ICTD
Centre International pour la Fiscalité et le Développement
International Centre for Tax and Development

Working Paper 99

The Economics of Tobacco Control in Nigeria: Modelling the Fiscal and Health Effects of a Tobacco Excise Tax Change

Precious C. Akanonu, Joseph Ishaku and Chukwuka Onyekwena

July 2019

Bill & Melinda Gates foundation

IDS Institute of Development Studies

UKaid from the British people

ICTD Working Paper 99

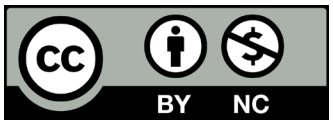
The Economics of Tobacco Control in Nigeria: Modelling the Fiscal and Health Effects of a Tobacco Excise Tax Change

Precious C. Akanonu, Joseph Ishaku and Chukwuka Onyekwena

July 2019

The Economics of Tobacco Control in Nigeria: Modelling the Fiscal and Health Effects of a Tobacco Excise Tax Change
Precious C. Akanonu, Joseph Ishaku and Chukwuka Onyekwena
ICTD Working Paper 99
First published by the Institute of Development Studies in July 2019

ISBN: 978-1-78118-578-0



Available from:
The International Centre for Tax and Development at the Institute of Development Studies, Brighton BN1 9RE, UK
Tel: +44 (0) 1273 606261
Email: info@ictd.ac
Web: www.ictd.ac/publication

IDS is a charitable company limited by guarantee and registered in England
Charity Registration Number 306371
Charitable Company Number 877338

The Economics of Tobacco Control in Nigeria: Modelling the Fiscal and Health Effects of a Tobacco Excise Tax Change

Precious C. Akanonu, Joseph Ishaku and Chukwuka Onyekwena

Summary

This paper examines the potential for changes in the tobacco tax to contribute to raising government revenues, reducing tobacco use, and improving public health in Nigeria. Specifically, it estimates the impact of a change in the excise tax structure and level on cigarette consumption, government revenue, smoking prevalence, net-of-tax (NOT) revenue, and the excise tax burden. To this end, we ran the Tobacco Excise Tax Simulation Model (TETSiM), adapted by the researchers to calibrate for the Nigerian context. We modelled four different policy interventions or changes to the tobacco tax structure and level, under 12 scenarios of economic/income growth (slow, medium, and high growth) and industry price response to an increase in excise taxes (either a full pass-through, or an under-shift or over-shift of the tax onto the retail price). We find that (1) cigarette consumption and smoking prevalence decrease in all 12 scenarios of possible economic/income growth and industry price changes under the policy interventions that impose higher tax levels and specific tax systems; (2) under all policy interventions and in all scenarios considered, government excise tax revenues from cigarette sales increase significantly but are most significant under the specific tax system, relative to the *ad valorem* tax system; (3) under all policy interventions, the best response to maximise NOT revenue for the tobacco industry is to increase the industry price; (4) under all policy interventions and in all scenarios considered, the excise tax burden to the consumer will at least double; however, since current excise tax burden is very low (at 4 per cent), the policy impact witnessed in the model remains minimal; and (5) we performed a three-year projection of the proposed policy change, which shows a consistent trend of increasing government revenues, decreasing consumption, and decreasing smoking prevalence rates if policy interventions are sustained each year over the three-year period. Based on the findings, we recommend that changes in tax policy need to be significant to have the desired effect on smoking prevalence. In particular, an effective tobacco control tax policy will require that: the tax system is changed from *ad valorem* to specific tax system; and the excise tax burden on tobacco products is continuously increased at least until it reaches 75 per cent.

Keywords: tobacco taxation, tax modelling, Nigeria, Africa.

Precious C. Akanonu is a Research Fellow at the Centre for the Study of the Economies of Africa (CSEA) in Abuja, Nigeria. She holds an MSc in International Economics and Finance from Glasgow Caledonian University, UK, and a Bachelor's in Economics from the American University of Nigeria, Yola, Nigeria. She is also a Fellow at the Energy for Growth, a G20 Young Global Changer scholar, and a member of the African Policy Circle.

Joseph Ishaku is a Research Associate at CSEA. He holds an MSc in Economics from University College London, UK and a Bachelor's degree in Economics from the American University Nigeria, Yola, Nigeria. He is also an On Think Tank fellow.

Chukwuka Onyekwena is the Executive Director of CSEA. He holds a PhD in Economics from the University of Portsmouth, UK and an MSc in Economics from the University of Kent, UK. He also holds certificates in Executive Education from the John F. Kennedy School of Government, Harvard University; Duke University; and the Abdul Latif Jamel Poverty Action Lab at Massachusetts Institute of Technology, USA. Dr Onyekwena is a member of the steering committee of the West African Think Tank Network (WATTNet), a member of the African Policy Circle and Global Economic Governance Africa (GEGAfrica), among others.

Contents

Tables

Figure

Acknowledgements

We wish to acknowledge the support of our partners the African Capacity Building Foundation (ACBF) and the University of Cape Town (UCT)'s Economics of Tobacco Control Project for their financial commitment and technical support on this project conducted by the Centre for the Study of the Economies of Africa (CSEA). While the report on the project has been published by ACBF, we also wish to acknowledge Oliver Roy and other ICTD reviewers in producing this academic paper from the project. All remaining errors in the paper are ours.

Abbreviations

BATN	British American Tobacco Nigeria
CIF	cost, insurance and freight
CISS	Comprehensive Import Supervision Scheme
ECOWAS	Economic Community of West African States
ETLS	ECOWAS Trade Liberalisation Scheme
FCTC	Framework Convention on Tobacco Control [WHO]
FOB	free on board
GDP	gross domestic product
NBS	National Bureau of Statistics
NCS	Nigerian Customs Service
NOT	net-of-tax
SI	smoking intensity
SP	smoking prevalence
TETSiM	Tobacco Excise Tax Simulation Model
UCA	unit cost analysis

1. Introduction

The World Health Organization (WHO) emphasises that tobacco use is a significant hurdle to public health and development gains worldwide, as it imposes significant economic costs on countries both in terms of direct medical care for adults and lost productivity. Cigarette smoking and other forms of tobacco use impose a large and growing public health burden globally and in Nigeria. Globally, tobacco use is the most preventable cause of death. Statistics show that tobacco use caused 100 million deaths in the twentieth century, and if current trends continue unchecked, one billion people (about 10 million, one in six adults, per year) will die from tobacco-related causes in the twenty-first century (Blecher and Ross 2013). Nearly 80 per cent of these deaths occur in low- and middle-income countries, especially in Asia (*ibid*.). Presently in Nigeria, more than 17,500 deaths are recorded each year on account of tobacco-related diseases; that is about 207 men and 130 women per week (Tobacco Atlas 2015).

In the past, tobacco use and tobacco control in Africa received little attention relative to other regions and health issues. This was due to the perceived low smoking prevalence in Africa in addition to the more immediate need for interventions against infectious diseases. However, the trends are quickly changing. With improving economic growth and health in Africa, the number of smokers and cigarettes smoked in the region is rising. In Nigeria, smoking prevalence is growing at an average of 4 per cent each year; from 11.3 per cent in 2000 to 17.4 per cent in 2015 (World Bank 2017). According to data from Nigeria Customs Service (NCS) and the GlobalData Plc, a total of 920 million cigarette packs were sold in Nigeria in 2015, of which 74 per cent were produced domestically.

The increasing use of tobacco products and the recognition of its health and economic consequences have led to calls for the adoption and implementation of strong tobacco control measures. Economic theory suggests that, when consumers know all the risks and bear all the costs of their choices in an efficient market, there is no justification for governments to intervene in a market. However, there are two key inefficiencies (or market failures) in the tobacco market: inadequate information about the health risks of tobacco and risks of addiction; and physical or financial costs imposed on non-smokers. Therefore, there are clear economic grounds for intervening, particularly to protect young people and non-smokers.

The use of price and tax measures to increase the retail price of tobacco products is widely recognised as the most effective way to curb demand for tobacco products and reduce diseases and deaths caused by tobacco use. The WHO Framework Convention on Tobacco Control (FCTC) Article 6 states that ‘price and tax measures are an effective and important means of reducing tobacco consumption by various segments of the population, in particular young persons’ (WHO 2005: 7). It is also widely documented that, other than the public health benefits of tobacco taxation, raising taxes on tobacco products can also boost government revenue in an appropriately structured tax policy regime (WHO 2015). In the Addis Ababa Action Agenda and the 2030 Agenda for Sustainable Development, tobacco taxation features as a means of mobilising domestic resources to finance health and other development programmes.

Empirical studies have shown that tobacco consumption decreases in the face of higher prices, and can increase government revenue (Chaloupka and Warner 1999; Sunley *et al*. 2000; Van Walbeek 2010; Goodchild *et al*. 2016). Despite addictiveness, tobacco consumption decreases as a result of decreases in smoking prevalence (i.e. the number of people quitting or not starting to smoke) and smoking intensity (i.e. change in the average consumption of remaining smokers). More so, due to addictiveness, tobacco use is relatively price inelastic; as such, an increase in the tobacco excise tax can also increase government revenue. For every given percentage increase in the excise tax per cigarette, the percentage

decrease in cigarette consumption is smaller; thus resulting in an overall increase in government revenue. For instance, Sunley *et al*. (2000) provide estimates of the revenue-generating potential of tax increases based on existing empirical evidence on price, tax, and demand elasticity for 70 countries. The authors conclude that an increase of 10 per cent in the tax on cigarettes in each of these countries would raise government revenues by nearly 7 per cent on average for low- and middle-income countries. Therefore, tobacco taxation could be a win-win policy for governments: simultaneously reducing tobacco use and creating a fiscal space to finance development and/or health programmes.

