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WORLD BANK GROUP

THE ECONOMICS OF TOBACCO TAXATION AND EMPLOYMENT IN INDONESIA

Health, Population, and Nutrition
Global Practice

Cover photos (clockwise from left): Hand holding green tobacco leaf. Photo by bdspn / iStock. Smiling Asian lady. Photo by joakimbkk / iStock. Gateway on the road to oil palm plantations. Photo by Flore de Preneuf / World Bank. Man in crop of tobacco plants. Photo by ribeiroantonio / iStock.

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SMOKING HAS BEEN A MAJOR CONTRIBUTOR TO THE DISEASE BUR IN INDONESIA.

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LIST OF ACRONYMS

BPJS	Badan Penyelenggara Jaminan Sosial
FGD	Focus Group Discussion
FT	Full-time
FTE	Full-time Equivalent
GDP	Gross Domestic Product
KIS	Kartu Indonesia Sehat
KKS	Kartu Keluarga Sejahtera
KPS	Kartu Perlindungan Sosial
NCD	Noncommunicable Diseases
PBI	Penerima Bantuan Iuran
PPP	Purchasing Power Parity
Rp	Indonesian Rupiah
SKM	Machine-made *kretek*
SKT	Hand-made *kretek*
SPM	White cigarettes

EXECUTIVE SUMMARY

Indonesia has one of the most complex cigarette excise tax structures in the world. The current cigarette excise tax is divided into 12 tiers, which are based on manufacturers' type of cigarettes, the number of cigarette productions, and per-unit retail price. The tiers in the cigarette excise tax structure aim to accommodate small-scale cigarette firms, especially hand-rolled *kreteks* (SKT) firms. The rationale for such a structure is that smaller SKT firms account for more than half of the total factories in the tobacco industry. Moreover, these firms are responsible for employing a significant share of the workers in tobacco manufacturing. Such a system favors downward substitution to lower priced products and has a limited impact on smoking reduction.

This report aims to contribute to the policy debate over the tobacco excise tax reform and, specifically, any effects it might have on employment in Indonesia. It uses data from the Central Bureau of Statistics to observe the trends in employment and output in the tobacco sector and estimate the potential impact on tobacco employment (gross effect) from raising cigarette taxes in Indonesia.

The report shows that tobacco manufacturing represents only a small share of economy-wide employment (0.60 percent). Additionally, the contribution of tobacco manufacturing to employment in the manufacturing sector is quite small (5.3 percent) in comparison to the contribution of the food (27.43 percent), garment (11.43 percent), and textile (7.90 percent) sectors. Although small, tobacco manufacturing jobs are heavily concentrated, with about 94 percent of tobacco manufacturing workers in Central Java, East Java, and West Nusa Tenggara. In these provinces, several districts are quite dependent on tobacco sector employment, for example, Kudus (30 percent), Temanggung (27.6 percent), and Kediri (26 percent).

We found that most tobacco manufacturing workers are females and unskilled. The share of female workers in tobacco manufacturing is 66 percent, which is the highest in the manufacturing industry. Other sectors in which most workers are female are the garment sector (63 percent) and textiles sector (56 percent). About 69 percent of total workers in the tobacco sector completed at most, junior high school. Among tobacco households, the share of tobacco households with female tobacco workers is 78 percent. Average years of schooling completed by tobacco manufacturing workers is among the lowest at 8.22 years, which is comparable to the average years of schooling completed by workers in the food processing sector (8.50 years), manufacturing of wood products sector (7.31), nonmetallic metal products sector (7.42), furniture sector (8.77), and recycling sector (5.20).

Tobacco households are partially dependent on income from tobacco employment, which represents 60 percent of household income, on average. Additionally, among these households, only 9 percent have a female as the primary income earner. These find-

ings from secondary data (the Sakernas data) are consistent with the ones from the World Bank/ACS *kretek* workers survey in Indonesia—the proportion of wage income from *kretek* is 54 percent and the share of female tobacco workers as primary earner is about 10 percent (World Bank, 2017a).

Productivity of tobacco sector workers, measured by the output per worker, is relatively low in comparison to productivity of workers in the comparable sector. A typical worker in the medium and large tobacco firms can produce IDR 104 million (US$7,761) worth of products annually. For comparisons, a typical worker in the food and drink, and textile industries can produce IDR 265 million (US$19,776) and IDR 300 million (US$22,388) worth of products respectively.

The estimated output elasticity of labor demand for the cigarette manufacturing sector is 0.160. This means that a 1 percent decrease in output results in a 0.16 percent decrease in employment in the cigarette manufacturing sector. On the other hand, the estimate for the tobacco processing sector implies that a 1 percent decrease in output corresponds to a 0.092 percent decrease in employment in the tobacco processing sector.

We predict that raising cigarette taxes by an average of 47% and simplifying the cigarette tax structure to 6 tiers will reduce cigarette demand by 2 percent, increase government revenue by 6.4 percent, and reduce gross employment in tobacco manufacturing sector by less than 0.50 percent. That means that a reduction of 2,914 tobacco manufacturing jobs, most of them in the SKT industry (2,245 less jobs). Given the additional revenues government will obtain with the reform (IDR 10,915 billion), there is scope to implement measures to reduce the impact on the tobacco workers' livelihoods (such as cash transfers or expanded access to social safety nets) or to find alternative occupations for the workers affected (retraining programs, educational grants, etc.).

The evidence presented in this report clearly shows that the gross employment impact of reforming tobacco excise taxes and structure in Indonesia is not as big as previously thought. Analyses presented here are complemented by other evidence presented in the World Bank/ACS *Indonesia Tobacco Studies*, which highlighted the economic and social costs of tobacco workers' and farmers' livelihoods. Given the additional revenues the government will obtain with the reform (IDR 10,915 trillion), there is an opportunity to implement measures to reduce the impact on the tobacco workers' livelihoods (such as cash transfers or expanded access to social safety nets) or to find alternative occupations for the workers affected (retraining programs, educational grants, etc.).

It is important to note that these estimates represent the gross employment effect of lower cigarette consumption. When prices of cigarettes increase, consumers may shift their consumption to other goods and services which will create jobs in these sectors. Evidence has shown that the job losses in the tobacco sector (gross effect) are usually compensated with job creation in the other sectors (net effect). For Indonesia, Ahsan and Wiyono (2007) estimated positive effects varying from 84,340 to 281.153 jobs with tax increases of 25 percent and 100 percent, respectively (Ahsan and Wiyono, 2007).

- For *kretek* hand-rollers

  o First, the most vulnerable groups in the affected population who would need immediate income support in the event of job loss include the workers who are less educated, older, heads of their households, and who contribute a significant proportion of total household income from *kretek* rolling. The government can provide income support to these workers with less than 2% of the revenue gained from a tax increase; and

  o The government (Ministry of Finance and Ministry of Social Affairs) should provide temporary income support using the existing Social Assistance programs (such as the unconditional cash transfer program, Bantuan Langsung Sementara Masyarakat - BLSM) and identify alternative employment or income-generating opportunities in the affected regions. The re-training of laid-off *kretek* workers should be designed to accommodate transitions into these alternative employment opportunities.

- For (tobacco and clove) farmers:

  o **The government should help to improve supply chains and value chains for other goods in tobacco-growing areas.** Many former tobacco farmers are making a better living growing other common, locally grown crops (e.g., corn, sweet potato, and green vegetables), an outcome that could be further enhanced with even small investments by governments in improved supply chains for these products. Results from the World Bank/ACS survey suggest that current tobacco farmers are already growing many of these crops, so it is an issue of shifting their factors of production to maximize economic opportunity.

  o **The government should help to facilitate access to credit for tobacco farmers.** Greater access to capital through improved credit schemes could help to improve the possibilities for tobacco farmers to cultivate other crops and/or develop other nonagricultural economic enterprises. That could be in the form of grants or low-interest loans to farmers willing to move away from tobacco cultivation; and

  o **Specifically, on clove farmers, it is important to emphasize that clove farming is not particularly profitable for most clove-producing households in at least a couple of major clove-producing districts.** The government needs to research which alternatives could be viable and target the least profitable areas for switching and help these farmers make successful transitions to growing other crops and/or economic activities.

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1 INTRODUCTION

Smoking has been a major contributor to the disease burden in Indonesia. Smoking prevalence among working-age individuals has exceeded 30 percent since 2001. In 2013, smoking prevalence among males was 66%, while among females was 6.7%. Smoking prevalence among children ages 10–14 in 2013 was 3.7%, twelve times higher than in 1995 (IAKMI, 2014; Ahsan, 2015). Diseases attributable to smoking include hypertension, acute respiratory infection, coronary heart disease, cardiovascular diseases, selected cancers, and perinatal disorders (IAKMI, 2014; Kosen et al., 2012; Kristina et al., 2015). In 2013, healthy years lost at the population level due to smoking-induced diseases was estimated to be 6.2 million disability-adjusted life years or DALY (IAKMI, 2014).

The government of Indonesia continues its efforts to reform the cigarette excise tax system. The main objectives of the excise tax reform are to reduce smoking prevalence and to increase tax revenues. Studies suggest that a 10 percent increase in cigarette excise tax would lead to a reduction in cigarette consumption by 0.9 to 3 percent and an increase in government revenue by 6.7 to 9 percent (Hidayat and Thabrany, 2010; Setyonaluri et al., 2008). Currently Indonesia has one of the most complex cigarette tax structures in the world, which favors downward substitution to lower priced cigarettes (World Bank, 2015). Cigarette prices across all tiers increased at a modest rate between 2010 and 2017 as the government continued to increase cigarette taxes; nevertheless cigarette prices were more affordable in recent years than they were in 2000 owing to a faster income growth (NCI-WHO, 2017). The main argument against adopting such a complex cigarette tax structure was to protect employment by differentiating firms with different production scales with those that employ more workers, such as hand-rolled *kreteks* (SKT) workers.

Despite the concerns, tobacco manufacturing represents only a small share of the economy-wide employment (0.60 percent). Additionally, the contribution of the tobacco manufacturing to employment in the manufacturing sector is quite small (5.3 percent) in comparison to the contribution of the food (27.43 percent), garment (11.43 percent), and textile (7.90 percent) sectors. Although small, tobacco manufacturing jobs are heavily concentrated in Central Java, East Java, and West Nusa Tenggara, where about 94% of tobacco manufacturing workers are employed. In these provinces, several districts are quite dependent on sector employment, as for example Kudus (30 percent), Temanggung (27.6 percent), and Kediri (26 percent). A tax change shock that affected the tobacco sector would affect these districts most.

The objective of this report is to analyze the recent employment trends in the Indonesian tobacco industry and estimate the potential effects of raising cigarette taxes on employment in the tobacco manufacturing sector. The report provides new evidence to contribute to the ongoing debate about the effects of raising cigarette taxes on tobacco sector employment. It complements the current analytical work conducted by the World Bank, in partnership with the American Cancer Society, to explore the employment conditions and livelihoods of tobacco and clove farmers and *kretek* rollers in Indonesia. The report is part of the World Bank technical assistance to the government of Indonesia in the areas of revenue policy reform and health systems reform.

This report is structured as follows: Section two provides a review of the global evidence on the impacts of raising cigarette taxes on population health outcomes and on the economy. It briefly reviews the economic issues around tobacco taxation, including a summary of the global evidence on the effects of taxation on smoking reduction, fiscal revenues, tobacco production and employment in the sector. Section three presents an overview of the cigarette tax reforms in Indonesia in recent years and discusses the government of Indonesia's plans for reforming the cigarette tax structure. Section four discusses the employment trends in the tobacco industry in Indonesia, analyzes workers' characteristics and compares workers to similar sectors and socio-demographic profiles. The section also discusses the potential impacts of raising cigarette taxes on employment by presenting results of simulations. The final section, section five, discusses the results in light of the current debate over cigarette tax reform in Indonesia and provides policy recommendations on the employment aspects of the reform.

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2 THE ECONOMICS OF TOBACCO TAXATION

Raising cigarette prices through taxes is a cost-effective way to reduce cigarette consumption as recommended by the World Health Organization Framework Convention on Tobacco Control (WHO FCTC, 2003). The objective of raising cigarette taxes is to decrease consumption of cigarettes through higher prices.[1] Additionally, raising cigarette taxes can increase government's tax revenues, which can be allocated to finance complementary tobacco control policies and social investments such as health and education. Experiences in both high and low-and middle-income countries (LIMCs) show how tobacco tax revenues can be used to expand health care coverage. In France, for example, tobacco tax revenues are used to supplement the funding for public health services. In Philippines, higher tobacco and alcohol tax revenues have been used to expand health coverage for the poor. On the other hand, the tobacco industry argues that lower consumption of tobacco products due to higher tobacco tax can have negative effects on production and, consequently, on employment. This section presents a summary of the global evidence on the impacts of tobacco consumption on population's health and the impacts of tobacco taxation on fiscal revenues and employment.

2.1 Tobacco Consumption, Health Outcomes, and Economic Costs

Smoking is a major cause of morbidity and premature mortality. Tobacco consumption has been directly linked to diseases of the circulatory system (e.g., ischemic heart and cerebrovascular diseases); cancers of the trachea, bronchus and lung, esophagus, oropharynx, larynx, stomach, liver, pancreas, kidney and ureter, cervix, bladder, colon/rectum, as well as acute myeloid leukemia; chronic respiratory diseases (e.g., asthma, chronic obstructive pulmonary disease); and metabolic diseases such as diabetes mellitus (U.S. Department of Health and Human Services, 2014). Besides the harm of direct consumption, it has been proven that secondhand smoking (sometimes referred to as passive smoking, environmental tobacco smoke, or tobacco smoke pollution) also has damaging health consequences. Secondhand smoking is quite dangerous because there are at least 50 carcinogenic chemicals inhaled by those who are around smokers, and the

1 We use the term cigarette taxes and tobacco taxes interchangeably because cigarettes are a major form of tobacco product in Indonesia.

scientific evidence shows that there is no safe level of exposure to secondhand smoking (US NCI-WHO, 2016). The World Health Organization (WHO) estimates that approximately 7.2 million deaths per year worldwide are attributable to smoking, more than 6 million of those deaths are the result of direct tobacco use, while around 900 000 are the result of non-smokers being exposed to second-hand smoke (WHO, 2017a). Half of these deaths occurred in LMICs. By 2030, the annual death toll could reach 10 million if no tobacco control measures are taken (WHO, 2008).

Smoking is one of the major risk factors for noncommunicable diseases (NCD) deaths. NCDs kill 40 million people each year, which is equivalent to 70% of all deaths globally. Each year, 15 million people die from a NCD between the ages of 30 and 69 years; over 80% of these premature deaths occur in LMICs (WHO, 2017b). Worldwide, approximately 14% of adult deaths from NCDs are attributed to tobacco use, including 10% of all adult deaths from cardiovascular diseases (14% among men, 6% among women), and 22% of all adult deaths from cancer (32% among men, 11% among women). The clear majority (71%) of adult lung cancer deaths (78% among men, 53% among women) were attributable to tobacco. In addition, 36% of all adult deaths from diseases of the respiratory system were attributable to tobacco (42% among men, 29% among women) (WHO, 2012). Tobacco smoking is also an important risk factor for chronic obstructive pulmonary disease (COPD). In 2004, about 49% of the COPD deaths among adult men and 34% of COPD deaths among adult women were attributable to tobacco (WHO, 2012).

NCDs have become a major public health concern in Indonesia. The WHO estimates that the proportional mortality due to NCDs has increased from 50.7% in 2004 to 71% in 2014 (WHO, 2014). Tobacco smoke is the fourth risk factor that contributes to most death and disability combined from NCDs, after dietary risks, high blood pressure, and high fasting plasma glucose (IHME, 2017). In 2012, NCDs accounted for more disability-adjusted life years (DALYs) than communicable diseases—approximately 476 million and 240 million DALYs, respectively (WHO, 2014).

