trade liberalisation policies with other countries (for example, free trade areas) needs to be considered as import duty rates will gradually disappear and therefore no longer provide a source of government revenue. This means that excise is becoming increasingly important. This can be seen from the Global Excise Summit, held for the first time on 2-3 July 2012 by the World Customs Organization (WCO) in cooperation with the International Tax and Investment Center (ITIC). There, participants from 160 countries discussed a wide range of excise duties collected by customs agencies, the theory and principles of tax policy, best practice, law enforcement, and excise as a means of maximising government revenue.

There are at least three things that determine excise policy: the excise burden, the excise system, and the structure of excise rates. Economists maintain that increasing excise is considered an effective means of reducing consumption. According to Chaloupka, Hu, Warner, Jacobs and Yürekli (2000), increasing the excise rate by 10 per cent of the retail price would reduce consumption of cigarettes by 4 per cent in high income countries and 8 per cent in low and middle income countries.

The excise system has also had an impact on consumption, government revenue and price (Chaloupka, Peck, Yürekli, Tauras & Xu 2010). There are three excise regimes: specific, *ad valorem* and hybrid. Specific excise is levied on the amount of goods produced or consumed as the amount per pack, stick or gram of tobacco; *ad valorem* excise is based on a percentage of the product value (price) or processing costs or the price of imports, while hybrid excise is a combination of the two.

The tariff structure determines the effectiveness of the tariff rate and excise system adopted. Variable excise rates can cause prices to rise or fall. Countries use a wide variety of tariff structures—they may impose different tax rates for each brand, a ‘complex tariff’, or a single rate applicable to all types of cigarettes.

Excise policy in Indonesia is constantly being reformed, especially since the Excise Act 2007 (Law No. 39) entered into force. From 2002 to 2006, the government implemented an *ad valorem* system (that is, multiple rates based on production capacity and type of tobacco products) by simply changing retail prices every year and leaving the *ad valorem* tariff fixed. From 2007 to 2008, the government used a complex hybrid system, which was a combination of the specific and *ad valorem* excise systems. Later, in 2009, the government began implementing a multiple specific tax system, where specific tax rates are increased annually in a ‘quasi *ad valorem*’ system. As a result, all tax rates in the excise tariff are specific rates levied ‘per stick’, however the classification which determines the rate is based on a retail sales value. In 2012, the government then simplified the excise tariff by merging the rate groups. A detailed description of Indonesia’s shift in excise policy can be seen in Table 1.

Table 1: Transition of the excise system and tariff rates from 2005 to 2012

| Type | System | | ad valorem | | Hybrid | | | | Specific | | | | |
|---------------------------------|-------------------------------|-------------|------------|---------|---------|--------------------|---------|-----------------|-------------------------------|-------------------|------|------|------|
| | Production | | 2005 | 2006 | 2007 | | 2008 | | | 2009 | 2010 | 2011 | 2012 |
| | Manufacturer Production Group | Sticks/year | Adv (%) | Adv (%) | Adv (%) | Spfc Rp/bt | Adv (%) | Spfc Rp/bt | Manufacturer Production Group | Specific Rp/stick | | | |
| Clove Cigarettes (Machine-made) | I | > 2.0M | 40 | 40 | 40 | 7 | 36 | 35 | I | 290 | 310 | 325 | 355 |
| | | | | | | | | | | 280 | 300 | 315 | 345 |
| | | | | | | | | | | 260 | 280 | 295 | 325 |
| | II | 0.5-2.0M | 36 | 36 | 36 | 5 | 35 | 35 | II | 210 | 230 | 245 | 270 |
| | | | | | | | | | | 175 | 195 | 210 | 235 |
| | | | | | | | | | | 135 | 155 | 170 | 235 |
| III | < 0.5M | 26 | 26 | 26 | 3 | 22 | 35 | merged II & III | | | | | |
| White Cigarettes (Machine-made) | I | > 2.0M | 40 | 40 | 40 | 7 | 34 | 35 | I | 290 | 310 | 325 | 365 |
| | | | | | | | | | | 230 | 275 | 295 | 365 |
| | | | | | | | | | | 185 | 225 | 245 | 365 |
| | II | 0.5-2.0M | 36 | 36 | 36 | 5 | 30 | 35 | II | 170 | 200 | 215 | 235 |
| | | | | | | | | | | 135 | 165 | 175 | 190 |
| | | | | | | | | | | 80 | 105 | 110 | 125 |
| III | < 0.5M | 26 | 26 | 26 | 3 | 15 | 35 | merged II & III | | | | | |
| Clove Cigarettes (Handmade) | I | > 2.0M | 22 | 22 | 22 | 7 | 18 | 35 | I | 200 | 215 | 235 | 255 |
| | | | | | | | | | | 150 | 165 | 180 | 195 |
| | | | | | | | | | | 130 | 145 | 155 | 195 |
| | II | 0.5 - 2.0M | 16 | 16 | 16 | 5 | 10 | 35 | II | 90 | 105 | 110 | 125 |
| | | | | | | | | | | 80 | 95 | 100 | 115 |
| | | | | | | | | | | 75 | 90 | 90 | 105 |
| IIIA | < 0.5M | 8 | 8 | 8 | 3 | 0 | 30 | III | 40 | 50 | 65 | 75 | |
| IIIB | < 0.06M | 4 | 4 | 4 | 3 | merged IIIA & IIIB | | | | | | | |

Source: Fiscal Policy Agency, Ministry of Finance, Republic of Indonesia 2012.

In 2009 there were 19 layers of excise tariffs on primary products. This was made up of six layers of machine-made clove cigarettes (SKM), six layers of white cigarettes machine-made (SPM) and seven layers of white cigarettes handmade/clove handmade (SPT/SKT). The number of layers was reduced to 15 in 2012 (5 layers of SKM, 4 layers of SPM, 6 layers of SPT/SKT), and further simplified in 2013 to 13 layers.

White cigarettes (filter)/Kretek (clove cigarettes) and handmade filters (SPF/TF) have the same number of layers as machine-made clove cigarettes (SKM). Initially, this product is made with SKM with the filters added manually, which is one of the strategies used by the tobacco industry to ensure their products are categorised as SKT which has a lower rate than SKM. Accordingly, white cigarettes and Kreteks made manually or by machine (either all or in part) will be classified at a specific tax rate equal to the specified SKM layer and rates (provided they use a filter).

The rate for these tobacco products (SKM, SPM, SKT/SPT and STF/SPF) made from imports has also increased but in the form of a single rate with no groups or layers. SPM attract the highest tariff, while the lowest is for SKT imports. The rate of SKM imports is equal to the rate of STF/SPF imports, following the same provisions with local products. All types of tobacco products made from imports are subject to the highest rates applied to the same type of tobacco products made locally.

Specific tax rates for other tobacco products, such as ‘slice cigarettes’ (Tembakau Iris [TIS]), ‘leaves cigarettes’ (Klobot [KLB]), ‘rhubarb incense cigarettes’ (Klembak Menyan [KLM]), ‘cigars’ (CRT) and ‘other tobacco processing products’ (HPTL) were not increased until 2012. In 2013 the government raised the rates of these five specific tobacco products, as can be seen in Table 2.

Table 2: Excise rate on other tobacco products

| Type | Manufacturer Production Capacity | | Specific Tariff | | | | | Description (Increased in 2013) |
|---------------------------|----------------------------------|-------|-----------------|---------|---------|---------|---------|---------------------------------|
| | Gol | Layer | 2009 | 2010 | 2011 | 2012 | 2013 | |
| Slice Cigarette | | 1 | 21 | 21 | 21 | 21 | 25 | Increase |
| | | 2 | 19 | 19 | 19 | 19 | 20 | Increase |
| | | 3 | 5 | 5 | 5 | 5 | 5 | Increase |
| Leaves Cigarette | | 1 | 25 | 25 | 25 | 25 | 25 | Increase |
| | | 2 | 18 | 18 | 18 | 18 | 20 | Increase |
| Rhubarb Incense Cigarette | | | 17 | 17 | 17 | 17 | 20 | Increase |
| Cigars | | 1 | 100.000 | 100.000 | 100.000 | 100.000 | 100.000 | |
| | | 2 | 20.000 | 20.000 | 20.000 | 20.000 | 20.000 | |
| | | 3 | 10.000 | 10.000 | 10.000 | 10.000 | 10.000 | |
| | | 4 | 1200 | 1200 | 1200 | 1200 | 1200 | |
| | | 5 | 250 | 250 | 250 | 250 | 250 | |
| Other Tobacco | | | 100 | 100 | 100 | 100 | 100 | |

Source: Analysed by the authors based on Finance Ministry Decree No. 203/PMK.011/2008, 181/PMK.011/2009, 99/PMK.0111/2010, 190/11/2010, 167/011/2011 about Excise Tariff on Tobacco Product.

Researchers have used the excise policies implemented in Indonesia as a means of measuring related impacts, ranging from the control and reduction of cigarette consumption and the increase in potential revenue, to the manufacturer's ability to respond to and survive in the face of any changes in tax policy. The impact of the amount of excise tax has been discussed in many studies and the impact that these three systems has on the price and consumption of cigarettes was analysed in a dissertation by Surjono (2013) but, to the authors' knowledge, there has not been any analysis based on empirical research of the advantages or impact of a simple fare structure or a single rate for reducing consumption and raising revenue.

2. The research problem

The imposition of excise tax may be approached differently by individual cigarette manufacturers. Any increases in tax rates can be borne entirely by the manufacturers so that they do not cause price increases and are more likely to occur when any tax increase is significant but the demand for the product is elastic and they risk losing market share. This, of course, directly impacts the manufacturer's profit margins. Alternatively, where a product is relatively price inelastic and consumers are less impacted by price increases then manufacturers pass the new tax burden on to consumers. The tax burden can also be transferred in total (full-shifting) or in part (under-shifting) to the consumer in the form of price increases. In some cases, increases in the cigarette price may even exceed the increase in excise rates (over-shifting). High tax rate increases are assumed to cause high increases in price and can ultimately affect the consumer's decision to reduce the consumption of cigarettes and this, in turn, can improve public health.