Therefore, this paper examines the potential for changes in the tobacco tax to contribute to raising government revenues, reducing tobacco use, and improving public health in Nigeria. Specifically, it estimates the impact of a change in the excise tax structure and level on cigarette consumption, government revenue, smoking prevalence, net-of-tax (NOT) revenue,[1] and the excise tax burden. To this end, we ran the Tobacco Excise Tax Simulation Model (TETSiM), adapted by the researchers to calibrate for the Nigerian context.[2]

The rest of the paper is organised into five parts. Section 2 presents a review of literature on the impact of tobacco taxes on consumption and government revenue. Section 3 presents the current state of tobacco taxes in Nigeria. Section 4 discusses the method and data, including sources, reliability, and coverage. Section 5 presents the results and analyses of the tobacco excise tax modelling, and Section 6 concludes the paper with some recommendations for tobacco taxation.

2. The relationship between tobacco taxes, consumption, and government revenue

There is substantial consensus in extant literature on the effectiveness of tobacco taxation in tobacco control. However, most of this evidence is based on analysis carried out in developed countries in the global North. Specifically, Biener *et al*. (1998) studied the responsiveness of adult and teenage smokers to an increase in cigarette tax in Massachusetts, USA. They find that a modest price change led to smoking cessation among adult smokers and reduced cigarette consumption among low-income teenagers. A similar study in New York by Frieden *et al*. (2005) found substantial impacts, such as decline in smoking among adults, of a comprehensive set of tobacco control measures including increase in cigarette excise taxes. These impacts were consistent across all socioeconomic groups considered, including age groups, race/ethnicities, gender, education level, nationality, and location of residence. Studies in Australia (Scollo *et al*. 2003), Canada (Zhang *et al*. 2006), and the United Kingdom (Levy, Currie and Clancy 2013) reach similar conclusions about the relationship between tobacco taxes and consumption. A recurring theme among these studies is that they all examine the impact of tobacco taxes changes ex post.

Although there are existing studies on the impact of tobacco tax changes for low- and middle-income countries, evidence remains scarce for Nigeria and the rest of sub-Saharan Africa, with the exception of South Africa. Many of the studies that make up the often-cited examination of literature across low- and middle-income countries, where an estimated

[1] Net-of-tax revenue refers to the total amount of net-of-tax revenue generated from cigarette sales. This is the gross revenue earned by cigarette manufacturers and sellers.

[2] We omitted the WHO Tobacco Tax Simulation Model (TaxSiM) due to the lack of data on the cost of production and quantity produced for each cigarette brand sold in Nigeria.

80 per cent of smokers live, are studies from Asia, the Gulf, Pacific and Caribbean Islands, and Latin America (Chaloupka, Yurekli and Fong 2012).

Furthermore, studies focus on the public health impacts of tobacco use by prioritising indicators such as smoking intensity and cessation. This may be due to the motivation behind many studies and the bias in author composition towards researchers with expertise in health policy and practice (Chaloupka, Straif and Leon 2011). Little attention is given to the revenue implications of tax changes. However, Jha and Chaloupka (2000) estimate the cross-country revenue-generating potential of tobacco taxes and note that while tax increases were found to raise government revenues, increases tend to be larger in high-income countries, where demand is less elastic and taxes account for a larger share of price. These fiscal implications are very important in the African context where the fiscal space is constrained and governments are not keen to pursue policies whose effect on fiscal revenues are uncertain.

This study contributes to the literature in three unique ways. First, it provides evidence on the impacts of changes in tobacco taxes within the African context. Second, it provides an ex ante analysis by modelling the likely impact of tobacco tax changes, compared to ex post policy analysis that dominate the literature. Third, the study estimates the effects of tax changes on government revenues in addition to tracking impact on health outcomes. This is particularly useful in providing empirical evidence for ongoing policy debate around tobacco taxation in Nigeria and directly contributes to reducing uncertainties of likely fiscal impacts.

3. State of tobacco taxes in Nigeria (2017–baseline scenario)

Nigeria's tobacco taxation regime does not comply with the best practice tobacco taxation policies enshrined in Article 6 of the WHO FCTC. While WHO recommends an excise tax burden of 75 per cent of retail price and a specific excise tax system for effective tobacco taxation, the excise tax rate on tobacco products in Nigeria has an *ad valorem* tax structure levied at 20 per cent of UCA (not retail price). It is important to note that the excise tax rate has fallen since 2009, from 40 per cent. More so, VAT levied on locally consumed products in Nigeria, including tobacco products, stands at 5 per cent, which is among the lowest VAT rates globally. In addition to the VAT rate, other taxes are applicable to imported tobacco products. Imported cigarettes are excluded from excise tax, but accrue an import levy of 40 per cent of CIF along with other smaller levies, such as the ECOWAS Trade Liberalisation Scheme (ETLS), Comprehensive Import Supervision Scheme (CISS), and surcharge. The levies on imported cigarettes include: Import Duty (20 per cent of CIF); Levy (40 per cent of CIF); CISS (1 per cent of cost of goods or FOB); Surcharge (7 per cent of total value of duty payable); and ETLS (0.5 per cent of CIF) (NCS 2015). While imported cigarettes incur higher taxes, these taxes are not significant enough to drive wide price disparities.

Given that Nigeria operates an *ad valorem* tax structure, all of these taxes are charged as a percentage of the value of tobacco products. According to the literature, the *ad valorem* tax structure is typically susceptible to undervaluation; encourages price reductions; disincentivises costly 'quality' improvements; and encourages 'trading down' in favour of cheaper tobacco products – thereby reducing health benefits (WHO 2010). While some of these issues can be addressed by establishing a minimum retail sales price as well as running a strong tax administration with technical capacity, Nigeria's tobacco tax system does not incorporate a minimum retail sales price and the tax administrative system remains weak.

About 80 per cent of the tobacco products that are consumed in Nigeria are produced by three registered tobacco companies: British American Tobacco Nigeria (BATN), Leaf Tobacco and Commodities Nigeria Ltd, and International Tobacco. According to available data from Global Data Plc, 18.4 billion cigarettes sticks were sold in 2015, 12.2 billion (66.3 per cent) of which were domestically produced by the three main tobacco companies. BATN holds considerable market power, accounting for 75 per cent of overall domestic production – based on data from the Nigerian Customs Service. Hence the price of average pack of 20 cigarettes is very low, costing approximately ₦183.50 (US$0.51) as at 2017.

4. Methods and data sources

4.1 Methodology

We applied the Tobacco Excise Tax Simulation Model (TETSiM) as developed by the Economics of Tobacco Control Project, adapted and empirically applied by researchers to fit the local setting. The TETSiM is a simulation tool used by tobacco control advocates and government officials to consider the impacts of changes in tobacco excise taxes on a number of outcomes. The mathematical model that underpins the TETSiM is generic and can be calibrated to a variety of countries (TETSiM 2017). Using the TETSiM, we calculated the effects of four possible changes (policy interventions) in Nigeria's tobacco tax structure and level on key outcomes. The measured outcomes include:

- Government revenue – this includes revenue generated by excise taxes as well as the import duty, VAT, CISS, ETLS, and levy on cigarettes;
- Cigarette consumption – the quantity of cigarettes smoked annually in Nigeria;
- Smoking prevalence – the percentage of the adult population that smoke cigarettes;
- Net-of-tax (NOT) revenue – the gross revenue earned by cigarette manufacturers and sellers; and
- Excise tax burden – the proportion of tax in the retail price of cigarettes.

The model consists of an initial equilibrium or baseline period, which is the current tax structure and level of 20 per cent *ad valorem* on UCA. Through simulations, new equilibria emerged that capture the effects of policy changes on the baseline tax structure and level on the key outcomes. Two sets of simulations were carried out: (1) once-off policy changes in the tobacco tax structure and level over a one-year period, and (2) the projected impact of policy changes on the key outcomes over a three-year period. In order to calibrate the TETSiM, we make a set of key assumptions, supported by literature. These include assumptions around price and income elasticities for licit and illicit cigarettes, the cross-price elasticity between illicit and licit cigarettes, as well as the proportion of a decrease in prevalence driven by a reduction in smoking intensity.

Our model consists of five market segments, each of which is affected differently by government policies. The first three market segments consist of domestically produced cigarettes (premium, mid-priced, and economy), which are affected by changes in the excise tax policy. The fourth market segment consists of imported cigarettes, which are affected by changes in import levy. Given that no excise tax is charged on imported cigarettes, policymakers make use of various import levies to affect the price of imported cigarettes. Finally, we also allow for an illicit trade segment of the market, which is not affected by a change in the tobacco tax structure and level, but rather by the legal tobacco industry's response to changes in the tobacco tax policy.

4.1.1 The TETSiM model

In order to determine the sensitivities of various taxation policies and pricing strategies on the future tobacco landscape, a spreadsheet-based model is developed. The following

outputs are estimated: (1) predicted future cigarette consumption; (2) the predicted excise tax, net-of-tax, and retail price of a pack of cigarettes; (3) predicted future government cigarette excise tax revenue and total government cigarette tax revenues (from VAT and import tariffs); (4) predicted future net-of-tax revenue; and (5) smoking prevalence (TETSiM 2017).

The retail price (P) is broken into two components: (1) the net-of-tax (NOT) price, and (2) taxes (excise tax, VAT, and tariffs). The net-of-tax is a catch-all category that represents the revenue distributed among all players along the tobacco value chain, i.e. primary producers, manufacturers, importers, logistical companies, wholesalers, and retailers. The contribution of each segment to the average retail price is weighted by its share of the market: domestic premium brands (36 per cent), domestic mid-priced brands (10 per cent), domestic economy brands (20 per cent), imported (24 per cent), and illicit (10 per cent).[3]

In order to obtain the desired outputs, we input the values of the following variables: (1) the average growth in the real net-of-tax-price; (2) the price elasticity of demand; (3) the income elasticity of demand; (4) the excise tax rate, VAT rate, levy rate, import duty rate, CISS, and ETLS; and (5) the tax burden (i.e. the total tax as a percentage of the retail price). The base year was chosen as 2016.

