



**An Overview of the Retail Cigarette Price Landscape and Response of
Prices to Tax Increases in Lesotho: Evidence from African Cigarette Prices
(ACP) Data**

By:

Beresi Pheea

Supervisor: **Ms Kirsten van der Zee**

Dissertation submitted in partial fulfilment for the requirements of the degree of Master of
Commerce in Economic Development

In the School of Economics

University of Cape Town

February 2025

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

Plagiarism declaration

1. This dissertation has been submitted to Turnitin (or equivalent similarity and originality checking software) and I confirm that my supervisor has seen my report and any concerns revealed by such have been resolved with my supervisor.
2. I certify that I have received Ethics approval (if applicable) from the Commerce Ethics Committee.
3. This work has not been previously submitted in whole, or in part, for the award of any degree in this or any other university. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works of other people has been attributed, and has been cited and referenced.

Student number	PHXBER001
Student name	Beresi Pheea
Signature of Student	B.Pheea
Date:	16/02/2025

ACKNOWLEDGEMENTS

I am very grateful to my supervisor, Ms. Kirsten van der Zee, for her invaluable guidance and support throughout the duration of this dissertation. Her timely comments, suggestions, and constructive criticism provided significant direction, making this work possible. She honed my critical thinking abilities and taught me how to navigate data challenges effectively.

I also want to thank Mr. Retselisitsoe Pokothoane, who introduced me to the economics of tobacco control. His constant research guidance and mentorship have ultimately made me a better scholar.

Lastly, I owe special thanks to my mother; her consistent prayers kept me going.

ABSTRACT

This dissertation provides a landscape of cigarette prices in Lesotho, over the years 2016 to 2024, looking at both legal and illicit cigarettes. In addition, in 2023, a tobacco levy was implemented. The dissertation also investigates how the price landscape changed in response to this levy. I first assessed whether cigarette prices significantly differ by brand, packaging format, outlet type, and district. I subsequently estimated the availability of illicit prices in the sample. Lastly, I used a regression analysis to determine the impact of the tax increase on the real cigarette prices of premium, mid-priced and cheap brands in formal and informal outlets.

I calculated the tax pass-through parameter to determine if the tobacco industry fully passed on the tax increase or if it was differentially shifted to consumers. I used the Minimum Legal Price (MLP) approach to assess the availability of illicit prices in the sample. For estimating the impact of the levy on real cigarette prices, I used the Difference-in-Differences (DID) approach using Namibia and South Africa as control groups.

The results indicate that cigarette prices significantly differ by brand, packaging format, outlet type and district. Price differences between informal and formal outlets are large. Districts in the rural parts of the country have relatively higher average prices than for those in urban areas. In response to the tax increase, the results suggest that the tobacco industry undershifted the tax increase in all price segments, both in formal and informal outlets. The undershifting behaviour was relatively large in the economy segment.

19.3% of all prices collected in the sample were illicit, with most of these prices coming from regionally located producers. The availability of illicit cigarettes increased over time. The regression results reveal that the real prices of premium and mid-priced segments in the sample for Lesotho increased in both formal and informal outlets in response to the tax compared to those in the control groups. In contrast, the prices of regional brands significantly declined. This study recommends that Lesotho implement the cigarette minimum legal price because low prices attract people to smoke. Also, the country should ratify the Protocol to Eliminate Illicit Trade in Tobacco Products and implement a track and trace system, and ban the sale of single cigarettes. The government should take strong action to these problems.

ABBREVIATIONS LIST

African Cigarette Prices	ACP
British American Tobacco.....	BAT
British American Tobacco South Africa.....	BATSA
Difference in Differences.....	DID
Framework Convention on Tobacco Control	FCTC
Global Adult Tobacco Surveys.....	GATS
Global Youth Tobacco Surveys.....	GYTS
Gold Leaf Tobacco Corporation.....	GLTC
Gross Domestic Product.....	GDP
High Income Countries	HICs
International Agency for Research on Cancer	IARC
International Tobacco Control	ITC
Japan Tobacco International.....	JTI
Lesotho Revenue Authority	LRA
Low and Middle Income Countries.....	LMICs
Minimum Legal Price.....	MLP
Ministry of Finance	MoF
Multinational Companies	MNCs
Net-of-Tax.....	NoT
Non-Communicable Diseases.....	NCDs
Phillip Morris International.....	PMI
Research Unit on the Economics of Excisable Products	REEP
Revenue Services Lesotho	RSL
Southern African Customs Union.....	SACU
Tobacco and Alcohol Products Levy	TAPL
World Health Organisation.....	WHO

Table of Contents

1. INTRODUCTION	1
1.1 Background on the cigarette price landscape and tobacco control in Lesotho	6
2. LITERATURE REVIEW	11
2.1 Theoretical overview of tobacco taxes and cigarette prices.....	11
2.2 Empirical literature review.....	13
2.2.1 Cigarette price differentials and variability.....	13
2.2.2 The impact of tobacco taxes on cigarette prices	18
3. DATA AND METHODOLOGY	24
3.1 Data sources	24
3.2 Reporting errors and data cleaning	26
3.3 Study variables and descriptive statistics.....	26
3.3.1 An overview of the cigarette price landscape	29
3.3.2 Mean characteristics of control and treatment groups	37
3.4 Methodology	38
3.4.1 Minimum legal price approach	38
3.4.2 Tax pass-through analysis	41
3.4.3 Difference-in-Differences approach.....	42
4. RESULTS.....	48
4.1 The availability of illicit cigarettes	48
4.1.1 The share of prices by producer	48
4.1.2 The share of prices by brand and producer	49
4.1.3 Estimates of the share of prices below the minimum legal price (MLP)	50
4.2 The impact of the levy on the real cigarette prices	54
4.2.1 Tax pass-through in formal and informal outlets	54
4.2.2 Econometric analysis	55
5. DISCUSSION	62
5.1 On the cigarette price differences by brand, packaging type, stores and district	62
5.2 On the availability of illicit cigarettes.....	64
5.3 On the effect of the levy on real cigarette prices in formal and informal outlets.....	65
5.4 On the limitations of the study	65
6. CONCLUSION AND POLICY RECOMMENDATIONS	67
REFERENCE LIST	69
Appendix.....	75
Appendix A	75
Appendix B	75

List of figures

Figure 1: The levy and data collection timeline	28
Figure 2: Trends in real prices for each price segment, by outlet type	35
Figure 3: Distribution of nominal prices for single cigarettes in informal outlets	36