On the other hand, an increase in excise rates does not necessarily increase government revenue. The amount of revenue is calculated by multiplying the quantity of cigarettes consumed by the excise rate. If the demand for cigarettes is inelastic, revenue will rise in line with rate increases. However, when excise rates are too high and products are relatively price elastic, a decrease in revenue is possible as consumption falls or consumers 'trade down' to products that pay less excise tax. This scenario was best highlighted by American economist, Arthur Laffer (Blecher & van Walbeek n.d.).

The complexity of tobacco taxation policy within the context of achieving revenue targets, improving the health of the population and supporting the local industry persuaded the Indonesian government to prepare a road map for the tobacco industry for the period 2007 to 2020.¹ In the short term (2007–2010), the government made employment its first priority, followed by government revenue and then health. Prioritising employment reflected the government's awareness of the need to escape the effects of the economic and financial crisis of 1997–1998. In the mid-term (2010–2015), government revenue became the top priority, followed by health and labour problems. In the longer term (2015–2020), tobacco excise policies will largely be determined by health aspects. The cigarette industry will be encouraged to export: manufacturers will be limited to prevent new players entering the market and old players will be encouraged to switch to other industries.

Implementing this road map requires, *inter alia*, an annual increase in the excise rate and ongoing simplification of the tariff structure. To this end, the Indonesian government established the specific excise system in 2009. In 2012 the government raised the specific excise rate and, at the same time, simplified the tariff structure. Cigarette brands based on the type of tobacco, and in a certain group and a certain excise rate (usually in the bottom layer of the group), were to be merged with the layer above. In other words, simplification entails a rate increase because of a merger between two or more layers of rates, while a rate increase by itself does not entail such a merger. As a result of this policy, the percentage increase owing to tariff simplification is higher than that owing to non-simplification. This can cause the price of cheap cigarettes to become more expensive and even approach premium price. Less variation in cigarette prices can reduce consumer incentives to substitute.

This policy implication was the motivating factor behind this research. It became apparent to the authors that no research has been carried out into the impact of simplifying tax rates (which in Indonesia are very complex) on the price of cigarettes, cigarette consumption and government revenue. In addition, although several countries have simplified their excise tariff structure, no empirical research is available to evaluate whether this policy can achieve its objectives. There has, however, been research on the effect of different rates for different tobacco products (Townsend 1998). According to Hanafy, Saleh, Elmallah, Omar, Bakr and Chaloupka (2010) Egypt shifted from complex specific rates to a single rate in a hybrid system in July 2010. However, that study did not look at the impact of simplification on consumption level. It did find, however, that a single hybrid tariff caused retail prices to rise by 40 per cent.

Examples of other studies that have been conducted in Indonesia include the impact of the *ad valorem* system and retail prices on market competition (Sarmuhidayanti 2008; Fauzan 2002), on government revenue (Kusumasto 1998; Purwanto 2003), and on consumption (Herlambang 2005); the impact of the *ad valorem* system on consumption and government revenue (Adioetomo, Djutaharta & Hendratno 2005) and on labour (Djutaharta, Surya, Pasay, Hendratno & Adioetomo. 2005), and the impact of three different excise systems (specific, *ad valorem* and hybrid) adopted by Indonesia on cigarette consumption (Surjono 2013).

Based on the background and issues outlined above, the aim of this study is to determine whether the effect of restructuring the excise rate would be greater than the usual price hike policy of increasing the price of cigarettes, reducing consumption, and increasing government revenue from tobacco excise.

3. Concept

Excise tax, as an economic instrument, has four goals (Cnossen 2005). Its first goal is to provide an alternative source of government revenue. Compared to income tax, excise can generate significant additional revenue at low political and economical cost (Hines 2007). Excise is also easier to administer because goods subject to excise are readily identifiable and the scope of the tax is usually narrow resulting in a limited number of taxpayers to control. Further reasons for using excise to boost revenue include the high volume of sales and limited substitutability with other items that can provide the same utility (despite the high prices due to excise duty). The second goal is the application of the benefit principle of taxation, whereby taxes are imposed on those who use the goods and services (that is, a 'user pays' principle). An example of this is where users of roads may pay an excise tax on both the automobile they purchase and on the fuel they consume, thus raising funds for the central budget from which road repair and maintenance will be funded. Correcting negative externalities is the third goal, with excise being considered compensation for external costs incurred by consumers or producers on others, at the same time the excise tax forming part of the price sends a signal to the consumer as to the cost of the harm that may be caused by consumption.

From the work of Cnossen (2005) and Hines (2007), the authors have identified at least five problems related to the design of excise collection:

1. Choosing which excise system to adopt (that is, a specific, *ad valorem* or hybrid system). As noted above, the specific system is the nominal amount of currency per unit of goods subject to excise, whereas *ad valorem* tax is based on a percentage of the selling price of goods subject to excise, and hybrid systems combine the specific and *ad valorem* systems.
2. Determining how the layer or level and the unit are used as a tax base. A single rate applicable to all tobacco products is seen as effective in reducing cigarette consumption, improving the effectiveness of tax administration and increasing government revenues. A uniform tariff also reduces the level of non-compliance and price manipulation by the cigarette manufacturers, and provides a disincentive for smokers to substitute to other types of tobacco products (WHO 2010).

3. Coordinating excise collection with the imposition of excise taxes on consumption and other indirect taxes, such as Value Added Tax (VAT), in order to achieve the intentions of each type of tax. Excise is primarily imposed to address the externalities of consumption whilst VATs are revenue-raising instruments. In all cases, excise will be applied before VAT and as such, VAT is levied on a value which includes excise.
4. Ensuring that policymakers consider the increased likelihood of smuggling, tax evasion and tax avoidance due to the implementation of the excise system, excise amount and structure of tariffs imposed on goods subject to excise.
5. Ensuring that issues related to the optimal tax rate are considered. This depends on whether the rate is set uniformly or flexibly. Ramsey (1927), who introduced the idea of optimum taxes, stated that the optimal tax rate (which does not distort economic decisions), must be charged flexibly based on the elasticity of demand for goods that will be subject to excise duty. A higher rate of excise duty will be imposed on goods that have a more inelastic demand (assuming constant supply elasticity).

Diamond (1975) elaborates on Ramsey's work, recommending that excise should satisfy the principle of optimal tax efficiency, that is, lower rates for elastic goods and the principle of fair distribution and higher tariffs for goods purchased by high-income individuals. Corlett and Hague (1953–54) add that the government's inability to collect leisure taxes led to a uniform or single tax rate which, according to Ramsey's model, was not optimal. The second-best correction in Ramsey's model is set on a higher excise tax on goods and services which complements leisure. Pigou (1920) argues that the excise rate should reflect its function of correcting externalities. He states that the tax rate is set at the marginal external damage to restore economic efficiency. Sandmo (1975) advocates the application of Pigouvian tax, whereby the government relies on excise to increase tax revenue.

This study focuses on measuring the impact of the specific system and simplification of the excise rate structure on cigarette consumption and government revenue.

3.1 Incidence tax analysis

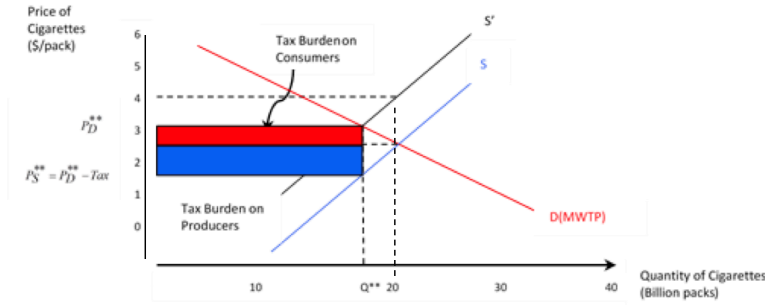
Incidence tax analysis is used to determine who bears the burden of the tax. The term 'tax incidence' can be divided into statutory incidence (a legal approach related to who is taxed) and economic incidence (who ultimately bears the burden of tax). This is possible because the tax burden can be shifted.

Incidence tax analysis on commodities can also be viewed from the perspective of who is consuming the goods (that is, users of income) and who is producing and earning income from them (that is, source of income). Rosen and Gayer (2010) maintain that the imposition of excise tax places more emphasis on the impact on consumers.

In a simple partial equilibrium, the imposition of excise duty depends on the elasticity of demand and supply. If demand for a particular commodity is elastic and supply is inelastic, then the excise duty will be paid by the seller (backward-shifting). Conversely, if demand is inelastic and supply elastic, then the tax is borne entirely by the purchaser (forward-shifting). When both the seller and the buyer are elastic, the excise burden will be borne by both parties.

A large tax burden borne by both parties (producers and consumers) also depends on the elasticity of demand and supply. When the demand curve is more elastic than the supply curve, the greater is the burden of excise duty borne by the manufacturer. This can be seen in Figure 1.

Figure 1: Demand curve more elastic compared to supply curve

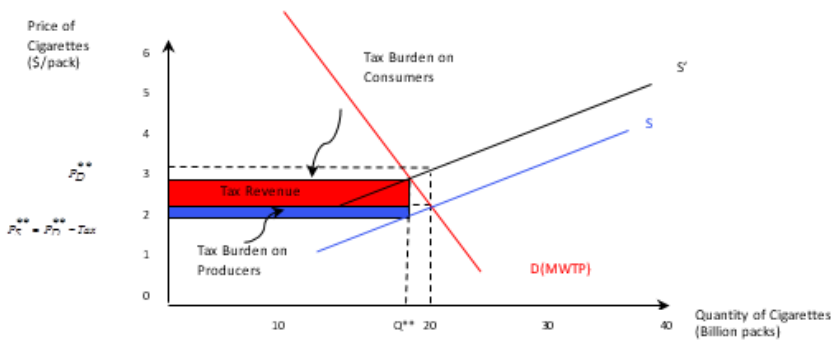


Source: Herriges 2010.

