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ACKNOWLEDGMENTS

This report was prepared by a team led by Patricio V. Marquez, Lead Public Health Specialist, World Bank Group, comprised of Rong Zheng (principal researcher and writer), Yang Wang, and Xiao Hu, WHO Collaborating Center for Tobacco and Economics, University of International Business and Economics, Beijing, China; and Abdillah Ahsan, Faculty of Economics and Business, University of Indonesia.

The authors would like to thank the following peer reviewers for their insightful comments, inputs, and valuable suggestions that helped to improve earlier drafts of the report:

Alan Fuchs, Senior Economist, Poverty and Equity Global Practice, World Bank Group

Jaffar Al Rikabi, World Bank Group

Frederico Gil Sander, Lead Country Economist, Economic Policy and Debt Department, World Bank Group

Paul Isenman, former senior manager with the OECD/DAC Secretariat, the World Bank Group, and USAID

Nigar Nargis, Assistant Professor, Department of Economics of the University of Dhaka, Bangladesh; Director, Economic and Health Policy Research, American Cancer Society, United States

Corne van Walbeek, Project Director and Professor, School of Economics, University of Cape Town, South Africa

Alexander Irwin edited the brief. Spaeth Hill LLC prepared the layout design.

The preparation of the report was carried out under the World Bank Group Global Tobacco Control Program, coordinated by Patricio V. Marquez, with the support of the Bill & Melinda Gates Foundation and the Bloomberg Philanthropies.

Washington, D.C., May 2018

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ABBREVIATIONS

BPS:	Central Statistics Board
CAI:	Cigarette Affordability Index
CPDIR:	Cigarette Price/Daily Income Ratio
CPI:	Consumer Price Index
CTFK:	Campaign for Tobacco-Free Kids
GBD:	Global Burden of Disease
GDP:	Gross Domestic Product
HIC:	High-income country
IAKMI:	(Ikatan Ahli Kesehatan Masyarakat Indonesia/Indonesian Public Health Association)
IHME:	Institute for Health Metrics and Evaluation
LIC:	Low-income country
LMIC:	Lower middle-income country
MoF:	Ministry of Finance
MoL:	Minutes of Labor
NCD:	Noncommunicable disease
NCI:	National Cancer Institute
RIP:	Relative Income Price
SDGs:	Sustainable Development Goals
SKM:	Machine-manufactured kreteks
SKT:	Hand-rolled kreteks
SPM:	Machine-made white cigarettes
SUSENAS:	National Socio-Economic Survey
UMIC:	Upper middle-income country
US:	United States
WHO:	World Health Organization

EXECUTIVE SUMMARY

Why Affordability?

Cigarette affordability analysis is an important input to guide tobacco control policy, in particular tobacco taxation. Global evidence shows that when cigarettes are made substantially less affordable for consumers, many people will quit or reduce smoking, despite the addictive power of nicotine, while many who would have smoked will never start.

This study investigates trends in cigarette affordability in Indonesia from 2002 to 2017. Affordability analysis is critical for Indonesia today, because the government has accelerated tobacco control measures, notably by raising the country's cigarette excise tax six times between 2011 and 2017. Affordability is key to understanding these measures' successes and shortfalls, and to honing future strategies that can build on the momentum achieved.

Background: Indonesia's Tobacco Epidemic

Health impacts. Estimated at 68.1 percent in 2016, Indonesia's male smoking prevalence is among the highest in the world. The country's five leading causes of death are all tobacco-related, including ischemic heart disease, cerebrovascular disease, tuberculosis, diabetes, and chronic respiratory diseases (IHME, 2017). Morbidity from smoking-related diseases accounts for more than 21 percent of all cases of chronic disease in Indonesia.

Economic damage. Along with its health impacts, tobacco consumption imposes a heavy economic burden, primarily on Indonesia's poor, who risk lost income, reduced labor productivity, and deeper impoverishment from out-of-pocket payments for the treatment of tobacco-related diseases. While the poor suffer most, all of Indonesian society is affected by the tobacco epidemic. Tobacco-related diseases increasingly burden the country's national health insurance program. Indonesia's smoking-attributable health expenditure is estimated at some US\$ 1.2 billion per year (Barber et al., 2008; Goodchild et al., 2017), equivalent to about 8 percent of Indonesia's total public expenditure on health (World Bank, 2016). Direct and indirect costs of tobacco-related disease divert resources needed for Indonesia's development—posing a growing challenge to the country.

Harm to children. In 2013, 56 percent of Indonesian children aged 0-4 years were exposed to secondhand smoke in their homes (IAKMI, 2014). Paternal smoking predicts an increased probability of short-term and chronic malnutrition among Indonesian children (Barber et al., 2008; Pradono et al., 2002). In Indonesian households where the father was a smoker, tobacco accounted for 22 percent of weekly per capita household expenditures,

with less money spent on food compared to households in which the father was a nonsmoker (Semba et al., 2007). This is troubling, as Indonesian children suffer from high rates of malnutrition and stunting, compromising their neurological development, educational outcomes, and future economic productivity (World Bank, 2016).

Key Findings from the Affordability Analysis

Our analysis of cigarette affordability trends in Indonesia yields the following results:

- **Distinct chronological stages.** In general, cigarette affordability in Indonesia presents three stages over the period 2002 to 2017: a fluctuating stage between 2002 and 2005; a stage of increasing affordability between 2005 and 2012; and a stage of decreasing affordability from 2012 to 2017.
- The bad news: a long-range upward trend. Looking at the whole period 2002-2016, on average, cigarette affordability in Indonesia increased by 50 percent, while aggregate cigarette consumption increased by 50.6 percent. This increase in affordability followed a rise of similar magnitude from the early 1980s to 2000. Thus, in 2016, cigarettes were twice as affordable for Indonesian consumers as they had been in the early 1980s.
- The good news: a recent drop in affordability, spurred by higher taxes. Focusing specifically on the years from 2011 onward, the analysis shows that cigarette affordability decreased by 10.2 percent from 2011 to 2017, using price data from Indonesia's Ministry of Finance. Price data from Euromonitor show a similar affordability drop of 9.7 percent from 2011 to 2016. These welcome, though still modest, reductions in affordability have mainly been driven by the government's successive tobacco excise tax increases.
- An affordability-consumption disconnect, largely due to additional smokers. Even as cigarette affordability dropped from 2011 to 2016, aggregate cigarette consumption in Indonesia increased by 14.5 percent during this period, a seeming paradox. Further analysis shows, however, that increased consumption mainly stemmed from additional smokers.
- Indonesia's cigarette affordability in global perspective. Studies comparing cigarette affordability across countries based on average price or the price of the most-sold brand have tended to place Indonesia at a medium level of affordability, relative to other lower middle-income countries. However, because of the wide range of retail cigarette prices in Indonesia, some kinds of cigarettes are available there at prices that are very low in international comparison (WHO, 2017). Indonesia's moderate global affordability rankings and simultaneous high prevalence show that

the availability of a variety of very cheap brands, together with non-price factors, are helping to drive the country's epidemic. Non-price factors include cultural norms, as well as weak restrictions on smoking in public places and on tobacco advertising.