At the outset, the retail price is given as P_1. The following formula is used to calculate the retail price in the next period (P_2):

$$P_2 = \{Market\ share_{Domestic\ premium} \times (NOT_{Domestic\ premium} + Excise_{Domestic\ premium} + VAT_{Domestic\ premium})\} + \{Market\ share_{Domestic\ mid-priced} \times (NOT_{Domestic\ mid-priced} + Excise_{Domestic\ mid-priced} + VAT_{Domestic\ mid-priced})\} + \{Market\ share_{Domestic\ economy} \times (NOT_{Domestic\ economy} + Excise_{Domestic\ economy} + VAT_{Domestic\ economy})\} \{(Market\ share_{Imported} \times (NOT_{Imported} + VAT_{Imported} + Levy_{Imported} + Duty_{Imported} + CISS_{Imported} + ETLS_{Imported})\} + \{Market\ share_{Illicit} \times (NOT_{Illicit})\} \quad (1)$$

At the outset, the excise tax (which in practice is expressed in naira per pack) is set as a percentage of the UCA of cigarettes ($Excise_1 = 0.2 * UCA_1$). The excise tax in the next period ($Excise_2$) is given as:

$$Excise_2 = Excise_1 \times (1 + \frac{\Delta Excise}{100}) \quad (2)$$

Similarly, a change to import levy is given as:

$$Import\ levy_2 = Import\ levy_1 \times (1 + \frac{\Delta Import\ levy}{100}) \quad (3)$$

The net-of-tax price (NOT) is obtained as:

$$NOT = Market\ share_{Domestic} \times (P_{Domestic} - Excise_{Domestic} - VAT_{Domestic}) + Market\ share_{Imported} \times (P_{Imported} - VAT_{Imported} - Levy_{Imported} - Duty_{Imported} - CISS_{Imported} - ETLS_{Imported}) + Market\ share_{Illicit} \times (P_{Illicit}) \quad (4)$$

[3] Computations are based on *Passport: Cigarettes in Nigeria*, Euromonitor International, 2017.

We use the price elasticity (ε_p) and income elasticity (ε_i) formulae to solve for cigarette consumption of licit cigarettes in the next period (Q Licit2). Q Licit2 subtracts change in consumption of illicit cigarettes (ΔQ Illicit1) from licit cigarette consumption. This is given as:

$$Q\ Licit_2 = \left(Q\ Licit_1 \times \left\{\frac{\left[1+\varepsilon_p\left(\frac{P_2-P_1}{P_2+P_1}\right)\right]}{\left[1-\varepsilon_p\left(\frac{P_2-P_1}{P_2+P_1}\right)\right]}\right\} + \left\{\frac{\left[1+\varepsilon_i\left(\frac{GDP_2-GDP_1}{GDP+GDP_1}\right)\right]}{\left[1-\varepsilon_i\left(\frac{GDP_2-GDP_1}{GDP_2+GDP_1}\right)\right]}\right\}\right) - \Delta Q\ Illicit \quad (5)$$

GDP is gross domestic product and is used to represent national income levels.

The consumption of illicit cigarettes is also affected by possible cross-price elasticity between illicit cigarettes and the cheapest licit cigarettes. That is, a decrease in the price of licit cigarettes due to an increase in tobacco tax may result in users switching to illicit cigarette consumption. Consumption of illicit cigarettes in the next period ($Q\ Illicit_2$) is calculated as follows:

$$Q\ Illicit_2 = Q\ Illicit_1 \times \left\{\frac{\left[1+\varepsilon_p\left(\frac{P_2-P_1}{P_2+P_1}\right)\right]}{\left[1-\varepsilon_p\left(\frac{P_2-P_1}{P_2+P_1}\right)\right]}\right\} + \left\{\frac{\left[1+\varepsilon_i\left(\frac{GDP_2-GDP_1}{GDP+GDP_1}\right)\right]}{\left[1-\varepsilon_i\left(\frac{GDP_2-GDP_1}{GDP_2+GDP_1}\right)\right]}\right\} + \left\{\frac{\left[1+\varepsilon_{cross-price}\left(\frac{Price_{Cheap\ licit\ 2}-Price_{Cheap\ licit\ 1}}{Price_{Cheap\ licit\ 2}+Price_{Cheap\ licit\ 1}}\right)\right]}{\left[1-\varepsilon_{cross-price}\left(\frac{Price_{Cheap\ licit\ 2}-Price_{Cheap\ licit\ 1}}{Price_{Cheap\ licit\ 2}+Price_{Cheap\ licit\ 1}}\right)\right]}\right\} \quad (6)$$

Smoking prevalence (SP) is given as:

$$SP_2 = SP_1\ [1+ \{\frac{Q2-Q1}{(Q1+Q2)/2}\}]\ x\ \rho \quad (7)$$

Where ρ is the percentage of decrease in cigarette consumption that is due to decrease in smoking prevalence.

Smoking intensity (SI) is given as:

$$SI_1 = Q_1/SP_1 \quad (8)$$

We can easily calculate the following aggregates:

- Total government revenue: $Q_2 \times \left[\{Market\ share_{Domestic\ premium} \times \left(Tax_{Domestic\ premium}\right)\} + \{Market\ share_{Domestic\ mid-priced} \times \left(Tax_{Domestic\ mid-priced}\right)\} + \{Market\ share_{Domestic\ economy} \times \left(Tax_{Domestic\ economy}\right)\} + \{Market\ share_{Imported} \times (Tax_{Imported})\}\right]$, where $Tax_{Domestic\ premium}$, $Tax_{Domestic\ mid-priced,}$ $Tax_{domestic\ \ economy}$, and $Tax_{Imported}$ represent taxes on domestically produced (premium brands, mid-priced brands, and economy brands) and imported cigarettes, respectively.

- Total net-of-tax revenue: $(NOT_2 \times\ Q\ licit_2)\ +\ (NOT_2\ X\ Q\ illicit_2)$

A limitation of the TETSiM model is that it does not consider population growth and inflation in the three-year simulation.

4.2 Data

4.2.1 Model inputs

For the purpose of this study, data were mostly derived from national sources; both primary and secondary data collection (Table 1). Other data were sourced from international databases due to its unavailability in home country.

The prices of cigarettes were collected from randomly selected kiosks, through a nationally representative survey across the six geopolitical zones in Nigeria (see Appendix 1): North Central, North-East, North-West, South-East, South-South, and South-West. A total of six states were surveyed: Abuja (North-Central), Adamawa (North-East), Kaduna (North-West), Anambra (South-East), Delta (South-South), and Lagos (South-West). The price bands for premium, mid-priced, and economy domestic market segments derived from Euromonitor International.

Key secondary data were collected from national sources. Data on cigarette brands and the quantity of cigarette packs produced in Nigeria were provided on request by the Nigerian Customs Service (NCS). Data on taxes collected on cigarette products sold in Nigeria were also sourced from NCS. Data on GDP (income) and adult population were also collected from the National Bureau of Statistics (NBS). Other secondary data include: total quantity of cigarettes consumed in the country – obtained from GlobalData Plc; smoking prevalence – World Bank; and price elasticity of demand, income elasticity of demand, illicit market share, and percentage increase in net-of-tax – obtained from the literature (see Kostova *et al*. 2013; Tauras *et al*. 2006; Gallus *et al*. 2006).

A summary of key baseline data and their sources are presented in Table 1.

Table 1: A summary of key baseline data

Item	Baseline data	Year	Data sources
Average cigarette retail price (domestic premium)*	₦250	2017	Primary – collected from six geopolitical zones in Nigeria
Average cigarette retail price (domestic mid-priced)	₦200		
Average cigarette retail price (domestic economy)	₦150		
Average cigarette retail price (imported segment)	₦180		
Average cigarette retail price (illicit segment)**	₦100		
Domestic market share	66%	2015	NCS, GlobalData Plc, *World Customs Journal*, authors' computation
Imported market share	24%		
Illicit market share	10%		
Excise tax *(based on unit cost of production – UCA)*	20%	2017	Nigerian Customs Service (NCS)
VAT	5%,	2017	NCS
Import duty + surcharge on duty payable	20% + 7% = 21.4%	2017	NCS
Levy	40%	2017	NCS
ETLS	1%	2017	NCS
CISS	0.5%	2017	NCS
Adult population	106,257,431	2015	National Bureau of Statistics (NBS)
Smoking prevalence	5.6%	2015	World Health Organization
GDP (US$)	405082.68	2016	World Bank
Slow GDP growth projection	−1.5%	Authors' computation using historical data from World Bank	
Medium GDP growth projection	2.7%		
High GDP growth projection	4.9%		
Projected GDP growth rate – Year 1 (2017)	1.2	World Bank	
Projected GDP growth rate – Year 2 (2018)	2.4		
Projected GDP growth rate – Year 3 (2019)	2.5		

* The average retail price of cigarettes from our survey corroborates with WHO estimates of retail prices in Nigeria, as well as estimates from the Ministry of Finance.
** We assume the average retail price of the cheapest cigarettes across regions represents the average retail price of the illicit market segment.

4.2.2 Assumptions about key parameters

Price elasticities ($\varepsilon_p < 0$): We assume five price elasticities of cigarette demand for each market segment (domestic premium, domestic mid-priced, domestic economy, imported, and illicit). For the licit market segments, the price elasticity of cigarette demand of -0.3 (domestic premium), -0.4 (domestic mid-priced), -0.6 (domestic economy), and -0.5 (imported) were selected based on literature (Kostova *et al*. 2013). We assume that demand for domestic premium cigarettes is most responsive to changes in price, while demand for domestic economy cigarettes is the least responsive to price changes. For the illicit market segments, the price elasticity of cigarette demand of -0.9 was selected, based on the assumption that the demand for illicit cigarettes is more responsive to price changes than the demand for licit cigarettes. The price elasticity is higher for the cheapest brand (illicit cigarettes) as these consumers cannot switch to an even cheaper brand.