List of tables

Table 1: An overview of the cigarette price observations in the sample from 2016 to 2024.	30
Table 2: Nominal average prices for a standardized pack of 20 cigarettes	32
Table 3: Trends in nominal and real cigarette prices for price segments in formal outlets	34
Table 4: Trends in nominal and real single stick prices for price segments in informal outlets	35
Table 5: Mean characteristics of treatment and control groups in formal outlets	37
Table 6: Mean characteristics of treatment and control groups in informal outlets	37
Table 7: Nominal minimum legal price by financial year.....	40
Table 8: Brands available in Lesotho, South Africa and Namibia.	44
Table 9: Share of data by Producer	48
Table 10: The price share and mean 20-stick pack nominal prices of top 15 brands by producer	49
Table 11: Estimates of the share of prices below the minimum legal price	51
Table 12: Comparison of the overall share of prices in the sample to those below the minimum legal price, by producer	52
Table 13: Producer share of prices below minimum legal price before and after the levy	53
Table 14: Average real prices, Levy and Net-of-Tax prices by outlet type	54
Table 15: Tax effect using South Africa as a control for multinational brands in formal outlets.....	57
Table 16: Tax effect using Namibia as a control for multinational brands in formal outlets	59
Table 17: Tax effect using South Africa as a control for multinational and regional brands in informal stores	60

1. INTRODUCTION

Tobacco use is a significant risk factor responsible for developing non-communicable diseases (NCDs), contributing to early mortality, disability, and economic costs that threaten economic development (World Health Organisation [WHO], 2023). The WHO projected that, by 2030, more than 80% of deaths that are tobacco-related will occur in low- and middle-income countries (LMICs) (WHO, 2008), largely due to rising smoking prevalence in these regions. Currently, the use of tobacco results in approximately eight million deaths annually, worldwide.

Among various factors, the price of tobacco is one of the key determinants of its use. Tobacco taxation is regarded as one of the tobacco control tools that are most effective (WHO, 2015). Increasing tobacco taxes yields multiple benefits: governments gain higher revenue generation while simultaneously reducing tobacco consumption death tolls. Moreover, higher prices deter non-smokers from starting to smoke (International Agency for Research on Cancer [IARC], 2011). However, from a public health perspective, tax increases are only effective when they translate into increases in tobacco prices that are higher than inflation and income growth, consequently reducing tobacco demand.

Among the tobacco products, cigarettes are one of the most commonly used, as illustrated by WHO global datasets (WHO, 2019). There is a robust literature and targeted attention on tobacco control in developed countries on the dynamics of the cigarette markets. However, African countries are behind in implementing the tobacco control initiatives. Amongst others, governments often call for more data before implementing more tobacco control policies. For tobacco control to be effective in reducing tobacco-related deaths, a comprehensive understanding of these markets is essential for the development of appropriate tobacco policies in these contexts (Van Der Zee & Mthembu, 2024).

Tobacco companies employ various strategies to undermine the effectiveness of tobacco taxation. In response to tax increases, these companies fully or differentially pass the tax increase to smokers through the retail price. That is, the magnitude of a price change resulting from the tax increase on the retail price may vary depending on whether a brand is premium (expensive), a mid-priced or an economy brand. The industry can either increase prices by the exact tax amount (perfect shifting), by more than the tax increase (overshifting), by less than the tax increase (undershifting) or employing a mixed strategy where both overshifting and undershifting occurs (Gilmore et al., 2013; Hiscock et al., 2018). Overshifting implies that the

tax burden falls entirely on consumers while undershifting implies that the industry absorbs at least part of the tax increase.

Research shows that overshifting has been consistently observed in many High Income Countries (HICs) particularly on premium brands while undershifting has been observed on budget (cheap) brands (Gilmore et al., 2013; Hiscock et al., 2018, 2019). In LMICs, undershifting behaviour is commonly observed across all price segments (Linegar & Van Walbeek, 2018; Sáenz De Miera Juárez et al., 2014; Saenz-de-Miera et al., 2010). Keeping the prices of cheaper brands unchanged while raising them on expensive brands widens the price gap between cheap and expensive brands. This makes it easier for people, particularly socially disadvantaged groups, to buy cheap cigarettes (Licht et al., 2011). Maintaining lower prices is often associated with reduced incentive to quit smoking. Consumers with lower socioeconomic status tend to be price-sensitive, and may switch to cheaper products rather than quit altogether when faced with higher prices (Partos et al., 2018). Consequently, the tactics employed by these companies, in part, attenuate the effect of tobacco tax policies.

In the case of Lesotho, as in many developing countries, there is limited knowledge about the existing cigarette market and how taxes affect the retail price of cigarettes. Critical to achieving effective policies is understanding price differences between popular cigarette brands and across stores that sell cigarettes, as well as the impact that tobacco taxes have on these prices. Given limited resources, hence the need for additional revenue, it is imperative to assess whether public policies ultimately achieve their intended objectives.

To the best of my knowledge, there are no studies that have investigated the cigarette market dynamics in Lesotho as I do in this dissertation, using the sample of African Cigarette Prices (ACP) data. The ACP data is non-representative retail-level data that collects tobacco prices across African countries. This dissertation aims to provide a landscape of cigarette prices in Lesotho, between the years 2016 to 2024, focusing on both legal and illicit cigarettes. In addition, in 2023 a levy was implemented. I will investigate how the price landscape changed in response to this levy, shedding light on the effects of policy interventions in the cigarette market dynamics.

This dissertation uses the recent data on African Cigarette Prices (ACP) spanning 2016 to 2024 to investigate the research questions below. Firstly, Lesotho presents an interesting case because it is an under-researched country in the academic literature on tobacco control. Secondly, Lesotho is amongst the developing countries with a high adult smoking prevalence.

Recently, in the African region, the adult smoking prevalence in Lesotho stood at 15% (WHO, 2023), making it the fourth country with the highest smoking rates. In prior decades, the trends in adult smoking prevalence upsurged from 15% in 2004 to 50% in 2015 (Drope et al., 2018). Indeed, this matters because the costs of smoking in Lesotho are substantial, amounting to about M721 million in economic expenditures and an associated death toll of 2625 each year.¹

The World Health Organisation's global reports on the tobacco epidemic only present cigarette prices of the most-sold, premium and cheap brands at a country level. These prices are collected only in supermarkets and small convenience stores in the capital cities, providing limited information on other available brands, outlets and districts. Aside from the most-sold cigarette brands, consumers in various income groups may predominately consume other available brands that are often not captured in the WHO reports. Kostova et al. (2014) assert that studies using single-brand prices for a standard pack of 20 cigarettes miss other important aspects contributing to the cigarette price variability in countries where a range of brands are sold. Equally important, is that not all cigarettes are sold in packs. Evidence from ACP data² and the study in ten African capital cities (African Tobacco Control Alliance, 2018) reveal that single cigarettes are widely available and consumed. For these reasons, this dissertation includes both loose cigarettes and packs and includes all popular brands, in order to provide a more complete picture of prices in Lesotho.