The implications would be different if the supply curve were more elastic than the demand curve. In this case, the tax burden borne by consumers would theoretically be greater than the tax burden borne by cigarette manufacturers.

The curve in Figure 2 further illustrates the supply and demand of commodities in which cigarette demand is inelastic or, in other words, supply more elastic than demand. Accordingly, producers charge more excise duty to consumers in the form of cigarette price increases (although not exceeding the amount of excise rates).

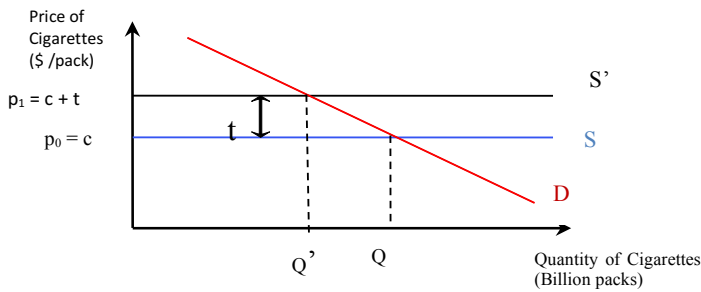
Figure 2: Supply curve more elastic than demand curve



Source: Herriges 2010.

Producers can shift the tax burden entirely to consumers in the form of price increases (full-shifting) when a perfectly elastic supply curve is a horizontal line. Figure 3 illustrates the tax incidence with perfectly elastic supply. In market competition with constant marginal cost, price is equal to marginal cost. Before subject to excise, equilibrium price is $p_0 = c$; once subject to excise duty, the price is $p_1 = c + t$. In that case, the total excise duty is charged to the buyer (full-shifting).

Figure 3: Tax incidence when supply is perfectly elastic



Source: Rosen & Gayer 2010.

Tax incidence also analyses the impact of imposing excise on price changes. When the selling price of the commodity increases but is below the level of the tax increases, the lesser tax burden is shifted to the consumer (under-shifting). If the price increase exceeds the increase in excise it is called ‘over-shifting’. Furthermore, if the price increase is the same as an increase in tax, consumers bear all the burden of excise duty (full-shifting).

Delipalla and O’Donnell (1998) state that in a perfect competition market, the tax burden due to specific and *ad valorem* systems will be full-shifting, but in imperfect competition both systems can be under-shifting, full-shifting or over-shifting. Market competition in the cigarette industry in Indonesia is an oligopoly market, especially among large producers.

For specific excise $\frac{\partial p'}{\partial u} = \frac{\partial p}{\partial u}(1-a) - 1$; $\frac{\partial p'}{\partial u} < 1$ *under shifting*, $\frac{\partial p'}{\partial u} = 1$ *full shifting* and $\frac{\partial p'}{\partial u} > 0$ *over shifting*.

3.2 Relationship between excise, tariff structure, price and demand

The impact of tax rates on consumption is not direct but affects the price of cigarettes first. A complex structure of excise rates converted into a simple structure will cause the price of cheap cigarettes to become more expensive, even becoming close to the premium price. This occurs when the government collapses low tax tiers so that the cheap cigarettes fall into the higher taxed categories. As an illustration, if the specific system (*u*) is imposed on expensive cigarettes (P_2) and cheap cigarettes (P_1) then the relative price difference between the two prices would be reduced and become:

$$P_2 + u_2)/(P_1 + u_1) \dots \dots \dots (2.1)$$

But on the contrary, if the *ad valorem* system (*a*) is applied to both prices, the relative price does not change:

$$(P_2.(1+a))/(P_1.(1+a)) = P_2 / P_1 \dots \dots \dots (2.2)$$

Furthermore, when cigarette prices do not vary significantly, prices do not affect cigarette consumption and the lack of variation reduces the incentive for substitution. The law that explains the link between the demand for a product and its price is the Law of Demand. This law states that the lower the price of an item, the greater the demand, and conversely, the higher the price, the lower the demand for that item.

From a microeconomic point of view, the consumer utility depends on the quantity of cigarettes consumed in relation to income level constraints, cigarette price, and the price of other goods. If X_1 X_2 is the quantity of cigarettes and a quantity of other consumer items, then the consumer will maximise utility by income as a constraint according to the following function:

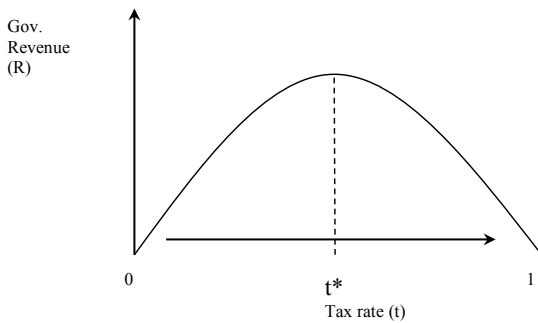
$$Max U = U (X_1 X_2) , subject to I = P_1X_1 + P_2X_2$$

From this equation, we assume that the more we consume cigarettes the higher utility without looking at the health impacts. Demand for cigarettes with utility maximisation is $X_1 = f(P_1, I)$ (Pyndick & Rubinfeld 1998).

3.3 Laffer curve

The Laffer curve theory describes the relationship between tax rates (excise) and tax revenue, with Laffer analysing the maximisation of tax revenue from the supply side (supply side). This theory states that higher tariff rates do not necessarily result in higher tax revenue because, at a certain level—which is when they reach the ‘prohibitive range of Government’—tax revenues will decline. The Laffer curve is shown in Figure 4.

Figure 4: Laffer curve



Source: Agung 2011.

The supply side of the economy considers the basic elements of human self-interest. In the context of cigarettes, where tax rates on cigarettes are lower, this is an incentive for consumers to increase consumption and for producers to increase production. In contrast, where the cigarette tax burden is too large, it will cause distortions in the economy both in the upstream sector (tobacco and clove farmers) and in the downstream sector (the tobacco industry and the expansion of the workforce).

From Figure 4 it can be seen that where there is an excise rate of 0 per cent, there is no government tax revenue (excise) and on the level of tax rates 100 per cent, the rational economic agents choose not to purchase and consume cigarettes. Both of these result in the absence of a government income tax. Tariff t^* is an extreme point or turning point of the curve and the point at which the maximum revenue from the tax will be generated.

4. Empirical research

4.1 The effect of tax rates on cigarette prices

Empirical studies on the effect of tax rates on cigarette prices show mixed results, ranging from no effect at all to doubling the price of the tax burden (Sullivan 2012). Sullivan (2012) conducted research on the tax effect on prices in the US using city-level data. The model addresses the influence of government and city taxes on prices.

Where the excise coefficient is equal to one, then the tax is fully passed on (fully shifted) to consumers in the form of a price increase of excise burden. Where the coefficient is equal to more than one there is over-shifting, while under-shifting (where the seller bears the burden of excise) occurs where the coefficient is less than one.

4.2 Cigarette demand

Empirical studies on cigarette demand are drawn from a variety of data sources, including aggregate demand data of an area, the household survey data, and transaction data by manufacturer tax. The data used in this study is excise transaction data per manufacturer.

4.3 Application of excise tariff structure

Some countries impose a higher tax burden on imported or premium cigarettes because cigarettes are not price-sensitive and are consumed by high-income people (WHO 2010). In addition, an excise structure with various rates is generally used where the government wants to protect domestic products against the invasion of multinational tobacco products and increase revenue, that is, attract higher excise duty on cigarettes as they are less sensitive to price. However, it should also be noted that such a policy is contrary to Article III of the General Agreement on Tariffs & Trade (GATT) and should not form part of policy consideration as it opens up the whole excise tax system to dispute by trading partners at the World Trade Organisation (WTO).

Theoretical and empirical evidence suggest that a single specific high rate, with an increase or adjustment for inflation each year, is better than other tax structures and systems in terms of improving public health and increasing revenue (Sunley, Yürekli & Chaloupka 2000). Townsend (1998) states that when the Egyptian government raised the excise tax on cigarettes, but not on shisha (other types of tobacco products), consumption of cigarettes was reduced while the consumption of shisha increased.

Chaloupka et al. (2000) also note that the different tax rates encourage consumers to substitute other types of tobacco products. For example, an increase in the cigarette excise tax rates in Poland (due to joining the European Union) led to the majority of Poles switching from cigarettes to roll-your-own tobacco (RYO). When RYO tax rates were increased to a similar level to that of cigarettes, consumers substituted pipe tobacco (WHO 2010).

On the producer side, a multi-level excise system based on production scale provides opportunities for companies to establish small enterprises in order to avoid a higher rate or reduce production levels. Bird (1999) uses production data for the years 1988 to 1992, from tobacco manufacturer, PT. Djarum, to show that companies reduce production to qualify for lower tax rates and maximise profits.

The WHO (2010), in their *Technical manual on tobacco tax administration*, stress the importance of changing the structure of complex taxes to simpler ones, gradually leading to a uniform specific rate. Single specific rates were recommended as they may facilitate customs administration, reduce tax avoidance and tax evasion, increase government revenue, and lead to improvement in health as they reduce the incentive for someone to switch to another cigarette when there is a tax increase.

Some countries have made the transition from complex tax systems to simple systems. As an example, India uses a specific tax system with a multi-rate based on the length and type of smoking cigarettes (filtered and non-filtered). In 2007–2008, the first two layers of rates for filter cigarettes were combined into a single tier, and then in 2008–2009, all non-filter cigarette rates were made equal to the rate for the first two layers of filter cigarettes greatly simplifying tobacco taxation (John et al. 2010). Egypt also used a multi-tier specific tax system before it eventually implemented a single hybrid tax in July 2010 (Hanafy et al. 2010). The single hybrid tariff led to an increase in retail prices of 40 per cent.

5. Methodology

5.1 Effect of simplification model specific tariff structure on price

Surjono (2013) conducted a study using 2005–2010 manufacturer-level data to examine the effect of specific, hybrid and *ad valorem* tax systems on the price of cigarettes. From the research, the dependent variable is affected by the price of cigarettes, the independent variable, tariff, of three excise systems, with dummies for 10 types of tobacco products, and the cigarette manufacturer group.

