Firms' Performance under a Different Cigarette Tax System: Empirical Evidence from Indonesian Cigarette Manufacturing Firms

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ABSTRACT

In an imperfect market, a percentage tax increase in an ad valorem system results in a smaller price increase and lower profits than under a specific regime, unless firms undertake a joint-profit maximization strategy using the ad valorem tax system. In this study, we analyze the effect of a price increase on the firms' performance under three different cigarette tax regimes in Indonesia, namely ad valorem tax, mixed tax, and specific tax. Using data from 2002 to 2013, we find that a percentage rise in the cigarette price increases the nominal profit across all three tax systems. However, the effect of price on the nominal profit is statistically indifferent in all three regimes. Using markup (i.e., the ratio of profit-to-cost) and profit margin (i.e., the ratio of profit-to-sales) as alternative measures of performance, we find that a percentage price increase reduces the firms' markup and profit margin. The reduction in markup and profit margin under an ad valorem tax is larger than the other two tax systems. For a product with an inelastic demand, a reduction in markup under a specific tax indicates the existence of tax under-shifting, which is likely to occur with the absence of minimum price regulations.

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INTRODUCTION

Increasing cigarette tax is an effective tool to reduce cigarette consumption, not only in developed countries but also in developing countries (Chaloupka et al., 2012; Ross and Chaloupka, 2006; van Baal et al., 2007). An increase in cigarette tax will cause the firms to increase cigarette prices, and therefore cause a reduction in the demand for cigarettes (e.g., Callison and Kaestner, 2014; Guindon et al., 2015; Hu and Mao, 2002; JiménezRuiz *et al*, 2008; Keeler et al., 1996; Lee, 2008; Lee et al., 2005; Sullivan and Dutkowsky, 2012; van Baal et al., 2007). There are three types of tobacco taxes: an *ad valorem* tax (a percentage of the tobacco product price), a specific tax (applied per unit of a tobacco product), and a mixed tax (a combination of both). Theoretical works have shown that a percentage tax increase in a specific tax leads to a larger price increase than for *ad valorem* tax (e.g., Anderson et al., 2001; Delipalla and Keen, 1992; Skeath and Trandel, 1994; Stern, 1987). Some empirical studies are consistent with this prediction, such as Delipalla and O'Donnell (2001) and Hanson and Sullivan (2009).[1] Thus, an equal percentage of cigarette tax increase in a specific tax system would result in a greater reduction of cigarette consumption than with any other systems.

Although larger consumption reduction is more likely to occur in a specific tax rather than *ad valorem* tax, it does not imply that the profit will be lower in a specific tax regime. As Delipalla and Keen (1992) suggest, a shift from specific tax to *ad valorem* tax would lead to a reduction in cigarette prices and lower profit (in most circumstances). In an *ad valorem* system, a higher cigarette price not only decreases cigarette demand, but also increases a firm's tax liability. Firms have a greater incentive to under-shift the tax increase to prevent not only a further decline in the cigarette demand, but also more tax liability. However, profit will remain unaffected if firms decide to maximize the joint-profit in an *ad valorem* system.

In contrast to this, a move from an *ad valorem* tax to a specific tax results in a higher cigarette price, yet a higher cigarette price does not cause a company's tax liability to increase. As cigarette demand is mostly inelastic in the short term, a firm's profit will still increase. However, when demand is linked over time, firms may limit the price increase in order to prevent a greater decline in future profits (Showalter, 1999). Cigarettes are an example of a product in which the demand is linked over time as the current consumption depends partly on the past consumption. Firms may set a lower price than the static profit-maximizing price, if by doing so, future profits are increased due to a greater level of consumption in the future (Showalter, 1999). The oligopoly structure of the Indonesian cigarette industry and the absence of a minimum cigarette price in Indonesia has increased the firms' probability to limit the price increase. Thus, whether or not profit in a specific tax system is higher than with an ad valorem tax becomes an empirical issue.

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[1] Using samples of 12 EU countries, Delipalla and O'Donnell (2001) found that over-shifting in a specific tax was significant in six countries (France, Greece, Ireland, Italy, Luxembourg, and the UK), while overshifting in an ad valorem tax was only significant in Italy. Hanson and Sullivan (2009) found that a $1 increase in tobacco tax caused the cigarette retail price to rise to between $ 1.06 and $ 1.17 in Wisconsin.