Governments use excise taxes to manipulate price, and hence consumption (especially for unhealthy products, like tobacco). In 2023, Lesotho included an additional levy that is *ad valorem* in nature (i.e., levied as a percentage on the value of products) on top of the excise taxes. It became the second country to implement this long-anticipated levy after Botswana in the Southern African Customs Union (SACU) member states. This levy is aimed at reducing consumption (improving public health) and increasing fiscal revenues to fund priority investments. On the 1st of March 2023, the levy was implemented at 30% for tobacco. This followed the same rate as that of Botswana in 2014. On the 1st of October 2023, the levy was reduced to 15%. This was the case because the tobacco industry claimed that the 30% levy would increase illicit trade.

Previous studies have attempted to analyse the cigarette market in African countries including Lesotho using the ACP data. The majority of these studies primarily relied on the cross-

¹ <https://gsthr.org/countries/profile/lso/1/>.

² <https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/927>.

sectional aspects of the data and did not take advantage of the time series variation in cigarette prices over time. For instance, Chinembiri (2018) used the ACP 2016 dataset which had very few price observations in the sample to find cigarette price differences across brands, outlet types and packaging formats in African countries including Lesotho. Also, the 2016 sample contained prices for the Mokhotlong district only.

Similarly, Chang et al. (2021) used the 2018 cross-section to assess price differences in eight sub-Saharan countries, only utilising data from Maseru and removing other districts. Moreover, their study only investigated the overall variation in cigarette prices without a detailed analysis of different brands. Gallien et al. (2024) focused on informal sectors selling single cigarettes across sub-Saharan Africa, using 2016 to 2020 ACP data. The paper also assessed the trend in single-stick nominal prices of a popular premium brand in Lesotho and South Africa. Van Der Zee & Van Walbeek (2019) focused on the difference in overall cigarette prices between Maseru and Ladybrand. Single sticks and packs of ten and twenty cigarettes were used. For Maseru, the sample cigarette prices were 1931 for the period covering December 2017 to January 2018.

This dissertation investigates three central research questions:

- 1) Do cigarette prices significantly differ across brands, store types, packaging formats and districts in the sample and have prices changed over time?
- 2) Are illicit cigarettes present in the sample?
- 3) What has been the effect of the Tobacco Levy on cigarette prices in the sample?

To investigate the three research questions, I use the following approaches:

- a) To assess price differentials by feature and over time, I use descriptive statistics.
- b) To assess the presence of illicit prices, I use the minimum legal price approach.
- c) To assess the price response to the tax levy, I use the tax pass-through and a difference-in-differences (DID) regression approach.

The availability of the cigarette price data in the ACP before and after the tobacco levy makes it possible to investigate the impact of the levy on cigarette prices. This study aims to address these research questions and contribute to a better understanding of cigarette market dynamics in Lesotho, thereby informing policy decisions. The findings are crucial for the government of Lesotho, as they provide a more precise sense of the dynamics that need to be understood in order to estimate the effects of tobacco taxation on the actual cigarette market in Lesotho.

The remainder of this dissertation is structured as follows; the next section provides the background and context on the cigarette market and tobacco control policies in Lesotho. This is followed by the literature review section on the area of cigarette price differentials and illicit cigarettes as well as the effect of tobacco taxes on cigarette prices. The data and methodology section includes a description of the data and the model used in the analysis. Chapter four presents the results, focusing on the availability of illicit cigarettes, tax pass-through analysis and the DID on the impact of the levy on cigarette prices. Finally, chapter five concludes and offers policy recommendations.

1.1 Background on the cigarette price landscape and tobacco control in Lesotho

Lesotho is categorised as a lower-middle-income country by the World Bank, with an annual gross domestic product (GDP) per capita of \$969.90 in 2022 (World Bank, 2024). Geographically, Lesotho is divided into four distinct regions, namely the Lowlands, Highlands, Senqu River Valley, and the Foothills. Administratively, it is further subdivided into ten districts within those segments: Mokhotlong, Butha-Buthe, Leribe, Berea, Maseru, Mafeteng, Mohale's Hoek, Qacha's Nek, Quthing, and Thaba-Tseka. Maseru is the national capital and serves as the main commercial hub.

The tobacco market in Lesotho is characterised by a wide variety of products, including manufactured cigarettes, cigars, pipe tobacco, snuff and other tobacco products. Among these products, as in many countries, cigarettes dominate the tobacco market and are sold in various formal and informal outlets such as supermarkets (largely grocery stores), liquor stores, spaza shops (informal convenience stores), and street vendors.

Most cigarette brands in Lesotho are imported from South Africa, with only 2% produced domestically (World Bank, 2017). These brands can be categorised into price tiers (depending on their relative prices), including premium (most expensive), mid-priced, and budget (cheap) brands. In addition to the domestic brand Sun, prevalent imported brands include Dunhill, Peter Stuyvesant, Craven and Rothmans. While Dunhill is regarded as a premium brand, the other imported brands are classified as mid-priced (World Bank, 2017).

In terms of tobacco use, in the 2023 WHO report on global tobacco epidemic, Lesotho ranked fourth among countries with the highest adult (aged 15 years or more) daily smoking prevalence within the WHO African region. The recent adult smoking prevalence was estimated at 15% in 2021 (WHO, 2023), showing a three percentage point decline compared to 2019, where the rate was highest (18%) in the region (WHO, 2019). The average daily cigarette smoking prevalence is 14.6% and is higher among males (29%) than females (0.2%) (WHO, 2023).

Because of these high smoking rates in Lesotho, there have been efforts trying to ban smoking indoors, such as in health facilities, government offices and workplaces. These efforts consist of two key legislations: the Ministry of Health and Social Welfare's internal circular notice No. 9 of 2000 regarding the smoking ban in health facilities and the Government Secretary Circular Notice No. 1 of 2001 which prohibits the smoking of tobacco products in government offices.

The Ministry declared institutions relating to the first legislation as non-smoking areas and prohibited the sale of all tobacco products within the health premises and in the immediate surroundings. The second legislation extended the smoking ban to every person in a workplace, whether employed or a visitor.

Lesotho ratified the WHO Framework Convention on Tobacco Control (FCTC)³ in 2005 and was approved by the cabinet in 2014. As part of the legislative intervention and regulatory framework, the government of Lesotho introduced the Tobacco Control Bill in 2015 (Sunday Express, 2015). The Bill was aimed at controlling the manufacturing, distribution, types and sales of tobacco products and educating society about the health hazards of tobacco use. In addition, the Bill was also meant to restrict the promotion, advertising, and sponsorship of tobacco products, amongst other things.

Despite these efforts and those of other countries, smoking prevalence in the African region is anticipated to rise due to targeting by tobacco companies and weak tobacco control laws and implementation (Husain et al., 2016; Vellios et al., 2018). Smoking rates are likely to increase if tobacco control advocates do not comprehensively implement effective tobacco control policies. Multinational companies (MNCs) primarily target young people, a rapidly rising population. This necessitates that governments devise strategies to counteract MNCs interference in tobacco control (Vellios et al., 2018). Lesotho is no exception to these challenges.