Smoking is also responsible for deaths from communicable diseases. Approximately 5% of global deaths from communicable diseases are attributed to tobacco, including 7% of all deaths due to tuberculosis (TB) and 12% of deaths due to lower respiratory infections (WHO, 2012). A systematic review of the literature found a significant positive relationship between exposure (passive or active) to tobacco smoke and TB infection and disease, independent of various potential health issues including alcohol use and socio-economic status (Salma et al., 2007). Recurrent TB and mortality resulting from TB were also associated with active smoking. This relationship is particularly important in Indonesia, given that the country has one of the highest TB infection rates in the world and where tuberculosis is one of the top causes of death (USAID, 2009).

The risk of death due to smoking declines with the length of time from an individual quits smoking. In other words, the sooner one quits smoking, the longer she/he will live. Studies have been conducted for the United States (Burns et al., 1997), India (Jha et al., 2008), and Germany (Neubauer et al., 2006) that have provided a quantitative relationship between the length of smoking, smoking cessation, and benefits of quitting smoking concerning mortality, showing that the reductions in relative risk of heart disease and stroke are more immediate than the effects on respiratory disease and cancer. Due to the lengthy time lags for the development of cancers and chronic respiratory diseases associated with tobacco smoking, deaths from these illnesses in LMICs may continue to rise, even if smoking prevalence remains the same or decreases (US NCI and WHO, 2016).

Smoking imposes a substantial economic burden on countries due to increased health care costs and worker's productivity losses. Goodchild and colleagues (2016) measured the economic costs of smoking in 152 countries, representing 97% of the worldwide smoking population. They considered direct costs related to health care treatment and indirect costs from productivity losses due to tobacco-related premature mortality and morbidity. The estimated total economic cost of smoking was equivalent in magnitude to 1.8% of the world's annual gross domestic product (GDP) in 2012 and 40% in LMICs. Of those, 76% are indirect costs related to productivity losses due to morbidity (35%) and premature mortality (65%). The direct health care costs were estimated at purchasing power parity (PPP) $467 billion (PPP international dollars), which is equivalent to 5.7% of global total health expenditures. The findings from this study highlight the urgent need to implement comprehensive tobacco control measures to reduce the economic costs of smoking.

2.2 Tobacco Taxes and Tobacco Consumption

Increasing tobacco and cigarette taxes reduces consumption and, consequently, can reduce smoking-attributable mortality and morbidity. The impact of tobacco taxation on the reduction of mortality depends on (i) the magnitude of the price increase resulting from a tobacco tax increase, (ii) the reaction of consumers to price changes, that is the price elasticity of demand,[2] which is related to smoking behavior (initiating, reducing intensity, or quitting), and (iii) the relationship between mortality and quitting smoking. The price of tobacco products in relation to income, i.e. affordability, also matters on initiation decisions, intensity, or quitting.[3] Empirical studies in high- and low- and middle-income countries have found a negative relationship between cigarette prices

2 Technically, the price elasticity of demand is the percentage change in the consumption of a product in response to a 1% change in the price of the product, with all else remaining constant.

3 To be effective in reducing tobacco demand, tax and price increases need to be significant to counteract the effect of income growth on tobacco demand and reduce affordability.

and smoking. Once prices increase, smokers adjust their decision of consuming through quitting or smoking reduction. Additionally, higher prices, due to a higher tax, act as a deterrent for new smokers, particularly among the youth or the poor. In high-income countries (HICs), price elasticity estimates are clustered around –0.4 percent (IARC, 2011). In LMICs also show a negative price-elasticities of tobacco demand, ranging from –0.1 to –1.0, with estimates clustered around –0.5 percent (John et al., 2010; Jha and Chaloupka, 2012; Szabo et al., 2016). In other words, in HICs, a 10 percent increase in the price of tobacco is expected to decrease tobacco consumption by 4 percent. In LMICs, a 10 percent increase in price would be expected to decrease tobacco consumption by 5 percent (IARC, 2011). A recent global simulation study shows that an 80 percent increase in excise per pack may lead to 42% increase in price, reduce global annual cigarette consumption by 18 percent and global smoking prevalence by 9 percent (Goodchild, Perucic, and Nargis, 2016).

Studies also show that smoking reduction after a tax increase has positive impacts on individual and public health. Several studies show the health benefits of quitting smoking due to tax increases (John et al., 2010; Blakely et al., 2015; Goodchild, Perucic and Nargis, 2016; Szabo et al., 2016). A recent systemic review of studies, published in English between 2000 and 2012, also concludes that tobacco taxation is a highly cost-effective policy, because the costs of intervention are minimal and significantly save health care costs after the tax increase implementation, although many health benefits of quitting take time to materialize (Contreary et al., 2015).

2.3 Tobacco Taxation and Tax Revenues

Tobacco and cigarette excise taxation can also be efficient sources of fiscal revenue. Given that tobacco demand is relatively inelastic, due to consumer addiction and the lack of close substitutes, tobacco taxes can generate considerable amounts of tax revenues, particularly if sales are large. Tobacco taxes may also create fewer distortions in the markets than would result from taxes on goods and services with more elastic demand. Also, given the small number of producers, tobacco taxes are relatively easy to collect at low administration and enforcement cost, as compared to general consumption and income taxes. Experiences in numerous countries indicate that an increase in tobacco taxes will increase nominal (as well as real) tax revenues in the short to medium terms.

The magnitude of tobacco and cigarette tax revenue that a government can generate largely depends on the tax system and the demand characteristics. Given a certain income level, per capita or total, a country's tobacco excise revenue depends on: (i) the level of taxation per unit of tobacco product (either as percent of the price or absolute amount of tax per pack); (ii) the number of different tax tiers; (iii) the price elasticity of tobacco demand; and (iv) the volume of tobacco sales. Normally, low levels of tobacco excise revenues are associated with low levels of taxation per unit of product (Chaloupka

et al., 2012). Different tax tiers, such as in Indonesia, allow producers to reduce their tax burden, expanding production through less taxed products. Also, smokers could avoid higher rates by switching to lower taxed cigarettes. The result may be lower revenues than potentially anticipated. The more inelastic the demand, the more government revenues can be generated with a certain tax rate increase. With an inelastic demand, the proportional reduction in cigarettes purchased by the consumer after the tax increase is smaller than the proportional increase in tax revenue. As the price elasticity of demand increases in absolute value, the possibility to raise revenues for a given tax rate change decreases. Finally, the volume of tobacco sales will determine the possibility of revenue expansion, given certain demand elasticity and percent changes on the taxation level.

Tobacco taxes are likely to remain high after a significant tax increase, even with a considerable decline in tobacco use. Chaloupka et al. (2012) argue that over time, inflation will erode the value of tobacco tax revenues, unless those taxes are increased often enough to keep pace with inflation. Similarly, as tobacco use declines in response to other tobacco control efforts, revenues from tobacco taxes will also decline, unless taxes are increased periodically. Nevertheless, it is possible that tax revenues may remain higher many years after a significant tax increase than they were before, even in the wake of a considerable decline in tobacco use. For example, in the case of California, tax rates increased by 770% between 1989 and 1999, while cigarette sales declined by more than 60% between 1989 and 2010, and tobacco excise revenues increased from US$250 million before 1989 up to US$845 million in 2010 (Chaloupka et al. 2012). In Brazil, the excise tax amount per cigarette pack was increased in real terms by 81.4% between 2011 and 2015, while total cigarettes sales decreased by 35% in the same period. However, real excise revenues in 2015 were still 17% higher than in 2011 (Iglesias, 2016).

2.4 Employment Impact of Tobacco Taxation

Despite its effectiveness in reducing tobacco consumption and increasing tax revenues, there is often a debate over the effects of tobacco tax employment in the tobacco industry. The tobacco industry generates jobs in diverse parts of the economy, including farming, manufacturing, and wholesale sectors. However, it is important to differentiate the employment that is from core-tobacco sectors (directly dependent on tobacco production, such as farming and manufacturing) compared to tobacco-related employment (jobs that are just partially dependent on tobacco, such as retail). Historic analyses of the tobacco industry show that the industry has significantly reduced employment because, over time, the industry has become more capital intensive and farming has become more efficient, so that job losses have occurred even in the absence of tobacco control measures (NCI-WHO, 2017). The tobacco industry has sponsored studies

to document the employment contribution of the sector. Usually these studies argue that tobacco control measures, such as higher taxation, would result in job losses in the tobacco industry and, consequently, increase unemployment (Zhang, 2002).

In contrast, most academic studies have shown that tobacco control policies, such as taxation, have an overall neutral or positive impact on employment. Zhang (2002) argues that the (industry-sponsored) studies use unrealistic assumptions about impacts of sales drop, overestimate the number of jobs associated with the tobacco industry and, consequently, overestimate the possible negative impact of tobacco control measures on overall employment. However, the main problem is that those studies do not consider: (i) the expansionary employment effect of consumption substitution of smokers who redirect their expenditure toward other products after the tax increase—tobacco expenditures do not disappear from the economy; rather, they are redistributed to the consumption and production of other goods and services; and (ii) the expansionary employment effect of higher public expenditure after the tax increase.[4]

Studies simulating the impacts of tobacco control policies on employment depend on key assumptions. For example, studies applying input–output models first estimate the change in final consumer demand for goods and services resulting from a tobacco control policy (US NCI and WHO, 2016). The change in demand is composed of two components: (i) the reduction of tobacco consumption, and (ii) the expansion of expenditures in other products, according to consumers (smokers) preferences. These studies then calculate the induced changes in outputs based on input–output tables that describe the flow of goods and services within the economy. Finally, changes in outputs are converted into changes in employment to obtain the employment impacts. The critical assumptions these studies rely on are: the impact of tobacco control measures—estimated price and income elasticities in the case of tax increases; and, more importantly, the type of consumption substitution that smokers display after the tax increase or tobacco control measure. The normal assumption is that ex-smokers would follow the average expenditure pattern or the most recent quitter expenditure pattern. If other selected goods and services have a larger direct and indirect employment input than tobacco product production, the net employment effect is positive.

The challenge to measure the employment impacts of higher tobacco taxes is that employment losses could be relatively concentrated, whereas employment gains tend to spread throughout the economy. Table 1 presents a selection of recent independent studies in low- and middle-income countries (LMICs). Under the assumptions discussed above, four out of the six studies resulted in net employment gains after

4 This expansionary effect depends on fiscal policy decisions; greater public revenues do not mean automatically higher public expenditures.

Table 1: Selected studies on net employment impact of tobacco control policies

STUDIES	MODEL AND ASSUMPTIONS	CONCLUSIONS
South Africa	Static input–output model	Net gain of 50,236 jobs occurred in 1995 by eliminating tobacco expenditures, with consumers acting as recent quitters and with the same government spending
Van der Merwe and Abedian, 1999	Domestic consumption expenditures were eliminated, and the rate of consumption decline in 1995 doubled.	
	Expenditures were allocated by recent quitter and average expenditure pattern.	
	Government spending was reduced or kept at the same level by increasing other taxes.	
Zimbabwe	Static input–output model	Net loss of 87,798 jobs in 1980, and 47,463 jobs when all output went to alternative agriculture products
Van der Merwe, 1998	Domestic consumption expenditures and tobacco production in 1980 were eliminated.	
	Average input–output pattern changed, and all tobacco production was shifted to alternative agriculture products.	
	Because of increases in other taxes, no change in government spending occurred.	
Bangladesh	Static input–output model	Net gain of 10,989,192 jobs in 1994
Van der Merwe, 1998	Domestic consumption expenditures and all tobacco production for tobacco products and bidis in 1994 were eliminated.	
	Average input–output pattern changed, and all tobacco production was shifted to alternative agriculture products.	
	Because of increases in other taxes, no change in government spending occurred.	
Bulgaria	Static input–output model	Net loss of 5,567 jobs in 1999
Petkova and colleagues, 2003	Domestic consumption expenditures and tobacco production in 1999 were eliminated.	
	Average input–output pattern changed, and all tobacco production was shifted to alternative agriculture products.	
	Because of increases in other taxes, no change in government spending occurred.	
Egypt	Static input–output model	Net loss of 5,567 jobs in 1999
Nassar and Metwally, 2003	Domestic consumption expenditures and tobacco production in 1999 were eliminated.	
	Average input–output pattern changed, and all tobacco production was shifted to alternative agriculture products.	
	Because of increases in other taxes, no change in government spending occurred.	
Indonesia	Static input–output model	Net gain of 84,340 jobs with a 25% tax increase; net gain of 140,567 jobs with a 50% tax increase; and net gain of 281,135 jobs with a 100% tax increase
Ahsan and Wiyono, 2007	Percentage increases of 25%, 50%, and 100% occurred in the cigarette tax.	
	Expenditures were allocated by the average expenditure pattern.	

Source: National Cancer Institute and World Health Organization (2017), Table 15.3, page 560.

tobacco control policies. Generally, the net effects were not significant, except in the case of Bangladesh and Egypt. Reductions occurred in core tobacco sectors, including tobacco farming and manufacturing; in tobacco-related sectors, such as wholesaling and retailing; and in ancillary sectors, such as the paper and pesticide industries. The net gains in employment depended on several factors, such as: the assumed structure of population (smoker) consumption; the production structure of the economy, i.e., the extent to which final products, inputs, and services were produced domestically or imported in the tobacco industry and in the industries where ex-smokers would spend their money; and the labor intensity of tobacco growing/manufacturing versus the rest of the industries composed of the average consumer expenditures. For example, Ahsan and Wiyono (2007) found that, in Indonesia, the top five sectors that would experience increased employment include rice, tea, coffee, sugarcane, and root crops, which have higher labor intensity than tobacco growing (Ahsan and Wiyono, 2007)

Table 2: Type of external tobacco trade and likely net employment impacts

TYPE OF EXTERNAL TOBACCO TRADE THAT A COUNTRY HAS	MEANING	LIKELY EMPLOYMENT IMPACTS
Net exporter of tobacco products	Production of tobacco leaf and cigarettes is higher than domestic consumption Tobacco employment distribution in domestic sales or exports would depend on the share of exports to total sales	Domestic tobacco demand is not the only determinant of production/employment in the core sectors. Drop of domestic tobacco demand could be compensated with production directed to external markets, and employment effects could be minimized. The relative effects of global and domestic policies depends on the share of production that is exported.
Balanced tobacco economy	Domestic production of tobacco leaf or cigarettes is used primarily for local consumption. Self-sufficient in tobacco	Domestic tobacco control policies may have negative net employment effects. Smoking prevalence and size of control policy could be important for absolute impact on net employment.
Net importers of tobacco products	Produce less tobacco leaf or cigarettes than they consume	Tobacco control policies in countries with small tobacco/cigarette production may increase overall employment. Not affected by global tobacco demand.
Mixed tobacco economy	Significant grower and producer, and imports and/or exports a substantial share of tobacco leaf and tobacco products	U.S. is an example: tobacco leaf producer, importer and exporter of large amounts of tobacco leaf. Changes in both domestic and global tobacco control policies would affect employment.

Source: Own elaboration based on US NCI and WHO (2016).

The possible employment impacts varied depending on whether the country was a net exporter or net importer of tobacco leaf. When tobacco control policies reduced the demand for cigarettes, a country was likely to have lower employment losses if that country imported a significant percentage of the cigarettes smoked and/or leaf used to make them, and domestically produced a large portion of the rest of the products included in the average consumption expenditure. Conversely, the more the tobacco leaf and other inputs and cigarettes were nationally grown and/or produced relative to the local content of the things people buy instead, the greater is the likelihood that there was some employment losses locally. The higher the production diversification of the economy, the higher was the domestic employment created by the demand switch from tobacco toward other products. In contrast, the higher the expenditure on tobacco and the lower the sectoral diversification of domestic production, the smaller (or even negative) was the net employment impact. The United States National Cancer Institute (US NCI) and the WHO published a report that presented a classification of countries and the likely employment impacts, based on a country's situation in terms of tobacco trade: net exporter, net importer, balanced economy and mixed situation (US NCI and WHO, 2016). As shown in Table 2, domestic tobacco control policies likely had a larger impact in countries with a balanced tobacco economy—self-sufficient in tobacco, because the employment destruction reduction of tobacco demand could not be offset.