Cross-price elasticity ($\varepsilon_{cross-price} > 0$): We assume a cross-price elasticity of demand from licit to illicit cigarettes to be 0.5. This is based on Tauras *et al*.'s (2006) study on cross-price elasticities between premium (licit in this study) and discount (inferior illicit) cigarettes. As the price of licit cigarettes increases, consumers of the cheapest licit brands are likely to switch to buying illicit cigarettes.

Income elasticity (licit cigarettes: $\varepsilon_i > 0$; illicit cigarettes: $\varepsilon_i < 0$): We make the assumption that illicit cigarettes are inferior goods and therefore, any increase in income will lead to a decline in illicit cigarette consumption. Income elasticity for licit cigarettes is set at 0.5 (Gallus *et al*. 2006), while we make an assumption that the income elasticity for illicit cigarettes is -0.5.

Change in smoking prevalence: Cigarette consumption can decrease in one of two ways: either fewer people smoke (a decrease in smoking prevalence), or remaining smokers consume less (a decrease in smoking intensity). Some studies in developed countries on youth smoking suggest that about 50 per cent of the decrease in cigarette consumption can be ascribed to a decrease in smoking prevalence, while the other 50 per cent of the decrease in cigarette consumption can be ascribed to a decrease in smoking intensity. Since there is no consensus for developing countries, we assume the 50 per cent found to be applicable to developed countries (TETSiM 2017).

It is worth noting that model estimates are influenced by the key parameters outlined above, which are calibrated based on model specification and with guidance from the literature. If in reality these parameters happen to fall significantly away from current calibrations, the reliability of the results will be in doubt. However, we are confident that our calibration is viable and yields credible estimates, given available evidence and expert guidance.

4.3 Proposed policy interventions

Four possible policy interventions were used for the tax simulations in our TETSiM. These are summarised in Table 2.

Table 2: Possible policy interventions

	Policy intervention	Description
Policy intervention 1 (PI.1)	Keep 20 per cent *ad valorem* tax, include ₦20 specific tax, and increase import levy to 50 per cent of CIF per pack.	This policy intervention represents the government's plans to retain the present *ad valorem* tax on tobacco while introducing a specific tax and increasing import levy from 40 to 50 per cent for 2018.
Policy intervention 2 (PI.2)	Change to specific tax system, set the excise tax burden to ₦30 per pack, and increase import levy to 50 per cent of CIF per pack.	This policy intervention simulates a complete change from *ad valorem* to specific tax system set at ₦30 per pack, which translates to 50 per cent specific excise duty on UCA (₦60). It also accommodates an increase in import levy to 50 per cent.
Policy intervention 3 (PI.3)	Change to specific tax system, set the excise tax burden to ₦60 per pack, and increase import levy to 50 per cent of CIF per pack.	This policy intervention simulates a complete change from *ad valorem* to specific tax system set at ₦60 per pack, which translates to 100 per cent specific excise duty on UCA. It also accommodates an increase in import levy to 50 per cent.
Policy intervention 4 (PI.4)	Change to specific tax system, set the excise tax burden to the equivalent of 75 per cent of current retail price, and increase import levy to 50 per cent of CIF per pack.	This policy intervention simulates a complete change from *ad valorem* to specific tax system in line with the WHO recommended 75 per cent benchmark, which is equivalent to ₦139 specific tax per pack for Nigeria. It also accommodates an increase in import levy to 50 per cent.

While PI.1 and PI.4 are motivated by current government plans and WHO recommendations respectively, PI.2 and PI.3 are included to provide a picture of what more intermediate tax changes may imply. Also, these additional proposals highlight what is possible with a change from *ad valorem* to specific taxation without radically increasing the tax burden as in PI.3 and PI.4.

4.4 Sensitivity analysis

4.4.1 Sensitivity analysis 1: Assumptions on economic growth and industry response

We model 12 possible scenario outcomes for different possible growth rates against possible industry responses. Given the sequence of the events that lead to changes in the outcomes of interest, the different scenarios are relevant for providing an overview of the possibilities, before uncertainties around tobacco industry response and future economic conditions are resolved. Table 3 provides a description of scenarios for income growth and industry price changes used in the model.

4.4.1.1 Economic/income growth rates
We use four growth rate options (no growth, slow, medium, and high growth). The slow, medium, and high growth rates used were sourced from the World Bank (see Table 1).[4]

4.4.1.2 Industry response
For the licit cigarette market, we use three potential industry responses to a change in the excise tax rate (no change in NOT price, a 10 per cent decrease in NOT price, and a 10 per cent increase in NOT price). We expect industry response not to fall too far from the narrow band of $(-\text{of xpec.})$. Moreover, the amount by which the industry can raise the NOT price is limited by potential competitive pressures, and by the marginal consumption that the industry is willing to give up. Generally, the tobacco industry tends to decrease the NOT price when trying to break into the market, otherwise they increase the NOT price if they have substantial market share (TETSiM 2017). For the illicit market segment, we make the assumption that it is linked to licit industry response. That is, if the licit industry price increases by 10 per cent, so will that of the illicit industry.

Table 3: Sensitivity analysis – income growth and industry response scenarios

Scenarios	Assumption on income growth	Assumption on industry price
Scenario 1 (S.1)	No income growth effect	No change in industry price
Scenario 2 (S.2)	No income growth effect	Industry price increases by 10%
Scenario 3 (S.3)	No income growth effect	Industry price decreases by 10%
Scenario 4 (S.4)	Slow economic growth	No change in industry price
Scenario 5 (S.5)	Slow economic growth	Industry price increases by 10%
Scenario 6 (S.6)	Slow economic growth	Industry price decreases by 10%
Scenario 7 (S.7)	Medium economic growth	No change in industry price
Scenario 8 (S.8)	Medium economic growth	Industry price increases by 10%
Scenario 9 (S.9)	Medium economic growth	Industry price decreases by 10%
Scenario 10 (S.10)	High economic growth	No change in industry price
Scenario 11 (S.11)	High economic growth	Industry price increases by 10%
Scenario 12 (S.12)	High economic growth	Industry price decreases by 10%

4.4.2 Sensitivity analysis 2: A three-year projection of results (in 2016 prices)
We simulate a three-year projection of results accounting for no economic growth and World Bank-projected economic growth (for 2017, 2018, and 2019), as well as potential industry response (retain, increase, or decrease NOT price). We implement the four policy interventions outlined in Table 2 in the base year, and subsequently assume an increase in specific excise tax of ₦20 (in 2016 prices) per year under PI.1, and an increase in the excise tax burden in retail price by two percentage points annually for PI.2, PI.3, and PI.4. This analysis aims to provide a more dynamic view of the potential impact of alternative policy proposals over the short-to-medium term. This is particularly relevant for gradual tax reform

[4] World bank data on GDP World Bank (https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?view=chart).

and provides options on how to implement dynamic and targeted multi-year tobacco tax adjustments.

5. Results and analysis

Using the TETSiM, we calculated the effects of four possible changes (policy interventions) in Nigeria's tobacco tax structure and level on key measured outcomes.

5.1 Baseline (2016) results

Our results provide estimates of the impact of policy changes in cigarette excise tax on average cigarette consumption, government revenue, smoking prevalence, net-of-tax revenue and tax burden in the baseline period.

A. Cigarette consumption
We find consumption decreases in all scenarios under PI.3 and PI.4 – which impose higher tax levels and specific tax systems. Changes in tax policy need to be significant to have the desired effect on cigarette consumption under all scenarios considered.

Specifically, under the government-proposed policy intervention which entails retaining the current 20 per cent *ad valorem* plus a 20 naira specific tax (PI.1), cigarette consumption will fall by the largest percentage (-7.58 per cent) if there is slow economic/income growth in the country and the tobacco industry price increases by 10 per cent (S.5). However, this policy intervention will have a counteractive effect on cigarette consumption if there is high economic/income growth and the industry decreases prices by 10 per cent (S.9) – this will in fact lead to a 2.19 per cent increase in the quantity of cigarettes consumed in the country.

Under the WHO-proposed policy intervention, which entails changing the tax system/structure from *ad valorem* to specific that is equal to 75 per cent of the current retail price of cigarettes (PI.4), we can expect an average of -18.52 per cent decrease in the quantity of cigarettes consumed in all 12 scenarios. The largest decrease (-25.47 per cent) occurs where there is slow economic growth and the industry price increases (S.5). This finding is intuitive given the negative impact of slow economic growth and price increase on demand. The results of other alternative policy interventions on cigarette consumption (PI.2 and PI.3) can be found in Table 4.

B. Government revenue (excise tax revenue)
We find that under all policy interventions and in all scenarios considered, government excise tax revenue from cigarette sales will increase significantly. This implies that there is a very wide scope for increasing tax revenue without adversely affecting fiscal revenue. The increase in excise tax revenues is more pronounced under specific tax system (as in PI.3 and PI.4) relative to *ad valorem* tax system (as in PI.1 and PI.2).

Under the government-proposed PI.1, excise tax revenue is expected to increase by an average of 157 per cent across all 12 scenarios. Excise tax revenue is highest under S.12 (from a baseline revenue of ₦7.3 billion to ₦19.7 billion) where there is high economic growth and industry decrease price by 10 per cent. Under the WHO-proposed PI.4, excise tax revenue is expected to increase by an average of 803 per cent across all 12 scenarios. However, excise tax revenue is highest under S.1 (from ₦7.3 billion to ₦76.1 billion) where there is no change in either income growth or industry price. A full summary of the impact of the various policy scenarios on government excise tax revenue is presented in Table 5.

C. Smoking prevalence
As with the cigarette consumption findings, changes in tax policy need to be significant to have the desired effect on smoking prevalence under all scenarios considered. Smoking

prevalence decreases in all scenarios under PI.3 and PI.4 – which impose higher tax levels and specific tax systems relative to PI.1 and P1.2.