The Bottom Line for Policy

Progress has recently been made to begin reducing tobacco affordability in Indonesia, but much remains to be achieved. Recent tobacco tax reforms in Indonesia have boosted retail cigarette prices. The nominal average cigarette price rose by 65 percent between 2011 and 2016, from IDR 11,578.5 to IDR 19,116.3 per pack. The real average cigarette price climbed by 27 percent, and cigarettes were 10 percent less affordable in 2016 than in 2011. These gains have begun to reverse the long trend of increasing cigarette affordability seen in Indonesia since the turn of the century, and indeed for the nearly 40 years for which data are available.

Indonesia's tobacco epidemic continues to threaten the country's future. Despite this progress, Indonesia's tobacco epidemic remains one of the world's most serious. It places the nation's health, human capital, and economic dynamism at risk. The potential harms to children and youth, from active smoking and secondhand smoke exposures, are especially concerning. To reap the demographic dividend from its young and growing population, Indonesia must ensure that young people stay healthy.

Cigarettes in Indonesia are still too cheap. Indonesian consumers can still buy cigarettes more cheaply than can smokers in most other middle- and high-income countries. A package of cigarettes can be bought for as little as US\$ 0.45, among the lowest prices in the world (Indonesian Investments, 2018; WHO, 2017). The sale of single cigarette sticks remains a common practice in Indonesia, making cigarettes even more cheaply accessible. This mode of purchase may especially encourage adolescents to experiment with smoking. On the other hand, expensive brand cigarettes maintain a large market share, suggesting that many Indonesian consumers still find these products affordable.

To get full benefit from affordability reductions, Indonesia's tobacco excise system must be simplified. The country's complex, multi-tiered tobacco tax structure might theoretically have favored small-scale domestic cigarette manufacturers. In practice, these small firms' market share has sharply declined. The current fragmented tax model also produces deleterious public-health consequences by encouraging smokers to switch to cheaper brands when tobacco taxes rise, rather than quitting altogether. This undermines the effectiveness of using tax policy to cut tobacco consumption. **Understanding this inconsistency provides an opportunity.** Indonesian policy makers can resolve the conflict by simplifying the tobacco excise tax structure to reduce cigarette affordability aggressively across the board, for all cigarette types. Cigarette affordability cuts can only achieve full impact if all tobacco products become less affordable simultaneously and stay that way over time. A bold streamlining of the tiered tax system is crucial to achieve this goal.

Tackling non-price factors. While continuing to lower affordability, tobacco control policy in Indonesia can further improve results by aggressively restricting tobacco advertising, enforcing smoke-free areas in public spaces, expanding the use of pictorial health warnings, and similar measures. The pervasive cultural perception of smoking as normal for adult men must and can be changed.

"Go big, go fast." International comparisons suggest that Indonesia's current tobacco tax rates remain far below what is feasible in terms of revenue potential. Thus, tobacco tax tier consolidation and further bold tax increases could serve revenue purposes as well as fighting tobacco-related death and disease in the years ahead. A growing number of countries have achieved success with a tobacco tax strategy of "Go big, go fast": large, rapid increases in tobacco tax rates, joined to impact-boosting measures including the swift merger of tax tiers. Together, these actions can permanently change consumers' expectations about how much smoking costs and durably alter their behavior (Marquez and Moreno-Dodson, 2017). This is a promising path for tobacco control in Indonesia.

1. INTRODUCTION

This study analyzes the recent evolution of cigarette affordability in Indonesia and weighs implications for the country's tobacco control policy. This introductory section discusses Indonesia's elevated smoking prevalence and quantifies destructive impacts on the nation's public health and economy. We underscore disproportionate consequences for the poor and other vulnerable groups, including Indonesia's children. Section 2 documents the principal types of cigarettes consumed in Indonesia and their market shares, assessing recent market changes. Section 3 considers the concept of affordability, including its definition, measurement, and potential salience for policy. Subsequent sections summarize the results of a literature review and discuss research methods, then present the results of our analysis of cigarette affordability in Indonesia from 2002-2017. The analysis tracks affordability changes over the period, relating them to consumption levels and key policy actions, notably recent tobacco tax hikes. We also compare Indonesia's cigarette affordability levels with those of other countries. A concluding section examines policy implications.

Smoking Prevalence in Indonesia: Health and Economic Consequences

Prevalence patterns. Smoking prevalence among Indonesian women is low, yet volatile (Figure 1). Prevalence among adult men, however, has followed a decades-long increasing trend. In 2016, an estimated 68.1 percent of Indonesian men smoked. This is among the highest rates in the world.



Figure 1. Smoking Prevalence in the Adult Population (15+), Indonesia (1995-2016)

Note: Tobacco use includes daily and occasional cigarette smoking and tobacco chewing.

Source: SKRT (1995), SURKESNAS (2001, 2004), RISKESDAS (2007, 2010, 2013), GATS (2011), SIRKESNAS (2016) Indonesia NIHRD-Litbangkes.

A crisis that demands action. The United Nations has called for global action to reduce tobacco use (United Nations, 2015). In the past decade, while many other countries have enforced tough tobacco controls, including tax and price measures, Indonesia has made little progress in curbing cigarette consumption. On the contrary, the number of Indonesian smokers almost tripled, from 25 million in 1980 to an estimated 73.6 million as of 2015 (World Bank, 2017). Within a single decade, from 2007-2017, Indonesia jumped from being the fifth-largest consumer of cigarette-consuming nation after China and Japan to being the world's third-largest cigarette-consuming nation after China and Russia (CTFK, 2017; Euromonitor International, 2017; Hidayat and Surjono, 2016). In addition, more than 97 million nonsmokers are regularly exposed to secondhand smoke in Indonesia, including 70 percent of all children under the age of 15 (Barber et al., 2008; Pradono et al., 2002).

Global and regional impacts. Tobacco use is an important contributor to the global burden of morbidity and mortality, accounting for 11.5 percent of deaths worldwide (GBD 2015 Tobacco Collaborators, 2017). Tobacco kills about one-half of its long-term consumers, ending their lives more than a decade prematurely, on average (Jha and Peto, 2014). So it is hardly surprising that tobacco also accounts for the world's highest substance-attributable mortality rates. At 110.7 deaths per 100,000 population, tobacco-related death rates are three times higher than those attributable to alcohol (33.0 per 100,000) and 17 times higher than those for illicit drugs (6.9 per 100,000). In East Asia, including Indonesia, the tobacco attributable mortality rate, at 145.9 deaths per 100,000, is the second highest in the world, exceeded only by Oceania (Papua New Guinea, Kiribati, Federated States of Micronesia, and Solomon Islands, excluding Australia and New Zealand) at 269.3 deaths per 100,000 (Peacock, Leung, Larney, et al., 2018).

Public health burden. Indonesia's five leading causes of death are all tobacco-related. They include ischemic heart disease, cerebrovascular disease, tuberculosis, diabetes, and chronic respiratory diseases (IHME, 2017). In 2015, total deaths attributed to tobacco use in Indonesia reached 230,862 (Kosen et al., 2017). Morbidity from smoking-related diseases accounts for more than 21 percent of all cases of chronic disease in the country. Global evidence shows that tobacco use also helps to fuel the global epidemic of tuberculosis, and that it worsens problems such as mental illness, HIV infection, and alcohol abuse (Drope et al., 2018; NCI/WHO, 2016; WHO, 2017).