The information on how profit is affected by regime change is important for policymakers. If regime change results in a reduction in profit, then firms will have an added incentive to undertake non-pricing strategies to prevent a further decline in profits.[2]

These actions by firms may therefore hamper a government's efforts to control tobacco consumption. In this study, we examine the impact of a change in tobacco taxes on a firm's profit. We utilize a natural experiment of multiple regime changes in Indonesia: from ad valorem to mixed tax in 2007, and then from mixed to specific system in 2009. These regime changes provide, to our knowledge, the first opportunity to analyze how each tax regime affects profit.

Using plant-level data from both medium and large manufacturing firms in the cigarette industry between 2002 and 2013, we find that an increase in the cigarette price causes the nominal profit to increase. However, the effect of a price increase on firm profit does not differ across tax regimes. When we use markup (i.e., the ratio of profit-to-cost) and profit margin (i.e., the ratio of profit-to-sales) as the alternative measures of performance, we find that a percentage price increase reduces both markup and profit margin, and the effect of a price increase also differs across the tax regimes. We find that the rate of decline in a firm's markup is significantly greater in an ad valorem tax than with other tax regimes. The results from the first two measures of dependent variables indicate that although the nominal profit increases over time, its rate of growth is lower than the cost growth rate, causing markup to fall. For an addictive product under an imperfect market, firms actually have a greater chance of tax over-shifting rather than with an ad valorem tax system. On the revenue side, a price increase will result in higher revenue because the percentage reduction in the demand is smaller than the percentage price increase. On the cost side, a price increase in a specific tax system does not cause a firm's tax liability to increase. Thus, a lower markup in a specific tax may indicate that a firm has not set a price high enough to compensate for the percentage increase in the cost due to an increased tax. We argue that the absence of a minimum retail price increases the chance of firms to limit the price increase. By doing so, firms can prevent a further decline in future profit because future consumption is linked with current consumption.

The remaining sections of this paper are organized in the following way; in the next section, we will briefly provide an overview of cigarette taxation in Indonesia. Section 3 will contain the data source and the empirical strategy. Discussion on the results will be presented in section 4 and then finally followed by the conclusion and policy implication in section 5.

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[2] There is some evidence on non-pricing strategy taken by firms in literature, such as Hoffer (2016) for the United States, Chapman and Carter (2003) for Australia, and Hurt et al. (2012) for Indonesia. Hoffer (2016) found that special interests have played a significant role in determining state cigarette tax in the United States. In Australia, delay of the implementation of health warnings on cigarette packaging was associated with industry efforts (Chapman and Carter, 2003). Hurt et al. (2012) provide two pieces of evidence on the tobacco firms' influence in public policies in Indonesia. First, there has been two amendments to the Government Regulation on the Tobacco Control in less than four years, favoring the tobacco industry over the health and safety of Indonesians. Second, the issuance of the 2007-2020 Roadmap of Tobacco Products Industry and Excise Policy in 2007, which aims to increase national revenue, promotes employment, and improved health through increased cigarette production.

CIGARETTE TAXATION IN INDONESIA

The cigarette industry provides a significant amount of revenue to the Indonesian government budget. Cigarette tax is the third largest tax revenue source after Income Tax and Value Added Tax, and contributed around nine percent of the total domestic revenue between 2001 and 2013.[3] Cigarette production has increased from 203.9 billion sticks in 2004 to 348 billion sticks in 2015, which is equivalent to an average of 4.9 percent annual growth rate.[4]

The Indonesian cigarette industry has an oligopoly structure, in which the three largest firms own a 71 percent market share (Barber et al., 2008). In addition to self-producing their brand, cigarette companies can contract another (usually smaller) firm to produce their brand, but the decision on production volume and cigarette price remains with the cigarette company (the brand owner).[5] The contract firms cannot sell the cigarette to the market directly, but they will receive manufacturing service revenues from the brand owner.