This study also used data per manufacturer related to ordering the excise ribbons² in the period 2009–2012 to examine the effect of the tariff structure simplification price. In the model of this study, the price of cigarettes as a dependent variable, with independent variable specific tax rate and dummy of four types of tobacco, simplification (merger) layer rate dummy (simplification = 1, no-simplification = 0), and variable interaction/multiplication between the tariff and dummy simplification to measure the difference before and after the effect of simplifying the structure rates. Dummy variables for Types of Tobacco Product and Production Capacity are also necessary in this model because cigarette prices are influenced by both (Herlambang 2005; Surjono 2013). Types of tobacco products that have been affected by the increase and the specific tariff simplification are SKM, SPM, SK /SPT and STF/SPF.

Research model:

$$Price_{i,t} = \alpha_0 + \alpha_1 excise\ sp_{i,t} + \alpha_2 D_SKM + \alpha_3 D_SPM + \alpha_4 D_SKT + \alpha_5 D_Gol\ I + \alpha_6 D_Gol\ II \\ + \alpha_7 D_Gol\ import + \alpha_8 D_simple_{i=j,t=2012} + \alpha_9 D_simple_{i=j,t=2012} * cukaisp_{i,t} + c_i \\ + \varepsilon_{i,t} \dots (3.1)$$

Where:

- $Price_{i,t}$ is the average nominal price of cigarettes per brand quarterly
- excise sp is the specific tariff nominal
- D_simple ($i = j, t = 2012$) is a dummy simplification, worth one (1) if $i = j$, where j is a brand of cigarette tobacco types and companies group which have been affected by simplification, $t = 2012$ means the period of simplification, year 2012. This variable is used to show the difference between before and after effect of simplification.
- D_SKM is a dummy, worth one (1) for the SKM type of tobacco product and zero (0) for other types of cigarette types
- D_SPM is a dummy, worth one (1) for the SPM type of tobacco product and zero (0) for other types of cigarette brands
- D_SKT / SPT is a dummy cigarette SKT / SPT, worth one (1) for SKT / SPT types and zero (0) for other types. Dummy STF cigarettes / SPF is used as reference
- $D_Gol\ I$ is a dummy manufacturer group I, is worth one (1) for manufacturer group I, 0 otherwise
 $D_Gol\ II$ is a dummy manufacturer group II, is worth one (1) for manufacturer group II, 0 otherwise
 $D_Gol\ import$ is a dummy for import-export manufacturer, is worth one (1) for import-export manufacturer, 0 otherwise
- $Gol\ III$ is used as a reference base
- D_simple ($i = j, t = 2012$) * $cukaisp$ is a dummy variable interaction between simplification and excise rates to determine whether the effect of the tariff simplification is larger or smaller as the excise rate increases.

5.2 Operational definitions of research variables

Cigarette retail selling price

Price variables used in this study are the retail prices per tobacco stick. Retail price is the transfer price from retailer to final consumer, which includes all taxes. The retail price in this model is a nominal price because we want to see the effect of the tax increase on cigarette price in the same time period.

Excise burden

This is the tax burden derived from the specific tariff in Indonesian Customs data and in the Minister of Finance Decree.

Dummy types of tobacco products

This refers to the explanation of Article 4(c) of Law 39 of 2007 on the Amendment to the Law No. 11 Year 1995 on Excise.

‘Dummy SKM’ means a cigarette brand with the type of tobacco in the form of SKM is 1, another type of tobacco is 0. ‘Dummy SPM’ means a cigarette brand with the type of tobacco in the form of SPM value is 1, for the other tobacco types is 0. ‘Dummy SKT/SPT’ means a cigarette brand with the type of tobacco in the form of SKT/SPT value is 1, for the other tobacco types is 0. Tobacco products STF/SPF are used as a reference.

Dummy production group

Dummy manufacturer groups are used to differentiate the brand of cigarettes based on the manufacturer’s production capacity and capability. Manufacturer Group I is a manufacturer that has a production capacity exceeding 2 billion cigarette sticks per year. Group II manufacturer is a manufacturer that is able to produce between 500 million cigarettes to 2 billion cigarettes per year. Group III manufacturer is a small manufacturer that can produce at most 500 million sticks per year. Dummy Gol I, means the value for the manufacturer’s Group I is one (1), the other was given a value of 0. Dummy Gol II, means the value of the Group II is one (1), the other was given a value of 0. Dummy Group Import, means one (1) for companies who import tobacco products, the other was given a value of 0. Brand of cigarettes made by manufacturer Group III (small manufacturer) is used as a reference base.

Dummy simplification

Cigarette brands from certain types of tobacco products and companies group which are included in the group that experienced tariff simplification in 2012 are set a value of 1 while the other is 0. The purpose of this dummy is to see the difference between the influence of the excise tariff simplification and regular excise rate increase.

Dummy variable interaction with tariff simplification

This variable is formed by multiplying the dummy of tobacco brands from which the type of tobacco products and the manufacturer group is included in the simplification, with the specific excise tariff. This variable enables us to see whether the effect of simplification is greater in increasing cigarette prices compared to the regular rate increase. The significance of the coefficient variable is used to answer the research question.

5.3 Effect of specific tariff structure simplification model on cigarette consumption

Economic variables have links to each other, so the empirical model constructed in this study tried to look at the effect of specific tax rates with simplification structure on cigarette prices, and the effect of the price on consumption through a 2SLS simultaneous panel model when there is endogeneity between

price and excise tax. If there is no endogeneity, a standard panel model is used. An endogeneity test (Wu-Hausman F test) was conducted to determine whether the price of cigarettes is an exogenous variable.

Model simplification of the tariff structure specific to consumption:

$$\begin{aligned}
 Consumption_{it} = & \beta_0 + \beta_1 Price_{i,t} + \beta_2 D_{SKM} + \beta_3 D_{SPM} + \beta_4 D_{SKT} \\
 & + \beta_5 D_{Gol I} + \beta_6 D_{Gol II} + \beta_7 D_{Gol import} + \beta_8 D_{simple_{i=j,t=2012}} + \beta_9 D_{simple} \\
 & * price_{it} + \beta_{10} PNcap_{it} + c_i + \varepsilon_{it} \dots \dots \dots (3.2)
 \end{aligned}$$

where:

- Consumption_{it} is the number of cigarettes per product per month
- PNcap_{it} is quarterly national income per capita
- D_simple * price_{it} is a dummy variable interaction with the simplification price
- Other independent variables as shown in the model referred to in section 5.1 above.

5.4 Operational definitions of research variables

Operational definitions provided here are limited to those that have not been provided elsewhere in this paper.

Consumption

‘Consumption’ refers to cigarette consumption data in studies in Indonesia using an approach derived from the annual SUSENAS data (Djutaharta et al. 2005). The data are the household expenditure data, however, variable cigarette consumption data from SUSENAS is too general and does not include the consumption of each type of cigarette in detail.

Cigarette consumption data used in this study is quarterly micro-data obtained from Indonesian Customs and Excise (DJBC) where there is known demand per quarter and per type. The unit of data used as a proxy of consumption is the number of sticks of the type of tobacco and production class group of companies. For example, if manufacturer A issued two types of tobacco products, namely SKM and SKT, SKT product where there are two different kinds of group production then it means there are three people/objects of research. This is done because the type of tobacco and production groups determine the amount of the rate charged.

A cigarette pack with a tax stamp affixed assumes that the cigarettes have been consumed. Cigarette-pack cigarettes with export stamps affixed means they are not intended for consumption so that cigarettes that are exported are not labelled ‘ribbon’ excise, while imported cigarettes will be consumed by domestic consumers that have ribbons affixed to cigarette packs. This fulfils the assumption that consumption is the addition of manufacturing production and reduced imports with exports. On the other hand, cigarettes are consumed within a year, as the quality and taste deteriorate within months, and the rate of excise stamps is less than 1 per cent. Data about packets of cigarettes with excise tax similar to the annual consumption data collected by the Indonesian cigarette ERC/TMA referenced several countries to determine cigarette consumption in a country.

Cigarette retail price

Price variables used in this study are the retail prices per production. Retail price is the transfer price from retailer to final consumer and includes all taxes. The retail price is a nominal price. In this study the nominal price is converted into a real price by the Consumer Price Index (CPI) and is applied to clove cigarettes, filter cigarettes and white cigarettes (tobacco only) using data from Statistics Indonesia (BPS).

Quarterly national income per capita

To calculate the quarterly national income at constant prices, the income is divided by the projected population at the end of the quarter of the year. National income is used as a proxy of income in this study following the consumption function. Djutaharta et al. (2005) use this data in models with monthly data consumption. National income is Gross National Product (GNP) minus depreciation and indirect taxes. GNP is Gross Domestic Product (GDP) plus net income from abroad. The proxy, National income, represents income before taxes (Djutaharta et al. 2005).

Dummy interaction variable with the simplification price

This variable is formed from dummy multiplication simplification with the retail selling price of cigarettes per stick. Signs of the coefficient of this variable are indicated if cigarette prices due to simplification cause cigarette consumption to be less than the increase in cigarette prices due to a standard tariff.

5.5 The impact of simplification on excise revenues

Research by Chaloupka et al. (2010) looks at the effects of the tax system with the independent variables of government revenue in the form of government income tax rates and investigates the influence of specific and *ad valorem* and other economic characteristics variables.

Model simplification of tariff policy effects on government revenue:

where:

- Revenue is Excise Revenue quarterly per manufacturer
- Information about the other independent variables is as included in the models and in sections 5.1 and 5.3 above.

This model can be ignored if consumption continues to rise with the increase in excise tariff.

5.6 Operational definitions of research variables

Operational definitions provided here are limited to those not defined elsewhere in this paper.

Excise revenue

Excise revenue is the quarterly tax revenue derived from customs data. As a comparison to ensure accuracy, the data are also seen from the Directorate General of Government Treasury, Treasury Management Directorate and Ministry of Finance. The data contain details of the monthly tax revenue. Data revenue from the tax is part of the income tax in the sub-section 'tobacco excise revenue'.