Decline in tobacco consumption as a result of taxation or tobacco control policies may occur gradually. Although most of the studies presented in Table 1 assume a sharp and total reduction in cigarette consumption, smoking prevalence reduction occurred gradually even when a significant tax increase was implemented in the short term.[5] Tobacco control policies normally gradually reduce smoking, distributing adjustment costs through time and diluting them in decades (US NCI and WHO, 2016). The adjustment costs of labor-intensive segments of the industry, such as tobacco farming, depend on the existence of viable alternatives. In many LMICs, such as Brazil and the Philippines, tobacco farmers are diversified, producing other crops, which may facilitate the transition to other crops. The result from the World Bank/ACS survey on the economics of tobacco farming unequivocally demonstrated that former tobacco farmers were growing many of the same crops as current tobacco farmers, and were simply increasing production of these crops. Moreover, these former tobacco farmers were typically generating higher revenues and incurring lower costs than their neighbors and peers who continued to grow tobacco.

5 The Philippines, for example, increased the excise taxes for the cheapest cigarettes by 341% in a one-year period that resulted in a decline of tobacco use prevalence by approximately 20% Global Adult Tobacco Survey (GATS).

The employment issue has lost preeminence in the debate of tobacco control policies in many countries. Since the first half of the last decade, there have been few studies about the employment effect of tobacco control policies from either side of the debate; instead the debate has concentrated on other issues, such as illicit trade in tobacco products. For example, in the recent Brazilian experience of large increases of tobacco taxes (2011–2016), effects on employment were not an issue, because the export share of leaf production in the country increased. In the Philippines (2012 onward) potential employment impact was a big issue during Congressional deliberations, but since 80% of tobacco leaf was exported, the Ministry of Finance recognized that the employment impact risk on tobacco farmers was low. Furthermore, a budget was also allocated to help those that may be adversely affected—15% of the incremental tobacco tax revenues was allocated to tobacco farmers to encourage them to shift to alternative crops.

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3 CIGARETTE TAX POLICIES IN INDONESIA

Indonesia has one of the most complex cigarette excise tax structures in the world. The current cigarette excise tax system has 12 tiers, which are based on manufacturers' types of cigarettes, the scale of cigarette productions, and per unit retail price.[6] There are three types of cigarettes: machine-made *kreteks* (SKM), machine-made white cigarettes (SPM), and hand-rolled *kreteks* (SKT).[7] Manufacturers of either SKM or SPM are considered as a Class I if they produce more than 3 billion cigarettes annually and as a Class II if they produce less than the 3 billion cigarettes. On the other hand, manufacturers of SKT are considered a Class I if they produce more than 2 billion cigarettes annually, a Class II if they produce between 500 million to 2 billion cigarettes annually, and a Class III if they produce less than 500 million cigarettes annually.

Excise taxes for cigarettes produced by larger manufacturers increased at a modest rate between 2010 and 2017 (Figure 1). As shown in column 4 of Table 3, the excise taxes for machine-made *kreteks* (SKM, Class I) and white cigarettes (SPM, Class I) increased by 27 and 46 percent, respectively in real terms between 2010 and 2017. Note that changes in the tariffs for the small-scale manufacturers were relatively smaller compared to changes for the Class I SKM and SPM manufacturers. For example, excise taxes for Class II SKM manufacturers increased 24 percent while excise taxes for Class II SPM manufacturers increased 35 percent. It is important to note that tax increases that occurred have not been enough to reduce cigarette affordability. The US NCI and WHO show that cigarettes in Indonesia were much more affordable in 2013 than they were in 2000 (US NCI and WHO, 2016).

The tiers in the cigarette excise tax structure aimed to accommodate small-scale cigarette firms, especially SKT firms. The rationale for such a structure was to protect smaller SKT firms that accounted for more than half of total factories in the tobacco industry (column 5 of Table 3). Moreover, these firms were responsible for employing a significant share of the workers in tobacco manufacturing. For example, the per-unit tariffs for a SKM produced by Class I manufacturers and sold for a minimum of IDR 1,120 per unit was IDR 530 (47.3 percent of retail sale price), while the per-unit tariffs for a SKT produced by

6 Ministry of Finance Decree Number 43/PMK.04/2005.

7 In addition to SKM, SPM, and SKT, there are hand-rolled white cigarettes with filters. The structure of the excise tax for these products are identical to the structure for SKM..

Table 3: Cigarette excise tax in Indonesia, 2017

TYPE OF CIGARETTE	CATEGORY (PRODUCTION)	PER-UNIT TARIFFS (TIERS), IN RUPIAH	% NOMINAL CHANGE (REAL), 2010-2017	NUMBER OF FACTORIES (2015)
Machine-made *kreteks* (SKM), hand-rolled *kreteks* with filter (SKTF), hand-rolled white cigarettes with filter (SPTF)	Class I, > 3 billion sticks	530	78 (27)	14
Hand-rolled white cigarettes with filter (SPTF)	Class II, ≤ 3 billion sticks	335-365	75 (24)	232
Machine-made white cigarettes (SPM)	Class I, > 3 billion sticks Class II, ≤ 3 billion sticks	555 290-330	106 (46) 90 (35)	1 25
Hand-rolled *kreteks* (SKT)	Class I, > 2 billion sticks Class II, 500 million–2 billion sticks Class III, ≤ 500 million sticks	265-345 155-165 80-100	66 (18) 64 (15) 38 (-2)	16 21 404

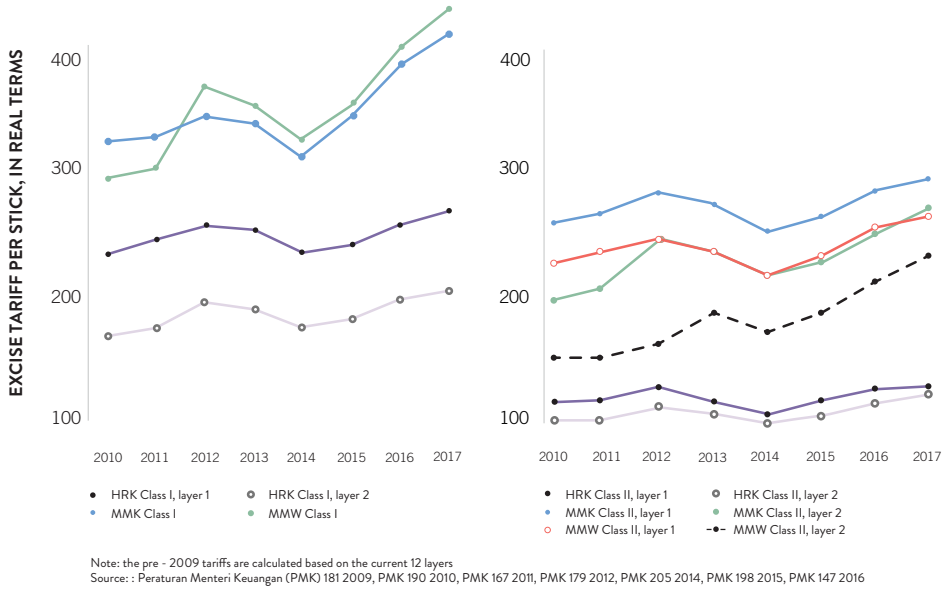
Source: Peraturan Menteri Keuangan (Ministry of Finance Decree) abbreviated as PMK: PMK Number 181 2009, PMK Number 190 2010, PMK Number 167 2011, PMK Number 205 2014, PMK Number 198 2015, PMK Number 147 2016.
Note: For parsimony, per-unit tariffs for Class II and Class III categories are simplified from per-unit tariffs for Class IIA, Class IIB, Class IIIA, and Class IIIB. Real change in per-unit tariffs accounts for changes in prices of goods and services in the economy.

Class I manufacturers and sold for a minimum of IDR 1,215 per unit was only IDR 345 (28.4 percent of retail sale price). These numbers imply that per-unit tariffs for SKT was half of the per-unit tariffs for SKM of a similar tier. The ratio between the highest and the lowest per-unit tariffs in the 2017 tax structure was quite high at 6.7. Changes in real excise tax for SKT between 2010 and 2017 was also quite low at 18% or lower. Additionally, SKT produced by Class III producers were cheaper, in real terms, in 2017 than they were in 2010.

Despite the low tax rates, there was a downward trend in the sale of SKT in the market. In 2001, the share of SKT in the market was about 40% (Ministry of Industry, 2009). The share decreased to 35.5% in 2005, to 30% in 2011, and to just 26% in 2013. We argue that the shift away from SKT was not likely the result of higher cigarette taxes. [8] First, as shown in Table 3, taxes imposed on SKT were among the lowest in the cigarette

8 Particularly because, as noted above, the tax increases were not enough to reduce affordability. cigarettes in Indonesia were much more affordable in 2013 than they were in 2000 (US NCI and WHO, 2016).

Figure 1. Trends of the Cigarette Excise Tax in Indonesia in real terms, 2010–2017



Note: the pre - 2009 tariffs are calculated based on the current 12 layers
Source: : Peraturan Menteri Keuangan (PMK) 181 2009, PMK 190 2010, PMK 167 2011, PMK 179 2012, PMK 205 2014, PMK 198 2015, PMK 147 2016

Source: Peraturan Menteri Keuangan (Ministry of Finance Decree) abbreviated as PMK: PMK Number 181 2009, PMK Number 190 2010, PMK Number 167 2011, PMK Number 205 2014, PMK Number 198 2015, PMK Number 147 2016.
Note: The pre-2009 tariffs were calculated based on the current 12 layers.

industry, and the changes of the taxes in real terms were quite small. Second, despite the decreasing share, productions of SKT were still increasing over time at least up to year 2010 (Tobacco Control Support Center, 2014). The shift away from SKT have been driven by changing preferences among smokers for machine-made products due to income growth. It may also have reflected substitution of more capital-intensive technology away from labor-intensive hand-rolling in cigarette production.

3.1 Effects on Cigarette Consumption, Revenues, and Employment

Previous evidence suggests that raising cigarette prices through taxes may have potential to reduce consumption in Indonesia. A review by Setyonaluri and colleagues (2008) reported price elasticities of demand ranging from –0.26 to –0.76. These estimates suggest that raising prices through taxes can reduce consumption. Ahsan (2011) suggested that a 16 percent increase in cigarette tax would reduce consumption by 4.7 percent, implying a price elasticity of –0.29. The impacts of raising cigarette tax on health were also potentially significant. A study suggested that raising cigarette taxes to 50 percent of retail prices can reduce expected mortality rate by 2 to 5 percent, depending on the price elasticity of demand (Setyonaluri et al., 2008).

This report updates earlier elasticity estimates. To do so, we used the 2015 National Socioeconomic Survey (Susenas) to estimate the price elasticity of cigarette demand.[9] The NSS contains data on whether an individual smoked *kreteks* or white cigarettes, the number of cigarettes smoked in the past week, and total expenditure for cigarettes. The limitation of our estimation was that we could not differentiate between hand-made and machine-made *kretek*. However, obtaining separate estimates for *kreteks* and white cigarettes offered a significant improvement over the existing literature. This information allowed estimating price elasticity of demand for SKT and SKM separately. Results showed variation in price elasticities of demand between *kreteks* and white cigarettes. The estimated price elasticity of demand for *kreteks* was about –0.42 while for white cigarettes was about –0.51 (within the range of –0.26 and –0.76 reported in previous studies). We acknowledge our price elasticities may be underestimated because they do not account for substitutions to cheaper products. For example, individuals can easily switch to cheaper cigarettes if cigarette prices increase because of higher excise taxes.

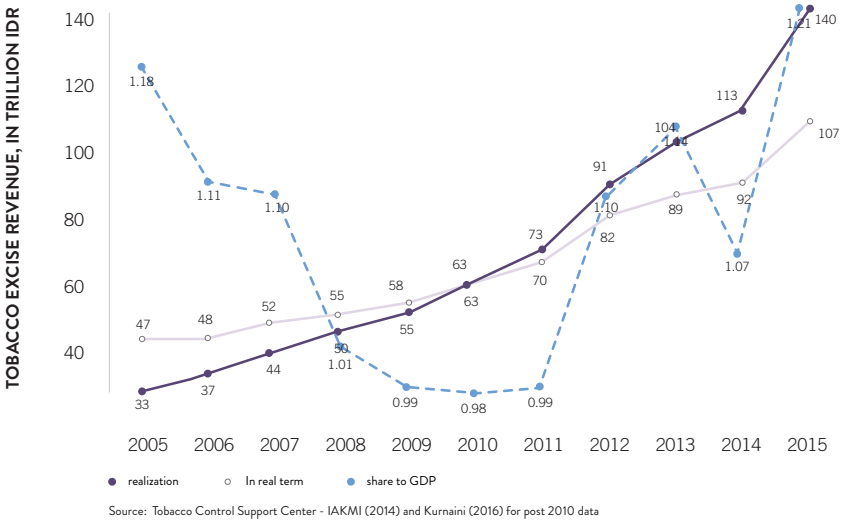
An important aspect is to observe the impact of tobacco excise tax across income groups. The global evidence suggests that cigarette tax was regressive and showed that the young and the poor were more responsive to price changes. For example, Nasrudin and colleagues (2013) estimated price elasticities of –0.15 to –0.16 among individuals in the first two income deciles and price elasticities of –0.20 to –0.28 among individuals in the third to ninth deciles. The authors estimated that the tax burden as a percentage of income of individuals in the first two deciles was between 3 to 10.63 percent and the tax burden of individuals from the other income groups was below 2 percent (Nasrudin et al., 2013). These results may be explained by the policy of keeping *kreteks* cheap. However, the study did not consider the benefits of raising cigarette taxes. A more recent study showed that once indirect benefits (such as lower health care expenditures and higher productivity) of raising cigarette taxes were accounted for, a tobacco tax increase was actually progressive (Fuchs and Meneses, 2017).

In Indonesia, annual excise tax revenues from tobacco products had been increasing monotonically since 2005 (Figure 2). In 2007, the realized excise tax revenue was IDR 43.54 trillion (US$4.87 billion). The figure grew to IDR 55.38 trillion (US$5.33 billion) in 2009, IDR 103.6 trillion (US$9.90 billion) in 2013, and IDR 139.5 trillion (US$11.76 billion) in 2014 (IAKMI, 2014; Dwi Kurnaini, 2016).[10] Historically, tobacco excise accounts for more than 95 percent of total excise revenue. Simulation studies suggest that a 10 percent increase in cigarette tax would increase excise revenues by 6.7 to 9.0 percent (Setyonaluri et al., 2008). Another simulation suggests that a 16 percent increase in cigarette tax would

9 We report the estimations of price elasticity of demand in Annex III.

10 The exchange rates were IDR 8,938/US$ in 2004, IDR 10,389/US$ in 2009, IDR 10,461/US$ in 2013, and IDR 11,865/US$ in 2014 (OECD, 2017).