Regarding the tax system, Indonesia has experienced two regime changes. The ad valorem tax was implemented until 2006, before it was replaced by a mixed tax in 2007. The specific tax was then introduced to replace the mixed tax in 2009 and is still in effect until now. In all of these regimes, Indonesia has adopted a multi-tier rate based on cigarette type, production volume, and retail prices. The type of cigarette tax set is dependent on the production technique (machine-made vs. hand-rolled) and the flavor (with clove vs. without clove). The hand-rolled cigarette always enjoys the most favorable tax rates. A lower cigarette tax is designed to minimize the adverse effect of cigarette tax on employment, because the hand-rolled cigarette production is more labor intensive than the machine-made cigarette.

The details of the cigarette tax rates during 2005-2013 is presented in Table 1. For some types of cigarette, the applicable cigarette tax has almost reached 57 percent (the maximum tax rate permitted under Indonesian law). The number of tiers has changed over time, from ten layers between 2005 and 2007 to nine layers in 2008. A sudden increase to nineteen layers occurred when the specific tax was introduced, although it gradually decreased to thirteen tiers in 2013. Theoretically, a reduction of layers would lead to a reduction in the economic inefficiencies (compared to multi-layers). In terms of reducing cigarette consumption, a simpler excise tax is also considered to be more efficient than a more complex tax structure (Chaloupka et al., 2012).

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[3] The industry contribution is higher when other applicable taxes are included (such as Income and Value Added Taxes).

[4] Calculated using geometric means, based on data from Indonesian Customs.

[5] The contract firm is called Mitra Produksi Sigaret (Cigarette Production Partner).

Table 1 Indonesia Excise Tax Rates on Tobacco Products, 2005-2013

Type	Tier	Volume	AD Valorem 2005 % to Retail Price	AD Valorem 2006 % to Retail Price	Hybrid 2007 Ad valorem (% to Retail Price)	Hybrid 2007 Specific (IDR/Stick)	Hybrid 2008 Ad valorem (% to Retail Price)	Hybrid 2008 Specific (IDR/Stick)	Type	Tier	Volume	Specific 2009 (IDR/stick)	Specific 2010 (IDR/stick)	2011 Retail Price Range (IDR)	2011 Excise Tariff (IDR)	2012 Retail Price Range (IDR)	2012 Excise Tariff (IDR)	2013 Retail Price Range (IDR)	2013 Excise Tariff (IDR)	2013 % Excise Tariff to Retail Price
Machine-Rolled cigarette (Singaret Kretek Mesin/SKM)	I	> 2 bio	40	40	40	7	36	35	Machine-Rolled cigarette (Singaret Kretek Mesin/SKM)	I	> 2 bio	290	310	>660	325	>660	355	>669	375	56
												280	300	630-660	315	630-660	345	631-669	355	55
												260	280	600-630	295	600-630	325	>549	285	52
												210	230	>430	245	>430	270	440-549	245	50
	II	0.5-2 bio	36	36	36	5	35	35		II	≤ 2 bio	175	295	380-430	210	374-430	235			
												135	155	374-380	170					
	III	<0.5 bio	26	26	26	3	22	35												
Machine-White Cigarette (Singaret Putih Mesin/SPM)	I	> 2 bio	40	40	40	7	34	35	Machine-White Cigarette (Singaret Putih Mesin/SPM)	I	> 2 bio	290	310	>600	325	≥375	365	>680	380	56
												230	275	450-600	295					
												185	225	375-450	245					
	II	0.5-2 bio	36	36	36	5	30	35		II	≤ 2 bio	170	200	>300	215	>300	235	>444	245	55
												135	165	254-300	175	254-300	190	345-444	195	49
												80	105	217-254	110	217-254	125			
	III	<0.5 bio	26	26	26	3	15	35												
Machine-Rolled Cigarette (Singaret Kretek Tangan/SKT)	I	> 2 bio	22	22	22	7	18	35	Machine-Rolled Cigarette (Singaret Kretek Tangan/SKT)	I	> 2 bio	200	215	>590	235	>590	255	>749	275	37
												150	165	550-590	180	520-590	195	550-749	205	32
												130	145	520-550	155					
	II	0.3-2 bio	16	16	16	5	10	35		II	0.3-2 bio	90	105	>379	110	>379	125	>379	130	34
												80	95	349-379	100	349-379	115	349-379	120	33
												75	90	336-349	90	336-349	105	336-349	110	32
	III.A	< 0.3 bio	8	8	8	3	0	30		III	< 0.3 bio	10	50	≥234	65	≥234	75	≥250	80	32
	III.B	< 6 mio	4	4	4	3														