The WHO FCTC mandates member countries to implement effective tobacco control policies to reduce tobacco use. These policies are based on scientific research accumulated over decades. The biennial reports under the MPOWER package, a set of six evidence-based interventions to reduce the demand for tobacco products, includes various components such as cessation programs to help people quit smoking, monitoring tobacco use and prevention, and warnings about the risks of smoking. To date, reports from 2011 to 2023 suggest that Lesotho has not comprehensively implemented these measures. However, recently there is an educational smoking cessation support available in most communities and health offices.

Lesotho is part of the Southern African Customs Union (SACU). SACU has an excise taxation policy which limits each country's power to set its own excise tax. The tax is solely set by South Africa under the 1969 SACU agreement (Van Der Zee & Van Walbeek, 2019). As a

³ World Health Organization Framework Convention on Tobacco Control. <https://fctc.who.int/who-fctc/overview>.

result, Lesotho mirrors the South African excise tax policy (World Bank, 2017). In South Africa, cigarette excise taxes are levied as a uniform specific tax. That is, the excise tax is charged as a specific amount based on the quantity of cigarettes. These excise taxes are annually adjusted by either the expected inflation or the amount required to maintain the total tax share at 52% of the retail price of the most-sold brand. The option that gives the higher tax increase is always chosen (Van Der Zee & Van Walbeek, 2019). Annual increases are implemented to avoid the tax being eroded by inflation. Notwithstanding, SACU allows member states to independently set extra tobacco taxes termed levies, which do not contribute to the revenue pool (Blecher & Drope, 2014). The countries use levies to take advantage of their own taxes on tobacco. The levies take the form of *ad valorem* taxes which are levied as a percentage on the value of products. A major limitation of this tax is that it can be bypassed by the producers in the case that they underreport their production value (Chaloupka & Tauras, 2020).

In 2016, the Ministry of Finance (MoF) and the Lesotho Revenue Authority (LRA) (now called Revenue Services Lesotho (RSL)), in collaboration with the World Bank Group, conducted simulations using the WHO model to estimate the potential impact of introducing tobacco and alcohol levies to reduce public health costs associated with their use (World Bank, 2017). Inspired by the successful implementation of the 30% tobacco levy in Botswana, the Lesotho government decided to raise taxes on top of the SACU excise taxes.

A series of simulation exercises for the fiscal year 2017-2018 were conducted to explore the potential impact of different levies (4%, 15% and 30%). The 30% levy was recommended presumably because these simulations showed the largest reduction in consumption as a result of an expected substantial increase in the cigarette retail price and hence lead to the highest revenue generation (World Bank, 2017). Furthermore, the share of cigarette taxes to retail prices fell short of the WHO-recommended 75% (World Bank, 2017). The Lesotho government began to draft the Tobacco and Alcoholic products Levy Bill in consultation with relevant stakeholders since 2018 (Budget Speech, 2018). In 2020, the Minister of Finance tabled the Levy Bill in the National Assembly. The levy was then officially proposed in the 2021/2022 Budget Speech.

Moreover, the Tobacconomics (now called Economics for Health) scorecard which assesses specific areas where countries need to improve their cigarette tax policy revealed that Lesotho needs to improve various components of its cigarette tax policy. Despite the country performing

well on the tax structure as it uses the uniform specific tax, it falls short in areas such as cigarette prices (regarded as low), affordability and total tax share on the most-sold brand. Specifically, according to WHO (2023), the total tax share of the most-sold brand is 52.68% compared to the WHO-recommended 75%. Consequently, Lesotho has an overall cigarette tax score of 2,38 out of 5 (Drope et al., 2024). Indeed, this indicates the need for the country to focus on strengthening components of its cigarette tax policy which it falls short of.

It has been well documented that tobacco companies argue against tobacco taxation. Common arguments against taxation are that increasing tobacco taxes proliferates illicit trade and unemployment (Tobacconomics, 2019; Drope et al., 2018). This claim is also echoed by the leading tobacco distributor (Morena Pty Ltd) in Lesotho, where concerns about the impact of increasing taxes on illicit trade have been raised (The Post, 2020). However, evidence of illicit trade seems to have been apparent prior to the proposed tax increase. In 2018, Revenue Services Lesotho confiscated 380,000 cigarettes (claimed illicit) of the Rudland and George (RG) brand, valued at over M1.4 million at the Maseru border post (Lesotho Revenue Authority, 2018). These cigarettes were deemed illicit as they were sold below the minimum price threshold of M20.00 for a pack of 20 cigarettes and had evaded excise duties through smuggling (Lesotho Revenue Authority, 2018).

Tobacco industries use media and governments to influence decisions about tobacco-tax policies concerning illicit trade. Often, the industry's estimates are higher than those of independent researchers (Van Walbeek & Shai, 2015). In 2019, the tobacco companies pleaded to the Parliament not to introduce the 30% levy, arguing that they were already facing tough competition from illicit brands (The Post, 2019). Morena Distributors (Pty) Ltd, a prominent marketer and distributor of British American Tobacco (BAT) cigarettes in Lesotho, expressed concerns that the levy would fuel the illicit cigarette market and raise the costs of manufacturing the legal 20 cigarette pack to M30,00 or more, including distribution costs and excise tax. The company highlighted the significant price gap between legal and illicit cigarettes, estimating it to be 82% (The Post, 2019). Additionally, the company stated that the levy would result in a legal pack price of M53,50, making the same brand sold in South Africa M13,00 less expensive. Lastly, they further indicated that 40% of the market would shift to illicit cigarettes (The Post, 2020). However, most of these arguments are countered by the tobacco control playbook, which indicates that if governments were to improve their tax enforcement, they would keep illicit trade under control (WHO, 2019).

Interestingly, the drafted levy coupled with the tobacco industry counterargument about illicit trade attracted a formal research study by the World Bank, assessing the possibility of illicit cigarette trade between Lesotho and South Africa, using Maseru and Ladybrand as potential smuggling/bootlegging route. The results showed that prices in Maseru were slightly higher than those in Ladybrand, and the likelihood of smuggling for resale was low (Van Der Zee & Van Walbeek, 2019). However, it was noted that Lesotho should reinforce customs administration to cater for the potential levy effects (Van Der Zee & Van Walbeek, 2019).

Despite the strong opposition to the levy, the government of Lesotho officially enacted the Tobacco and Alcohol Products Levy (TAPL) ACT NO.1 of 2023 which was effected on the 1st of March 2023 with the 30% levy. For domestically produced tobacco products, this levy is applied to the selling price that is exclusive of Value Added Tax (VAT). Upon importation, the levy is charged on the final price that is inclusive of all other customs duties and associated costs incurred. The introduction of the new levy means that similar to Botswana (Filby, 2025), Lesotho's now has a specific tax component and an additional levy. The implementation of this levy was delayed due to the absence of enabling legislation. However, following its implementation, various stakeholders and the public expressed dissatisfaction, citing that the increased alcohol and tobacco prices have led to significant reductions in sales and job losses due to decreased consumption (The Post, 2020).