Data

There are two original data sets in the form of 'unbalanced panel' because there are companies that ceased operation in the period of study and/or there are companies that entered the market part-way through the study. Manufacturers do not always reserve duty within three months so that there are 'empty' transaction data used in the quarterly period. Where there is no booking transaction tax within three months it can be assumed that the production of the cigarette manufacturer has not been consumed within three months. The model used to estimate the data is the unbalanced panel random effect model of the maximum likelihood estimator. The second data set is data taken from the original form of the data portion of the balanced panel data (balanced panel) where the research data are provided in the quarterly period. Data sub-balanced panels were used to reinforce the results of the analysis with unbalanced panel data.

The main data used in this study are the data related to the ordering of excise ribbons for the period April 2009 to December 2012. The data are the daily transaction data from the database of the Directorate General of Customs and Excise, which accumulates data on quarterly transactions. Specific excise rates data are taken from the Ministerial Regulation on Customs Tariff Tobacco results for 2008–2011. The retail price of cigarettes per stick is obtained from the conversion of constant prices using the CPI according to the type of tobacco smoking investigated. This index consists of a filter cigarette, white cigarettes and Kretek cigarettes which is obtained from the Central Bureau of Statistics. The number of cigarettes, cigarette type and class (capacity) is obtained from the Directorate General of Customs and Excise data of production. Quarterly national income per capita of data was sourced from Statistics Indonesia, which is obtained from the Quarterly National Income Sub GDP and population data each quarter, based on estimated demographics.

6. Results and analysis

From Table 3 it can be seen that the nominal tax rate ranges between Rp 40 in 2009 to Rp 365 in 2012. The lowest tax rate is the tax rate for Group II (Gol II)I products SKT layer 1, while the tax rate is the highest tax rates for Group I SPM product layer 1 and SPM products imported. The real tax rate, which is adjusted for the cigarette price index, rates range only from Rp 33.39 to Rp 257.197.

Table 3: Tax rates

| Variable | Mean | Std. Dev. | Min | Max | Observations |
|---|-------------------------|-------------------------|---------|-------------------------|--------------|
| nexcisesp | 93,1472 | 64,895 | 40 | 365 | 14040 |
| Excisesp | 71,451 | 47,949 | 33.39 | 257.197 | 14040 |
| nPrice | 344,915 | 100,467 | 217.5 | 2083.33 | 14040 |
| Price | 268,317 | 76,514 | 142,016 | 1800,167 | 14040 |
| Consumption | 8,09 x 10 ⁷ | 5,72 x 10 ⁸ | 1200 | 1,64 x 10 ¹⁰ | 14040 |
| Revenue | 1,95 x 10 ¹⁰ | 1,74 x 10 ¹¹ | 48000 | 5,32 x 10 ¹² | 14040 |
| Number of Product (<i>unbalanced</i>) | | | | | 1890 |
| Number of Product (<i>sub-balanced</i>) | | | | | 281 |

Source: Customs & Excise data, analysed by author.

The cheapest nominal cigarette price (current prices) was Rp 217.5 and the most expensive cigarettes are Rp 2083.33 per stick. When we compared the lowest tax rates with the lowest price and the highest tax rates with the highest price of cigarettes, we obtained the same result, with the amount of excise tax being equal to 18 per cent of the price of cigarettes.

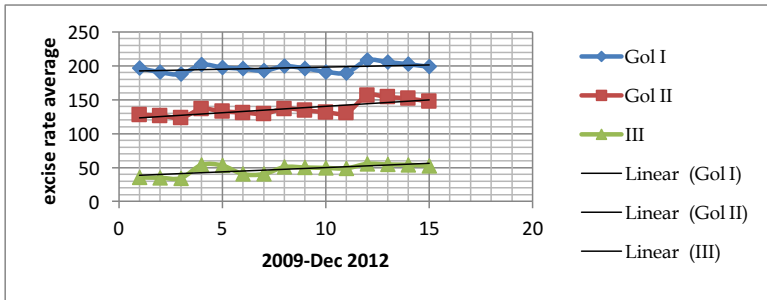
Consumption data shows that at least one cigarette brand can sell 1,200 sticks in a single quarter. On the other hand, the other cigarette brands sold over 16 billion cigarettes over a three-month period. We surmise that the companies generate considerable profit and cash flow by selling this quantity of cigarettes.

Excise revenue from one product/brand of cigarettes in the quarter ranges between USD48,000 to a significant USD5 trillion. This data may also indicate the financial capacity of tobacco companies operating in Indonesia. The extent of excise revenue indicates that the tobacco companies in Indonesia include very large companies to micro-scale enterprises.

6.1 Statistics analysis

Figure 5 shows the average tax rate in the aggregate, based on increased production class for the four-year period of the study. It also illustrates that the policy has not led to simplification of the excise tariff rates for cheap cigarettes produced by small manufacturers with regard to excise tax of cigarettes produced by companies Group II (Gol II) and Group I. The average increase in cigarette excise in Group II (Gol II) was higher than the average increase in the cigarette tax in another group. The average cigarette excise for Group II (Gol II) is close to the average cigarette excise for Group I.

Figure 5: Average tax rate per class production

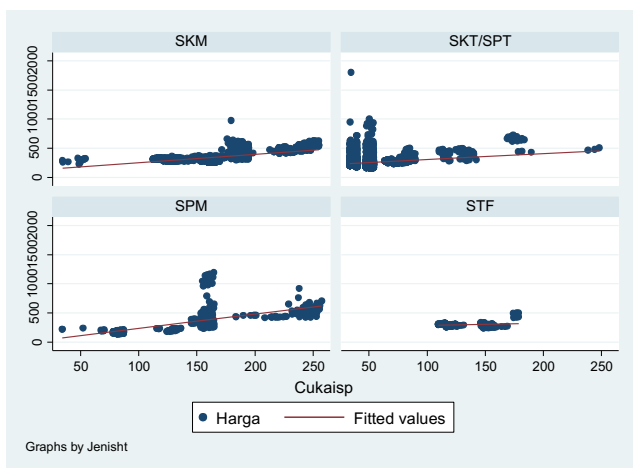


Source: Customs and Excise Data, analysed by author.

Cigarette prices

If we compare the price of cigarettes to excise tax there is a positive relationship. Figure 6 shows that when all types of tobacco products are analysed, any specific tax rate increase is also followed by a rise in prices which can be seen in the ‘fitted value’ line. These results show that manufacturers of all types of tobacco products responded to the government’s policy of increasing excise tax by raising the price of cigarettes, although the rate of increase varied.

Figure 6: Relationship between excise tariff and price of cigarette per type

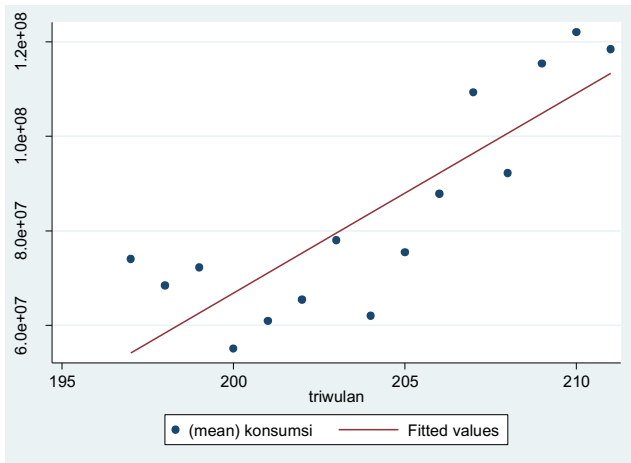


Source: Customs and Excise Data, analysed by author (Harga = Price).

Cigarette consumption

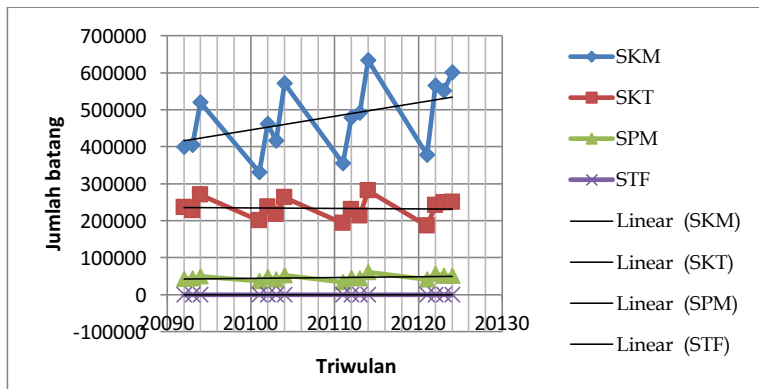
Consumption of cigarettes increased during the period 2009–2012, as shown in Figure 7. Based on the types of tobacco products, Clove Cigarettes Machine (SKM) experienced the greatest increase in the amount of production (consumption). Other types of tobacco products also tended to fluctuate despite experiencing rising trends, as shown in Figure 8.

Figure 7: Data aggregate average cigarette consumption per quarter



Source: Customs & Excise Data, processed by author.

Figure 8: Quarterly cigarette consumption 2009–2012 based on type of cigarette (in hundred thousand sticks)

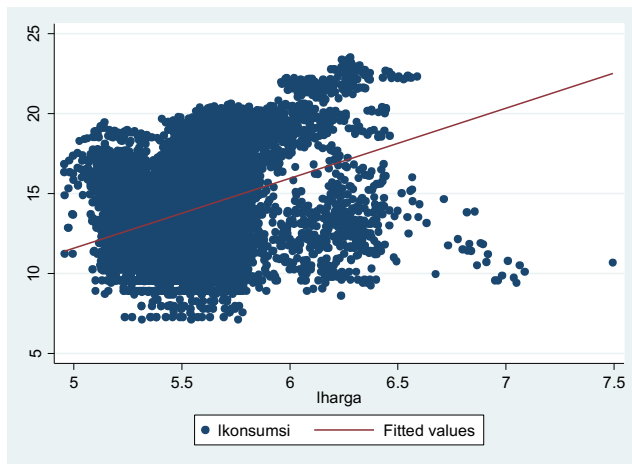


Source: Customs & Excise Data, processed by author.