Figure 2. Revenue from the tobacco excise, 2005–2015



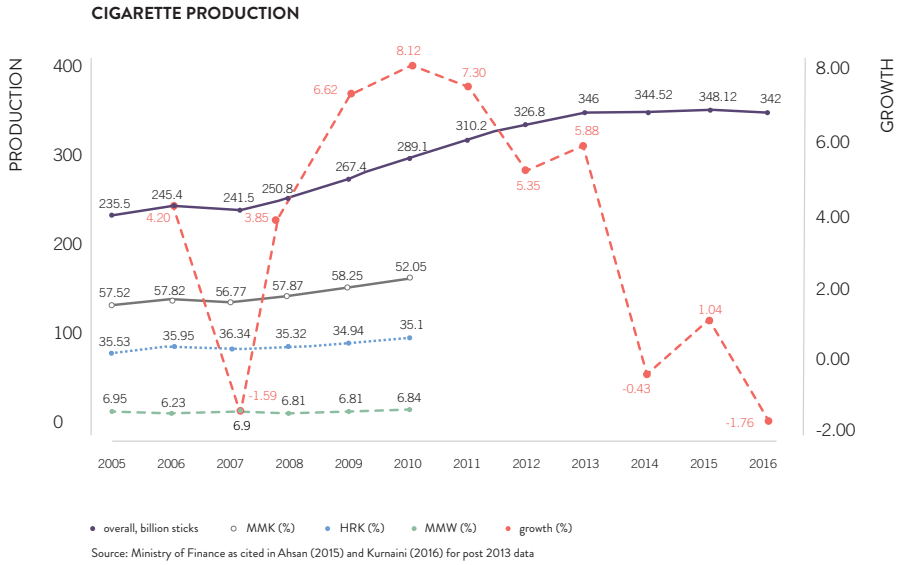
Source: Data collected from Tobacco Control Support Center—IAKMI (2014) and Dwi Kurnaini (2016) for post 2010 data.

boost excise revenue by 30.5 percent (Ahsan, 2011). These studies suggest that the tax elasticity of revenue is between 0.67 to 1.90.

Raising cigarette taxes did not seem to affect cigarette production as production exhibited an increasing trend over the years. As shown in Figure 3, the tobacco industry produced 235.5 billion cigarettes in 2005 and increased that number for the next 10 years. Cigarette production hit the 300 billion mark in 2011, peaked at 348 billion in 2015, and decreased to 342 billion sticks in 2016 (Ahsan, 2015; Dwi Kurnaini, 2016). A positive trend in cigarette production over the years could have been driven by growing cigarette affordability and the ineffectiveness of low excise taxes in reducing affordability. Nevertheless, it is important to note that growth of cigarette production exhibited a decreasing trend post 2010.

Despite a positive production trend, the number of cigarette firms decreased quite significantly in the past decade. Dwi Kurnaini (2016) reported that the number of cigarette factories decreased from 4,699 in 2007 to just 713 in 2015. There were 246 factories in the SKM industry (34.5 percent), 441 factories in the SKT industry (61.9 percent), and 26 factories in the SPM industry (3.6 percent) in 2015 (Dwi Kurnaini, 2016). Moreover, the Class III SKT industry operated 404 factories in 2015 which accounted for 56.6 percent of total factories in the cigarette industry (Dwi Kurnaini, 2016). The reduction in the number of factories was partly due to closing a tax loophole. Larger companies formed small cigarette firms to take advantage of a lower tax rate for small-scale firms. The government closed this loophole by the requirement that there should be no ownership link between the small and the large cigarette firms.

Figure 3. Trends of cigarette production in Indonesia, 2010–2016



Source: Ministry of Finance as cited in Ahsan (2015) and Dwi Kurnaini (2016) for post 2013 data.
Note: production data by types of cigarette are not available for public after 2010

Previous evidence showed that raising cigarette taxes had a net positive impact on employment in Indonesia. A study by Ahsan and Wiyono (2007) investigated three policy scenarios using an input–output (IO) model: a 30%, 50%, and 100% increase in cigarette tax. These increases corresponded to higher cigarette prices by 8%, 13%, and 26%, respectively. The authors found overall employment gains in all scenarios, although employment in cigarette manufacturing, and tobacco and clove farming decreased (which meant net employment effect was positive). The analysis suggested that workers would have shifted to other agricultural sector such as other food crops, paddy, tea, coffee, sugarcane, and root crops. The net effect on employment of a 100% increase in cigarette taxes was an additional 281,135 workers. This was equivalent to a 0.3% increase in total employment (Ahsan and Wiyono, 2007). Another study by Marks (as cited in Ahsan and Wiyono, 2007; Setyonaluri et al., 2008) showed that an increase in real price of cigarettes by 80% resulted in a gross reduction of jobs in the SKT sector by 86,000. A more recent study by Nasrudin and colleagues (2013) showed that raising cigarette taxes resulted in gross employment reduction in the cigarette manufacturing sectors. Specifically, the study estimated a decrease in employment by 3.27 to 3.46 percent among small SKT producers, by 6.66 to 6.78 percent among medium and large SKT producers, and by 5.85 to 6.04 percent among the machine-made cigarette sector (Nasrudin et al., 2013).

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4 EMPLOYMENT IN THE INDONESIAN TOBACCO SECTOR

This section presents an overview of the employment trends in the Indonesian tobacco industry and estimates the effects of raising cigarette taxes on gross employment in the tobacco sector. It reviews the recent trends in employment in the tobacco sector, such as the number of workers, the share of tobacco manufacturing employment to total manufacturing employment, and labor productivity. The section also discusses the concentration of tobacco workers across provinces in Indonesia and compares employment trends to other similar sectors.

The core Indonesian tobacco sector includes workers in the tobacco manufacturing sector, tobacco farmers, and clove farmers. The tobacco manufacturing sector is divided into three main industries: *kretek*, white cigarette, tobacco processing and tobacco/clove farming. In 2014, there were 307,793 workers in the *kretek* industry, 10,598 workers in the white cigarette industry, 352,086 workers in tobacco processing, and 16,529 workers in the non-cigarette industry.[11] There were also approximately 761,310 tobacco farmers in 2011 and 1.04 million clove farmers in 2013.[12] However, evidence suggests these farmers also dedicated some percentage of their time to other crops and, therefore, the full-time equivalent of the number of workers should be significantly lower (World Bank, 2017a; 2017b; 2017c). Clove farmers were considered as the core employment because 90 percent of annual clove production was purchased by cigarette companies to produce *kreteks* even though a clear majority of clove farmers made just a fraction of their income from clove (World Bank, 2017c).

4.1 Data Sources

To provide a picture of the size, composition, and trends of the tobacco sector workforce, this report utilized firm- and household-level micro data. We used the annual survey of micro and small industry (SIMK), aggregated statistics of micro and small

11 Non-cigarette products included cigars, kelembak menyan, and tobacco flavoring.

12 The numbers were calculated or obtained from the 2014 Annual Survey of Manufacturing Industry (SI), the 2014 Annual Survey of Micro and Small Manufacturing Industry (SIMK), Table 4.8 of Tobacco Control Support Center—IAKMI (2014), and the 2014 Clove Farming Statistics.

industry, the annual survey of manufacturing industry (SI), and the National Labor Force Survey (Sakernas), all published by the Central Bureau of Statistics.[13] The firm-level data included, among others, variables such as the number of workers, wages, materials, costs of inputs, outputs, and value added. We used these data to generate the employment trend in the tobacco industry and to estimate output elasticity of employment of output. The Sakernas included employment variables such as years of schooling, hours of work, type of jobs, employment status, and occupation category. We used these data to describe the labor market characteristics of workers in the tobacco manufacturing sector.[14]

For the tobacco manufacturing sector, we focused our analysis on the *kretek*, white cigarette, and tobacco processing industry. We acknowledged that we could not identify in SIMK or SI whether *kretek* firms produced SKT or SKM. This information would have been very useful for estimations of output elasticity of labor since SKT firms tend to be more labor intensive than SKM firms. Moreover, we could not identify tobacco and clove farmers in the Sakernas dataset. Therefore, we use aggregated data of tobacco and clove farmers from Tobacco and Clove Farming Statistics.

The analysis complemented the household level data collected under the Indonesian Tobacco Employment Studies, which focused on small-holders' tobacco and clove farmers and *kretek* rollers. Results from these surveys are reported in the accompanying reports (World Bank, 2017a, b and c).

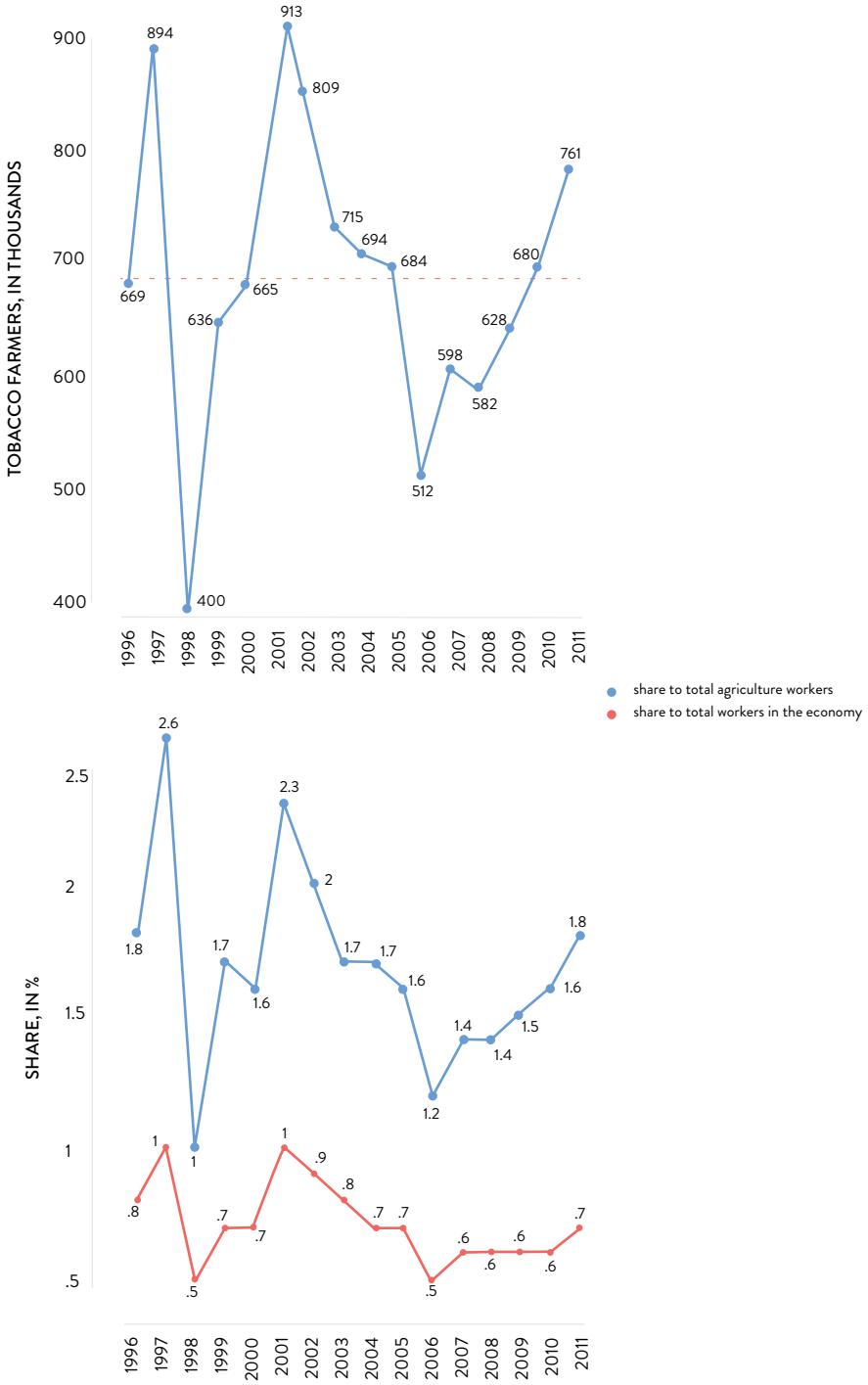
4.2 Employment in the Indonesia Tobacco Farming Sector

The share of tobacco farmers to total farmers in the agricultural sector fluctuated around 1.6 percent in recent decades. Additionally, the share to total workers in the economy fluctuated around 0.7 percent (see Figure 4). Furthermore, tobacco was just a part of what the farmers did economically. As reported by the World Bank/ACS report on tobacco farming in Indonesia, tobacco farmers only dedicated a portion of their land to cultivate tobacco and only a minority of tobacco-farming households relied on tobacco farming as their major income-earning activity (World Bank, 2017c). We can observe in Table 4 that tobacco farmers were concentrated in Java, particularly in East Java and Central Java. The combined number from these two provinces made up about 84% of total tobacco farmers in the nation. There was also a non-negligible number of tobacco farmers in Nusa Tenggara Barat, which accounted for about 7% of total Indonesian tobacco farmers. These statistics underlined the phenomena that the tobacco industry, particularly tobacco manufacturing and tobacco farming, was concentrated in few provinces.

13 The annual survey of micro and small industry was available from 2010.

14 When using the National Labor Force Survey (NLFS), we acknowledge that estimation of statistics using 3-digit International Standard Industrial Classification (ISIC) yields high relative standard error owing to the sampling design.

Figure 4: Number of tobacco farmers and share of tobacco farmers to total workers, 1990–2011



Source: Data collected from Tobacco Control Support Center—IAKMI (2014).

Table 4. Distribution of tobacco farmers across regions, 2014

PROVINCE	FARMER, 2014	SHARE, 2014 (%)	PRODUCTIVITY (TON/FARMER)
East Java	351,217	61.87	0.308
Central Java	125,154	22.05	0.26
NTB	38,336	6.75	0.967
West Java	26,319	4.64	0.31
Sumatera (all provinces)	11,188	1.97	0.671
DIY	8,888	1.57	0.123
Sulawesi	2,874	0.51	0.546
NTT	2,563	0.45	0.509
Bali	1,098	0.19	0.853
Indonesia	567,637	100	0.349

Source: Indonesian Plantation Statistics: Tobacco (2014).

Similar to tobacco farmers, clove farmers were concentrated in East, Central, and West Java (Table 5). Data from the Indonesian Plantation Statistics (2015) suggest that there were around one million clove farmers in Indonesia. This suggests that about 2.69 percent of all agricultural workers grew cloves, or 0.95 percent of total workers in the economy. However, the World Bank/ACS survey showed that clove farming was just but one of the crops that these farmers grew. As reported in the World Bank/ACS report, farmers did not need to tend the plants for much of the year (World Bank, 2017c). Clove farming also contributed a small part to household income. Using the aggregated statistics, we found that the productivity of clove farmers in Java was quite low, which is similar to tobacco farmers in Java. Nevertheless, the calculation of productivity was crude because it didn't consider many aspects of clove farming reported in the World Bank/ACS report (World Bank, 2017c).

4.3 Employment in the Tobacco Manufacturing Sector

The tobacco manufacturing sector employed approximately 692,000 workers in 2014. As shown in Table 6, employment in the *kreteks* and tobacco processing industry accounted for 96 percent of tobacco employment. The *kretek* industry employed 307,793 workers in 2014, while the tobacco processing industry employed 352,086. Tobacco processing usually involved farming households that dried, cured, and sometimes cut the tobacco leaves for further processing, such as for cigarette manufacturing. Most

Table 5. Distribution of clove farmers across regions, 2014

PROVINCE	FARMERS, 2013	SHARE, 2013 (%)	PRODUCTIVITY (TON/ FARMER)
East Java	238,100	22.62	0.045
Central Java	189,527	18.00	0.033
West Java	143,249	13.61	0.046
Sumatera (all provinces)	76,109	7.00	0.115
North Sulawesi	72,284	6.87	0.130
Maluku	65,352	6.21	0.212
South Sulawesi	61,114	5.81	0.286
Bali	53,233	5.06	0.058
Central Sulawesi	44,629	4.24	0.309
East Nusa Tenggara	24,725	2.35	0.078
North Maluku	19,749	1.88	0.227
Southeast Sulawesi	17,826	1.69	0.368
Banten	17,618	1.67	0.267
DI Yogyakarta	12,591	1.20	0.029
Gorontalo	6,360	0.60	0.119
West Nusa Tenggara	3,344	0.3=2	0.038
West Sulawesi	2,705	0.26	0.146
Kalimantan (all provinces)	2,490	0.24	0.145
Papua (all provinces)	1,639	0.16	0.037
Total	1,052,644	100	0.104

Source: Indonesian Plantation Statistics: Clove (2015).

kreteks workers worked in large firms (97 percent) while most tobacco processing workers worked in micro or small firms (92 percent).[15] As pointed out above, the available data do not allow to distinguish between firms that produced SKM and SKT. Therefore, we assumed that most of the large firms were firms producing SKT as they required a larger number of workers in the production process.