Although the number of tiers has declined, complexity continues as the excise rate also depends on the government's retail sales prices (HJE/*Harga Jual Eceran*). The government sets HJE based on the cost of production, producer profit, as well as the distributors', agents' and retailers' margins (World Health Organization, 2010). The reference price is the maximum cigarette price under which firms can sell their products.[6]

Consequently, the ratio of excise to HJE does not vary much within the tier, which resembles an ad valorem tax (Barber and Ahsan, 2009; Liber, Ross, Ratanachena, et al., 2015). The ratio of excise rate to HJE of the leading brands in the highest tier were 42.7% to 43.2% and 26.3% to 27.1% for the machined-rolled clove cigarettes and the hand-rolled clove cigarette respectively (Barber and Ahsan, 2009). The ratio of excise rate to actual retail prices were higher and varied more than the ratio of excise rate to HJE. Barber and Ahsan (2009) estimated that HJE was 17% to 22% higher than the actual retail price. A high excise incidence (to the actual retail price) did not imply that cigarette was less affordable, but on the other hand, it became more affordable because the actual price was lower due to price discount.

There are two disadvantages of the tiered tax system. First, a multi tiers tax system causes a greater price variation among cigarette brands than a uniform tax system (Chaloupka et al., 2010; Liber, Ross, Ratanachena, et al., 2015; Shang et al., 2015). A higher price variation will reduce the effectiveness of cigarette taxation in reducing consumption because consumers may switch to a cheaper cigarette. Second, the tiered tax system is more complex than a uniform tax system, which may lead to a suboptimal government revenue. As taxation literature suggests, tax avoidance/evasion is determined by – among others - tax rates and tax complexity (Alm, 2012). The progressive rate may also generate larger incentives for tax evasion as the return for non-compliance increases as the marginal tax rate increases. On the other hand, tax avoidance can also be carried out by limiting the production of the existing brands (below the tier threshold) and at the same time creating a new brand with a similar taste to an existing brand through an affiliate company scheme with a lower price. Until 2013, firms had a greater incentive to pursue such a strategy as the tax rate was based on the cumulative production by the same brand instead of the aggregate production of the affiliated companies.[7] Thus, if a firm decides to take such action, the cumulative profit of affiliated companies will increase.

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[6] If the actual retail price is at least 5% higher than the HJE, firms must request the government for a higher HJE. The rationale for requesting a higher HJE is for the Value Added Tax calculation. An unreported higher actual price (than HJE) results in lower VAT than it should have been otherwise. The 5% limit is removed in 2015 with the issuance of PMK 198/PMK.010/2015

[7] Since 2013, the excise tax is based on the total output of affiliated companies by the issuance of Ministry of Finance Decree No 78/2013. Companies are considered affiliated if the owners are the same or owned by relatives. A lower cigarette price for the new brand is a feasible strategy for firms as there is no minimum retail price regulation until January 1st, 2017.

DATA AND METHODOLOGY

For empirical analysis, we utilized the Annual Survey of Medium and Large Manufacturing Firms dataset from 2002 to 2013, published by the Indonesian Central Bureau of Statistics (BPS). As cigarette tax rate is based on the production volume and cigarette types, although the same cigarette brand may produce different products, the applicable cigarette tax rate is based on the cumulative production under the same brand. While our data is at the plant-level, there is no information regarding the plant's name as the BPS keeps them confidential. Thus, we cannot trace the affiliation among firms. After data cleaning, we have 1,140 observations for empirical investigation from an unbalanced panel data of 455 firms. The number of observation by firm ranges from one to seven observations. The descriptive statistics of the data for empirical estimation is presented in Table 2.