Harm to children. Paternal smoking is a predictor of an increased probability of shortterm and chronic child malnutrition in Indonesia. In households where the father was a smoker, tobacco accounted for 22 percent of weekly per capita household expenditures, with less money spent on food than in households in which the father was a non-smoker (Semba et al., 2007). This is troubling, as Indonesian children suffer from high rates of malnutrition with a prevalence of stunting at 37 percent and of wasting at 12 percent (World Bank, 2016). With over 8 million children affected, Indonesia has the fifth-highest number of stunted children in the world (Millennium Challenge Account-Indonesia, 2015). Stunting in the first two years of life can lead to irreversible damage, including shorter adult height, lower school attainment, reduced adult income, and increased incidence of morbidity in later life, which undermines human capital development.

Economic damage. Along with its health impacts, tobacco consumption imposes a heavy economic burden, primarily on Indonesia's poor. The economic burden connected with smoking falls hardest on low-income smokers who risk lost income, reduced labor productivity, and impoverishment due to out-of-pocket payments for the treatment of tobacco-related diseases. While the poor suffer most, all of Indonesian society is affected. The costs of tobacco use include illness, disability, premature death, and forgone consumption and investment. The smoking-attributable health expenditure in Indonesia is estimated at about US\$ 1.2 billion per year (Goodchild et al., 2017; Barber et al, 2008). This represents about 8 percent of total public expenditures on health (including government budgetary and social insurance expenditures), and about 3.3 percent of total health expenditures (including government budgetary and social insurance expenditures, out-ofpocket, and other private spending) (World Bank, 2016). This figure is consistent with the observed experience in other countries. For example, using data from medical spending surveys in the United States, researchers calculated that 8.7 percent of all health care spending, or US\$170 billion a year, is for illness caused by tobacco smoke, and that public programs like Medicare and Medicaid paid for most of these costs (Xu et al., 2015).

Indirect costs. In terms of indirect economic costs from smoking, Kosen (2009) used a variation of the Peto method (Doll and Peto, 1981) developed for the Global Burden of Disease Project (various, cited at National Cancer Institute (NCI)/WHO, 2016) to estimate the cross-sectional direct health costs for 11 tobacco-related diseases, morbidity, and the present value of mortality from smoking in Indonesia for 2005. The study reported that the indirect costs from tobacco-attributable morbidity and mortality in Indonesia amounted to about US\$ 1.9 billion and US\$ 4.9 billion, respectively, for a total indirect cost of US\$ 6.8 billion. A decade later, in 2015, the indirect morbidity, disability, and premature mortality costs associated with tobacco in Indonesia had reached an estimated US\$ 28.78 billion (IDR 374,06 trillion), or 3.3 percent of Indonesia's GDP (Kosen et al., 2017).

Cumulative health and economic losses: the coming "tsunami." If the tobacco use pattern now observed in Indonesia is not controlled, the country risks what some experts term a future "public health and fiscal tsunami," due to increasing rates of tobacco-related

noncommunicable diseases (NCDs) that are costly to treat and that will place growing strain on government and household budgets (World Bank, 2016). This in turn will undermine human capital development and the total wealth of the country. Decisive policy action is needed to avert this threat and drive rapid reductions in smoking rates.

Cigarette Production, Consumption, and Market Share in Indonesia

Major cigarette types. Three types of cigarettes are produced in Indonesia: machinemade kretek (Sigaret Kretek Mesin, SKM), handmade kretek (Sigaret Kretek Tangan, SKT), and white cigarettes (Sigaret Putih Mesin, SPM).





Source: Ministry of Finance, Republic of Indonesia

Shifting market shares. Kretek is a domestically produced cigarette type which consists of tobacco, cloves, and other ingredients. The period 2011-2017 saw a shift in market share towards SKM. Market share for SKM rose from 63.75 percent in 2011 to 74.79 percent in 2017. At the same time, market shares for the SKT and SPM formats were decreasing. Specifically, SKT market share decreased from 30.37 percent in 2011 to 20.23 percent in 2017, while SPM (mostly international brands) also lost ground slightly in the same period, falling from 5.87 percent to 4.98 percent (Figure 2).

Dominant players. For machine-manufactured kreteks (SKM), the market is dominated (to 63 percent) by cigarette companies classed as Category I that produce over 3 billion sticks each year. The markets for hand-rolled kretek cigarettes (SKT) and machine-made white cigarettes are dominated by the same Category I companies.

A complex tobacco tax structure. Within each of the three broad types of cigarettes, multiple tiers are defined for tax purposes, based on type, number of cigarettes produced, and per-unit maximum retail price (Table 1 and Figure 3). In 2017, for example, the tobacco tax structure included 12 such tiers, though these will be reduced to 10 in 2018.

_	6	Volume of produc- tion Casure			Tariff (Rp/Stick)										
Туре	Group	(Billions of sticks)	2011	2012	2013 - 2014	2015	2016	2017	2011	2012	2013 2014	2015	2016	2017	
		>= 2	660	660	669				325	355	375				
	I		630- 660	630- 660	631-	800	1000	1120	315	345	355	415	480	530	
SKM (machine-			600- 630	600- 630	669				295	325					
made		< 2	430	430	549	588	740	820	245	270	285	305	340	365	
KTELEKS)	Ш		380- 430	374- 430	440- 549	511- 588	590- 740	655	210	235	245	265	300	335	
			374- 380						170						
		>= 2	600	375	680	820	930	1030	325	365	380	425	495	555	
	I		450- 600						295						
SPM (machine-			375- 450						245						
made	II	< 2	300	300	444	444 520 345- 425-	800	900	215	235	245	270	305	330	
white			254- 300	254- 300	345-		425-	425-	505-	585	175	190	105	220	255
			217- 254	217- 254	444	520	800		110	125	195	220	233		
		>= 2	590	590	749	825	1115	1215	235	255	275	290	320	345	
	I		550- 590	520- 590	550- 749	606- 825	775- 1115	860	180	195	205	220	245	265	
SKT			520- 550						155						
(hand- made		0.3 - 2	379	379	379	417	605	730	110	125	130	140	155	165	
kreteks)	Ш		349- 379	349- 379	349- 379	385-	403-	470	100	115	120	125	140	155	
			336- 349	336- 349	336- 349	417	605		90	105	110	125	1-40		
		< 0.3	234	234	250	286	400 370	465 400	65	75	80	85	90 80	100 80	

Table 1. Cigarette Excise Tax Structure in Indonesia, 2011-2017

Note: In 2017, for SKM and SPM, Production group 1 = output > 3 billion; Production group 2 = output < 3 billion. For SKT, Production group 1 = output > 2 billion; Production group 3A: output > 10m and < 500m; Production group 3B < 10m

Source: Ministry of Finance, Republic of Indonesia



Figure 3. Evolution of Cigarette Market Share by Tax Tiers, Indonesia (2010-2017)

Source: Ministry of Finance, Republic of Indonesia

Production and consumption trends. Both cigarette production and consumption rose dramatically in Indonesia between 2011 and 2016. Cigarette production climbed from 279 to 342 billion sticks, while consumption increased from 296 to 339 billion sticks over the period. Both measures saw a slight downturn in 2016 (Figure 4).