The relationship between price and consumption

Based on price data and consumption in the natural logarithm, it can be seen that the price increase has no effect on consumption in general. Figure 9 shows that the increase in cigarette prices was followed by a rise in consumption. This indicates demand for cigarettes is inelastic, where the price increase does not affect the level of consumption. Commodities, such as cigarettes, that are inelastic goods have the potential to increase government revenue by the imposition of excise tax.

Figure 9: Relationship between price and cigarette consumption (in natural logarithm)



Source: Analysed by author.

6.2 Excise revenue

Government revenue from tobacco excise increases each year, and over the past five years has consistently exceeded the set target (see Table 4).

Table 4: Excise revenue on tobacco product

| No. | Year | Revenue Target | | | | | (in million rupiah) |
|-----|------|----------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------------|
| | | | 1 st Quarter | 2 nd Quarter | 3 rd Quarter | 4 th Quarter | Total |
| 1 | 2008 | 44,535,359 | 11,954,330 | 11,030,664 | 14,552,342 | 12,389,096 | 49,926,432 |
| 2 | 2009 | 53,258,354 | 14,437,333 | 11,234,386 | 14,533,215 | 15,176,085 | 55,381,019 |
| 3 | 2010 | 55,865,922 | 15,921,412 | 15,237,241 | 16,032,918 | 16,105,339 | 63,296,910 |
| 4 | 2011 | 65,381,865 | 16,725,484 | 16,398,011 | 20,645,572 | 19,483,715 | 73,252,782 |
| 5 | 2012 | 79,864,500 | 20,506,000 | 21,978,310 | 25,162,652 | 22,901,918 | 90,548,881 |

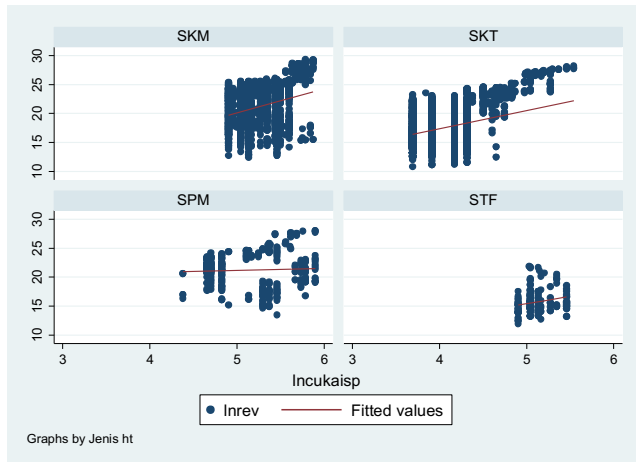
Source: DG of Treasury, Indonesia MoF.

Relationship with revenue customs tariffs

Smoking has a specific commodity impact in relation to the imposition of customs taxes. Types of cigarettes that have inelastic demand will continue to increase revenue because consumers continue to purchase them even when they are expensive due to the imposition of a very high tax.

The four cigarette products that are the subject of this analysis, and have the greatest market share, are the Clove Cigarettes Machine (SKM), White Cigarette Machine (SPM), Clove Cigarettes Hand (SKT) and Hand Clove Cigarettes Filter (STF). Results show that not all goods demand is inelastic, with the consumption of SPM cigarettes decreasing with rising prices. Figure 10 shows the SPM cigarette consumption decrease does not cause tax revenues to fall. Furthermore, the inelastic types of tobacco products are cigarettes SKM, SKT, and STF and Figure 10 shows an increase in government revenue. Cigarette excise revenue from SPM still increased, although the increase is smaller than for the other three types of cigarettes, as seen from the movement of the fitted line type of cigarette.

Figure 10: Relationship between excise tariff in each type of cigarette with revenue (in natural logarithm)



Source: Analysed by author.

6.3 The impact of specific tariff structure simplification on cigarette prices

Unbalanced panel data

According to Baltagi (2005), unbalanced panel data requires a different treatment to the balanced panel. Wansbeek and Kapteyn (1989), Baltagi, Song and Jung (2001), Davis (2002) and Boumahdi, Chaaban and Thomas (2004) state that standard estimation methods cannot be used. According to Moulton (1986), standard error and t-statistic on the ordinary least-squares (OLS) are biased due to not considering the individual and time effects. Furthermore, according to Baltagi (2005, p. 190), based on Monte Carlo Simulation, there are three models to better estimate the regression coefficient and variance component against the severe unbalanced panel; random effect method of maximum likelihood (MLE), restricted maximum likelihood (REML) or Anova Swamy and Arora estimator (MQA).

We used random effect MLE. Using MLE models, the excise burden is significant at the 1 per cent level with coefficient 0.52. A coefficient of less than one (1) indicates that the excise burden is not entirely charged to consumers through price, partly borne by producers, resulting in under-shifting. This finding contrasts with that reported by Surjono (2013) who used the pooled least square (POLS) method, concluding that there was over-shifting. Authors using the POLS models also discovered the phenomenon of over-shifting, where the tax increase raised the price between Rp 1 and Rp 1.4. In this study, we did not use POLS as a reliable model, based on the steps of model selection in panel data.

Coefficient of the interaction dummy simplification of excise tariff 0.672 showed a positive statistical significance at the 1 per cent level. In other words, after controlling for other variables, the rate increase due to simplification (merge to upper layer) increases the price by 0.672 greater than for a regular rate increase. Coefficient of dummy simplification is negatively significant at -184.39 at a rate of 1 per cent as the price of tobacco products before simplification is cheaper than the price of cigarettes in the upper layer before they were merged.

According to Harris (1987), there are two approaches to address the phenomenon of tax effect on cigarette prices in oligopoly markets. The first is to explain the relationships and rules of interaction between sellers and analyse the tax effect based on the rules of interaction, for example, whether an oligopoly market operates like a cartel, or a non-collusive behaviour, or shows partial interdependence. The second approach is that the imposition of excise affects or changes the rules of inter-firm oligopoly. In other words, the manufacturer could turn into a cartel or even damage an existing collusive relationship.

Under-shifting conditions occur because the manufacturer has raised the price of cigarettes slowly so that the tax increase is not so influential on the price of cigarettes. In partial equilibrium theory, under-shifting may occur when the supply curve has an upward slope. The opposite occurs when the tax increase is a critical focal point for the oligopolists who join together to raise the price of cigarettes, and the tax increase causes a multiplier effect on prices.

Subdata balanced panel

Baltagi (2005, p. 187), based on the Monte Carlo Simulation carried out by Baltagi and Chang (1994), concludes that the extracted data of a balanced panel from an unbalanced panel data (sub-balanced panel data) will cause a great loss in terms of efficiency and is not recommended. Mátyás and Lovrics (1991), also using Monte Carlo Simulation to compare the efficiency loss within estimator and generalised least square (GLS) models, concludes that the loss in efficiency can be nil if $NT^3 > 250$.

Sub-balanced panel data that the authors extracted is $NT = 4215$, which means qualified sub-balanced perform modelling of the data panel. Little loss in efficiency occurs because, apparently, only the SKM products, SKT and SPM, where SKT are used as a reference base. Imported tobacco products were not included as they were not routinely imported during the quarterly periods analysed. The Breusch-Pagan test through Lagrange multiplier (LM) test is used to check the presence of unobserved heterogeneity and it is known that the absence of unobserved heterogeneity hypothesis cannot be accepted, so POLS was unusable. The fixed effect Chow test is considered to be superior to POLS. Through the Hausman test, it is believed that the fixed effect estimator is best among random effect models and POLS. Modified Wald test shows heteroskedasticity, and with the Wooldridge test shows autocorrelation, then the most appropriate model for this kind of problem is to psar1 panel-corrected standard error (PCSE) models.

Based on the chosen model, the coefficient of tax rates 0.45, has a significant positive effect on the level of 1 per cent, where the results are not very different from the coefficient on the unbalanced panel data model. It can be concluded that there is under-shifting.

Coefficient of dummy simplification is significant at 1 per cent, which means there is a price difference between cigarette product-imposed excise simplification and those where it was not. Coefficient of the interaction dummy excise tariff simplification, which is the core of this study, shows a significant positive coefficient at the level of 10 per cent. This means that the rate increase due to simplification shows greater influence in increasing the price compared to the regular rate increases.

In summary, the results of MLE and PCSE model estimations can be seen in Table 5. Both models show that the effect of tariff simplification is a greater increase in cigarette prices than the usual increase.

Table 5: Price Model PCSE (balanced) and MLE (unbalanced)

| Variable Independent | PCSE (balanced) | | MLE (unbalanced) | |
|---|-----------------|---------------------|------------------|---------------------|
| | Coefficient | p-value Significant | Coefficient | p-value Significant |
| Excise Tariff (nExcisesp) | 0,45 | 0,000*** | 0,52 | 0,000*** |
| Dummy simplification (D_simple) | -59,22 | 0,003*** | -184,39 | 0,000*** |
| Dummy interaction simplification and excise tariff (D_simple*nexcisesp) | 0,144 | 0,070* | 0,672 | 0,000*** |
| Constanta | 314,957 | 0,000*** | 309,537 | 0,000*** |
| Chi2 | 923,86 | 0,000*** | 2225,43 | 0,000*** |
| R- squared | 0,9556 | | | |

Note: ***, **, * : significant at alpha (α) 1%, 5%, 10%

Impact of excise on the price of cigarettes by production group

The effect of an increase in excise tax on cigarette prices is greatest on large manufacturers who produce more than 2 million cigarette sticks per year, who we classified as Group I (Gol I in Indonesian) as indicated by a coefficient of 0.65, with a significance level of 1 per cent. Group II (Gol II) were of 0.56. The coefficients of Group III (Gol III), the lowest group based on cigarette production, is 0.379 (see Table 6). Hence, the imposition of excise tax rates on cigarettes is mostly transferred to price by large-scale cigarette production manufacturers (Group/Gol I).