Table 2 Descriptive Statistics of Cigarette Manufacturing Firms in Indonesia, 2002-2013

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum	Median
Profit (Million Rupiah)	1140	67155	363185	0.164	8761000	4801
Total Cost (Million Rupiah)	1140	119286	591725	92.831	15400000	12024
Total Revenue (Million Rupiah)	1140	186441	857058	100.036	20300000	21161
Profit-to-Cost Ratio	1140	0.6817	1.1583	0.0002	20.189	0.3141
Profit-to-Revenue Ratio	1140	0.2903	0.2254	0.0002	0.9528	0.239
Average Cost Energy (Thousand Rupiah per Kilo Watt Hour Electricity)	1140	8.25	58.38	0.08	1625.82	1.54
Average Cost per Production Worker (Thousand Rupiah per Worker)	1140	7549.66	6122.41	1007.14	79265	6533.33
Average Cost per Non-Production Worker (Thousand Rupiah per Worker)	1140	17068.55	15301.52	1000	99179.5	12000
Wholesale Price Index (2001=100)	1140	194.04	38.69	136	239.41	200.21
Ad valorem	1140	0.3737	0.484	0	1	0
Mixed	1140	0.4175	0.4934	0	1	0
Specific	1140	0.2088	0.4066	0	1	0
Contract Firm	1140	0.0877	0.283	0	1	0

Theoretically, investigating the effect of tax regime on a firm's performance can be carried out through regressing a measure of the firm performance on output prices (at different tax regimes) and input costs as the control variables. Thus, the empirical specification is described by the following equation:

$$Perfomance_{it} = f(Direct\ Input\ Price_{it}, Price_t, Excise\ System_t, Price_t \\ \times Excise\ System_t, Z) \quad (1)$$

We use three measures of performance for empirical investigation, namely (nominal) profit, markup, and profit margin. The nominal profit is measured by subtracting all costs (tax inclusive) from the total revenue. When we use profit as the dependent variable, the parameter of cigarette price indicates how much (nominal) profit changes for a given change in the output price, after controlling for other variables. However, a positive parameter may not be sufficient to conclude that real profit (i.e., measured in a constant term) increases, as both dependent and independent variables tend to rise over time. A better measurement to indicate a causal relationship is by using all variables at constant prices. Nevertheless, incorrect use of the deflator in calculating the constant price value may result in bias in the estimated parameters, even if it only occurs in one variable.

Using a normalized dependent variable - such as markup - not only reduces the extent of bias due to measurement error, but also reveals the level of tax shifting. The amount of tax shifting is derived from one of the properties in a profit function, namely the homogeneous of degree one in the input and output prices. Based on this, if the input costs and the output price increases at the same percentage, profit will also increase at the same rate.[8] Consequently, markup will remain unchanged unless the percentage price increase differs from the percentage cost increase. A percentage increase in cigarette prices, which results in a higher markup (i.e., a positive parameter), reveals the existence of over-shifting, while a lower markup (i.e., a negative parameter) suggests the presence of under-shifting. For a validity check, we also used another normalized profit measure (i.e., profit margin) as an alternative measure of a dependent variable.

Direct Input Prices $_{it}$ is a vector of input prices of plant *i* in year *t,* which consists of three components. First, the average cost of production workers, which is calculated by dividing the total expenditure for production workers with the number of production workers. Second, the average cost of non-production workers, which is measured by dividing the total expenditure for non-production workers with the number of non-production workers. Third, the cost of capital usage, which is computed by dividing the spending for electricity with total electricity consumption.[9]

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[8] For firms, an increase in the cigarette tax means that the amount of tax payable increases, causing the total cost to increase. Firms will then transfer the increased cost onto the consumer by setting a higher price.
[9] Burnside et al. (1995) argues that electricity consumption reflects the capital usage in the production process. Thus, we used the unit cost of electricity consumption as the measure of the unit cost of capital usage.

Variable $Price_t$ reflects the output price, measured by the wholesale price index for tobacco products.[10] As there are three cigarette tax regimes during 2002-2013, we created two dummy variables for cigarette tax systems and assigned the *ad valorem* tax as the base regime. The first dummy is *Mixed*, which equals one in 2007 and 2008, and zero for the other years. The second dummy is *Specific*, which equals one in 2009 and beyond, and zero for the other years. The parameter of dummy regimes indicates the underlying difference of performance between a given tax regime with the *ad valorem* system. We then create interaction terms between the price and the excise tax system – $Price_t \times Excise\ System_t$ – which reflects the effect of price on the firm's profit under different excise tax systems, which is our variable of interest.[11]

We also used a dummy variable for contract firms to account for the possibility of a different effect between contract firms and non-contract firms (brand owner). This variable equals to one if a firm is a contract firm, and zero otherwise.[12] As additional control variables, we also created interaction terms between a dummy contract firm and a dummy tax regime. In the empirical estimation, all variables are measured in the natural logarithm form (except for the dummy variables).