Figure 4. Cigarette Production and Consumption, Indonesia (2011-2016)

igure 4-2: Cigarette consumption 2011-2016, sourced from Euromonitor

Source: Euromonitor International 2017.

Varied results by cigarette type. In percentage terms, Indonesia's overall cigarette production increased by 22.41 percent from 2011 to 2016, while consumption increased by 14.46 percent. Behind these aggregate figures, cigarette types fared differently. Production of machine-made kretek cigarettes (SKM) increased by nearly 25 percent, while handmade kretek cigarette (SKT) production decreased by 27 percent. White cigarettes (SPM) maintained a basically constant production level over the period (Figure 5). The market share change measured by production reflects Indonesian consumers' apparent increasing preference for machine-made kretek over other types of cigarettes.



Figure 5. Percentage Change in Cigarette Production by Type of Cigarette, Indonesia (2011-2016)

Source: Ministry of Finance, Republic of Indonesia

Tackling Affordability: A Critical Task for Tobacco Control in Indonesia

The power of tobacco taxes. Evidence from many countries points to tobacco taxation as the single most effective tool to reduce tobacco consumption and health care costs, while providing a potential revenue stream to finance country-level development. Higher tobacco taxes help raise cigarette prices, which can contribute to reducing the prevalence and intensity of smoking significantly, despite the addictive nature of tobacco. Dedicated tobacco taxes can also provide sustainable funding for social insurance programs, health promotion, and other programs targeting the Sustainable Development Goals (SDGs).

An opportunity to be seized. Indonesia, however, has not yet fully harnessed this potential. Price and tax incidence in the country has generally been low in absolute and relative terms. In 2016, total taxes (i.e., specific excise tax, local tax, and VAT) as a percentage of the retail price of Indonesia's most-sold cigarette brand stood at 57.4 percent, far below the WHO-recommended standard of 75 percent (WHO, 2017). **Beginning to turn the tide?** Indonesia's government raised its cigarette excise tax six times during the seven-year period 2011-2017, with hikes in every year but 2014. These regular excise tax hikes pushed up both nominal and real retail cigarette prices. Indonesia's cigarette sales volume, however, continued to show increasing trends from 2011 to 2015, before dropping slightly in 2015-2016. As shown in Figure 6, cigarette consumption kept growing until 2016, when it also declined (slightly) for the first time in the period. The 2016 consumption drop appears due mainly to Indonesia's unfavorable economic situation at the time, marked by a significant increase in the cost of basic necessities and reduced household purchasing power (Euromonitor International, 2017).





Source: Cigarette consumption data combine registered retail sales and illicit trade volume. Data on both were sourced from Euromonitor International, along with data on smoking prevalence and retail price.¹

¹ Euromonitor data often draw on industry sources. Depending on the specific case, this could raise questions of reliability. However, there is no comparable substitute for the breadth and frequency of Euromonitor data.

The real challenge: affordability. While tobacco product price conveys how expensive the product is, it does not measure individuals' ability to purchase tobacco products. Over the past decade a clear dichotomy has emerged between developed and developing countries. Cigarettes are becoming less affordable in developed countries and much more affordable in many developing countries. This increase in the affordability of tobacco hinders positive health impacts from non-tax tobacco control measures. To strengthen tobacco control results, it is vital to monitor and reduce tobacco affordability.

Understanding cigarette affordability in Indonesia: key for tobacco control policy making. An earlier study found that cigarettes became more affordable in Indonesia between 2000 and 2010 (Ahsan et al., 2011). This explains the rapid growth of tobacco production, consumption, and smoking prevalence in the past decade. In recent years, Indonesia's government increased the tobacco excise tax on a regular basis. This paper investigates the impact that these tax increases have had on cigarette prices and consumption, along with the increases' potential public health consequences. To make tax and price policy an effective weapon against tobacco use in Indonesia, it is necessary to examine the current trend of cigarette affordability, especially before and after the tax increases implemented during the past few years.

To understand changing patterns of cigarette affordability, this study examines tobacco taxes and cigarette prices vis-à-vis Indonesia's economic growth and consumers' increased purchasing power. The findings will provide supportive evidence to Indonesian policy makers for a shift from price-based tobacco policy solutions to affordability-based solutions, with the aim of making cigarettes less affordable, as well as optimizing the country's tobacco excise tax structure.

2. LITERATURE REVIEW

Affordability refers to an individual's purchasing power with regard to a product. Over the past decades, various methodologies have been developed defining cigarette affordability as a function of cigarette price and individuals' income levels, with reference to the quantity or share of resources required to buy a pack of cigarettes.

Guindon et al. (2002) defined affordability by Minutes of Labor (MoL), meaning how many working minutes are needed to buy a pack of locally produced or Marlboro (or equivalent) cigarettes. Guindon's study showed that an Indonesian needed to work 62 minutes to purchase a pack of Marlboros or local-brand cigarettes in 2000, suggesting that cigarettes were not very affordable in Indonesia at that time, relative to the 56 countries in the study.

In subsequent research examining cigarette affordability in Southeast Asia, Guindon et al. (2003) applied a different methodology by dividing relative prices of tobacco products by a country's per capita gross domestic product (GDP). Most importantly, they looked at changes in affordability over time, rather than just across countries. The study found that tobacco products in Indonesia became 50 percent more affordable between 1980 and 1998. A similar trend was seen in Sri Lanka and India.

Blecher et al. (2004) established the Relative Income Price (RIP), which has become the most widely used measurement indicator of cigarette affordability. RIP calculates the percentage of GDP per capita required to buy 100 packs of cigarettes. In this study of 70 countries, Indonesia was ranked as the third most affordable in the low-income country (LIC) group during the period 1999-2001.

Kan (2007) developed an alternative instrument, the cigarette price/daily income ratio (CPDIR), to evaluate cigarette affordability by calculating the percentage of daily income needed to buy a pack of lowest-priced cigarettes. The CPDIR in Jakarta, one of the cities in Kan's study, was 0.14. This means that a pack of cigarettes cost 14 percent of the daily income in Jakarta in 2006, a medium affordability level compared with the 60 cities included in Kan's study.

Barber et al. (2008) extended Guindon's (2003) analysis to the period from 2001 to 2005. In contrast to the rising affordability trend in the 1980s and 1990s, Barber's study found that Indonesia's affordability index remained nearly unchanged from 2001 to 2005. This suggests that tobacco tax increases during this period were sufficient to keep affordability from further increasing, but not to reduce it.

Rumbogo and Ahsan (2011) examined cigarette affordability in Indonesia using two methods. Using the RIP method, they found that cigarettes became 50 percent more

affordable in Indonesia from 2003 to 2010. As an alternative metric, the researchers also used the percentage of Indonesia's national average nominal daily wage needed to buy a pack of cigarettes. This approach showed that the nominal price of cigarettes represented only a small portion of an average Indonesian's daily wages, and it confirmed that cigarettes became increasingly affordable between 2003 and 2010 (Rumbogo and Ahsan, 2011).