Table 6: Comparative tax incidence per production capacity group

| Variable Dependent Price | Group I | Group II | Group III |
|--------------------------|----------|----------|-----------|
| Excise Tariff | 0,653*** | 0,560*** | 0,379*** |
| Standard error | (0,0385) | (0,0210) | (0,0200) |

Note: ***, **, *: significant at alpha (α) 1%, 5%, 10%

6.4 Impact of tariff simplification on cigarette consumption

Unbalanced panel data

Using random effect MLE, it is known that the coefficient of interaction between the dummy simplification and price is significantly negative at the 5 per cent level. This shows that as prices increase, simplification has a greater effect in reducing consumption than non-simplification. Dummy simplification has a significant positive indicator at the 5 per cent level. It is acceptable, because the affected simplification cigarettes are cheaper before simplification, so that the consumption is greater at the beginning of the policy being applied. Elasticity of demand for cigarettes excise is -0.9 . This suggests that cigarettes are goods with inelastic demand. When divided by the type of tobacco products, the elasticity of demand SKM, SPM, SKT and STF respectively is -0.12 , -1.7 , -0.8 , -0.3 . It can be concluded that the SPM represent more elastic cigarettes while the other three are inelastic.

National income per capita coefficient is positive and statistically significant at the 1 per cent level. Positive signs mean that the higher the level of income, the greater cigarette consumption, which explains that cigarettes are normal goods, which is consistent with Handayani (2012). Coefficient of dummy types of tobacco products and the dummy group is to look at the differences between the types of HT⁴ and production groups.

Sub-balanced panel

Through the selection model, the fixed effect model was selected. The classical assumption test showed that this model contains issues of heteroskedasticity and contemporaneous correlation, proven by the test of cross-sectional dependence by Pesaran test, but there is no autocorrelation, hence the final model used is the default PCSE.

The coefficient of interaction between simplification and price is negatively significant at 10 per cent and indicates that the slope for cigarette consumption caused by simplification is smaller than the slope for consumption of non-simplification cigarette brands. In other words, the effect of cigarette price increase affected by simplification is greater than the effect of reducing consumption of non-simplification price increases.

Dummy simplification is positive and significant at the 5 per cent level because the price of cigarette brands exposed to simplification (which merge into a rate layer above) is cheaper than the price of cigarettes in upper layer rates. Cheaper prices caused more consumption.

Through testing with the Wu-Hausman endogeneity test, it is believed there was no endogeneity between tax rates and price. The results of these tests are aligned with research by Surjono (2013) and Adioetomo, Djutaharta and Hendratno (2005). Hence, two-stage least squares (2SLS) models do not need to be made. Summary PCSE models and MLE results are contained in Table 7.

Table 7: Consumption model PCSE (balanced) and MLE (unbalanced)

| Variable Independent | PCSE (balanced) | | MLE (unbalanced) | |
|---|-----------------|---------------------|------------------|---------------------|
| | Coefficient | p-value Significant | Coefficient | p-value Significant |
| Price | 1724184 | 0,000*** | 432868,5 | 0,000*** |
| GDP per capita quarterly (Pncap) | | 366,17*** | 72,754 | 0,000*** |
| Dummy simplification (D_simple) | 2,66 x 109 | 0,018** | 2,05 x 108 | 0,142 |
| Dummy interaction simplification and price (D_simple*harga) | -1,02 x 107 | 0,016** | -858,300 | 0,083* |
| Constanta | -1,24 109 | 0,000*** | -4,33 x 108 | 0,000*** |
| Chi2 | 680,12 | 0,000*** | 905,20 | 0,000*** |
| R- squared | 0,5647 | | | |

Note: ***, **, * : significant at alpha (α) 1%, 5%, 10%

When disaggregated by type of tobacco products, the effect of simplification on cigarette prices varies. For SKM and STF cigarettes, simplification did not significantly affect the influence of cigarette consumption decline. The effect of price increases due to simplification is a significant influence in reducing cigarette consumption for SPM cigarettes. This can be seen in the coefficient of the interaction dummy simplification with prices marked negative (negative slope) and significant at the 1 per cent level and below. The reverse occurs in cigarette SKT. With simplification, the SKT cigarette consumption level is higher than the non-simplification, indicated by the coefficient of the interaction dummy simplification with prices marked a significant positive at levels below 1 per cent.

6.5 Estimation model government revenue

Unbalanced panel of data

At MLE models, the average increase in tariffs of Rp 1 boosts revenue from excise to an average of Rp 7.09 x 108 with a significance level of 1 per cent. Dummy coefficient simplification interaction with the rate increase showed positive signs with a significance level of 1 per cent (see Table 8). This means simplification rates have a greater effect on increasing government revenues as compared to the usual rate increases.

Sub-balanced panel

The model PCSE panel was the default for the sub-balanced panel due to problems of heteroskedasticity and cross-sectional dependence, but there was no auto-correlation problem. In the model, the increase in the average tax rate of Rp 1 boosts revenue from excise to an average of Rp 1.71 x 109 with a significance level of 1 per cent.

Coefficient of dummy simplification is negatively statistically significant at the 1 per cent level, indicating that the tax revenue from cigarette brands affected by simplification is smaller than the non-simplification. This is understandable because for cigarette brands affected by simplification, tax rates are lower than the previous tax rates on an upper layer. Interaction dummy coefficient indicates tariff simplification with a positive sign with a significance level of 1 per cent. This means simplification rates have a greater effect on increasing government revenues as compared to the usual increases.

Table 8: Revenue Model PCSE (balanced) and MLE (unbalanced)

| Variable Independent | PCSE (balanced) | | MLE (unbalanced) | |
|---|-----------------|---------------------|------------------|---------------------|
| | Coefficient | p-value Significant | Coefficient | p-value Significant |
| Excise rate (nCukaisp) | 1,71 x 109 | 0,000*** | 7,09 x 108 | 0,000*** |
| Dummy simplification (D_simple) | -1,23 x 1012 | 0,000*** | -1,21 x 1012 | - |
| Dummy interaction simplification and excise tariff (D_simple*nexcisesp) | 4,58 x 109 | 0,000*** | 4,88 x 109 | 0,000*** |
| Constanta | -1,02 x 1011 | 0,000*** | -2,6 x 1010 | |
| Chi2 | 923,86 | 0,000*** | 2225,43 | |
| R- squared | 0,9556 | | | |

Note: ***, **, * : significant at alpha (α) 1%, 5%, 10%

7. Conclusions

Based on the above analyses, the following conclusions can be made:

1. Simplification of a specific excise (tax) rate has a higher impact on raising the prices than the usual rate increase.
2. Increasing the specific excise has the greatest effect in raising prices on tobacco products produced by large manufacturers. The large manufacturers group (Group I/Gol I) is a group of manufacturers that have a production capacity exceeding 2 billion cigarettes per year.
3. The empirical model on tax incidence analysis shows under-shifting, where producers tend to raise prices under the tax increase. This means that producers bear most of the burden of excise.
4. The level of cigarette consumption due to cigarette prices affected by simplification is generally smaller than the consumption of cigarettes which do not undergo simplification of excise rate.
5. Simplification of the tariff structure significantly raises the price and reduces the consumption of White Cigarettes Machine Made (SPM), while it has no effect on consumption of Clove Cigarettes Hand Made (SKT) and even raises this kind of cigarette consumption, likely due to SPM consumers ‘switching’ to this cheaper category of product. SKT is a unique Indonesian tobacco product.
6. Demand for three types of cigarettes—SKM, SKT and STF—is inelastic so it is appropriate to apply the high excise rate to optimise the government revenue from the tax.
7. Simplification of the tariff structure generally has a greater impact on revenue increase than non-simplification.

7.1 Policy recommendations

Based on the results and conclusions presented in this paper, the following policy recommendations are made:

1. Governments need to be consistent and continually encouraged to implement simplification tariffs as part of their policy road map, where the purpose of imposing excise for cigarette consumption reduction and revenue optimisation can be realised. This policy can also reduce the administrative challenges of excise withdrawal.

2. Specific tariff policy is strongly influenced by inflation. Therefore, any rate increases need to be adjusted for inflation. If the specific tax burden remains (in nominal terms) or there is an increase below the rate of inflation, then over time inflation will reduce the tax burden.
3. Policies to reduce cigarette consumption need to be implemented with the material increase in tax rates, rather than to increase gradually and in stages. Gradual tax increases lose their influence because they can easily be eroded by inflation.
4. Simplification/streamlining the actual tariff structure can only be done on a specific system. If the government re-adopts the *ad valorem* tariff, then it will indirectly create hundreds of tariff structures even though only a single rate is set. This is because the amount of tax burden will follow the variations in the price of cigarettes in the market. This would be a significant setback.
5. Types of tobacco products, such as Machine Clove Cigarettes (SKM), Clove Cigarettes Filters Hand (SKTF) and Hand Clove Cigarettes (SKT), continue to provide potential as a source of government revenue by raising tax rates because demand for these products is inelastic.