RESULTS AND DISCUSSION

The regression results are presented in Table 3 - 5. We performed random effect and fixed effect regressions with cluster-robust standard error to address possible serial correlation and heteroscedasticity problems. The results in Table 3 show that a percentage price increase leads to a higher nominal profit. Nevertheless, we do not find the regime dummies or the interaction terms to be statistically significant. In other words, there is no underlying difference on the effect of price on profit among the three cigarette tax regimes.

When we use markup as the dependent variable, we find that a percentage increase in the cigarette price reduces markup (Table 4). The results from Table 3 and Table 4 suggest that although the nominal profit increases, the firms' markup declines. Both dummy variables are positive and significant, inferring that markup under mixed and specific regimes are higher than with *ad valorem* tax. The interaction terms for both tax regimes are also positive and significant.[13] Despite a higher markup, the parameter magnitude of the interaction terms are smaller (in absolute terms) than the parameter for

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[10] As there is a variation on the cigarette price increase, the ideal measurement for the cigarette price is the actual cigarette price for each firm. However, the data on cigarette prices are not available in the dataset, which leads us to use the cigarette price index as the second best measure.

[11] Interaction terms and (individual) regime dummies cannot be used in the same regression due to collinearity.

[12] Although the dataset does not explicitly indicate whether or not a firm is a contract firm, we can identify from the revenue variable. We define a contract firm if it has revenue from manufacturing services and does not have any income from product sales.

[13] Since each firm is applied the same cigarette tax in a given year and the tax system affects cigarette prices, when we include interaction terms, regime dummies are dropped due to collinearity.

price, indicating that firms still experience a declining markup. A greater markup decline in the *ad valorem* tax occurs because each cigarette price increase results not only in a reduction in cigarette demand, but also a higher tax liability. In a specific tax, the amount of tax liability is independent of the cigarette price, resulting in a higher markup. For a mixed tax, the increase in the tax liability will be between the other two tax regimes. The results of using profit margin as the dependent variable (Table 5) is also similar to Table 4.

The reduction in firms' markup in a specific tax implies that firms do not over-shift the tax increase, despite firms having the ability to do so. In the Indonesian cigarette industry, with an oligopoly structure and progressive tax rate based on volume, firms may achieve a higher total profit by limiting the price increase in the existing product and at the same time creating a new product through an affiliate company. This strategy may be made by a company whose production volume is close to the threshold of a higher tax rate. By creating a new firm, the parent company may achieve a higher joint profit as they can prevent a higher tax liability in the existing firm and then earn more profit from the new firm due to a lower tax rate.

We realize that the absence of cigarette prices at the firm-level may rise a debate that a reduction in markup is insufficient to conclude the existence of under-shifting. We argue that if under-shifting is indeed a common phenomenon, it will be reflected at the aggregate data. Theoretically, the percentage change in consumption is the difference between the percentage increase in consumption due to an increase in income and the percentage reduction in the consumption caused by a price increase, as described in the following formula:

$$C_g = \varepsilon_{C,I} \times I_g - \varepsilon_{C,P} \times P_g \qquad (2)$$

C_g reflects the percentage change in the cigarette consumption, $\varepsilon_{C,I}$ reflects the income elasticity of demand, I_g is the percentage growth rate of income, $\varepsilon_{C,P}$ is the reflection of the price elasticity of demand, and P_g reflects the percentage growth rate of cigarette price. The percentage change in cigarette price is the product of a tax shifting parameter - α - and the rate of cigarette tax increase, *T*. In other words, $P_g = \alpha \times T_g$. An α greater than one indicates the existence of tax over-shifting, while under-shifting occurs if α is less than one. An α equals to unity implies that the percentage of price increase is the same as the percentage increase in cigarette tax. Substituting P_g with $\alpha \times T_g$ and rearranging the previous equation (2) will give us the extent of tax shifting as described in the following equation.