WHO (2015) compared changing rates of cigarette affordability (defined by RIP) between 2008 and 2014 for 15 countries. Indonesia was one of the four countries that experienced an increase in cigarette affordability over the observed period. A recent study by the U.S. National Cancer Institute (NCI) and WHO (2016) found that Indonesia's rate of cigarette affordability increase was the second fastest among ten lower middle-income countries studied, from 2000-2013. The examination of affordability change rate explains why, although cigarettes remain less affordable in LMICs than in high-income countries (HICs) overall, changes in affordability over time have led to a decrease in consumption of cigarettes in HICs, but an increase in LMICs.

The above studies examined tobacco/cigarette affordability in Indonesia in different periods and applied different methods. The diverse studies reached a common conclusion: that tobacco/cigarette affordability has been increasing in Indonesia during the last three decades. Specifically:

- 1. Tobacco affordability rose by 50 percent from the early 1980s to the end of the 1990s;
- 2. Affordability increased again by 50 percent from 2003 to 2010, thus reaching more than double its level in the early 1980s;
- 3. In the 2000s, cigarettes in Indonesia have been more affordable than in the median LMIC. However, as in LMICs in general, cigarettes have remained less affordable in Indonesia than in HICs;
- 4. The rate of increase of cigarette affordability in Indonesia has been very rapid, ranking second-fastest among ten lower middle-income countries from 2000-2013.

Based on the extensive literature on the relationship between consumption and tobacco affordability, these findings could explain the steady increase of cigarette consumption in Indonesia in the last two decades.

We conducted the present study to further investigate cigarette affordability in Indonesia with the following aims: (i) to examine cigarette affordability in the short (2011-2017) and longer (2002-2016) terms; (ii) to compare changes in cigarette affordability in Indonesia with those in other countries; (iii) to assess how effectively tobacco tax hikes in the past decade have reduced affordability; and (iv) to explore tobacco tax policy implications pertaining to tobacco control.

3. METHODOLOGY

Cigarette Affordability Definition

A two-pronged approach. In this study, we use two complementary methods of defining cigarette affordability. One is the RIP method. The other is the Cigarette Affordability Index (CAI) method.

The strengths of RIP. Among the methods for measuring cigarette affordability applied in previous studies, the RIP method has several important advantages and has been widely adopted. First, GDP per capita is a good indicator of living standard and income. Second, this data is commonly available and therefore makes it easier to calculate cigarette affordability, compared with other approaches (Blecher et al., 2004). Third, every country calculates GDP per capita annually using a consistent methodology, thus enabling global comparisons of tobacco affordability. The World Health Organization (WHO) has adopted the RIP method, calculating cigarette affordability for all countries with available data. This makes it possible for our study to identify the current level of cigarette affordability in Indonesia compared with other countries.

The RIP method defines cigarette affordability as the percentage of GDP per capita required to buy 100 packs of cigarettes. Equation (1) provides the formula for calculating the RIP. The higher the RIP, the less affordable cigarettes are.

$$RIP = \frac{100 \times P}{GDP_{per \ capita}} \tag{1}$$

where RIP represents the relative income price of cigarettes, and P is the retail price of a pack of cigarettes with 20 individual pieces.²

A helpful complement: CAI. The Cigarette Affordability Index (CAI) method measures the magnitude of cigarette-affordability change compared with the base year.

Equation (2) demonstrates the rationale of the CAI method.

$$CAI_{t} = \frac{RIP_{2002}}{RIP_{t}}$$
, where t = 2002, 2003 ... 2017 (2)

The CAI has been created as a useful way to present changes over time using the RIP. Since it is a measure of affordability, it has the desirable characteristic, as compared to the RIP, that a higher value means more rather than less affordability. This in turn means that the higher the CAI, the higher the expected smoking prevalence and cigarette consumption.

² The RIP can be measured in nominal terms for both the cigarette price and the per capita GDP. This removes "translation issues" when working in constant prices or in a foreign currency, e.g. USD.

Price Data

For our affordability calculations, we adopt two sets of price data obtained from different sources. We term the first **average price (Euromonitor)**. Sourced from Euromonitor International, it calculates per unit average price by dividing sales value over sales volume for each year between 2002 and 2016. While Euromonitor's data are valuable and widely used, the concern exists that Euromonitor's reliance on tobacco industry intelligence and an opaque modelling process may lead to biased estimates. This may especially be the case, if information provided by industry sources is influenced by firms' common narrative that increases in tobacco excise taxes cause increases in illicit trade (Blecher et al. 2010; Skafida et al., 2014). To protect against potential distortions in the Euromonitor data, we calculate a second value termed **average price (MoF)**. This is calculated from the transaction price of each cigarette type (SKT/SKM/SPM), weighted by the respective market share for each year from 2011 to 2017. Both the transaction price of each cigarette type and the respective market shares are provided by the Ministry of Finance of Indonesia. Transaction price data comes from a regular market survey conducted by the Ministry.

All prices in this study are recomputed for a pack of cigarettes containing 20 individual pieces. To define real prices, the nominal retail price is adjusted by the consumer price index (CPI), sourced from the World Bank Database.

Income Data

The GDP per capita of Indonesia for the period 2002- 2016 is sourced from World Bank national accounts data.³ The GDP per capita of Indonesia for 2017 is sourced from the Central Statistics Board (BPS) of Indonesia.⁴ We use the nominal value here to calculate the RIP, combining it with the average nominal retail price.

Based on the price and income data described, we have conducted two sets of analyses: (i) we examine average cigarette affordability using GDP per capita and the average price (Euromonitor) over the 2002-2016 period; (ii) we examine average cigarette affordability using per capital GDP and the average price (MoF) over the 2011-2017 period.

 $^{^{3}\} https://data.worldbank.org/indicator/NY.GDP.PCAP.CN?locations=ID\&view=chart$

⁴ https://www.bps.go.id/pressrelease/2018/02/05/1519/ekonomi-indonesia-triwulan-iv-2017--tumbuh-5-19-persen.html

4. RESULTS

Cigarette Affordability: Level, Trend, and Magnitude of Change

Using the GDP per capita and average cigarette price, we examined cigarette affordability on average in Indonesia with the following aims: (i) to estimate the levels of cigarette affordability in each year; (ii) to present the trends of cigarette affordability through the observed period; (iii) to calculate the magnitudes of cigarette affordability change; and (iv) to examine the annual growth rates, as well as the fixed-base growth rates of cigarette affordability over the observed period.

Table 2 lists the GDP per capita, two sets of average price data, and cigarette affordability measured by RIP and CAI respectively.