15 We used the government's definition to define the production scale of a firm. Firms that employed less than 5 workers were considered micro firms, between 5–19 workers were considered small firms, between 20–99 workers were considered medium firms, and more than 99 workers were considered large firms.

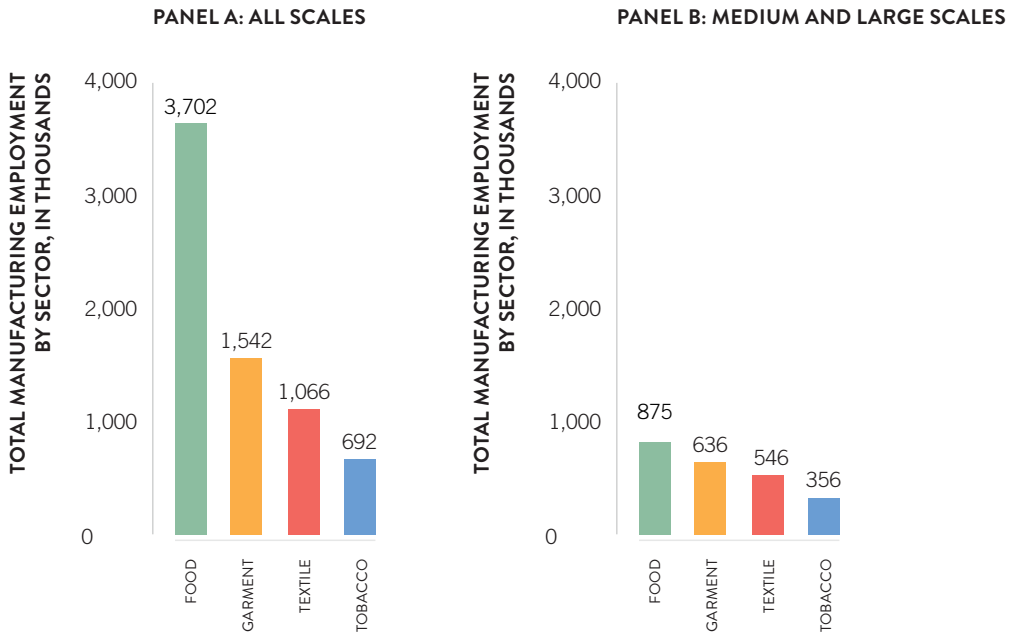
Table 6. Employment structure of the Indonesian tobacco industry, 2014

PRODUCTION SCALES	*KRETEKS*		WHITE		PROCESSING		OTHERS	
	Worker	Firms	Worker	Firms	Worker	Firms	Worker	Firms
Micro	828	368			119,400	36,500	5,288	4,334
Small	1,748	92			203,067	21,363	558	54
Medium	6,132	148	448	6	13,094	399	1,606	44
Large	299,085	209	10,150	11	16,525	32	9,077	13
Total	307,793	817	10,598	17	352,086	58,294	16,529	4,445

Source: Calculated using data from ASMSI & ASMI (2014).

Total number of workers in the tobacco manufacturing sector was 692,000 in 2014. About 365,000 of these workers worked in the medium and large manufacturing industry, mostly as workers in the *kreteks* firms. Employment in the medium and large tobacco firms grew from 245,000 in 2000 to 356,000 in 2014. However, the employment contribution of the tobacco manufacturing sector is lower than the contribution of the food, garment, and textile industries, whose share of female workers are also quite high.

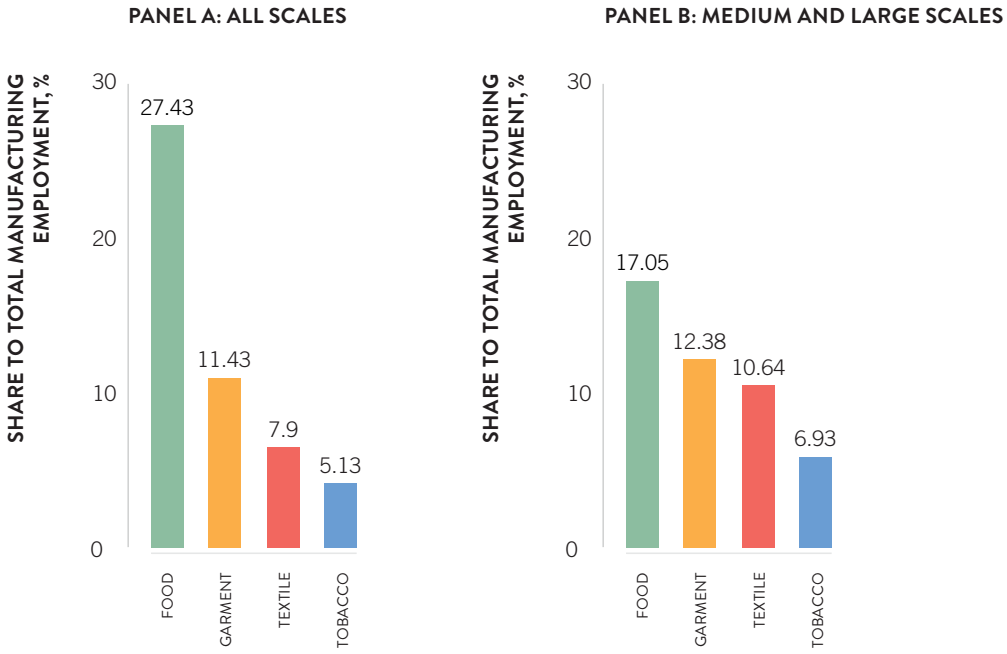
Figure 5. Number of medium and large tobacco manufacturers, 2014



Source: Calculated using data from ASMSI (2014) and aggregated statistics of micro and small industry (2014).

The contribution of the tobacco sector to employment in the manufacturing sector was quite small relative to similar manufacturing sectors (Figure 5). Tobacco manufacturing employment represented 5.13 percent of total manufacturing employment in Indonesia, while industries such as food employed 27.43 percent, garment employed 11.43 percent, and textile employed 7.90 percent. Furthermore, the contribution of tobacco manufacturing employment to economy-wide employment was also quite low at 0.60 percent in 2014. The employment contribution of tobacco sector in the medium and large manufacturing industry is also quite low at 6.93%.

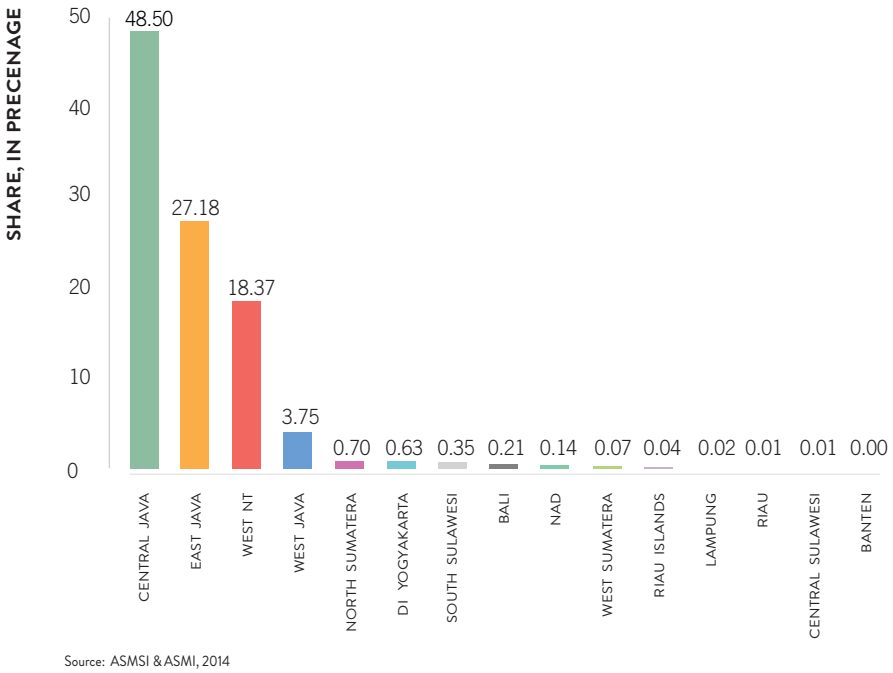
Figure 6. Share of tobacco employment to total manufacturing employment, 2014



Source: Calculated using data from ASMSI (2014) and aggregated statistics of micro and small industry (2014).

Tobacco manufacturing jobs were heavily concentrated in a few regions of Indonesia. Most of the tobacco manufacturing workers were concentrated in Central and East Java (Figure 7). Our estimates from the 2014 annual industry survey showed that the combined share of tobacco manufacturing workers in Central and East Java was about 76 percent of total tobacco manufacturing workers in Indonesia. Another 18 percent of manufacturing workers were in West Nusa Tenggara. This was a higher concentration when compared to other sectors, for example, 40 percent of the workers in the food and drink sector were concentrated in Central Java (21 percent), East Java (19 percent) and 18 percent in West Java. In the garment sector 42 percent of workers were in West Java and 29 percent in Central Java.

Figure 7. The concentration of tobacco manufacturing workers, 2014



Source: Calculated using data from ASMSI (2000–2014) and aggregated statistics of micro and small industry (2014).

This concentration of tobacco workers meant that some districts were dependent on tobacco sector employment. In Kudus, Temanggung, and Kediri, employment in the tobacco sector accounted for more than 60 percent of local manufacturing employment and more than 25 percent of overall local employment (Table 7). The type of tobacco industry varied across districts. For example, Kudus and Kediri relied quite heavily on the *kreteks* industry. In Kediri, the share of *kreteks* workers to total employment in the manufacturing industry was about 67.6 percent. On the other hand, Temanggung relied heavily on the tobacco processing industry. Any intervention to alleviate possible employment impacts of tobacco consumption shocks should be focused on these districts.

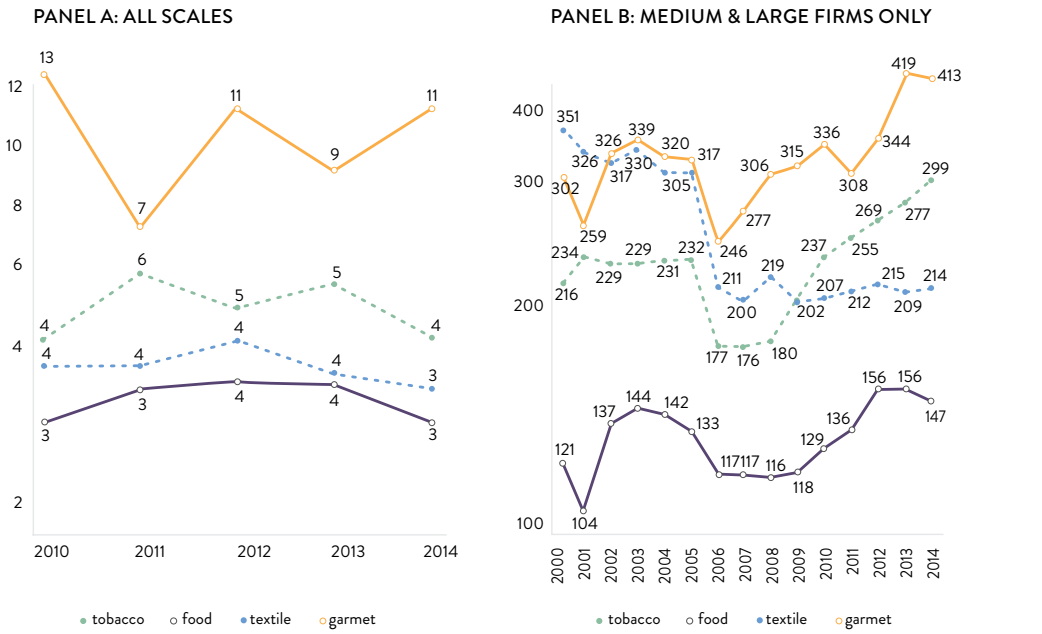
The Indonesian tobacco manufacturing sector exhibited a high worker per firm ratio relative to other sectors, and that was mostly due to *kretek* manufacturing. Available data only focused on the medium and large industries in which we observed variations across firms (Figure 8). In the food and textile industries, typical firms employed on average 157 and 214 workers in 2014, respectively. In contrast, a typical tobacco manufacturer employed, on average, 414 workers in 2014. Note that we could not distinguish whether firms produced SKT or SKM. Nevertheless, a recent report by the Tobacco Control Support Center—IAKMI showed that the SKT industry was the most labor-intensive indus-

Figure 8. Number of workers per firm by industry

SHARE TO TOTAL LOCAL EMPLOYMENT IN MANUFACTURING INDUSTRY	CENTRAL JAVA	KUDUS	TEMANGGUNG	EAST JAVA	KEDIRI	SRABAYA	MALANG	WEST NT
Kreteks	5.47	57.98	-	5.99	67.6	12.29	34.55	-
White cigarettes	0.02	0.13	-	0.23	-	-	0.61	-
Tobacco processing	6.6	2.6	66.48	0.66	-	0.19	-	39.18
Total tobacco	**12.18**	**60.72**	**66.48**	**7.32**	**67.6**	**12.49**	**35.2**	**39.18**
Food	31.08	8.99	9.83	28.91	17.54	16.71	17.24	13.9
Wood products	12	0.58	18.26	15.83	0.36	2.15	0.04	17.55
Garment	11.64	6	1.29	3.64	0.2	6.42	6.06	3.53
Textiles	9.39	2.18	0	5.2	0.1	2.56	2.5	5.54
Furniture	6.23	4.06	0.4	4.93	0.36	1.97	4.49	1.88
Others	17.48	17.47	3.71	34.17	13.84	57.7	34.47	18.42
Share of tobacco employment to local employment (%)	**2.01**	**30.13**	**27.65**	**0.97**	**26.29**	**2.12**	**5.07**	**6.03**

Source: Calculated from ASMI & ASMSI (2014) and NFLS (2014).

Figure 8. Number of workers per firm by industry



Source: Calculated using data from ASMSI (2000–2014) and aggregated statistics of micro and small industry (2014).

try in the tobacco manufacturing sector, with a typical SKT firm employing 662 workers and a typical machine-made *kreteks* firm employing just 84 workers (IAKMI, 2014).

Most tobacco sector workers were females and unskilled. The share of female workers in the tobacco industry was 66 percent, which was the highest in the manufacturing industry (Table 8). Other sectors in which most workers were female were the garment sectors (63 percent) and textiles sectors (56 percent). About 69 percent of total workers in the tobacco sector completed at most junior high school. Among tobacco households, the share of tobacco households with female tobacco workers was 78 percent. Average years of schooling completed by tobacco sector workers was among the lowest at 8.22 years, which was comparable to average years of schooling completed by workers in the food processing sector (8.50 years), manufacturing of wood products (7.31), non-metallic metal products (7.42), furniture sectors (8.77), and recycling sectors (5.20).

Table 8. Characteristics of tobacco sector workers, 2011, 2013, and 2015

VARIABLE	2011	2013	2015
1 if rural	52.50%	55%	60%
Age	36.2	35.9	37.1
1 if female	72%	75%	66%
1 if production workers	93%	91%	92%
Hours worked	46.7	34.6	44.1
Years of schooling	7.79	8.12	8.21
1 if less than elementary school	16%	15%	15%
1 if completed elementary school	32%	31%	30%
1 if completed junior high school	27%	25%	24%
1 if completed high school	25%	26%	26%
1 if working part-time, i.e., <30 hours pw	7.96%	33.04%	13.73%
1 if wage is below regional minimum wage	40.51%	44.86%	50.10%
1 if wage is below regional poverty line	5.01%	5.51%	3.62%
Number of workers[17]	**518,328**	**504,726**	**465,236**

Source: Statistics Indonesia, the August National Labor Force Survey, 2011, 2013, 2015.
Note: The statistics are based on population-weighted estimates. The sample includes only working-age individuals who were currently employed or those who were temporarily out of their jobs during the survey. Tobacco sector workers were those whose firms were classified as ISIC 160.