Despite several studies on tobacco taxation refuting tobacco companies' misleading statements regarding job losses, declines in revenues and illicit trade against tax increases, the government of Lesotho went on to reduce the levy. Consequently, six months after introducing the 30% levy, the government issued Legal Notice No. 89 of 2023, which amended the TAPL by reducing the tobacco initial rates of 30% to 15%. This amendment came into effect on the 1st of October 2023. The 15% levy corresponds with the second of the simulated rates by the World Bank Group in 2017. This rate yields lower expected revenue and a smaller reduction in tobacco consumption than the initial 30%.

2. LITERATURE REVIEW

2.1 Theoretical overview of tobacco taxes and cigarette prices

The economic theory underpinning tobacco taxation begins with a fundamental premise of consumer choice; the law of demand. This principle establishes that, all else being equal, as the price of a normal good increases, the quantity demanded by consumers decreases (Anderson et al., 1997). In the context of public health policy, this relationship is critical, as it suggests that raising cigarette prices can directly reduce consumption. The primary mechanism through which governments influence price is excise taxation, which is expected to be passed on to consumers in the form of higher retail prices.

The effectiveness of taxes at curbing tobacco consumption depends, among other things, on the price elasticity of demand for these products. Price elasticity is defined as a percentage change in the quantity demanded attributed to a one per cent change in price, *ceteris paribus* (Dare et al., 2021). Therefore, understanding the price elasticity of demand for cigarettes is essential for predicting the behavioural impact of tax reforms, and ultimately evaluating the success of tobacco control policies.

The extent to which taxes are passed through depends on the market structure. Economic theory suggests that in a perfectly competitive market, where firms have a constant marginal cost, increases in excise taxes will be fully passed on to consumers but never differentially (overshifted or undershifted) shifted. Imperfect competition models are often used to explain the overshifting or undershifting of excise taxes. For instance, Delipalla and Keen (1992) and Anderson et al. (2001) illustrate how various forms of imperfect competition – such as Oligopoly, Cournot, and Bertrand – along with product types (differentiated or homogeneous) and the demand elasticities for those products influence the incidence of specific and *ad valorem* taxes.

Anderson et al. (2001) illustrate that in an oligopolistic market characterized by different products, firms typically engage in Bertrand competition. Consequently, the introduction of a specific tax can be overshifted, leading to higher prices for consumers. In the context of Bertrand competition, a firm's optimal response to a competitor's price is to raise its own prices. Thus, an increase in taxation can be viewed as a price hike by a leading firm – often the one with the largest market share – which subsequently prompts price increases among rival firms. For overshifting to take place, the model states that demand elasticities must be less than

negative one (Anderson et al., 2001). However, because Chaloupka and Warner (1999) estimated that the price elasticity of demand for cigarettes is between -0.30 and -0.5, the requirement of the model is not likely to be met.

The model proposed by Delipalla and Keen (1992) deals with a homogeneous product within an oligopolistic market where firms can enter freely. The model suggests that overshifting is likely to occur when the demand elasticity of a product is less than zero, making this model more aligned with empirical estimates of demand elasticity. However, despite its better fit with empirical data, the assumption of a homogeneous product may be strong. In the context of cigarettes, this assumption depends on whether consumers perceive brands as distinct products considering that there are more than ten cigarette brands in Lesotho.

The Delipalla and Keen model also explains the differences in tax incidence between cheap and expensive cigarette brands. The model emphasises that these brands have different demand elasticities, with expensive brands being more inelastic than cheap brands. This suggests that consumers are more sensitive to changes in prices of cheap brands. Specifically, higher-income consumers may have smoking preferences influenced by brand loyalty, which makes them less sensitive to price changes compared to lower-income consumers.

Becker et al. (1990) propose that, “due to the oligopolistic nature of the cigarette industry, companies maximise profits by increasing the price of their products for addicted smokers – those with relatively inelastic demand who will continue to buy cigarettes even after a tax increase.” Cigarette sellers understand that a tax increase may lead to the loss of casual or new smokers. However, the additional profit gained from raising prices for addicted smokers will outweigh the future losses from a decline in purchases by casual or new smokers.

2.2 Empirical literature review

The following sub-sections evaluate the empirical literature on cigarette brands and their pricing in various cigarette markets, including both developed and developing countries. This review also considers studies on the prevalence of low-priced cigarettes. Additionally, a comprehensive analysis of various studies pertaining to the impact of tobacco taxes on cigarette prices is presented.

2.2.1 Cigarette price differentials and variability

Literature on the cigarette market has gained attention in both developing and developed countries due to the devastating effects of tobacco use. However, due to sparse cigarette price data, while some studies use retail-level cigarette price data, many studies rely on global adult tobacco surveys data to obtain information about cigarette prices. The ACP data is non-representative retail-level data that collects tobacco prices across African countries. The availability of ACP data has enabled researchers and policymakers to determine cigarette price differentials between brands, packaging formats, stores and locations. More details about the data collection method can be found in section 3. Since the inception of the ACP project, several studies have assessed cigarette price differences in the African context.

Using the ACP data, Chinembiri (2018) examined the price differences for a standardised pack of 20 cigarettes by brand, packaging formats and store types across African countries, including Lesotho. The study utilised ACP data for the 2016 cross-section, encompassing brand prices from Mokhotlong district in the sample. The price observations were relatively few and did not include prices from spaza shops - common stores that sell cigarettes in Lesotho. For instance, the price observations from retail outlets and street vendors were recorded at 189 and 27, respectively. The exclusion occurred because, during the first four rounds of the ACP project, fieldworkers were permitted to collect prices only from formal retail outlets and street vendors. In terms of brands, among the five brands observed in the dataset, the paper found that Dunhill was relatively the most expensive brand in Mokhotlong, followed by Peter Stuyvesant. This order was consistent in Botswana, South Africa and the Kingdom of Eswatini. Conversely, the domestic brand Sun, emerged as the least expensive in Mokhotlong.

While Chinembiri (2018) included price differences across brands, other studies have generally focused on disparities between the prices of a standardised pack of 20 cigarettes across various packaging types. For instance, Chang et al. (2021) quantified the price differential in packing type, expressing it as the proportion of the difference between the median and the minimum price over the median. This approach was adopted due to the susceptibility of mean prices to outliers, whereas median prices mitigate the impact of extreme values (Kostova et al., 2014). Additionally, the median accounts for potential skewness in the price distribution of cigarettes. However, this does not necessarily imply that the mean and median prices are always statistically significantly different.