Under the government-proposed PI.1, smoking prevalence will fall by the largest percentage under S.5 (from a baseline of 5.6 per cent to 5.39 per cent). However, smoking prevalence will rise under the scenario where there is high economic/income growth and the industry decreases price by 10 per cent (S.12) to 5.66 per cent. These two conditions make cigarettes more affordable for consumers, hence the rise in prevalence. Under the WHO-proposed PI.4, we can expect smoking prevalence to fall to at least 5.29 per cent (S.1). The largest decrease (4.89 per cent) occurs where there is slow economic growth and the industry price increases (S.5). The results of other alternative policy interventions (PI.2 and PI.3) can be found in Table 6.

D. Net-of-tax (NOT) revenue

We find that under all policy interventions, the optimal response for the tobacco industry is to increase industry price in order to maximise NOT revenue. The industry stands to lose revenue when they do nothing or decrease industry price in response to policy interventions.

Under PI.1 and PI.2, the NOT revenue of the tobacco industry from cigarette sales will only rise when they pass on some of the tax burden to consumers by increasing industry price. The industry stands to lose revenue when they do nothing or take up the tax burden (by decreasing industry price) in efforts to possibly frustrate policy interventions. Specifically, under the government-proposed PI.1, the NOT revenue of the tobacco industry will rise most significantly under S.11 (from a baseline revenue of ₦154 billion to ₦162.3 billion) where there is high economic growth and the industry price increases by 10 per cent. However, the industry will record the largest decrease under S.6 (from ₦154 billion to ₦137.3 billion) where there is slow economic growth and the industry price decreases by 10 per cent.

Under the WHO-recommended PI.4, the tobacco industry will record a decline in its NOT revenue in all scenarios. The worst outcome for the industry occurs in S.6; it stands to lose around one-third of its revenue (-32.6 per cent) where there is slow economic growth and the industry price decreases by 10 per cent. Table 7 provides a summary of the impact of excise tax changes on NOT revenue under all policy scenarios.

E. Excise tax burden

We find that under all policy interventions and in all scenarios considered, the excise tax burden to the consumer will at least double. However, since current excise tax burden is very low (at 4 per cent), the policy impact witnessed in the model remains minimal relative to the WHO-recommended excise tax burden. This implies that the political will for tobacco control policies has to be strong and consistent in order to raise the excise tax burden to meet the WHO-recommended level of 75 per cent of retail price.

Intuitively, the excise tax burden increases more when the tobacco industry decreases the industry price. Under PI.1, the excise tax burden will increase from a baseline of 4.0 per cent to about 10.2 per cent in all scenarios where the industry price decreases (S.3, S.6, S.9, S12). Under P1.4, the excise tax burden increases most significantly (to 27.0 per cent) in S.3. The results are presented in Table 8.

In terms of setting policy targets and monitoring impact, tracking the excise tax burden is a more useful indicator compared to the excise tax rate. The excise tax burden shows the impact of policy interventions after the industry response, whereas simply focusing on the excise tax rate will mask the pass-through effect on retail prices. For instance, even after implementing the 75 per cent excise tax rate in PI.4, the result shows that the excise tax burden does not exceed 27 per cent under all 12 scenarios. Hence, the focus of policy interventions should not be on the level of the excise tax levied but on the burden after price changes.

Table 4: Cigarette consumption (in millions of sticks)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10	Scenario 11	Scenario 12	Average
Assumption on industry price	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	
Assumption on income growth	No income growth effect	No income growth effect	No income growth effect	Slow economic growth	Slow economic growth	Slow economic growth	Medium economic growth	Medium economic growth	Medium economic growth	High economic growth	High economic growth	High economic growth	
Baseline	920	920	920	920	920	920	920	920	920	920	920	920	920
Policy intervention 1	891	864	920	882	850	914	899	868	931	909	877	940	895
Percentage change relative to the baseline	-3.19	-6.04	0.03	-4.14	-7.58	-0.70	-2.25	-5.69	1.19	-1.25	-4.69	2.19	-2.68
Policy intervention 2	882	856	910	871	839	902	888	856	920	897	866	929	885
Percentage change relative to the baseline	-4.18	-6.92	-1.09	-5.35	-8.79	-1.91	-3.47	-6.91	-0.03	-2.46	-5.90	0.98	-3.84
Policy intervention 3	861	838	887	843	811	875	860	829	892	869	838	901	859
Percentage change relative to the baseline	-6.41	-8.91	-3.61	-8.38	-11.83	-4.94	-6.50	-9.94	-3.06	-5.49	-8.93	-2.05	-6.67
Policy intervention 4	819	780	809	717	686	749	735	703	766	744	712	776	750
Percentage change relative to the baseline	-11.00	-15.25	-12.08	-22.03	-25.47	-18.59	-20.14	-23.58	-16.70	-19.13	-22.58	-15.69	-18.52

Table 5: Government revenue

Excise tax revenue (million naira)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10	Scenario 11	Scenario 12	Average
Assumption on industry price	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	
Assumption on income growth	No income growth effect	No income growth effect	No income growth effect	Slow economic growth	Slow economic growth	Slow economic growth	Medium economic growth	Medium economic growth	Medium economic growth	High economic growth	High economic growth	High economic growth	
Baseline	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Policy intervention 1	18.6	18.2	19.2	18.4	17.8	19.0	18.9	18.2	19.5	19.1	18.5	19.7	18.8
Percentage change relative to the baseline	+155	+148	+163	+152	+143	+160	+158	+149	+166	+161	+153	+170	+156.5
Policy intervention 2	22.9	22.4	23.6	22.6	21.8	23.3	23.1	22.3	23.9	23.4	22.7	24.2	23.0
Percentage change relative to the baseline	+214	+206	+223	+208	+198	+219	+216	+206	+227	+220	+210	+231	+214.8
Policy intervention 3	33.2	32.5	34.0	32.2	31.0	33.3	33.0	31.8	34.2	33.5	32.3	34.7	33.0
Percentage change relative to the baseline	+354	+344	+365	+340	+324	+356	+351	+335	+368	+358	+342	+374	+350.8
Policy intervention 4	76.1	72.3	73.6	61.6	58.7	64.5	63.7	60.8	66.7	64.9	61.9	67.8	66.1
Percentage change relative to the baseline	+940	+889	+906	+742	+702	+782	+771	+731	+812	+787	+747	+827	+803.0

Table 6: Smoking prevalence (in percentage)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10	Scenario 11	Scenario 12
Assumption on industry price	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%
Assumption on income growth	No income growth effect	No income growth effect	No income growth effect	Slow economic growth	Slow economic growth	Slow economic growth	Medium economic growth	Medium economic growth	Medium economic growth	High economic growth	High economic growth	High economic growth
Baseline	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Policy intervention 1	5.51	5.43	5.6	5.48	5.39	5.58	5.54	5.44	5.63	5.57	5.47	5.66
Percentage change relative to baseline	-1.61	-3.04	0.00	-2.14	-3.75	-0.36	-1.07	-2.86	0.54	-0.54	-2.32	1.07
Policy intervention 2	5.48	5.41	5.57	5.45	5.35	5.55	5.5	5.41	5.6	5.53	5.43	5.63
Percentage change relative to baseline	-2.14	-3.39	-0.54	-2.68	-4.46	-0.89	-1.79	-3.39	0.00	-1.25	-3.04	0.54
Policy intervention 3	5.42	5.35	5.5	5.37	5.27	5.46	5.42	5.32	5.51	5.45	5.35	5.54
Percentage change relative to baseline	-3.21	-4.46	-1.79	-4.11	-5.89	-2.50	-3.21	-5.00	-1.61	-2.68	-4.46	-1.07
Policy intervention 4	5.29	5.17	5.26	4.98	4.89	5.08	5.04	4.94	5.13	5.06	4.97	5.16
Percentage change relative to baseline	-5.54	-7.68	-6.07	-11.07	-12.68	-9.29	-10.00	-11.79	-8.39	-9.64	-11.25	-7.86

Table 7: Net-of-tax revenue (billion naira)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10	Scenario 11	Scenario 12	Average
Assumption on industry price	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	
Assumption on income growth	No income growth effect	No income growth effect	No income growth effect	Slow economic growth	Slow economic growth	Slow economic growth	Medium economic growth	Medium economic growth	Medium economic growth	High economic growth	High economic growth	High economic growth	
Baseline	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154
Policy intervention 1	149.1	159.6	138.3	147.6	157.0	137.3	150.8	160.4	140.1	152.4	162.3	141.6	150
Percentage change relative to the baseline	-3.2	3.6	-10.2	-4.2	1.9	-10.9	-2.1	4.2	-9.0	-1.0	5.4	-8.0	-2.79
Policy intervention 2	147.6	158.1	136.8	145.7	154.9	135.6	148.9	158.4	138.4	150.6	160.3	140.0	148
Percentage change relative to the baseline	-4.2	2.7	-11.2	-5.4	0.6	-12.0	-3.3	2.9	-10.1	-2.2	4.1	-9.1	-3.94
Policy intervention 3	144.1	154.7	133.3	141.1	149.8	131.4	144.3	153.3	134.3	146.0	155.2	135.8	144
Percentage change relative to the baseline	-6.4	0.4	-13.5	-8.4	-2.7	-14.7	-6.3	-0.5	-12.8	-5.2	0.8	-11.8	-6.76
Policy intervention 4	127.3	133.8	112.3	110.9	117.1	103.8	114.2	120.8	106.8	116.0	122.7	108.4	116
Percentage change relative to the baseline	-17.4	-13.1	-27.1	-28.0	-24.0	-32.6	-25.8	-21.6	-30.7	-24.7	-20.3	-29.6	-24.57

Table 8: Tax burden

Excise tax burden (in percentage)