17 The firm- and household-level estimates of total tobacco workers were quite different. This discrepancy can be attributed to a high relative sampling error when we estimate industry-level statistics using the household-level data.

On average, the share of tobacco income to overall household income was 60 percent. One interesting aspect to note was that the share of female tobacco workers as primary earners was only 9 percent.[18] The findings from the Sakernas data were quite consistent with the ones from the World Bank/ACS *kretek* workers survey in Indonesia (World Bank, 2017b). In this survey, we found that the proportion of wage income from *kretek* was 54 percent. We also found that the share of female tobacco workers as primary earners was about 10 percent.

Unconditional wages in the tobacco industry were relatively low, reflecting the fact that the industry employed a high share of low-skilled workers.[19] In 2015, the average and median real monthly wage of tobacco production workers was IDR 758,859 (US$56.6) and IDR 556,994.6 (US$33.4) respectively. For comparisons, the average and median real monthly wage of workers in the economy was IDR 1,080,530 (US$80.6) and IDR 756,107 (US$56.4), respectively. The ratio of average and median wage to minimum wage was 1.06 and 0.78.[20] Nevertheless, about half of tobacco manufacturing workers earned less than the minimum wage. Between 2011 and 2015, the average annual growth of real monthly wage of these workers was 4.23 percent. During the same period, the average annual growth of minimum wage was 7.4 percent while the average annual wage growth in the economy was 3.23 percent.

Regression analysis showed that female production workers earned 25% lower wages than male production workers.[21] One possible explanation for the male-female wage gap in the tobacco industry was the education gap between male and female tobacco workers. Female production workers in this sector completed 7.7 years of schooling while their male counterparts completed 8.4 years of schooling.[22] We conjecture that male production workers worked in high-productivity tobacco manufacturing firms (machine operators), while female production workers worked in low-productivity tobacco manufacturing firms (hand rollers). However, our data did not have the relevant variables to estimate this conjecture. Note that the male-female education gap in the tobacco sector was wider than the male-female education gap in the economy. On average, male workers completed 8.7 years of schooling while female workers completed 8.4 years of schooling. To investigate relative wages of tobacco workers, we included a dummy variable for the tobacco sector in the regression specification and we presented it in column 1 to 3 (Table 9). We found that tobacco workers earned higher wages than workers in other manufacturing workers, even those in comparable sectors such as the

18 A female worker was considered a primary earner in the household if the only source of income in the household came from the female worker.

19 Unconditional wages refers to average wages for every worker in a sample. Wages, however, were determined by many factors such as gender, age, years of working experience, years of schooling completed, employment status, and other characteristics. It is important to note that there were determining factors when we discuss unconditional wages.

20 For the ratio, we used the average regional minimum wage of Central Java, East Java, DIY, and West Nusa Tenggara.

21 Annex I provides a detailed description of the econometrics model for this estimation.

22 These statistics suggest a gender segmentation in the tobacco manufacturing sector. In developing countries, female workers were more likely to be employed as informal workers while male workers were more likely to be employed as formal workers, thus gender segmentation (Chen, 2005, 2012).

food and drink, garments, and textile industries. We found that, on average, tobacco workers earned about 15 percent higher wages than other manufacturing workers.

Table 9. Estimation results of the wage equation, 2001–2015

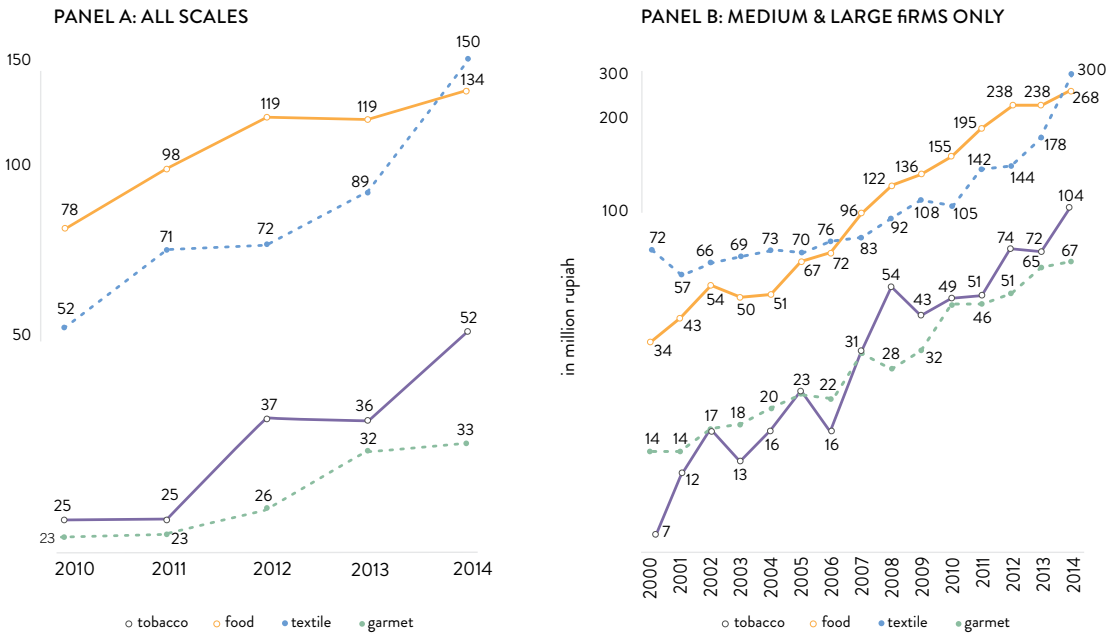
DEP. VARIABLE: LOG OF WAGE	1: MANUF. INDUSTRY	2: WITH COMPARABLE SECTORS	3: PRODUCTION WORKERS ONLY	4: TOBACCO
1 if female	-0.276*** (0.024)	-0.248*** (0.026)	-0.304*** (0.026)	-0.088 (0.069)
Years of schooling	0.060*** (0.002)	**0.055*** (0.002)**	**0.054*** (0.002)**	0.044*** **(0.004)**
1 if production worker	-0.315*** (0.017)	-0.366*** (0.028)		**-0.191** (0.105)
1 if tobacco		0.155*** (0.025)	0.162** (0.061)	
Female x production				-0.247** (0.082)
Observations	152,377,119	69,493,078	131,981,606	6,437,039
R-squared	0.54	0.51	0.51	0.55
Year	2001-15	2001-15	2001-15	2001-15
Clustering of S.E.	District	District	District	District
Controls	Y	Y	Y	Y

Source: Calculated from the August National Labor Force Survey, 2001–2015.
Note: ***, **, * indicate significance at the 1, 5, and 10 percent levels. The control variables include age, age squared, a dummy for urban status, dummies for employment status (employee, casual workers, etc.), dummies for type of work (managers, administrative, sales, services, etc.), dummies for industry, dummies for districts, and year dummies. The standard errors are clustered at the district level. Sample weights are used for the estimations.

Productivity of tobacco sector workers, measured by the output per worker, was relatively low in comparison to productivity of workers in the comparable sector.[23] In 2014, a typical worker in the medium and large tobacco industry produced IDR 104 million (US$7,761) worth of products annually (Panel B of Figure 9). For comparisons, a typical worker in the food and drink and textile industries produced IDR 265 million (US$19,776) and IDR 300 million (US$22,388) worth of products, respectively. However, there were variations within the tobacco sector. The productivity of workers in the *kreteks* industry

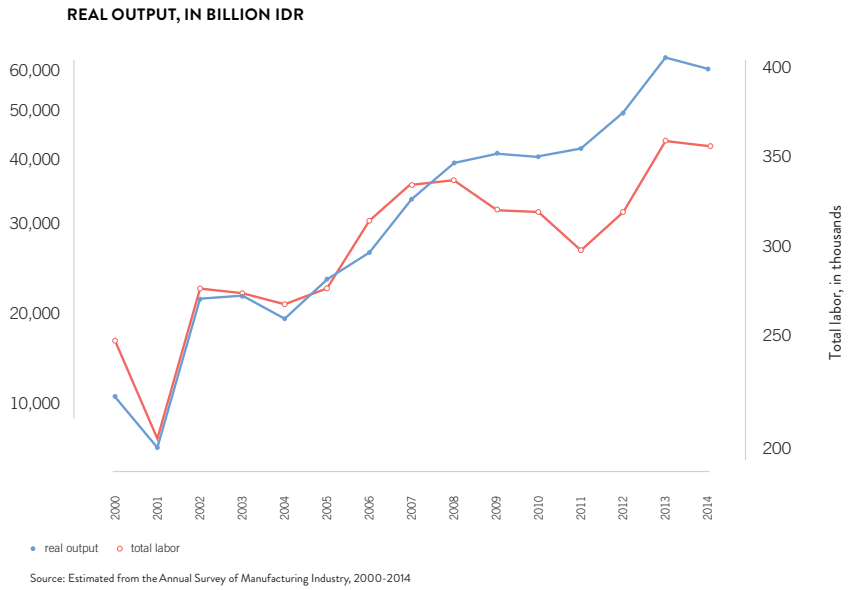
23 The Central Bureau of Statistics, Indonesia does not publish the quantity of goods produced in the Annual Survey of Manufacturing Industry. The Bureau published the value of output produced, which may include the value of goods, the value of electricity sold, the value of services sold, and the value of the difference in the inventory of intermediate goods. We used output in the text for simplicity..

Figure 9. Productivity of workers, 2000–2014



Source: Calculated using data from ASMSI (2000–2014) and aggregated statistics of micro and small industry (2014).

Figure 10. Relationship between output and labor in medium and large industry, 2000–2014



Source: Calculated using data from ASMSI (2000–2014).

was IDR 152 million (US$11,343), while the productivity of workers in the white cigarette industry was IDR 421 million (US$31,417).[24] We could not distinguish the productivity of the SKT and SKM industries. However, we expected that the productivity of the SKT industry was far below the productivity of the SKM industry. Figure 10 shows that output and labor were positively correlated. However, this correlation masked important variations across manufacturing firms within the sector.

We estimated the output elasticity of labor demand for the cigarette manufacturing sector at 0.160. This estimate implied that a one percentage decrease in output corresponded to a 0.160 percent decrease in employment in the cigarette manufacturing sector (Table 10). On the other hand, the estimate for the tobacco processing sector implied that a one percentage decrease in output corresponded to a 0.092 percent decrease in employment in the tobacco processing sector.[25]

Table 10. Estimation of own-wage and output elasticity of labor demand, 2000–2014

DEPENDENT VARIABLE: LOG OF EMPLOYMENT	FE, ALL	FE, CIGARETTE	FE, *KRETEKS*	FE, PROCESSING	OLS, PROCESSING
Log of wage	-0.045*** (0.001)	-0.107*** (0.013)	-0.107*** (0.013)	-0.058*** (0.007)	-0.157*** (0.019)
Log of output	0.157*** (0.003)	0.160*** (0.017)	0.162*** (0.017)	0.092*** (0.022)	0.177*** (0.043)
N	275,189	4,135	4,031	6,471	1,557
Clusters	27,580	458	453	762	-
Year	2000-14	2000-14	2000-14	2000-14	2010, 2011, 2014
Clustering of S.E.	Firm-level	Firm-level	Firm-level	Firm-level	Robust SE
Scale	M & L	M & L	M & L	M & L	Mi & S

Source: Estimated from the Annual Survey of Manufacturing Industry, 2000–2012, and the Annual Survey of Micro and Small Industry, 2010, 2011, and 2014.
Note: ***, **, * indicate significance at the 1, 5, and 10 percent levels. The regression sample included an unbalanced panel of manufacturing firms in Indonesia as explained in Annex II. Wage, output, and other nominal variables were adjusted by wholesale price index. The control variables included price-adjusted capital, price-adjusted material expenditures, and price-adjusted energy expenditures, the share of production workers, scale of production, investment status, dummies for districts, dummies for industries, year dummies, and the interaction between industry and year dummies. The standard errors were clustered at the firm level.

24 Note that we could not differentiate productivity of workers in the hand-rolled *kreteks* industry and that in the machine-made *kreteks* industry.

25 We noted several advantages and drawbacks of using a fixed-effect model to estimate output elasticity of labor demand. First, a fixed-effect model accounted for firm-specific unobserved heterogeneity which may bias the estimate of the elasticity. On the other hand, a fixed-effect model may not account for a possible simultaneity bias between output and labor demand.

SMOKING HAS BEEN A MAJOR CONTRIBUTOR TO THE DISEASE BUR IN INDONESIA.

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5 SIMULATIONS ON THE EFFECTS OF RAISING CIGARETTE EXCISE TAX ON EMPLOYMENT

In this section, we present simulations on the effects of raising cigarette excise tax. The main objective of these simulations is to analyze the effects on tobacco industry employment and government revenue from excise tax. We consider three simulations with different excise tax increase scenarios. We first simulate the effects of the 2018 cigarette excise tax regulation on government revenue. We then use the 2018 cigarette excise tax law as a baseline. We use this baseline to simulate the effects of raising cigarette excise tax and tier simplification.

5.1. Simulation of the 2018 Cigarette Excise Tax Regulation

The Government of Indonesia issued a new tobacco excise tax law for 2018 through Ministry of Finance Regulation Number 146/PMK.010/2017. The 2018 regulation remains a continuation of the 2017 regulation. It features different treatments for machine-made (SPM and SKM) and hand-made cigarettes (SKT), and multi-tiered excise tax. Despite these similarities, the 2018 regulation offers two key changes. First, the tax burden is increased through higher tariffs for each tier. Second, it establishes a 4-year roadmap to reduce the number of tiers to just 5 by 2021.

Table 11 and 12 shows the analysis of the 2018 regulation. The average increase in tariffs of machine-made cigarettes (SKM and SPM) is 6.8%, higher than the 5.8% increase in tariffs of SKT. This feature is consistent with the ones in the 2016 and 2017 regulations. The average tax burden for SKM and SPM is 52%, higher than the average tax burden for SKT of 29%. This suggests that there is a room for improvement in the SKT segment.

Table 11. Analysis of the 2018 Cigarette Excise Tax Regulation

TYPE	A: TIER	B: CONSUMPTION (BILLION OF STICKS)	C: MINIMUM RETAIL PRICE, 2017	D: TAX, 2017	E: PROPOSED TAX INCREASE (INFLATION ADJUSTED)	F: NEW TAX (10 TIERS)	G: REGULATED PRICE (2018)	H: CHANGE IN REGULATED PRICE (INFLATION ADJUSTED)	I: RATIO OF TARIFF TO PRICE	J: MARKET SHARE
SKM	I	212	1,120	530	7.0%	590	1,120	-3.8%	53%	61%
	IIA	17	820	365	1.4%	385	895	4.9%	43%	5%
	IIB	21	738	335	6.2%	370	805	5.0%	46%	6%
SKT	IA	13	1,215	345	1.7%	365	1,260	-0.3%	29%	4%
	IB	40	1,038	265	5.2%	290	1,075	-0.4%	27%	12%
	IIA	5	730	165	4.9%	180	470	-38.1%	38%	1%
	IIB	5	600	155	11.7%	180	470	-24.7%	38%	1%
	IIIA	5	465	100	-3.8%	100	400	-17.3%	25%	1%
	IIIB	7	400	80	20.2%	100	400	-3.8%	25%	2%
SPM	I	16	1,030	555	8.3%	625	1,130	5.5%	55%	5%
	IIA	2	900	330	7.8%	370	935	-0.1%	40%	1%
	IIB	2	743	290	17.7%	355	788	2.0%	45%	1%
Total		345								100%
Weighted Average					6.6%			-2.8%	47%	
Weighted Average SKM & SPM					6.8%				52%	
Weighted Average SKT					5.8%				29%	

Source: authors' calculation
Note: we assume inflation rate of 4% to calculate inflation-adjusted prices.