Chang et al. (2021) used the ACP 2018 cross-sectional data from eight Sub-Saharan countries with 22 347 price observations and found that the equivalent of 20 cigarette pack was more expensive when sold as single cigarettes rather than in packs. These findings are consistent with the studies by Chinembiri (2018) and Gallien et al. (2024). Gallien et al. (2024) focused largely on informal vendors to understand the pricing mechanism in these markets in some African countries. Gallien et al. (2024) assert that these markets have been largely ignored, hence requiring more attention in the tobacco taxation literature. Unlike Chinembiri (2018) and Chang et al. (2021), Gallien et al. (2024) used a repeated cross-section from 2016 to 2020. The paper reached similar conclusions that prices of loose cigarettes are relatively higher than the per-stick price of those sold in packs. They also found that the nominal average prices of single sticks do not always move in parallel to the per-stick average prices of those sold in packs. This may also be the case in real prices.

Thus, taken together, the above three studies using the ACP data indicate that the average price of 20 single cigarettes is higher than that of a pack, although the sample sizes differed. Furthermore, Chinembiri (2018) went on to assess price differences by store type. The results showed that packs of 20 sticks from street vendors are generally more expensive than those from retail outlets.

In addition to studies utilising the ACP data, other studies also examined the cigarette prices by brand, packaging format and store type, both within the African and international context. While some studies used the observed cigarette prices from different retail outlets, other studies utilised the smokers' self-reported cigarette prices from Global Adult Tobacco Surveys (GATS), Global Youth Tobacco Surveys (GYTS) and International Tobacco Control (ITC) surveys. Although the Global Tobacco Surveys are nationally representative, the major limitations of

these datasets are that the smokers may not accurately report the prices of their last purchase. Secondly, the prices do not reflect available brands in the entire market, but rather, what smokers choose to buy. This means that if cigarettes are sold to smokers in low socioeconomic status in a particular area, the surveys are likely to capture cheap cigarettes. This then might affect the overall price level in these areas depending on the type of brands smokers purchase (Filby, 2025). The same analogy applies to high socioeconomic areas.

In the context of Zambia, Salloum et al. (2015) in part, investigated the popular cigarette brands in Zambia using the ITC Zambia survey. The authors found Pall Mall, Peter Stuyvesant and Sweet Menthol as the dominant cigarette brands in the market. This dominance hierarchy was also true for prices, with Pall Mall being the most expensive brand while Sweet Menthol was the cheapest. Both Salloum et al. (2015) and Filby et al. (2024) attributed the availability of lower prices to an *ad valorem* tax structure. Even though the paper used the cross-sectional component of a longitudinal survey, Salloum et al. (2015) further emphasised the importance of conducting longer-run studies to observe prices over time.

Similarly, in Minnesota, USA, Toomey et al. (2009) determined the cigarette price variation by brand. The data comprised 605 prices from three cigarette brands (i.e., Premium, Menthol and Discount) purchased by data collectors across convenience stores. Notably, all the brands were from the same producer. For the same cigarette brand, their paper finds the highest average price to be 1.7 times more than the lowest price.

In an Asian cross-country context, Liber et al. (2015) used cigarette price data from retailers' surveys conducted from street vendors, home-based stores and supermarkets. The observed brands were selected based on their market share and were also categorised into the three least expensive and the three most expensive brands. The authors found that domestic brands were cheaper than international brands. This is intuitive, as international brands might be liable to pay taxes upon importation and may also incur high distribution costs. The costlier brands were affiliated with the leading tobacco industry suppliers such as BAT and Phillip Morris. Confirming Salloum et al. (2015)'s advocacy of longitudinal studies, Liber et al. (2015) emphasise that forthcoming surveys will be essential in observing cigarette price changes and variation over time.

In Scotland, Shortt et al. (2021) used data from the 2016 Scottish Tobacco Retailer Register containing the packs of 20 cigarettes. Among the top ten brands by sales, the majority of brands were cheap. This was evident as half of the most popular brands fell within the sub-value

category, with the remaining three brands split between value and mid-price tiers (Shortt et al., 2021). In addition, the paper also highlighted significant price differences among top brands. The authors suggest that this indicates a shift in market share towards subvalue brands, particularly in deprived areas, as the market share of premium brands declined (Shortt et al., 2021).

Apart from studies investigating the cigarette price differences by brand, several other studies have assessed the prevalence of loose cigarettes and found that they are widely available (Chang et al., 2021; De Ojeda et al., 2013; Gallien et al., 2024; Hall et al., 2015; Lal et al., 2015; Von Lampe et al., 2018). In eight Sub-Saharan African countries, Chang et al. (2021) used the ACP 2018 cross-section and found that in Ethiopia and Maseru (Lesotho), among other countries, loose sticks were widely available in the sample dataset. Specifically, they accounted for more than 99% of all prices. In a separate study using ACP data for 2016 to 2020, Gallien et al. (2024) examined the characteristics of informal vendors in terms of how their cigarette pricing mechanism differs to those of formal outlets. The paper found that these are the stores where single sticks are decidedly available.

Based on a sample of leading brands in four regions of India's economy Lal et al. (2015) estimated that three-quarters of all cigarettes were sold as loose sticks. However, Singh et al. (2017) later corrected this estimate and found that loose cigarettes are consumed by 57% of smokers in India. Similarly, Hall et al. (2015) in Mexico and Von Lampe et al. (2018) in New York found a wide availability of single sticks. Of particular concern in New York was that single sticks were associated with illicit trade (Von Lampe et al., 2018). Conversely, Hall et al. (2015) notably found the availability of single sticks increasing with time. De Ojeda et al. (2013) found that 97% of the surveyed stores including supermarkets sold single sticks in Guatemala.

In terms of the price distribution of single cigarettes, studies find that the pricing of loose cigarette prices differs from that of per-stick prices sold in packs. Gallien et al. (2024) and Liber et al. (2015) found that single-stick prices are clustered around currency denominations. That is, the prices centre around whole number values of a local currency (i.e., 1, 1.5, 2, 2.5, etc). Gallien et al. (2024) emphasise that this attribute may have negative implications for tobacco taxation. First, they find that this distribution of informal vendor prices may result in prices rising slowly over time. Second, they suggest that because of this characteristic, the prices of single sticks may require large tax increases to sustain price rises over time. Put differently,

small increases in tax may lead to little or no tax increases being passed on to consumers in the form of retail prices in single cigarettes. The authors indicate that the tobacco taxation effects on the price of single sticks are less certain. Therefore, it might be worth exploring, among others, the effects of tax increases on loose cigarette prices in countries like Lesotho where single sticks are highly prevalent in informal vendors in the sample.