GDP por		Average af	fordability (Euror	monitor) (1)	Average affordability (MoF) (7		1oF) (2)
Year	capita	Average Price (Euromonitor)	RIP Average (Euromonitor)	CAI Average (Euromonitor)	Average Price (MoF)	RIP Average (MoF)	CAI Average (MoF)
Unit	Million IDR	IDR/20 sticks	%		IDR/20 sticks	%	
2002	8.92	5381.3	6.03%	1.00			
2003	9.72	6012.3	6.18%	0.98			
2004	10.93	6430.8	5.88%	1.03	Data not available		
2005	13.03	8222.3	6.31%	0.96			
2006	15.47	8683.3	5.61%	1.07			
2007	18.06	9110.2	5.05%	1.20			
2008	22.31	9316.2	4.18%	1.45			
2009	24.94	9800.8	3.93%	1.54			
2010	28.30	10413.5	3.68%	1.64			
2011	31.87	11578.5	3.63%	1.66	13462.3	4.22%	1.00
2012	34.62	12421.2	3.59%	1.68	13924.6	4.02%	1.05
2013	37.88	13789.0	3.64%	1.66	15412.3	4.07%	1.04
2014	41.43	15446.4	3.73%	1.62	17745.3	4.28%	0.99
2015	44.67	17291.5	3.87%	1.56	19642.2	4.40%	0.96
2016	47.51	19116.3	4.02%	1.50	22302.2	4.69%	0.90
2017	51.89	Data not available			24418.5	4.71%	0.85

Table 2. Cigarette Affordability: RIP Average and CAI Average

Data source: GDP per capita (2002-2016) is sourced from World Bank national accounts data. GDP per capita (2017) is sourced from the Central Statistics Board (BPS) Indonesia. Average price (Euromonitor) data are sourced from Euromonitor International. Average price (MoF) data are calculated by the authors from the average transaction price of each cigarette type (SKT/SKM/SPM) weighted by the market share. Data for the latter calculation are obtained from the Indonesian Ministry of Finance.

Three phases of affordability. Figure 7 presents the affordability results using the Euromonitor data, which cover the years 2002-2016. The average cigarette affordability presents three stages during the observed period: a fluctuating stage between 2002 and 2005, a stage of increasing affordability between 2005 and 2012, and a stage of decreasing affordability from 2012 to 2016. During the whole period, cigarettes were most affordable in 2012 and least affordable in 2005. In 2016, cigarettes were 1.5 times more affordable than in 2002. The 2016 RIP (4.02 percent) remains well below the value in 2005, the year of lowest affordability, when the RIP stood at 6.31 percent.



Figure 7. Cigarette Affordability, Indonesia (2002-2016)

Data source: RIP and CAI are calculated by the authors based on the data in Table 2.

Relating affordability and consumption. Figure 8 describes the correlation between cigarette consumption and affordability. From 2002 to 2012, cigarette consumption steadily increased, in association with an increase in affordability. In the period 2012-2016, cigarette affordability presents a descending trend reflected in both the Euromonitor and MoF data. However, it is notable that the decreased affordability over this period did not lead to reduced consumption. The volume of cigarette sales continued to increase until 2016, when it declined—slightly—for the first time in the observational period





Data source: Both the registered retail sales and illicit trade are sourced from Euromonitor International. Illicit trade figures are difficult to estimate and should be treated with caution. The CAI average (Euromonitor) and CAI average (MoF) are calculated by the authors based on the data listed in Table 2.

Figure 9 compares the RIP measured by average price (Euromonitor) and average price (MoF) between 2011 and 2017. Both present similar trends, indicating that cigarettes became less affordable over this period. RIP average (MoF) has a higher level than RIP average (Euromonitor) in each year during this period because of a higher average retail price (MoF) compared with the average retail price (Euromonitor). The trends of a modest increase in the RIP – i.e., a modest decrease in affordability – are consistent between the two.





Data source: Calculated by the authors based on data in Table 2.

Price changes vs. income changes. Indonesia's government has raised the country's cigarette excise on an annual basis since 2011. This has driven the average cigarette price steadily upward. Cigarette affordability since 2012 has decreased accordingly (Figure 10-1). The trend in cigarette affordability depends on the relative magnitude of the income change and the price change. As illustrated in Figure 10-1 and Figure 10-2, cigarette affordability increased in 2012, when the annual growth rate of nominal GDP per capita exceeded the annual growth rate of the nominal average cigarette price (MoF). On the other hand, when the annual growth rate of nominal average price (MoF) outpaces the annual growth rate of nominal GDP per capita, cigarette affordability decreases, as happened in 2012-2017.





Data source: Calculated by the authors based on data listed in Table 2.

Figure 11 illustrates the annual growth rate and fixed-base growth rates (with 2011 as the base year) of cigarette affordability. On average, cigarette affordability decreased by 10.2 percent between 2011 and 2017. 2012 was the only fiscal year when cigarettes became more affordable than in the previous year. Cigarette affordability decreased most sharply (by 6.3 percent) in 2016.





Indonesia's Position in Global Rankings of Cigarette Affordability

To assess the importance of changes in cigarette affordability in Indonesia, it is helpful to compare Indonesia's affordability levels and trends to those reported in other countries, particularly countries that can be seen as Indonesia's economic peers.

1999-2001: low relative affordability at baseline. Blecher's 2004 study ranks cigarette affordability, measured by RIP (the percentage of per capita GDP required to buy 100 packs of cigarettes), in 70 countries between 1999 and 2001. Indonesia appeared near the bottom of the affordability ranking, 59th of the 70 countries examined, indicating that, at that time, cigarettes were not very affordable in Indonesia compared to other countries (Blecher et al., 2004).

Extending the analysis. Based on WHO's published RIP data for the most-sold cigarette brand (WHO, 2015), we picked 70 countries to rank for cigarette affordability in 2008 and 2016 respectively. (Sixty-six of these countries overlapped with Blecher's original study.) This allows us to see how Indonesia's cigarette affordability has evolved over time, compared to patterns in other countries.

2008-2016: Moderate affordability, relative to peer countries. Our analysis shows that in 2008 and 2016, as expected, Indonesia's RIP remained high (and thus its tobacco afford-ability remained low) relative to high-income countries (Figure 12). Indonesia's affordability level was moderate compared to those of other lower middle-income countries. Specifically, in 2016, Indonesia's RIP was the 8th highest among the 17 lower middle-income countries included in the study, placing it solidly in the middle of this group (Figure 12).

Data source: Calculated by the authors based on data in Table 2.

Very low retail prices for some types of cigarettes. WHO's global ranking of cigarette affordability is based on each country's most-sold brand. This approach works well for countries where a limited variety of cigarette brands are available. It is less effective for countries with a large variety of brands whose retail prices are separated by wide gaps, as is the case in Indonesia. In such countries, the most-sold-brand approach may mask the collective importance of a large set of low-end brands. For example, WHO reports that the most sold cigarette brand in Indonesia in 2016 was Gudang Garam, priced at IDR 21,666.67 per 20 sticks. Indonesia's cheapest brand, meanwhile, sold for IDR 5,833.33 per 20 sticks, one-quarter of the Gudang Garam price.

While Indonesia's overall affordability falls in a medium range for economic peer countries, some of its cigarettes are retailed at prices that are very low in international perspective, including compared to other lower middle-income countries (Table 3).





Data source: WHO Report on the Global Tobacco Epidemic, 2017. Country income group classification is based on World Bank Analytical Classifications for 2016 (World Bank 2016).⁵

⁵ World Bank Analytical Classifications for 2016. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-countryand-lending-groups.