$$\alpha = \frac{C_g - \left(\varepsilon_{C,I} \times I_g\right)}{\varepsilon_{C,P} \times T_g} \qquad (3)$$

The estimated income elasticity of demand for Indonesia is 0.76, while the price elasticity of demand is -0.61 (Adioetomo et al., 2005). Using data from Ahsan et al., (2014) for cigarette production during 2010-2013, we calculate that production grew at a rate of 5.7 percent annually (using geometric means). During the same period, Indonesian GDP grew at 5.99 percent annually, and the average increase in cigarette taxes ranged between 5 percent and 11 percent.[14] Inserting these numbers into equation (3) would give a parameter % below unity, which would indicate under-shifting.

For control variables, when we use markup as the dependent variable, we find that the markup of the contract firms in the specific tax is higher than in the *ad valorem*. We argue that since the cigarette tax is counted as the cost in the parent company, any increase in the cigarette tax does not cause the cost of a contract firm to increase. Thus, if the brand owner decides to create a new product and assigns a contract firm to produce the new brand, the revenue of the contract firm will increase, while the cost will increase at a lower rate than the revenue as the contract firm is not liable to pay the cigarette tax. Consequently, markup will increase. When we use profit margin as the dependent variable, the effect becomes insignificant, implying that profit grows at the same rate as the revenue growth.

Table 3 Regression Results Using Profit as the Dependent Variable

	Specification 1		Specification 2		Specification 3	
	Random Effect	Fixed Effect	Random Effect	Fixed Effect	Random Effect	Fixed Effect
Log(Average Cost per Energy)	-0.051	0.088	-0.052	0.089	-0.061	0.074
	(0.95)	(1.20)	(0.96)	(1.21)	(1.14)	(1.01)
Log(Average Cost per Production Worker)	1.190	1.010	1.190	1.009	1.183	1.004
	(8.91)***	(5.59)***	(8.89)***	(5.58)***	(8.96)***	(5.61)***
Log(Average Cost per Non Production Worker)	0.521	0.197	0.522	0.196	0.533	0.208
	(5.32)***	(1.75)*	(5.33)***	(1.74)*	(5.64)***	(1.92)*
Contract Firm	1.108	0.388	1.111	0.377	0.594	-0.115
	(3.47)***	(0.74)	(3.48)***	(0.72)	(1.81)*	(0.22)
Log(Wholesale Cigarette Price Index)	0.479	1.627	0.280	2.138	0.485	2.288
	(0.59)	(1.97)**	(0.23)	(1.65)*	(0.39)	(1.75)*
Mixed	0.019	-0.227				
	(0.06)	(0.70)				
Specific	-0.095	-0.350				
	(0.24)	(0.88)				

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[14] Calculated using the simple average of all tiers within the same year.

Table 3 Cont

Mixed X Log(Wholesale Cigarette Price Index)			0.000	-0.002	-0.001	-0.003
			(0.20)	(0.83)	(0.22)	(1.15)
Specific X Log(Wholesale Cigarette Price Index)			0.000	-0.002	-0.001	-0.003
			(0.01)	(0.95)	(0.31)	(1.20)
Mixed X Contract Firm					1.101	0.949
					(2.50)**	(2.22)**
Specific X Contract Firm					0.680	0.738
					(1.47)	(1.65)*
Constant	-2.611	-3.789	-1.624	-6.320	-2.607	-7.046
	(0.65)	(0.91)	(0.27)	(0.98)	(0.43)	(1.08)
Observation	1117	1117	1117	1117	1117	1117

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 4 Regression Results Using Profit-to-cost Ratio as the Dependent Variable

	Specification 1		Specification 2		Specification 3	
	Random Effect	Fixed Effect	Random Effect	Fixed Effect	Random Effect	Fixed Effect
Log(Average Cost per Energy)	0.024	0.012	0.026	0.016	0.020	-0.002
	(0.92)	(0.23)	(1.00)	(0.32)	(0.81)	(0.05)
Log(Average Cost per Production Worker)	0.072	-0.007	0.074	0.002	0.060	-0.021
	(1.22)	(0.06)	(1.26)	(0.02)	(1.00)	(0.18)
Log(Average Cost per Non Production Worker)	0.072	0.044	0.073	0.045	0.062	0.016
	(1.25)	(0.39)	(1.26)	(0.39)	(1.14)	(0.16)
Contract Firm	1.197	0.689	1.197	0.695	0.558	-0.084
	(4.52)***	(1.65)	(4.50)***	(1.64)	(3.67)***	(0.14)
Log(Wholesale Cigarette Price Index)	-1.231	-1.549	-1.120	-1.834	-0.934	-1.613
	(3.09)***	(3.53)***	(2.01)**	(2.75)***	(1.73)*	(2.38)**
Mixed	0.486	0.678				
	(2.83)***	(3.60)***				
Specific	0.824	1.047				
	(3.23)***	(3.78)***				