References

- Adioetomo, SM, Djutaharta, R & Hendratno 2005, 'Cigarette consumption, taxation, and household income: Indonesia case study', Health, Nutrition and Population (HNP) Discussion Paper, Economics of Tobacco Control Paper No. 26, World Bank, Washington, DC.
- Agung, Permana 2011, 'Optimisation of tobacco tax rates: an analysis of the Laffer curve', ['Optimalisasi Tarif Cukai Tembakau Suatu Analisis dengan Kurva Laffer'], in *DTSD Kepabeanaan UU Cukai* [DTSD Customs and Excise Act].
- Akbar 2013, personal interview with Tobacco Excise Section Head II, [Kepala Seksi Cukai Hasil Tembakau II], April.
- Baltagi, Badi H 2005, *Econometric analysis of panel data*, 3rd edn, John Wiley & Sons, Chichester, UK.
- Baltagi, Badi H & Chang, Y-J 1994, 'Incomplete panels: a comparative study of alternative estimators for the unbalanced one-way error component regression model', *Journal of Econometrics*, vol. 62, no. 2, June, pp. 67-89.
- Baltagi, Badi H, Song, Seuck Heun & Jung, Byoung Cheoi 2001, 'The unbalanced nested error component regression model', *Journal of Econometrics*, vol. 101, no. 2, April, pp. 357-81.
- Bird, K 1999, 'Industrial concentration and competition and manufacturing', Doctoral thesis, Australian National University, Canberra.
- Blecher, E & van Walbeek, C n.d., 'An increase in the excise tax does not reduce government revenue', *FCA Bulletin*, COP6 update.
- Boumahdi, R, Chaaban, J & Thomas, A 2004, 'Import demand estimation with country and products effects: application of multi-way unbalanced panel data models to Lebanese imports', *Cahier de Recherche INRA de Toulouse* 2004-17.
- Chaloupka, FJ, Hu, TW, Warner, KE, Jacobs, R & Yürekli, A 2000, 'The taxation of tobacco products', in P Jha & FJ Chaloupka (eds), *Tobacco control in developing countries*, Oxford University Press, New York, NY, pp. 237-72.
- Chaloupka, FJ, Peck, R, Yürekli, A, Tauras, JA & Xu Xin 2010, 'Cigarette excise taxation: the impact of tax structure on prices, revenues and cigarette smoking', NBER Working Paper Series.
- Cnossen, S 2005, *Theory and practice of excise taxation: smoking, drinking, gambling, polluting, and driving*, Oxford University Press, Oxford.

- Corlett, WJ & Hague, DC 1953-54, 'Complementarity and the excess burden of taxation', *Review of Economic Studies*, vol. 21, pp. 21–30.
- Davis, P 2002, 'Estimating multi-way error components models with unbalanced data structures', *Journal of Econometrics*, vol. 106, no. 1, pp. 67-95.
- De Beyer, JA & Yürekli, AA 2000, 'Curbing the tobacco epidemic in Indonesia', Watching Brief, East Asia and the Pacific Region, World Bank, Jakarta, Indonesia, May, no. 6.
- Delipalla, S & O'Donnell, O 1998, 'The comparison between *ad valorem* and specific taxation under imperfect competition: evidence from the European cigarette industry', *Studies in Economics*, School of Economics, University of Kent, UK.
- Diamond, PA 1975, 'A many-person Ramsey tax rule', *Journal of Public Economics*, no. 4, pp. 335–42.
- Djutaharta, T, Surya, HV, Pasay, NHA, Hendratno & Adioetomo, SM 2005, 'Aggregate analysis of the impact of cigarette tax rate increases on tobacco consumption and government revenue: the case of Indonesia', Health, Nutrition and Population (HNP) Discussion Paper, Economics of Tobacco Control Paper No. 25, World Health Organization, Washington, DC.
- Fauzan 2002, 'Influence of excise rate and minimum retail price policy on the tobacco product industry' ['Pengaruh Kebijakan Tarif Cukai dan Harga Dasar terhadap Industri Hasil Tembakau'], Undergraduate essay [Skripsi], Sekolah Tinggi Ilmu Ekonomi Dwipa Wacana, Jakarta.
- Hanafy, K, Saleh, ASE, Elmallah, MEBE, Omar, HMA, Bakr, D & Chaloupka, FJ 2010, *The economics of tobacco and tobacco taxation in Egypt*, International Union Against Tuberculosis and Lung Disease, Paris.
- Handayani, Piping Setyo 2012, 'Cigarette consumption [by] the poor and non-poor in Indonesia', ['Konsumsi Rokok pada Rumah Tangga Miskin dan Tidak Miskin di Indonesia'], Masters thesis, University of Indonesia, Jakarta.
- Harris, JE 1987, 'The 1983 increase in the federal cigarette excise tax', in LH Summers (ed.), *Tax policy and the economy*, MIT Press, Cambridge, MA, pp. 87–111.
- Herlambang, Arie S 2005, 'Impact of excise rate on cigarette consumption for period 1999-2004' ['Pengaruh Kebijakan Tarif Cukai Terhadap konsumsi Rokok Periode Tahun 1999-2004'], Masters thesis, University of Indonesia, Jakarta.
- Herriges, JA 2010, *Principles of microeconomics*, Chapter 7, Taxes, [PowerPoint presentation], www2.econ.iagovernment.edu/classes/econ101/herriges/Lectures10/Chapter%207H-%20Taxes.pdf.
- Hines, JR, Jr 2007, 'Excise taxes', Office of Tax Policy Research, Ross School of Business, University of Michigan, MI.
- Jha, P & Chaloupka, FJ (eds) 2000, *Tobacco control in developing countries*, Oxford University Press, New York, NY.
- John, RM, Rao, RK, Rao, MG, Moore, J, Deshpande, RS, Sengupta, J, Selvaraj, S, Chaloupka, FJ & Jha, P 2010, 'The economics of tobacco and tobacco taxation in India', International Union Against Tuberculosis and Lung Disease, Paris.
- Kosen, S 2004, 'The health burden of tobacco use', in *The tobacco sourcebook*, Ministry of Finance, Republic of Indonesia.
- Kusumasto, S 1998, 'Policy-setting tax rates and retail prices rolled cigarette machine and its effect on tax revenues', Masters thesis, University of Indonesia, Jakarta.
- Mátyás, L & Lovrics, L 1991, 'Missing observations and panel data: a Monte-Carlo analysis', *Economic Letters*, vol. 37, no. 1, pp. 39-44.
- Ministry of Health [Indonesia], Agency for Health Research and Development 2010, 'Basic health research' (Riset Kesehatan Dasar [RISKESDAS]), www.litbang.depkes.go.id/sites/download/buku_laporan/lapnas_riskesdas2010/Laporan_riskesdas_2010.pdf.

- Moulton, BR 1986, 'Random group effects and the precision of regression estimates', *Journal of Econometrics*, vol. 32, no. 3, pp. 385-97.
- National Socio-Economic Survey (SUSENAS) [Indonesia] 2001, www.rand.org/labor/bps/susenass/2001.html.
- Pigou, AC 1920, *The economics of welfare*, Macmillan, London.
- Purwanto, Dian 2003, 'Policy of imposing excise rate and minimum retail price on large-scale company of hand-rolled cigarette and the influence on excise revenue', ['Kebijakan Penetapan Tarif Cukai dan harga Jual eceran Jenis Sigaret Kretek Tangan (SKT) Golongan Besar dan Pengaruhnya Terhadap Penerimaan Cukai'], Masters thesis, University of Indonesia, Jakarta.
- Pyndick, RS & Rubinfeld, DL 1998, *Microeconomics*, 4th edn, Prentice Hall, New Jersey, NJ.
- Ramsey, FP 1927, 'A contribution to the theory of taxation', *Economic Journal*, vol. 37, pp. 47-61.
- Republic of Indonesia n.d., www.promkes.depkes.go.id/index.php/program/pengendalian-rokok/40-indonesia-bukan-surga-rokok.
- Republic of Indonesia 2007, *Act No. 39 of 2007 on the Amendment of Act No. 11 of 1995 on Excise* [Undang-Undang Nomor 39 Tahun 2007 tentang Perubahan atas Undang-Undang Nomor 11 Tahun 1995 tentang Cukai], Jakarta.
- Rosen, HS & Gayer, T 2010, *Public Finance*, 9th edn, McGraw-Hill Education, Europe.
- Sandmo, A 1975, 'Optimal taxation in the presence of externalities', *Swedish Journal of Economics*, vol. 77, pp. 86-98.
- Sarmuhidayanti, Y 2008, 'Effect of retail pricing policy (HJE): Clove cigarettes tobacco products type hand rolled cigarettes (SKT) on business competition between manufacturers (GPP) of tobacco cigarettes Kretek hand (SKT)', Master of Science in Administrative Science thesis, University of Indonesia, Jakarta.
- Sullivan, R 2012, 'The effect of cigarette taxation on prices: an empirical analysis using city-level data', Department of Economics, Syracuse University, NY.
- Sunley, EM, Yürekli, A & Chaloupka, FJ 2000, 'The design, administration, and potential revenue of tobacco excise', in P Jha & FJ Chaloupka (eds), *Tobacco control in developing countries*, Oxford University Press, New York, NY.
- Surjono, Nasruddin Djoko 2013, 'Impact of *ad valorem* excise system, specific, and hybrid against cigarette prices and consumption' ['Dampak Sistem Cukai *ad valorem*, Spesifik, dan Hybrid Terhadap Harga dan Konsumsi Rokok'], Doctoral dissertation, University of Indonesia, Jakarta.
- Townsend, JL 1998, 'The role of taxation policy in tobacco control', in I Abedian, R van der Merwe, N Wilkins & P Jha (eds), *The economics of tobacco control: towards an optimal policy mix*, Applied Fiscal Research Centre, University of Cape Town, South Africa.
- Wansbeek, T & Kapteyn, A 1989, 'Estimation of the error-components model with incomplete panels', *Journal of Econometrics*, vol. 41, no. 3, July, pp. 341-61.
- World Health Organization (WHO) 2010, *WHO Technical manual on tobacco tax administration*, WHO, Geneva.

Notes

- 1 Tobacco Industry Roadmap 2007-2020, see http://agro.kemenperin.go.id/e-klaster/file/roadmap/KITNTB_1.pdf, viewed 29 April 2016.
- 2 Excise ribbon: one of the payment mechanisms to pay excise tax in Indonesia.
- 3 NT means Number of observations; N units and T time periods, in panel data.
- 4 HT is an abbreviation in Indonesian: Hasil Tembakau (Tobacco Product).

Ade Hidayat



Ade Hidayat is a senior auditor and analyst with the Research and Analysis Unit of the Indonesian Directorate General Customs and Excise. He holds a Master of Science in Economics and a Bachelor degree in accounting.

Nasruddin Djoko Surjono



Dr Nasruddin Djoko Surjono is Deputy Director of Customs and Excise Policy, Fiscal Policy Agency, Ministry of Finance, Indonesia, having been appointed to the position in 2015. His educational qualifications include a PhD and Masters in economics and an MBA in International Business. Dr Surjono has presented his tobacco-related research at conferences in Chicago and Singapore and has participated in a WHO internship program while completing his doctorate.