Country	Price of Premium Brand	Price of Cheapest Brand	
Indonesia	\$2.16	\$0.45	
Bangladesh	\$2.81	\$0.64	
Brazil	\$2.28	\$1.53	
Canada	\$8.56	\$6.55	
China	\$6.76	\$0.38	
Germany	\$6.67	\$5.56	
India	\$3.67	\$0.87	
Malaysia	\$4.19	\$2.22	
Mexico	\$2.86	\$1.27	
Philippines	\$1.26	\$0.86	
Singapore	\$9.65	\$7.20	
Sri Lanka	\$7.27	\$3.84	
Rep. of Korea	\$4.46	\$3.57	
Russian Federation	\$1.86	\$0.72	
Thailand	\$2.06	\$1.15	
United Kingdom	\$13.31	\$8.17	
Vietnam	\$1.17	\$0.27	

Table 3. Retail Price for a Pack of 20 Cigarettes - Premium Brand and Cheapest Brand - Indonesia and Selected Countries, 2016, in US\$

Source: WHO Report on the Global Tobacco Epidemic, 2017 (Appendix IX: Tobacco taxes, prices and affordability).

5. DISCUSSION: CLARIFYING RESULTS, LIMITATIONS, AND POLICY IMPLICATIONS

Cross-test analysis with household expenditure data validates the reliability of the cigarette affordability trend measured by GDP per capita. We have conducted additional statistical tests to confirm the soundness of the results presented above. One potential concern relates to the use of GDP per capita as the proxy for income in RIP methodology. While this approach is widely practiced and accepted, it is recognized that GDP per capita is an imperfect marker of income, particularly in the context of high levels of inequality. To address the concern, we conducted a cross-test analysis using self-reported per capita expenditure data as the income proxy. Expenditure data was processed and provided by the World Bank, based on the National Socio-Economic Survey (SUSENAS). Expenditure is sometimes a preferable measure of income, as it captures the disposable income in families.

Expenditure may be an especially useful marker when a country's informal labor market is large, as in Indonesia. Of individuals employed in Indonesia in August 2017, 39.7 percent held wage jobs (excluding casual work), leaving 60.3 percent of workers in non-wage jobs. Under the definition of formality used for official purposes in Indonesia, the formal sector comprises the wage-employed and self-employed individuals who employ permanent workers. In August 2017, 43.0 percent of Indonesian workers were formal under this definition, while 57.0 percent were informal.⁶

	RIP average (Euromonitor)_expenditure	RIP average (Euromonitor)
2011	18.16%	3.63%
2012	18.22%	3.59%
2013	18.20%	3.64%
2014	18.42%	3.73%
2015	18.69%	3.87%
2016	18.77%	4.02%

Table 4. Cross-Test RIP: Expenditure vs. GDP Per Capita

Note: RIP_average (Euromonitor)_expenditure is calculated based on the average price sourced from Euromonitor and expenditure per capita sourced from the World Bank Group. RIP average_(Euromonitor) is calculated using the average price sourced from Euromonitor and GDP per capita sourced from the World Bank Group.

⁶ Data provided by World Bank Indonesia staff.



Figure 13. Cross-Test RIP: Expenditure vs. GDP Per Capita

Data source: Based on data in Table 4.

As shown in Figure 13, over the period 2011-2016, the affordability trend illustrated by expenditure data is generally similar to the affordability trend illustrated by GDP per capita, though slight differences are seen. The value of RIP measured by expenditure, however, is almost six times larger than RIP measured by GDP per capita (Table 4). This reflects the fact that expenditure per capita is lower than GDP per capita. Importantly, this relationship also suggests that the burden of tobacco expenditure on a family's ability to purchase necessities is much larger than it appears when RIP is calculated using per capita GDP.

Additional smokers have contributed significantly to total aggregate cigarette consumption in Indonesia since 2011, partially off-setting the decreased affordability achieved by higher tobacco taxes. Over the last two decades, the Indonesian population has grown substantially, increasing the number of smokers and total cigarette consumption (Table 6 and Figure 8). Figure 14 takes account of that population growth. It shows a clear relationship between population growth and Indonesia's cigarette afford-ability. Both were broadly rising through most of the period considered.

Table 5. Adult Cigarette Co	nsumption Per Capita
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	Consumption (Billion Packs)	Total Adult Population (Million)	Adult Consumption Per Capita (Sticks)
2002	225.36	151.58	1487
2003	225.81	153.92	1467
2004	225.81	156.25	1445
2005	226.09	158.59	1426
2006	246.66	161.49	1527
2007	241.95	164.33	1472
2008	263.29	167.09	1576
2009	276.43	169.73	1629
2010	286.87	172.27	1665
2011	296.48	175.20	1692
2012	320.44	177.94	1801
2013	327.67	180.63	1814
2014	335.04	183.38	1827
2015	342.48	186.24	1839
2016	339.37	188.91	1796

Data source: Total cigarette consumption is sourced from Euromonitor International. The number of adults (15+) is sourced from the World Bank Group. The adult cigarette consumption per capita is calculated by the authors based on the above data.



Figure 14. Adult Cigarette Consumption Per Capita and Cigarette Affordability, Indonesia (2002-2016)

Data source: Adult cigarette consumption per capita by is listed in Table 5. The CAI average (Euromonitor) is calculated by the authors based on data listed in Table 2.

Overall, cigarette affordability increased by half from 2002 to 2016, and consumption per capita rose by 21 percent. However, we can delineate three distinct phases during these years:

2002-2012: Cigarette affordability and consumption evolve in step. From 2002 to 2005, both cigarette affordability and adult cigarette consumption per capita trended downward. Cigarettes were least affordable in 2005, and in that year adult cigarette consumption per capita fell to its lowest level during the whole observed period. Subsequently, from 2005 to 2012, cigarette affordability increased steadily, and adult per capita cigarette consumption likewise rose. Cigarette affordability reached its highest point in 2012.

2012-2015: An affordability-consumption disconnect, largely driven by additional smokers. From 2012 to 2015, cigarette affordability in Indonesia declined by about 7 percent, largely due to the regular tax increases that began in 2011. However, consumption per capita increased, rather than falling, during these years. Table 7 shows the growth in the number of smokers, cigarette consumption growth, and the percentage of increased consumption contributed by additional smokers over the period 2011-2016. As illustrated in Table 7 and Figure 15, around 85 percent of the increased total consumption in 2014 and 2015 was contributed by additional smokers. For 2013, the corresponding figure was 71 percent. In contrast, in 2012, an increased number of smokers had accounted for just 21 percent of the annual cigarette consumption rise. The balance was primarily contributed by higher affordability, together with non-price factors. In each year of rising aggregate cigarette consumption, the increased consumption not accounted for by additional smokers was due to greater affordability and other variables. These variables included changes

in overall tobacco control programs and in group norms, as well as cumulative changes in affordability and expectations of future changes in affordability.

The question persists whether reported cigarette consumption data are accurate enough to permit definitive decomposition of annual changes. A small remaining disconnect is noted between the 7.3 percent decline (measured by Euromonitor data) in affordability from 2012-2015 and the essentially flat consumption per capita -- about 1800 cigarettes per year, with a slight increase above 1830 in 2015.