Analysing changes in cigarette prices over time provides insights into changes in the affordability of cigarettes, with a judgement from the price perspective only as a determinant of tobacco use. That is, whether the cost of cigarettes keeps up with increases in income over time. Gallien et al. (2024) analysed the trends in average prices of individual cigarettes and the per-stick price for those sold in packs for the popular brand (Peter Stuyvesant) in South Africa. The study revealed a significant price gap between the average prices of these loose sticks, with the gap fluctuating over time. The price variations were attributed to different dynamics prevailing between formal and informal sectors. Specifically, the authors found that these prices do not always have a parallel movement.

In a separate study, Gilmore et al. (2013) explored the tobacco industry's (TIs) pricing strategies in the UK cigarette market over time. The authors noted that the industry segmented brands from premium to ultra-low price. The paper found that while the real prices of premium brands, mid-priced brands and economy brands increased over time, the real prices of ultra-low brands barely changed. Alarming, the paper also found that ultra-low brands continued to rapidly gain higher market shares over time.

In summary, it is clear that the existing literature on cigarette price variation reveals two primary limitations. First, many studies rely on cross-sectional data that is now dated, relative to the current context. Secondly, most have failed to leverage the longitudinal nature of available data to analyse price dynamics over time. This gap is particularly relevant for the market of single sticks, which has been largely overlooked. To address this problem, this study utilises the ACP data from 2016 to 2024 to analyse price differences across key variables, and crucially, to track the evolution of prices over this period. This longitudinal approach also allows for the observation of how price trends respond to the introduction of new tax policies.

2.2.2 The impact of tobacco taxes on cigarette prices

This subsection presents a review of the literature on the effect of tax increases on cigarette prices. The review is categorised into two phases: the papers that investigate the effect of tax increases using tax pass-through analysis to determine if the tax increases were undershifted, overshifted or both. This is followed by papers that use the econometrics approach such as the Difference-in-Differences analysis to isolate the effect of tax increases on cigarette prices.

Amongst several other papers, Hanson and Sullivan (2009) studied the impact of an increase in the excise tax on a pack of 20 cigarettes in Wisconsin state. The paper adopted a difference-in-difference model to quantify the effects of this policy. Later in this dissertation, I adopt similar techniques to explore the change in cigarette prices as a result of a tax increase in Lesotho using the sampled prices. Due to the similarity in methodology with this dissertation, I therefore provide a more detailed outline of their method and findings.

Hanson and Sullivan (2009) used the non-nationally representative cross-sectional micro-level data on cigarette prices from a telephone survey of retailers to measure the incidence of tax increase. Specifically, the survey requested price information on two cigarette brands: the name brand and generic brand. This information was obtained from various stores that sell cigarettes, including convenience stores, grocery stores, and tobacco-only stores. The data collection took place between December 2007 and January 2008. The December prices were collected before the tax change while the January prices were obtained post-tax increase. Nominal prices were used because the difference between the data collection periods was not large, i.e., about 42 days. For the control group, the paper used four states that surrounded Wisconsin and were not affected by the tax change.

On the descriptive statistics, the authors did not find large significant changes in prices in the controlled states. On the DID regression analysis, besides the default DID variables, the paper controlled for the type of store and the state level location of the store and on whether the store was a national chain or regionally established store. All the control variables were included as dummies. Overall, the paper found that the average prices of both the name and generic brand cigarettes increased more than the tax increase. However, the increase was larger for name brands than generic brands. The paper further found that prices in grocery stores were higher than those in convenience stores for the name brand but lower for generic brands. The paper did not control for the type of cigarette packaging.

Besides Hanson and Sullivan (2009), Mengesha and Ross (2024) investigated the effect of a more than 600% change in the cigarette excise tax (an increase of both specific and *ad valorem* component) in Ethiopia on the average prices of single sticks. The study focused on the prices of legal and illicit brands to measure the tax effect. Unlike Hanson and Sullivan (2009), this paper assessed the change in cigarette prices using both the nominal and real prices. The nominal and real prices were used in the summary statistics while their regression analysis used nominal prices. The paper used the two empty pack survey of 1774 cigarette prices collected at kiosks and street vendors in 2018 and 2022. The legal cigarettes comprised domestic and legally imported brands which made up 70.7% of total price observations. The illicit cigarettes consisted of all foreign brands imported after the cigarette import ban in 2019 and appeared in the 2022 survey. The paper also investigates the changes in cigarette prices by store type, across towns and over time. Besides stores and towns, the paper also assessed whether the number of illicit cigarette brands increased post the tax increase.

In their regression analysis, the authors use both the bivariate and multivariate difference-in-difference specification. The summary statistics revealed a 15% increase in the real cigarette price of the most popular domestic brand, Nyala. On the other hand, the real price of Nyala premium increased by 5%. From the dataset, the authors note that these were the only two licit brands that were observed in both surveys, i.e., before and after tax. The authors also found that the only company that manufactures, imports and distributes cigarettes undershifted the tax increase to the two legal brands. This was obtained from the summary statistics by conducting the following analysis: for Nyala, the paper compared the change in inflation from the nominal price that is tax inclusive to the change in the overall inflation between 2018 and early 2022. The overall inflation between the two periods was about 77% while the inflation-driven price for Nyala increased by 50%. This then indicated that the prices were undershifted to Nyala. For licit brands that appeared in both surveys, their prices significantly increased, including the and some had over 120% real price increase.

For changes in prices across towns and outlet types, the paper found that the real prices of licit brands increased in 8 out of 9 towns, with a decrease noted in the remaining town. When examining cigarette prices by outlet type, the summary statistics revealed that real prices in street vendors declined in 2022. However, the authors observed that this decline was due to the change in the composition of brands that were sold between the two periods. Another interesting change that was noted in the summary statistics was that the cigarette prices sold in kiosks increased more rapidly than those sold in street vendors. While the average prices of

legal brands compared to illicit brands were higher before the tax increase, the opposite was true after the tax. This was also the case on the number of price observations between these brands by legal status.

Secondly, the paper also assessed changes in the cigarette price variation among the brands' legal status and the type of store. The cigarette prices varied significantly post the tax increase among stores, including a 100% increase in variability in Kiosks. On the other hand, while the price variation for illicit brands largely increased, legal brands had only a negligible change. Overall, the real cigarette prices increasingly varied after tax.

The paper then went on to perform a regression analysis of the tax impact on cigarette prices using a difference-in-difference treatment versus control approach. The econometric analysis revealed a statistically significant increase in cigarette prices of both legal and illicit brands after the tax increase, even though the paper underrepresented the regression output. The authors also observe that, consistent with the summary statistics, the average price of illicit brands was significantly higher than that of legal brands in the post-policy period. This might indicate that the sellers of illicit brands also cash in to increase prices when taxes increase. Furthermore, the authors found that the tobacco industry's claims that higher taxes proliferate illicit trade lack empirical support, as evidenced by the higher prices of illicit brands following the tax increase.