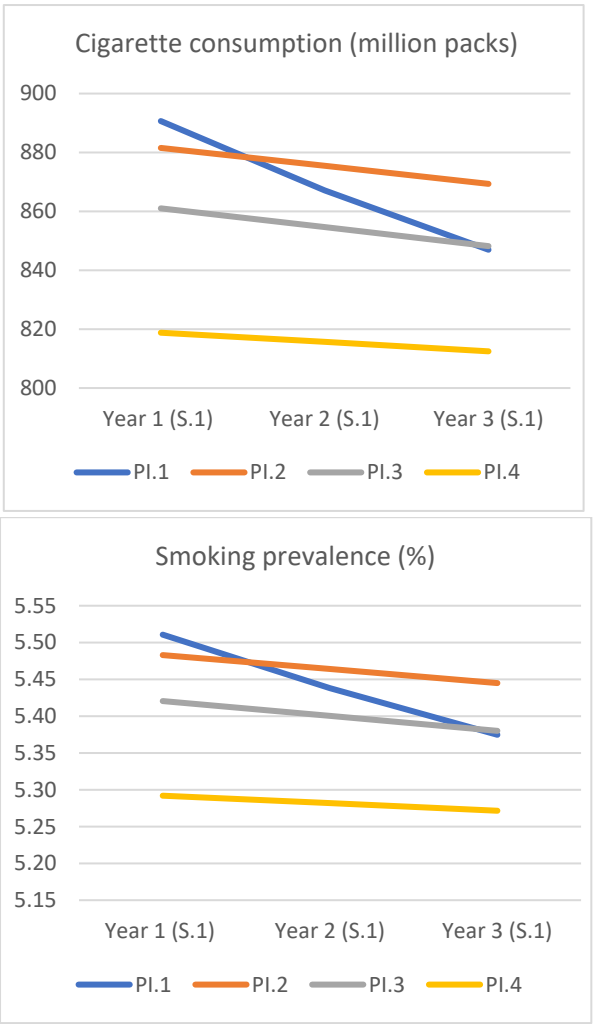
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10	Scenario 11	Scenario 12	Average
Assumption on industry price	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	No change in industry price	Industry price increases by 10%	Industry price decreases by 10%	
Assumption on income growth	No income growth effect	No income growth effect	No income growth effect	Slow economic growth	Slow economic growth	Slow economic growth	Medium economic growth	Medium economic growth	Medium economic growth	High economic growth	High economic growth	High economic growth	
Baseline	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4
Policy intervention 1	9.3	8.6	10.2	9.3	8.6	10.2	9.3	8.6	10.2	9.4	8.6	10.2	9
Percentage change relative to the baseline	+136	+118	+158	+135	+117	+157	+136	+118	+158	+137	+118	+159	+137
Policy intervention 2	11.1	10.3	12.1	11.1	10.2	12.1	11.1	10.3	12.1	11.2	10.3	12.2	11
Percentage change relative to the baseline	+182	+162	+206	+180	+159	+205	+182	+160	+207	+183	+161	+208	+183
Policy intervention 3	15.0	14.1	16.2	14.8	13.8	16.1	14.9	13.9	16.2	15.0	13.9	16.2	15
Percentage change relative to the baseline	+281	+256	+310	+275	+249	+306	+278	+251	+309	+279	+252	+310	+280
Policy intervention 4	26.2	24.7	27.0	23.6	22.2	25.2	23.9	22.5	25.5	24.0	22.6	25.6	24
Percentage change relative to the baseline	+562	+525	+584	+498	+462	+538	+505	+469	+545	+508	+472	+548	+518

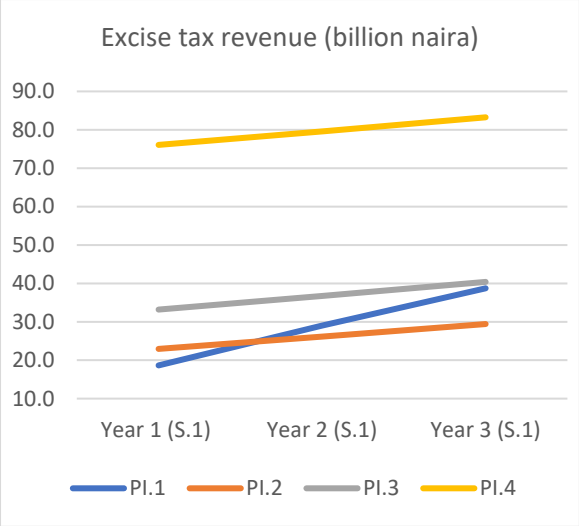
5.2 A three-year projection of results (in 2016 prices)

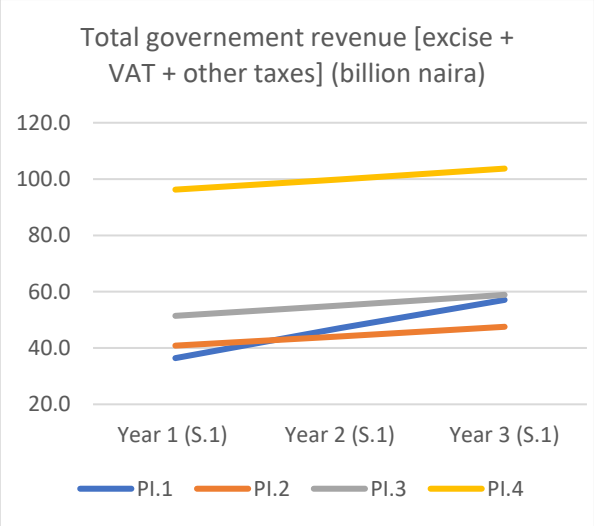
We also performed a three-year projection of the proposed policy changes, which shows a consistent trend of increasing government revenues, and decreasing consumption and prevalence rates if policy interventions are sustained each year over the three-year period. Given that the excise tax burden is considered a more important benchmark for setting a tobacco control policy target, we simulate the impact of policy interventions that are benchmarked on it. Such policy targeting ensures that cigarette consumption and smoking prevalence remain low and maintain a steady decline over time, while government revenue steadily increases.

Therefore, for PI.1, we maintain the base year (2016) policy change then add a ₦20 increase in specific excise tax annually. For PI.2, PI.3, and PI.4, we set the base year (2016) policy change then add a two percentage point increase in the excise tax burden annually. The results are presented in Figure 1 and Appendix 3.

Figure 1: Cigarette consumption, smoking prevalence, and government revenues for Scenario 1




Excise tax revenue (billion naira)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
Year 1 (S.1)
Year 2 (S.1)
Year 3 (S.1)
PI.1
PI.2
PI.3
PI.4


Total governement revenue [excise + VAT + other taxes] (billion naira)
120.0
100.0
80.0
60.0
40.0
20.0
Year 1 (S.1)
Year 2 (S.1)
Year 3 (S.1)
PI.1
PI.2
PI.3
PI.4

6. Conclusion and recommendations for future tobacco tax policy in Nigeria

Tobacco taxation can prevent millions of smoking-attributable deaths throughout the country, reduce the number of young people initiating smoking, and contribute to the achievement of national public health objectives. It can also create the fiscal space needed to finance the country's economic development and public health programmes. At present, the level of the excise tax is well below the WHO benchmark (set at 75 per cent of retail price) and this has an adverse present and future impact on smoking prevalence and smoking intensity, with attendant health and economic costs at household and national levels. From the perspective of public health and public finance, there is an urgent need to raise excise tax on tobacco products in the country.

Our simulations show that a substantial upward review of excise tax level on cigarettes alongside a change to a specific excise tax system yields the most significant gains in public health (measured by reductions in cigarette consumption and smoking prevalence), as well fiscal revenue (measured by increase in excise tax and other government revenues). Specifically, policy interventions (PI.3 and PI.4) that substantially raise excise tax levels and apply the specific tax system record the most favourable outcomes, both in magnitude and direction.

The implications of our findings are that, first, there is significant scope for upward review of the tobacco excise tax without having negative impacts on public health or government revenues. This holds under various scenarios and is robust to substantial sensitivity test/analysis. Second, changes in tax policy need to be significant to have the desired effect on public health and fiscal revenue. Third, under all policy interventions, the optimal response for the tobacco industry is to increase the industry price in order to maximise NOT revenue. The industry stands to lose revenue when it does nothing or decreases the industry price in efforts to possibly frustrate policy interventions. Fourth, in terms of setting policy targets and monitoring impact, tracking the excise tax burden is the most useful indicator relative to the excise tax rate, as focusing on the excise tax rate will mask the pass-through effect on retail prices. Fifth, given that the current excise tax burden is very low (at about 6 per cent), even the most stringent policy intervention (PI.4) in our model yields a maximum excise tax burden of 27 per cent, hence still under-performing relative to the WHO-recommended benchmark of 75 per cent of retail price, which is based on a series of country studies and best practices. Thus, strong and consistent political will for tobacco control policies will be needed in order to continuously raise the excise tax burden annually and meet the WHO benchmark. Lastly, it is important to note that the measured outcomes from our model incorporate the potential impact of illicit trade in cigarettes following price adjustments of licit cigarettes.

Therefore, based on the results of the study, an effective tobacco control tax policy will require that: the tax system is changed from *ad valorem* to specific tax system; and excise tax on tobacco products is continuously increased until it reaches the excise tax burden of 75 per cent.

A critical limitation of this study is that data gaps imposed constraints to the depth and rigor of the analysis. For instance, the lack of data on the quantity of cigarettes produced for each cigarette brand and the cost of production of each cigarette brand did not allow the researchers to perform cross-price analysis in order to estimate changes in the measured outcomes for each brand – in line with the WHO Tobacco Tax Simulation Model (TaXSiM). Nevertheless, the available data provided useful insights on the impact of changes in cigarette excise tax structure and level on public health and fiscal revenue, which can

provide useful guidance for intervention to policymakers. Going forward, there is a need to conduct country-specific baseline surveys that capture the critical data on tobacco products in order to close the data and research gaps.