2016: A turning point? One cannot place too much faith in the results of a single year, particularly because of lagged effects. However, it is encouraging that, in 2016, cigarette consumption declined in both per capita and overall terms. 2016 also saw the largest drop in cigarette affordability achieved during the period— 6.3 percent (Figure 11).

	Total Consumption	Total Number of Smokers	Consumption Per Smoker
	Billion Sticks	Million	Sticks
2011	296	57.96	5115
2012	320	58.89	5441
2013	328	59.84	5476
2014	335	60.98	5495
2015	342	62.14	5511
2016	339	63.33	5358

Table 6. Total Number of Smokers and Consumption Per Smoker

Data source: Both total cigarette consumption and the number of smokers are sourced from Euromonitor International. The consumption per smoker is calculated by the authors based on data in the table.

	(1) ∆ Smokers com- pared with previous year (thousands)	(2) Cigarette consump- tion of ∆ smokers (million sticks)	(3) ∆ Total consump- tion compared with previous year (million sticks)	(4) = (2)/(3) Consumption of Δ smokers as % of Δ total consumption
2011-2012	932.40	5073	23963	21.17%
2012-2013	947.50	5189	7235	71.71%
2013-2014	1139.40	6260	7368	84.97%
2014-2015	1165.30	6422	7436	86.37%
2015-2016	1191.60	6385	-3111	-205.23%

Table 7. Growth in Number of Smokers and Cigarette Consumption Growth (2011-2016)

Data source: Calculated by authors based on data listed in Table 6.



Figure 15. Change in Total Cigarette Consumption and Cigarette Consumption by Additional Smokers

Data source: Data in Table 7.

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Indonesia's multi-tiered tobacco tax system has weakened the positive impact of tax hikes to date. Indonesia applies an elaborate, multi-tiered tobacco excise system based on cigarette type, the number of cigarettes produced, and per-unit maximum retail price. Reforms between 2009 and 2017 reduced the number of tiers from 19 to the current 12. However, this still remains the most complex excise tax system in the world. In theory, such a system might be expected to benefit small-scale domestic cigarette firms, especially hand-rolled kretek (SKT) firms, by incentivizing consumers to choose these comparatively inexpensive products. In practice, such a benefit for small firms has not materialized. Between 2011 and 2016, market share for SKT dropped from 30.37 percent to 20.72 percent. Meanwhile, the fragmented tax structure blunts the impact of tobacco tax hikes by providing smokers with "escape routes" to shift to alternate brands when taxes and prices rise, rather than quitting altogether.⁷

Methodological lessons and paths for future work. By testing different approaches to affordability using different data sources, this study has generated methodological insights that may inform future work. (1) We have found significant drawbacks with the widely applied approach of using per capita GDP as a proxy for income. Particularly in a country such as Indonesia, with substantial income inequality and widespread informal employment, household expenditure would be a better measure to capture actual disposable income in families. (2) Focusing on average cigarette prices or the price of a country's most-sold brand can mask important features of affordability as it plays out in the daily lives and choices of consumers. For example, if the average cigarette price in a country is US\$ 2.00, but the realistic range of prices extends from US\$ 0.45 to US\$ 6.00, there is clearly much scope for downtrading and substitution. This especially needs to be taken into account for countries like Indonesia, whose cigarette markets encompass a wide range of brand and price varieties. (3) The drawbacks of measuring affordability by per capita GDP and average price or most-sold brand price explain the paradox between Indonesia's static global ranking in cigarette affordability and its notable rise in the global ranks of tobacco consumption (from the world's fifth-largest to third-largest consumer nation) during the past decade. (4) To address the above drawbacks, household surveys comprising both price data and income data would be preferable. Such instruments would enable researchers to assess the affordability of different cigarette price categories consumed by different income groups. This nuanced approach would contribute important knowledge for tobacco tax policy.

⁷ Indonesia Tobacco Tax Policy Note: Evaluating options to reform the tobacco excise tax system, November 2014.

6. CONCLUSIONS

Progress has recently been made to begin reducing tobacco affordability in Indonesia, but much remains to be achieved. Recent tobacco tax reforms in Indonesia have boosted retail cigarette prices. The nominal average cigarette price rose by 65 percent between 2011 and 2016, from IDR 11,578.5 to IDR 19,116.3 per pack. The real average cigarette price climbed by 27 percent, and cigarettes were 10 percent less affordable in 2016 than in 2011. These gains have begun to reverse the long trend of increasing cigarette affordability seen in Indonesia since the turn of the century, and indeed for the nearly four decades for which data are available.

Indonesia's tobacco epidemic continues to threaten the country's future. Despite this progress, Indonesia's tobacco epidemic remains one of the world's most serious. It places the nation's health, human capital, and economic dynamism at risk. The potential harms to children and youth, from active smoking and secondhand smoke exposures, are especially concerning. To reap the demographic dividend from its young and growing population, Indonesia must ensure that young people stay healthy.

Cigarettes in Indonesia are still too cheap. Indonesian consumers can still buy cigarettes more cheaply than can smokers in most other middle-and high-income countries. A package of cigarettes can be bought for as little as US\$ 0.45, among the lowest prices in the world (Indonesian Investments, 2018; WHO, 2017). The sale of single cigarette sticks remains a common practice in Indonesia, making cigarettes even more cheaply accessible. This mode of purchase may especially encourage adolescents to experiment with smoking. On the other hand, expensive brand cigarettes maintain a large market share, suggesting that many Indonesian consumers still find these products affordable.

To get full benefit from affordability reductions, Indonesia's tobacco excise system must be simplified. The country's complex, multi-tiered tobacco tax structure might theoretically have favored small-scale domestic cigarette manufacturers. In practice, these small firms' market share has sharply declined. The current fragmented tax model also produces deleterious public-health consequences by encouraging smokers to switch to cheaper brands when tobacco taxes rise, rather than quitting altogether. This undermines the effectiveness of using tax policy to cut tobacco consumption.

Understanding this inconsistency provides an opportunity. Indonesian policy makers can resolve the conflict by simplifying the tobacco excise tax structure to reduce cigarette affordability aggressively across the board, for all cigarette types. Cigarette affordability

cuts can only achieve full impact if all tobacco products become less affordable simultaneously and stay that way over time. A bold streamlining of the tiered tax system is crucial to achieve this goal.

Tackling non-price factors. While continuing to lower affordability, tobacco control policy in Indonesia can further improve results by aggressively restricting tobacco advertising, enforcing smoke-free areas in public spaces, expanding the use of pictorial health warnings, and similar measures. The pervasive cultural perception of smoking as normal for adult men must and can be changed.

"Go big, go fast." International comparisons suggest that Indonesia's current tobacco tax rates remain far below what is feasible in terms of revenue potential. Thus, tobacco tax tier consolidation and further bold tax increases could serve revenue purposes as well as fighting tobacco-related death and disease in the years ahead. A growing number of countries have achieved success with a tobacco tax strategy of "Go big, go fast": large, rapid increases in tobacco tax rates, joined to impact-boosting measures including the swift merger of tax tiers. Together, these actions can permanently change consumers' expectations about how much smoking costs and durably alter their behavior (Marquez and Moreno-Dodson, 2017). This is a promising path for tobacco control in Indonesia.

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