Table 4 Cont

Mixed X Log(Wholesale Cigarette Price Index)			0.002	0.004	0.001	0.003
			(1.85)*	(2.79)***	(1.41)	(2.25)**
Specific X Log(Wholesale Cigarette Price Index)			0.003	0.005	0.002	0.003
			(2.29)**	(3.05)***	(1.74)*	(2.41)**
Mixed X Contract Firm					0.533	0.573
					(1.65)*	(1.35)
Specific X Contract Firm					2.834	3.299
					(1.80)*	(1.85)*
Constant	5.343	7.881	4.769	9.229	4.139	8.710
	(2.80)***	(3.63)***	(1.77)*	(2.82)***	(1.58)	(2.60)***
Observation	1140	1140	1140	1140	1140	1140

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$

CONCLUSION

Existing studies that analyze the effect of cigarette taxation from the consumer and government revenue perspective conclude that a specific tax leads to a more significant reduction in cigarette consumption and provides more stable government revenues than the other cigarette tax systems (Chaloupka et al., 2012; Chaloupka et al., 2010). From the producer's perspective, specific tax also yields a higher profit (Delipalla and Keen, 1992). However, such results may not hold true if firms decide to not over-shift the tax increase onto consumers. Our empirical results have shown although nominal profit increases over time, markup and profit margin decline in all regimes, indicating the presence of tax under-shifting. The Indonesian cigarette industry has the conditions that allow for tax under-shifting to occur. To be specific, the absence of a minimum retail price regulation will increase the chance of firms to limit the cigarette price increase. The progressive tax rate based on production volume may increase profit if the existing firm maintains the production of the current brand at the current tax tier and then creates a new firm to sell a similar product at a lower price (as the new firm will have a lower tax rate). As a result, the total profit of the affiliated companies will increase.

Based on the argument above, we consider that Indonesian cigarette tax policy (i.e., the current multi-tier system and the absence of a minimum retail price) plays a role in explaining the growth of cigarette production in Indonesia. Although increased cigarette production generates some benefits (employment, government taxes revenue, and firm profit), health outcomes will worsen due to a higher level of cigarette consumption. Existing studies have shown that the health consequences of cigarette consumption are significantly above the price of cigarettes (Gruber and Köszegi, 2001; Sloan et al., 2004;

Viscusi and Aldy, 2003; Viscusi and Hersch, 2008). Thus, it is imperative to apply an effective policy that reduces cigarette consumption.

A reduction of tax tiers and implementing minimum retail price (at a higher level) are viable options to reduce cigarette consumption. Reducing the tax tiers will lessen the incentive to create a new brand because the advantage of a lower tax rate disappears. Reducing tiers will also decrease the price variation among cigarette brands and consumers' ability to switch to a cheaper cigarette brand/type (Chaloupka et al., 2010; Liber, Ross, Ratanachena, et al., 2015). The implementation of minimum retail price should complement the tiers reduction, jointly achieving a significant effect on cigarette consumption reduction. However, if the minimum cigarette retail price is not significantly higher than the prevailing prices, the effect of cigarette price increase on cigarette consumption will not be significant, as it is evidenced in the case of Malaysia (Liber, Ross, Omar, et al., 2015). From the consumers' point of view side, a higher minimum retail price will make cigarettes less affordable and therefore reduce consumption. From the producers' point of view, it reduces the firm's ability to undershift the tax increase. Unlike changing the maximum excise rate, the implementation of a minimum retail price and cigarette tax simplification do not require an amendment to the existing excise tax law as it is solely the domain of the government and can be implemented without the need for a lengthy process of law amendment.

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