Table 12. Simulations on the effects of the 2018 Tax Law on excise revenue

TYPE	A: TIER	C: BASE REVENUE	D: CHANGE IN REGULATED PRICE (INFLATION ADJUSTED)	E: PRICE ELASTICITY OF DEMAND	F: % CHANGE IN DEMAND	G: CONSUMPTION	H: ESTIMATED REVENUE	I: CHANGE IN ESTIMATED REVENUE (INFLATION ADJUSTED)
SKM	I	112,360	-3.8%	-0.412	1.6%	215	127,062	10,208
	IIA	6,205	4.9%	-0.412	-2.0%	17	6,412	-42
	IIB	7,035	5.0%	-0.412	-2.0%	21	7,611	295
SKT	IA	4,485	-0.3%	-0.412	0.1%	13	4,751	86
	IB	10,600	-0.4%	-0.412	0.2%	40	11,618	594
	IIA	825	-38.1%	-0.412	15.7%	6	1,041	183
	IIB	775	-24.7%	-0.412	10.2%	6	992	186
	IIIA	500	-17.3%	-0.412	7.1%	5	536	16
	IIIB	560	-3.8%	-0.412	1.6%	7	711	129
SPM	I	8,880	5.5%	-0.502	-2.8%	16	9,724	489
	IIA	660	-0.1%	-0.502	0.1%	2	740	54
	IIB	580	2.0%	-0.502	-1.0%	2	703	100
Total		153,465		309		349	171,901	12,297
Weighted Change			-2.8%		1.1%			
Increased in Revenue								8.01%

Source: authors' calculation
Note: we assume inflation rate of 4% to calculate inflation-adjusted prices.

We discuss the implications of the 2018 regulation. First, the regulation incentivizes expansion of the market. The minimum retail prices for cigarettes with the largest market share, SKM I and SKT 1B, are lower in real terms. Lower minimum retail prices increase affordability of these cigarettes and their sales. As shown in Column G of Table 12, the simulation suggests that sales of SKM I product may increase by 3 billion sticks. This is a setback from progresses made in the 2015 to 2017 tobacco excise tax regulations. Second, the regulation aims to keep employment losses in the labor-intensive SKT industry to a minimum. This is evident from the negative price changes among SKT products. These products remain affordable despite higher tariffs, which may induce higher sales and protect the demand for *kretek* rollers. Increase in prices of SPM and SKM may not affect labor demand that much owing to mechanization in these industries.

Table 13. Estimated number of workers in each tax tier

TYPE	A: TIER	B: NUMBER OF FACTORIES (2015)	C: WORKERS PER FIRM (2011)	D: ESTIMATED NUMBER OF WORKERS	E: ESTIMATED SHARE (%)	F: IMPLIED NUMBER OF WORKERS (2014 ESTIMATE)
SKM	I IIA IIB	14 84 148	85 85 85	1,190 7,140 12,580	0.38 2.28 4.01	1,167 7,005 12,342
SKT	IA IB II III	1 15 21 404	664 664 664 664	664 9,960 13,944 268,256	0.21 3.17 4.44 85.50	651 9,771 13,680 263,176
SPM	I IIA IIB	1 7 18	31 31 31	31 217 558	3.85 26.92 69.23	408 2,853 7,337
Tobacco processing	n/a	58,294				352,086
Estimated total workers, *kretek* Estimated total workers, white				313,734 806		
Actual total workers, SKM & SKT (2014) Actual total workers, SPM (2014) Actual total workers, processing (2014)						307,793 10,598 352,086

Source: We obtained the numbers of factories in 2015 from Dwi Kurnaeni (2016), the average workers per firm from Tobacco Control Support Center—IAKMI (2014), and the actual total workers in each tobacco subindustry from the 2014 SIMK and SI. For conformity with the 2018 regulation, we merge SKT IIA and SKT IIB into SKT II, and SKT IIIA and SKT IIIB into SKT III.

5.2. Simulation of Alternative Tax Increase Scenarios

To estimate the impact of raising taxes on employment, we needed to estimate the number of workers in each production tier. Given that available data did not allow to directly identify the number of workers in each tier, we used secondary data and applied a few assumptions to estimate the number of workers in each tier. Given that we have data for total workers in the *kretek* and white cigarettes industry, we need the share of workers in each tier. First, we obtain the number of factories by cigarette type and tier using 2015 data from Dwi Kurnaini (2016); secondly, we use the average workers per firm in 2011 reported in Tobacco Control Support Center and IAKMI (2014). These are shown in Column B and C of Table 13, respectively; thirdly, we calculated the estimated total workers per tier by multiplying the number of factories and the average workers per firm; and finally, we summed these numbers by subindustries to obtain total workers in the *kretek* and white cigarette industries, which are shown in Column D of Table 13.

Note that estimated total workers in *kretek* and white cigarette industries were consistent with the actual total workers.[26] Next, we calculated the estimated share of workers in each

tier to total employment in the *kretek*s and white cigarette industries, and we show these shares in Column E. Using these shares, we calculated the implied number of workers by multiplying the shares with the actual number of workers in the *kretek* and white cigarette industries calculated using SIMK and SI. We show the implied number of workers that we used for simulations in Column F of Table 13.

We observed that most *kretek* workers worked in the small *kretek* firms. Specifically, small SKT firms employed about 268,000 workers or 86 percent of total *kretek* workers in Indonesia. These workers produced 12 billion sticks or 3% of total cigarette production. On the other hand, workers in SKM firms employed only 6.7% of total *kretek* workers in Indonesia. These workers produced 250 billion sticks or 72% of total cigarette production. These figures highlight a drastic productivity difference between the two sectors.

We use the estimated number of workers in each tier to simulate the effects of raising cigarette excise taxes. We propose two alternative scenarios for the simulation of the tax effects. The first scenario is a hypothetical government scenario, which raises taxes and simplifies the tax structure to 8 tiers. The World Bank has been providing inputs for the tobacco tax excise reform since 2015, in which the reform proposal was to streamline the excise tax structure and increase disproportionately the average excise tax rate across tiers. The second scenario is our proposal, which raises higher taxes for cigarettes with lower taxes and simplifies the tax structure to just 6 tiers. Note that we use the 2018 regulation as the baseline for both simulation scenarios.

We show the hypothetical government scenario in Table 14. We breakdown the minimum retail prices in the 2018 regulations into base price, excise tax, and VAT. For the simulation, we assume that excise taxes would increase at the same pace with the increases in 2018. We follow the 2018 regulation for the tier simplification by reducing the number of tiers to 8. Specifically, we merge the tariffs of SKM IIA and SKM IIB into a single tariff, and similarly for the tariffs of SPM IIA and SPM IIB. The new tariffs are shown in Column G of Table 14. The value-added tax is going to increase to 10% in 2019, and we incorporate this change in the calculation prices.

We use the new tariffs and VAT to calculate the new minimum retail prices, and we show these prices in Column I of Table 14. Higher tariffs of the SKM and SPM products will be fully passed through higher prices. On the other hand, higher tariffs of the SKT products will not be passed through higher prices. We keep prices of SKT products the same with prices in the baseline, while keeping the tax burden of SKM and SPM products below 57%. Notice that the tax burden of SKT products are still quite low in comparison to the tax burden of SKM and SPM products.

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26 However, we acknowledge that the estimated total workers in the white cigarette industry was underestimated.

Table 14. A hypothetical government scenario

TYPE	A: TIER	B: MINIMUM RETAIL PRICE, 2018	C: TAX, 2018	D: VAT 2018 (9.1%)	E: BASE PRICE, 2018	F: PROPOSED TAX INCREASE (INFLATION ADJUSTED)	G: NEW TAX (8 LAYERS)	H: VAT 2019 (10%)	I: PROPOSED MINIMUM RETAIL PRICE	J: CHANGE IN REGULATED PRICE	K: TAX BURDEN
SKM	I	1,120	590	102	428	7%	630	118	1,176	5%	54%
	IIA	895	385	81	429	1%	390	91	910	2%	43%
	IIB	805	370	73	362	5%	390	84	835	4%	47%
SKT	IA	1,260	365	115	780	1%	370	126	1,260	0%	29%
	IB	1,075	290	98	687	5%	305	108	1,075	0%	28%
	II	470	180	43	247	8%	195	47	470	0%	41%
	III	400	100	36	264	5%	105	40	400	0%	26%
SPM	I	1,130	625	103	402	8%	675	120	1,197	6%	56%
	IIA	935	370	85	480	8%	400	98	978	5%	41%
	IIB	788	355	72	361	13%	400	85	845	7%	47%

Source: authors' calculation
Note: we assume inflation rate of 4% to calculate inflation-adjusted prices.

We show the effects of raising taxes on revenue under the hypothetical government scenario in Table 15. Higher prices owing to higher tariffs of the SKM and SPM induce lower demand for these products. Note that the demand for SKT products remain the same because prices of these products are kept the same. We estimate that there would be a reduction of consumption by 1.45%. Since demand for cigarettes is inelastic, excise tax revenue would increase if excise tax is raised. Indeed, we estimate that the increase in tariffs would increase government revenue by 4.43%

Table 15: The effects of raising taxes on revenue: a hypothetical government scenario

TYPE	A: TIER	B: BASE REVENUE	C: NEW TAX (8 TIERS)	I: CHANGE IN PRICE (INFLATION ADJUSTED)	J: PRICE ELASTICITY OF DEMAND	K: % CHANGE IN DEMAND	L: ESTIMATED CONSUMPTION	M: ESTIMATED REVENUE	N: CHANGE IN ESTIMATED REVENUE
SKM	I	125,080	630	5%	-0.412	-2%	208	130,826	5,746
	IIA	6,545	390	2%	-0.412	-1%	17	6,591	46
	IIB	7,770	390	4%	-0.412	-2%	21	8,063	293
SKT	IA	4,745	370	0%	-0.412	0%	13	4,810	65
	IB	11,600	305	0%	-0.412	0%	40	12,203	603
	II	1,800	195	0%	-0.412	0%	10	1,948	148
	III	1,200	105	0%	-0.412	0%	12	1,260	60
SPM	I	10,000	675	6%	-0.502	-3%	16	10,479	479
	IIA	740	400	5%	-0.502	-2%	2	782	42
	IIB	710	400	7%	-0.502	-4%	2	770	60
Total		170,190		4%		-2%	340	177,732	7,542

Source: authors' calculations

We show the effects of raising taxes on tobacco sector employment in Table 16. We estimate that the effects on employment of such scenario is quite minimal. Only SKM and SPM sectors that would experience loss of employment, and the loss of employment is quite small at less than 0.5%. We estimate that the tobacco processing sector would experience a loss of employment by about 0.14%. This loss is driven by a lower demand in processed tobacco by SKM and SPM industries. Note that we assume identical output elasticity of employment for the machine-made and hand-made cigarette firms owing to data limitations. We also do not have a strong prior statistic on the difference in the elasticities between these two firms owing to a lack of information from previous studies. If labor elasticity of output is less elastic in te machine-made cigarettes, then we would expect even lower impact of higher taxes on employment.

Table 16: The effects of raising taxes on employment: a hypothetical government scenario

TYPE	A: TIER	B: PRICE CHANGE	C: NUMBER OF WORKERS (2014)	D: PRICE ELASTICITY OF DEMAND	E: CHANGE IN DEMAND (%)	F: LABOR ELASTICITY OF OUTPUT	G: CHANGE IN EMPLOYMENT (%)	H: LOSS OF EMPLOYMENT
SKM	I	5%	1,167	-0.412	-2%	0.160	-0.33%	-4
	IIA	2%	7,005	-0.412	-1%	0.160	-0.11%	-8
	IIB	4%	12,342	-0.412	-2%	0.160	-0.25%	-31
Total:								**-42**
SKT	IA	0%	651	-0.412	0%	0.160	0.00%	0
	IB	0%	9,771	-0.412	0%	0.160	0.00%	0
	IIA	0%	13,680	-0.412	0%	0.160	0.00%	0
	IIIA	0%	263,176	-0.412	0%	0.160	0.00%	0
Total: B								**0**
SPM	I	6%	408	-0.502	-3%	0.160	-0.48%	-2
	IIA	5%	2,853	-0.502	-2%	0.160	-0.37%	-10
	IIB	7%	7,337	-0.502	-4%	0.160	-0.59%	-43
Total: C								**-56**
Tobacco processing		4%	352,086		-2%	0.092	-0.14%	-505 -603
				Actual	Loss	%		
A: Actual total workers, *kretek* (2014)				307,793	-42	-0.01%		
B: Actual total workers, white (2014)				10,598	-56	-0.53%		
C: Actual total workers, processing (2014)				352,086	-505	-0.14%		
A+B+C: Total tobacco industry workers				670,477	-603	-0.09%		

Source: authors' calculations
Note: The change in demand for tobacco processing sector is the weighted average of cigarette demand change.

Higher tariffs of SKT products and constant prices means that the SKT industry will absorb the tax increase. Many SKT firms would experience a significant drop in the profit margin, and several SKT firms may shut down if they experience losses. Consequently, there would be loss of employment in the longer run. This is a win-win scenario for the government and tobacco sector employment. Under this scenario, revenue would increase and the loss of employment would be kept to a minimum, at least in the immediate fiscal year.

We propose another simulation scenario, which expedites the tier simplification, and we show the simulation on Table 17. Our scenario simplifies the tax structure by reducing the tiers from 10 to just 6. We merge SKT IA and IB into a singler tier and similarly for SKT II and III. Specifically, we increase the tax of SKT 1B by 28% and the tax of SKT III by 95%. Our scenario also allows increases in prices of SKT products, which eases SKT firms' tax burden. We estimate that the increase in tobacco tax would decrease cigarette demand by 1.89%. However, we estimate that the excise tax revenue would increase by 6.41% owing to

Table 17: The effects of raising taxes on employment: World Bank and ACS scenario

TYPE	A: TIER	B: NEW TAX	B: PRICE CHANGE	D: CHANGE IN DEMAND (%)	E: CHANGE IN EMPLOYMENT (%)	F: LOSS OF EMPLOYMENT	G: CHANGE IN ESTIMATED REVENUE
SKM	I	630	5%	-2%	-0.33%	-4	5,746
	IIA	390	2%	-1%	-0.11%	-8	46
	IIB	390	4%	-2%	-0.25%	-31	293
Total:						**-42**	
SKT	IA	370	1%	0%	-0.08%	-1	41
	IB	370	2%	-1%	-0.15%	-15	3,058
	IIA	195	2%	-1%	-0.14%	-19	131
	IIIA	195	13%	-5%	-0.82%	-2,169	1,019
Total: B						**-2,203**	
SPM	I	675	6%	-3%	-0.48%	-2	479
	IIA	400	5%	-2%	-0.37%	-10	42
	IIB	400	7%	-4%	-0.59%	-43	60
Total:						-56	
Tobacco processing		4%	352,086	-2%	-0.17%	-613	-2,914
					Actual	**Loss**	**%**
A: Actual total workers, *kretek* (2014)					307,793	-2,245	-0.73%
B: Actual total workers, white (2014)					10,598	-56	-0.53%
C: Actual total workers, processing (2014)					352,086	-613	-0.17%
A+B+C: Total tobacco industry workers					670,477	-2,914	-0.43%

Source: authors' calculations
Note: The change in demand for tobacco processing sector is the weighted average of cigarette demand change.

inelasticity of cigarette demand. Lastly, we estimate that the loss of employment would be 2,914 tobacco industry workers. The estimated loss would be quite low, which is 0.43% of total tobacco sector employment. This is a win-win scenario for the government, employment, and public health.

It is important to note that these analyses qualified as the effects of raising cigarette taxes on gross employment. Consumers may shift their consumption to other goods and services when prices of cigarettes increase. Over time, a higher demand of other goods and services leads to a higher demand in labor. Workers laid off from the cigarette industry due to higher cigarette taxes can be employed in another sector. Former cigarette industry workers may fulfill the higher labor demand. However, a subsequent study is required to identify these sectors, and whether former cigarette industry workers have the skills to work in these sectors. While it is more ideal to evaluate the effects on net employment, this study provides an estimate to the government of the number of workers who would need immediate income support and training programs during the transitional period.