References

Biener, L.; Aseltine, R.H.; Cohen, B. and Anderka, M. (1998) 'Reactions of Adult and Teenaged Smokers to the Massachusetts Tobacco Tax', *American Journal of Public Health* 88.9: 1389–91

Blecher, E. and Ross, H. (2013) *Tobacco Use in Africa: Tobacco Control through Prevention,* Washington DC: American Cancer Society

Chaloupka, F. and Warner, K. (1999) *The Economics of Smoking*, Cambridge: National Bureau of Economic Research

Chaloupka, F.J.; Straif, K. and Leon, M.E. (2011) 'Effectiveness of Tax and Price Policies in Tobacco Control', *Tobacco Control* 20.3: 235–38

Chaloupka, F.J.; Yurekli, A. and Fong, G.T. (2012) 'Tobacco Taxes as a Tobacco Control Strategy', *Tobacco Control* 21.2: 172–80

Frieden, T.R.; Mostashari, F.; Kerker, B.D.; Miller, N.; Hajat, A. and Frankel, M. (2005) 'Adult Tobacco Use Levels after Intensive Tobacco Control Measures: New York City, 2002–2003', *American Journal of Public Health* 95.6: 1016–23

Gallus, S.; Schiaffino, A.; La Vecchia, C.; Townsend, J. and Fernandez, E. (2006) 'Price and Cigarette Consumption in Europe', *Tobacco Control* 15.2: 114–19

Goodchild, M.; Anne-Marie, P. and Nargis, N. (2016) 'Modelling the Impact of Raising Tobacco Taxes on Public Health and Finance', *Bulletin of the World Health Organization* 94.4: 250–57

Jha, P. and Chaloupka, F.J. (2000) 'The Economics of Global Tobacco Control', *British Medical Journal* 321.7257: 358–61

Kostova, D.; Tesche, J.; Perucic, A.M.; Yurekli, A.; Asma, S. and GATS Collaborative Group (2013) 'Exploring the Relationship between Cigarette Prices and Smoking among Adults: A Cross-Country Study of Low- and Middle-Income Nations, *Nicotine and Tobacco Research* 16, suppl. 1: S10–15

Levy, D.T.; Currie, L. and Clancy, L. (2013) 'Tobacco Control Policy in the UK: Blueprint for the Rest of Europe?', *European Journal of Public Health* 23.2: 201–06

NCS (2015) *Tobacco Products: Volumes (20 Sticks/Packet)*, Abuja: Nigeria Customs Service

Scollo, M.; Younie, S.; Wakefield, M.; Freeman, J. and Icasiano, F. (2003) 'Impact of Tobacco Tax Reforms on Tobacco Prices and Tobacco Use in Australia', *Tobacco Control* 12: ii59–ii66

Sunley, E.; Yurekli, A. and Chaloupka, F. (2000) 'The Design and Administration, and Potential Revenue of Tobacco Excises', in P. Jha and F. Chaloupka, *Tobacco Control in Developing Countries*, New York: Oxford University Press

Tauras, J.A.; Peck, R.M. and Chaloupka, F.J. (2006) 'The Role of Retail Prices and Promotions in Determining Cigarette Brand Market Shares', *Review of Industrial Organization* 28.3: 253–84

TETSiM (2017) *Tobacco Excise Tax Simulation Model*, available at www.commerce.uct.ac.za/cwalbeek/TeTSim/index.html

Tobacco Atlas (2015) *Country Fact Sheet: Nigeria*, www.tobaccoatlas.org/country-data/nigeria/ (accessed 23 August 2017)

Van Walbeek, C.P. (2010) 'A Simulation Model to Predict the Fiscal and Public Health Impact of a Change in Cigarette Excise Taxes', *Tobacco Control* 19.1: 31–36

WHO (2015) *WHO Report on the Global Tobacco Epidemic, 2015: Raising Taxes on Tobacco*, Geneva: World Health Organization

WHO (2010) 'Tobacco Tax Levels and Structure: A Theoretical and Empirical Overview', in *WHO Technical Manual on Tobacco Tax Administration*, Geneva: World Health Organization: 27–53

WHO (2005) *WHO Framework Convention on Tobacco Control*, Geneva: World Health Organization

World Bank (2017) *Smoking Prevalence, Males (% of Adults)*, http://data.worldbank.org/indicator/SH.PRV.SMOK.MA?locations=ZG-NG (accessed 23 August 2017)

Zhang, B.; Cohen, J.; Ferrence, R. and Rehm, J. (2006) 'The Impact of Tobacco Tax Cuts on Smoking Initiation among Canadian Young Adults', *American Journal of Preventive Medicine* 30.6: 474–79

Appendix 1: Cigarette brand prices collected for the study (in naira, per pack of 20 cigarettes)

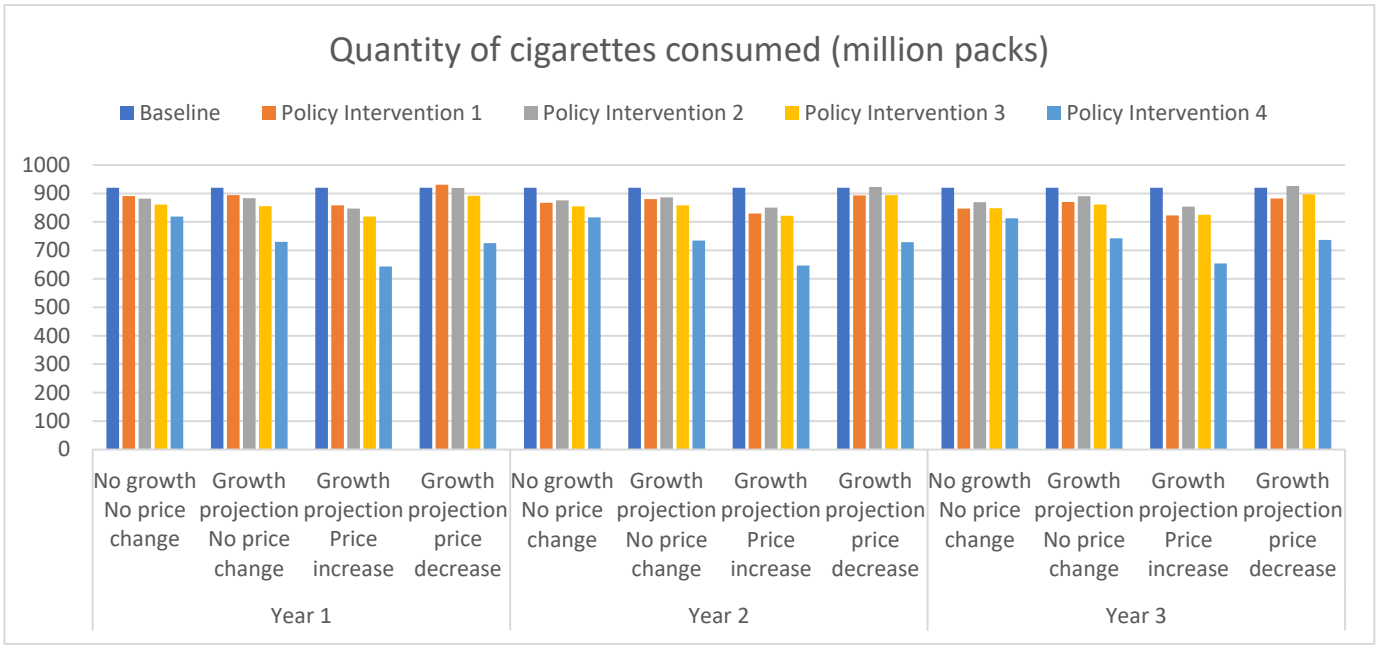
Brands/regions	Company	North-Central	North-East	North-West	South-East	South-South	South-West	Brand average
		Abuja	*Adamawa*	*Kaduna*	*Anambra*	*Delta*	*Lagos*	
Pall Mall M	BAT	150	150	100	90	100	250	140
Pall Mall FF	BAT	100	130	100	100	130	100	110
Excel	BAT	100	130	90	90		200	122
Benson & Hedges	BAT	300	250	190	180	250	200	228.3333
Benson & Hedge Switch	BAT	300	250	220	220	300	250	256.6667
Benson & Hedges Demi Slim	BAT	150	200	200	130		200	176
St Moritz	BAT	200	200	100	170	200	200	178.3333
St Moritz by Dunhill	BAT	300	300	250	220	350	350	295
Rothmans	BAT	200	200		170	200	200	194
Dunhill Switch	BAT	350	400	190	200	350	300	298.3333
Dunhill FF	BAT	250		250	200			233.3333
Dunhill Light	BAT	250		250	200		230	232.5
London M	BAT	300	220		140		200	215
London FF	BAT	180	250	140	140		200	182
Royal Standard	BAT	120	100	90	90	100	200	116.6667
Three Rings	BAT		100	140	90	90	150	114
Consulate	BAT	400	400	300	450	450	250	375
Rothmans Demi Slim	BAT	200			200		200	200
Aspen	ITC	180	180	140	150		200	170
Business Club	ITC	300	200					250
Dorchester Menthol	ITC	180	200	180	130	180	200	178.3333
Forum Menthol	ITC						100	100
Forum Regular	ITC						150	150
Yes	LTCN	200	230	250	130	220		206
Peterfield	LTCN			190				190
All Star Brand	LTCN			150				150
Marlboro	PM	200	200	170	170	200	200	190
Chesterfield	PM	180	200	200	120	200	150	175
Chesterfield Switch	PM	140	200	200	120	250	200	185
Bond Menthol	PM	100		100	80		150	107.5
Edge	Others	100					200	150
Bohem	Others	200		150				175
Esse Change	Others	200		200				200
Oris Slims	Others	300	200	200	160	250	200	218.3333
Overall average retail price of cigarettes								**190.0686**