SMOKING HAS BEEN A MAJOR CONTRIBUTOR TO THE DISEASE BUR IN INDONESIA.

SMOKING PREVALENCE AM WORKING-AGE INDIVIDUALS HA EXCEEDED 30

6 CONCLUDING REMARKS

This report provides an overview of the main economic issues related to tobacco taxation and employment to inform current debate over tobacco tax reform in Indonesia. Overall, there is consistent global evidence suggesting that raising tobacco taxes has a positive effect on government revenues and a small negative effect on employment in the tobacco sector. However, research has demonstrated that the job losses in the tobacco sector (gross effect) are usually compensated with job creation in the other sectors (net effect). [28]

This report used data from the Central Bureau of Statistics to estimate trends in employment and output in the tobacco sector and estimated the potential impact on tobacco employment (gross effect) from raising cigarette taxes in Indonesia.

The share of tobacco employment to total manufacturing and economy-wide employment was quite low at 5.13 and 0.60 percent in 2014, respectively. Tobacco jobs were heavily concentrated in Central Java, East Java, and West Nusa Tenggara—about 94% of tobacco manufacturing workers and about 91% of tobacco farmers were concentrated in these three provinces. In these provinces, several districts were quite dependent on the tobacco sector. For example, the share of tobacco employment to local employment was 30 percent in Kudus, 27.6 percent in Temanggung, and 26 percent in Kediri. Any effect from tobacco taxation to the tobacco sector affected these districts more.

Most tobacco manufacturing workers were female and production workers. Additionally, there was a considerable male-female wage gap in the tobacco industry (female production workers earned 25% lower wages than male production workers). We found that about 43 percent of tobacco households were poor. The World Bank/ACS survey among *kretek* workers provided more details on the livelihoods of these workers and how they would be affected by an increase in cigarette taxes (World Bank, 2017b).

We predict that raising cigarette taxes by an average of 47% and simplifying the cigarette tax structure to 6 tiers will reduce cigarette demand by 2 percent, increase government revenue by 6.4 percent, and reduce gross employment in tobacco manufacturing sector by less than 0.50 percent. TThat means that a reduction of 2,914 tobacco manufacturing jobs, most of them in the SKT industry (2,245 less jobs). Given the

28 For Indonesia, Ahsan and Wiyono (2007) estimated positive net effects of 84,340 jobs (25 for a percent tax increase), 140,567 jobs (50 percent tax increase), and 281,135 jobs (100 percent tax increase) (Ahsan and Wiyono, 2007).

additional revenues government will obtain with the reform (IDR 10,915 billion), there is scope to implement measures to reduce the impact on the tobacco workers' livelihoods (such as cash transfers or expanded access to social safety nets) or to find alternative occupations for the workers affected (retraining programs, educational grants, etc.).

In line with the other reports of the World Bank/ACS Indonesia Tobacco Studies, this report recommends:

- For *kretek* hand-rollers

  o The groups affected by the reform who would need income or other transitional support in the event of job loss include the workers who are less educated, older, heads of their households, and who contribute a significant proportion of total household income from *kretek* rolling. Any losses in jobs or incomes will be quite gradual, though. The government could provide income support to these workers with less than 2 percent of the revenue gained from a tax increase.

  o The government (Ministry of Finance and Ministry of Social Affairs) should provide temporary income support using the existing Social Assistance programs (such as the unconditional cash transfer program, Bantuan Langsung Sementara Masyarakat - BLSM) and identify alternative employment or income-generating opportunities in the affected regions. The re-training of laid-off *kretek* workers should be designed to accommodate transitions into these alternative employment opportunities.

- For (tobacco and clove) farmers:

  1) **The government should help to improve supply chains and value chains for other goods in tobacco-growing areas**. Many former tobacco farmers are making a better living growing other common, locally grown crops (e.g., corn, sweet potato, and green vegetables), an outcome that could be further enhanced with even small investments by governments in improved supply chains for these products. Results from the World Bank/ACS survey suggest that current tobacco farmers are already growing many of these crops, so it is an issue of shifting their factors of production to maximize economic opportunity.

  2) **The government should help to facilitate access to credit for tobacco farmers.** Greater access to capital through improved credit schemes could help to improve the possibilities for tobacco farmers to cultivate other crops and/or develop other nonagricultural economic enterprises. Access could be in the form of grants or low-interest loans to farmers willing to move away from tobacco cultivation.

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Annex I. Estimation of the Wage Equation

We use the basic Mincer model to estimate the wage equation. Let w_{ist} indicates the real monthly wage of worker *i* in industry *s* at time *t*. The specification of the model is:

$$\log w_{ist} = b_0 + b_1 educ_i + b_2 female_i + b_3 production_i + BX_{ist} + u_{ist}$$

where *educ* indicates the years of schooling completed, *female* takes a value of one for female workers, and *production* takes a value of one for production workers. The vector X includes age, age squared, a dummy for urban status, dummies for employment status (employee, casual workers, etc.), dummies for type of work (managers, administrative, sales, services, etc.), dummies for industry, dummies for districts, and year dummies. We cluster the standard errors for the district level and we use the sample weights for the estimations.

We estimate the model using the August National Labor Force Survey from year 2000 to 2015. The August National Labor Force Survey data is an individual-level data system that includes workers' characteristics and labor market variables. The availability of survey data for multiple years allow us to construct a pooled cross-section data for the estimation. We present the summary statistics of variables used in the estimation in Table 18.

Table 18: Summary statistics, National Labor Force Survey Sample

VARIABLE	MEAN	SD	MIN	MAX	N
Log of wage	13.416	0.802	7.853	18.449	152,377,119
1 if female	0.398	0.490	0	1	152,377,119
Years of schooling completed	8.959	3.436	0	16	152,377,119
1 if production worker	0.866	0.340	0	1	152,377,119
Industry code	21.644	6.540	15	37	152,377,119
Type of work	6.501	1.349	1	8	152,377,119
Age	33.321	11.432	15	98	152,377,119
1 if lives in urban area	0.678	0.467	0	1	152,377,119
Employment status	3.719	1.209	1	6	152,377,119
Hours worked in a month	178.241	50.421	0	392	152,377,119
Province ID	33.968	11.041	11	94	152,377,119
District ID	400.927	139.346	1	1001	152,377,119
Year	2008.514	4.385	2001	2015	152,377,119

Source: Calculated using data from the August 2001–2015 National Labor Force Survey.
Notes: Sample weights are used for the estimation.

Annex II. Sample Selection Procedure for the Manufacturing Industry Data

We do not obtain data on the quantity of production outputs and inputs such as capital, machine, materials, and energy. This is quite common when using survey data. Thus, we use sales data for the outputs and expenditure data for the inputs. A study shows that estimations of production functions using sales and expenditure data are sensible (De Loecker and Goldberg, 2014).

We also face thorny issues of unbalanced panel data and missingness in our data. In this section, we discuss the procedure that we use to deal with the unbalanced panel data and missingness. Our data include 48,739 manufacturing firms with 332,360 firm-level observations from 2000 to 2014 (Table 19). However, many firms have gap observations with undisclosed reasons which leads to unbalanced panel data.

Table 19: Selected sample, Annual Survey of Manufacturing Industry

	INITIAL SAMPLE	SELECTED SAMPLE	SAMPLE KEPT (IN PERCENTAGE)
All manufacturing industry			
Number of firms	48,739	27,580	56.69
Number of observations	332,360	275,280	82.83
Tobacco industry			
Number of firms	2,322	1,208	52.02
Number of observations	14,101	11,270	79.92
Kretek industry			
Number of firms	764	453	59.29
Number of observations	4,757	4,031	84.74

Source: Calculated using the 2000–2014 Annual Survey of Manufacturing Industry.

Thus, we create a selection criteria based on observation gaps within each firm and the length of observations. First, we drop firms with more than three unbroken chains of observations. For example, we keep firms with three unbroken chains of observations between 2000–2006, 2009–2011, and 2013–2014. Second, we drop firms with less than 5 total observations in the data. As shown in Table 14, we keep about 57 percent of initial firms but these firms account for 83 percent of initial observations. This selection procedure is important because we rely on a fixed-effects model to estimate the output elasticity of labor demand.

The second issue that we face is data missing, particularly in terms of capital, machine, energy, and materials. In the data, several firms only have one, or just few, observations of capital and machine across periods. First, we assume that firms without any observation of capital and machines do not use capital and machines in their production processes. Thus, we impute zeros to the missing observations. Second, for firms with one or just a few observations of capital and machines, we impute the maximum value to the missing observations.

We use univariate imputation using linear regressions for the energy and materials variables (Raghunathan et al., 2001). We choose linear regressions for the imputations because energy and materials are continuous variables. For the imputation, we regress the variables on log of output, log of wage, log of production workers, share of production workers, a dummy for firm scale, year dummies, and industry dummies. We simulate the imputations for 30 times for each variable. We then use the 30 sets of imputed variables to estimate the output elasticity of labor demand.

Annex III. Estimation of Output Elasticity of Labor Demand

We assume that tobacco manufacturers follow a constant-elasticity of substitution (CES) production function. Given this production function, we can derive the labor demand function for the estimation of the output elasticity of labor demand. The derivation of the labor demand function is beyond the scope of this paper but it is available in previous publications (Hamermesh, 1986).

Let e_{ist} be the number of workers that firm *i* in industry *s* employ at time t. The specification of the model is:

$$\log e_{ist} = b_0 + b_1 \log w_{ist} + b_2 \log q_{ist} + BX_{ist} + u_{ist}$$

where *w* indicates wage rate, and *q* indicates output, proxied by the value of output. The vector *X* includes capital, material expenditures, energy expenditures, the share of production workers, scale of production, investment status, dummies for districts, dummies for industries, year dummies, and the interaction between industry and year dummies. All nominal variables are adjusted with the industry-specific wholesale price index. The standard errors are clustered at the firm level to account for autocorrelations of the unobservables within each firm.

We use the 2001 to 2014 Annual Survey of Manufacturing Industry published by the Indonesian Central Bureau of Statistics to estimate the model. The survey collects firm-level data including, but not limited to, production, employment, capital, material and energy expenditures, ownership status, and type of industry. Note that the survey data allow us to construct an unbalanced panel data of firms. In Table 20, we present summary statistics of the variables used in the estimation.

Table 20: Summary statistics, Annual Survey of Manufacturing Industry

VARIABLE	MEAN	SD	MIN	MAX	N
Log of labor	4.046	1.228	0	10.893	275,280
Log of wage rate	12.541	1.179	–1.531	19.475	275,280
Log of output	14.501	2.224	6.480	24.846	275,280
Log of capital	12.480	4.991	–0.550	29.692	275,280
Log of material expenditures	13.376	0.006	–0.106	24.230	275,280
Log of energy expenditures	9.917	0.005	–0.448	21.553	275,280
% of production workers	84.350	16.114	0.370	100	275,280
Investment status	2.456	0.910	0	3	275,280
Industry	17.732	7.057	10	33	275,280
District unique ID	199.659	67.205	1	444	275,280
Year	2008	4	2000	2014	275,280

Source: Calculated using the 2000–2014 Annual Survey of Manufacturing Industry..
Notes: Statistics for log of material and energy expenditures are estimated using univariate imputation methods with 30 replications.

Annex IV. Estimation of Price Elasticity of Demand

We estimate price elasticity of cigarette demand using the 2015 National Socioeconomic Survey conducted by the Indonesian Central Bureau of Statistics. Let q_i be the number of cigarette sticks consumed by individual *i*. The specification of the model is:

$$\log q_{ist} = b_0 + b_1 \log price_i + b_2 kretek_i + b_3 \log price_i \cdot kretek_i + BX_{ist} + u_{ist}$$

where *price* indicates the price per cigarette stick. The price is estimated by dividing total cigarette expenditure to total cigarette sticks consumed. We include a dummy for *kretek* cigarettes and the interaction between log of price and this dummy. The interaction terms allow us to investigate whether price elasticities of demand between *kreteks* and white cigarettes differ significantly.

The vector *X* includes age, a dummy for female, a dummy for marital status, a dummy for urban status, dummies for highest schooling completed, a dummy that indicates working status, a dummy that indicates poverty, dummies for occupation sector, dummies for districts, and a dummy for possession of health insurance. We include per-capita expenditure in the vector X which is a proxy for income. We use the sample weights for the estimations.

Table 18 presents the estimate of the price elasticity of cigarette demand in 2015. The estimates show that price elasticity of demand significantly differs by cigarette type. As implied by the estimates in column 1 of Table 21, the price elasticity of demand for *kreteks* is about –0.42, while the price elasticity of demand for white cigarettes is about –0.51. These estimates are quite close to previous estimates which range from –0.29 to –0.67 (Setyonaluri et al., 2008).

Table 21: Estimation of price elasticity of cigarette demand, 2015

DEPENDENT VARIABLE: LOG OF QUANTITY (CIGARETTE STICKS)	ALL	ALL	ALL *KRETEKS*	*KRETEKS* W/ FILTER	*KRETEKS* W/O FILTER	WHITE
Log of price	-0.421*** (0.000278)	-0.510*** (0.00110)	-0.416*** (0.000285)	-0.476*** (0.000391)	-0.376*** (0.000385)	-0.502*** (0.00103)
Log of price x *kreteks*		0.0945*** (0.00112)				
N	53,584,645	53,584,645	50,113,104	29,553,444	25,065,756	5,477,027
R-squared	0.158	0.158	0.160	0.170	0.154	0.185
Year	2015	2015	2015	2015	2015	2015
District-FE	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y

Source: Calculated using data from the 2015 National Socioeconomic Survey.
Note: ***, **, * indicate significance at the 1, 5, and 10 percent level. The control variables include per-capita expenditure, age, a dummy for female, a dummy for marital status, a dummy for urban status, dummies for highest schooling completed, a dummy that indicates working status, a dummy that indicates poverty, dummies for occupation sector, dummies for districts, and a dummy for possession of health insurance. Sample weights are used for the estimations.

Annex V. Simulation of the Effects of Raising Cigarette Prices on Employment

The simulation of the effects of raising cigarette prices on employment in the tobacco industry consists of three steps. The first step is an estimation of the change in cigarette consumption followed by an estimation of the change in output. Lastly, we estimate the change in employment in the tobacco industry. We discuss these steps in more detail below.

Step 1: Estimation of the change in cigarette consumption

We use the estimates of price elasticities of demand to predict the change in cigarette consumption. Let q_j be consumption of type *j* cigarette, $E_{qp,j}$ be the price elasticity of demand for type *j* cigarette, and P_j be the price of type j cigarette. The estimated change in consumption is:

$$\%\Delta C_j = E_{qp,j} \cdot \%\Delta P_j$$

Step 2: Estimation of the change in the value of output (sales)

We do not have evidence about the elasticity between cigarette consumption and production, and between cigarette consumption and the value of output. Therefore, we assume that changes in consumption will be reflected in equivalent changes in cigarette production and the value of output (sales) of cigarette firms. This is a strong assumption but it is necessary given the lack of data about consumption and production.

Let Q_j be the output of firms that produce type *j* cigarette. Then:

$$\%\Delta C_j = \%\Delta Q_j$$

We also need to make an additional assumption that changes in cigarette consumption will be reflected in equivalent changes in output of tobacco processing firms. We use price elasticity of demand for all types of cigarette (column 1 of Table 18) to estimate the change in output in the tobacco processing firms.

Step 3: Estimation of the change in employment by industry

Lastly, we can estimate the change in employment by using our estimates of output elasticity of labor. Let E_{eQ} be the estimated output elasticity of labor. Then, the change in employment is:

$$\%\Delta E_j = E_{eQ,j} \cdot \%\Delta Q_j$$

Given the base number of employment, we can calculate the change in terms of number of workers. Specifically, let E_1 be the number of workers before the price change. The change in the number of workers is:

$$\%\Delta E_j / 100 \cdot E_1$$