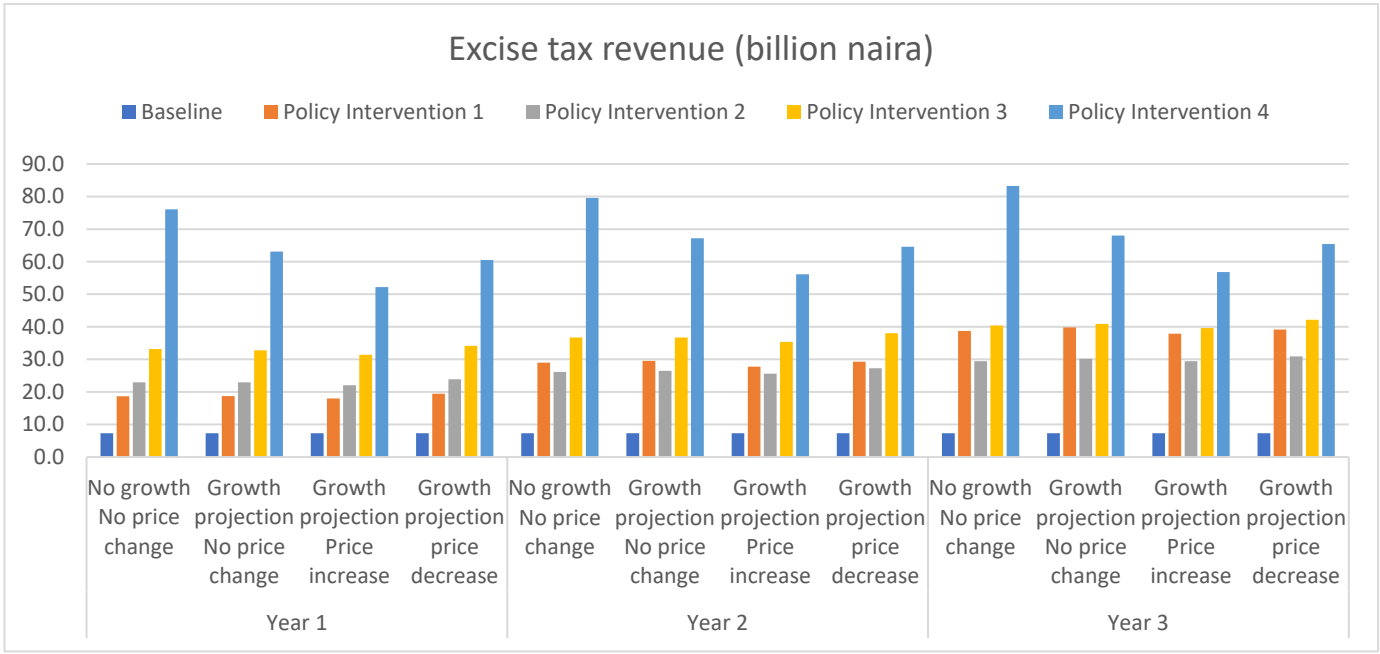
*BAT – British American Tobacco (domestic producer); ITC – International Tobacco Company Ltd (domestic producer); LTCN – Leaf Tobacco & Commodities Nigeria Ltd (domestic producer).
*PM – Phillip Morris (international producer/importer); Others – other imported cigarette brands.

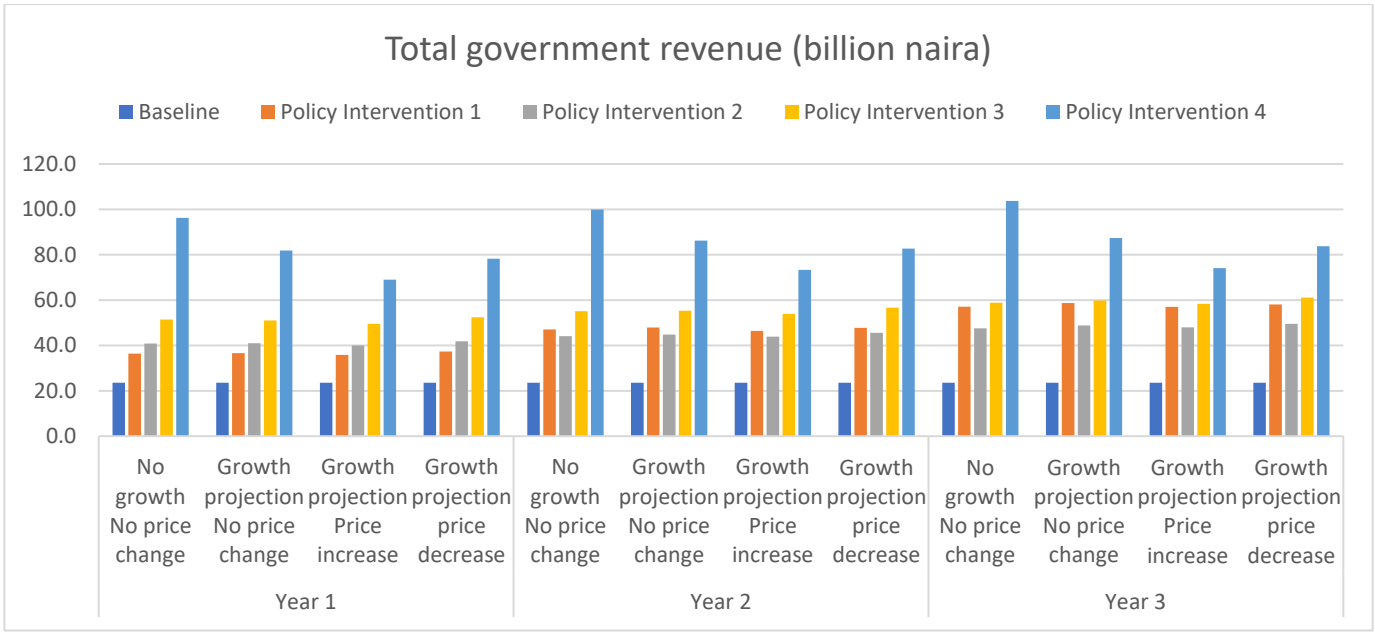
Appendix 2: Cigarette brands segments and market share

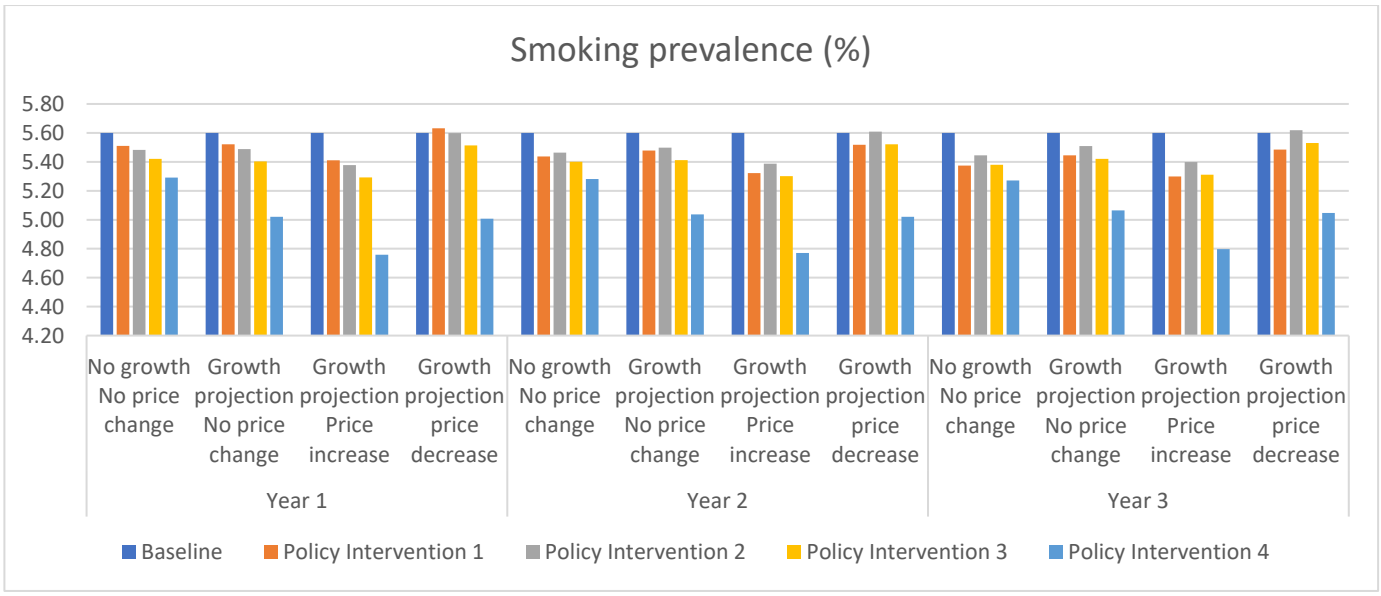
Brand segments	**Market share when looking at entire market**	**Market share when looking at domestic market**
Premium	51.1	54.01691332
Economy	14.6	15.43340381
Mid-priced	28.9	30.54968288
Imported and other	5.4	
Total	**100**	**100**

Appendix 3: Three-year simulation outputs






Total government revenue (billion naira)
Baseline
Policy Intervention 1
Policy Intervention 2
Policy Intervention 3
Policy Intervention 4
120.0
100.0
80.0
60.0
40.0
20.0
0.0
No growth No price change
Growth projection No price change
Growth projection Price increase
Growth projection price decrease
Year 1
Year 2
Year 3


Smoking prevalence (%)
5.80
5.60
5.40
5.20
5.00
4.80
4.60
4.40
4.20
No growth No price change
Growth projection No price change
Growth projection Price increase
Growth projection price decrease
Year 1
Year 2
Year 3
Baseline
Policy Intervention 1
Policy Intervention 2
Policy Intervention 3
Policy Intervention 4

International Centre for Tax and Development
at the Institute of Development Studies
Brighton BN1 9RE, UK
T: +44 (0)1273 606261
F: +44 (0)1273 621202
E: info@ictd.ac
www.ictd.ac