Other than Hanson and Sullivan (2009) and Mengesha and Ross (2024), several other papers also analysed the impact of tobacco taxes on cigarette prices using the difference-in-difference approach (Brock et al., 2016; Ma & Golden, 2024). In Minnesota, Brock et al. (2016) estimated the impact of about 109% increase in cigarette taxes on cigarette prices. Additionally, the paper also investigates the extent to which the prices of the same brand vary. The paper used the retail prices from 61 convenience stores in Minnesota and 13 from other smaller neighbourhood states. In the dataset, more than 75% of price observations in the retail price dataset were from Minnesota. Specifically, for cigarettes, the paper primarily focused only on premium brands, i.e., Marlboro and Camel Blue, as the brands claimed the largest market share.

The authors also employed similar econometric specifications as Mengesha and Ross (2024) to assess how cigarette prices changed by state. The regression analysis notably revealed significantly higher average cigarette pack prices in Minnesota after the tax increase. Similar to Hanson and Sullivan (2009), the increase in prices was higher than the actual tax increase.

Thus, the tax increase hiked the overall price of cigarettes and was over-shifted by the tobacco industry.

The paper also assessed the cigarette price variation among Minnesota stores using the last Round of data collection. The authors found a large variation in prices paid for Camel Blue. Nonetheless, price variation was the smallest for Marlboro. By store type, the average price of Marlboro was not different between those sold in independent stores versus chain stores. On the contrary, the pack price for Camel Blue has always been cheaper in chain stores than in independent stores. Thus, the degree of price variation largely depended on the brand and store type.

Ma and Golden (2024) evaluated the impact of a 2015 minimum price floor on cigarette prices in New York City (NYC). The paper used real prices, using the 2019 consumer price index for yearly comparisons, to isolate this effect using the DID approach, with non-New York cities as controls. They used the cross-sectional telephone survey data collected quarterly from NYC residents, spanning from January 2016 to September 2019. To document the appropriateness of using DID, the trends in real prices between NYC and control were shown. They found a significant increase in real prices in NYC. Notably, increases in prices were lower for low-priced cigarettes than higher-priced ones.

In Mexico, Saenz-de-Miera et al. (2010) assessed the impact of a thirty percentage point increase on self-reported cigarette prices using the ITC Mexico survey. The authors primarily focused on the brands used by many smokers. Similar to Mengesha and Ross (2024), the cigarette brands were disaggregated into domestic and international brands. The authors found an overall increase in cigarette prices. While the price increase was higher for international brands, it was lower for domestic brands. However, the authors note that this increase in prices was lower than expected. Lastly, this analysis was performed on prices where almost 95% of cigarettes were purchased in convenience stores rather than supermarkets (Saenz-de-Miera et al., 2010).

Furthermore, Sullivan and Dutkowsky (2012) distinguished between the effect of excise taxes at the state, city and country level. The paper finds that increases in taxes lead to higher cigarette prices but at differing magnitudes. Specifically, the authors find that increases in urban prices are more likely to be lower if located near lower tax jurisdictions and vice versa. As a result, the paper finds higher incremental changes in state prices than local prices. The authors suggest

that disparities in geographical areas could explain variations in retail price levels (Sullivan & Dutkowsky, 2012).

In New Zealand, Marsh et al. (2016) examined the effect of excise tax on the retail price of tobacco products. In particular, Marsh et al. (2016) specifically looked at how retailers adhere to the Recommended Retail Price (RRP) after the tax increase. The authors used the retail price data from convenience stores, liquor stores and supermarkets selected from three BAT brands based on their market share. Further, the study covered premium, mainstream and budget brands. Overall, the findings revealed that the retailers demonstrated 82% compliance with RRP for mid-priced brands, while compliance was lower for premium and budget brands. This was attributed to the undershifting of tax increases to budget brands and overshifting to premium brands.

In a longer-run study (using brand cigarette price data from 1999 to 2009), Gilmore et al. (2013) explored the tobacco industry's (TIs) pricing strategies in the UK cigarette market. The authors highlight that the industry segmented brands from premium to ultra-low price. When examining the tax effect, they discovered that the prices of expensive brands increased more than the tax increase, while the prices of ultra-low brands barely changed. Alarming, the ultra-low brands continued to gain higher market shares over time. Confirming these findings, Hiscock et al. (2019) used more recent (at that time) tobacco sales data from 2010 to 2015. The paper finds that in periods of unexpectedly high changes in tax, tax increases were much smaller. Thus, prices were kept low despite large tax increases (Hiscock et al., 2019). In contrast, in the period of small tax increases, the industry increased prices by brand segmentation, with higher prices on premium brands (Hiscock et al., 2019).

In Pakistan, Cevik (2016) used a balanced panel from 2004 to 2015 to determine the amount that cigarette prices increase per unit increase in the tax amount. The paper also estimates the rate at which taxes are passed on to consumers. The author finds that 90% of the tax amount is contemporaneously passed through over two months. Similarly, in the South African context, Linegar and Van Walbeek (2018) also used long-term price data from 2001 to 2015. They found that excise taxes have been undershifted. The paper also notes that the degree to which taxes are passed through depends on the level of competition in the cigarette market.

Lastly, in Mauritius, Berthet Valdois et al. (2019) examined the long run sustained increases of excise taxes on cigarette prices. With tax increases being higher than the inflation rate, the paper finds that overshifting occurred not only on the premium brands but also on the popular

brands which are less expensive than premium brands. Confirming Gilmore et al. (2013) findings, the paper finds that the excise tax burden was unchanged for lower-priced brands.

3. DATA AND METHODOLOGY

This chapter presents the data sources, descriptive statistics, and methodology used to provide an overview of the cigarette price landscape, assess the presence of illicit cigarettes, and determine the effect of the levy on cigarette prices. The first section describes the data sources. The second section reports errors observed during data cleaning. The third section outlines the study variables and descriptive statistics. Finally, the last section details the methodological approach based on the characteristics of the dataset.

3.1 Data sources

This dissertation uses the African Cigarette Prices (ACP) project data collected by the Research Unit of the Economics of Excisable Products (REEP), based at the University of Cape Town (UCT). The data provides individual prices, with brand and store details, for tobacco products sold in various African countries. The project was launched in December 2015 and data collection began with the first round (cross-section) in 2016. The data are publicly available online on the DataFirst website⁴ and are characterised as a repeated cross-sectional retail survey. They are not nationally representative; the results cannot be inferred to the entire country because the fieldworkers collect data based on where they choose to go, as there is no sampling frame. This approach may introduce potential geographic bias that may arise due to fieldworkers' preference for easily accessible urban areas over remote poor areas. To overcome this limitation, district-level controls are used. These data are large and therefore can give a sense of what the cigarette market looks like, especially in countries without nationally representative data (Van Der Zee & Mthembu, 2024). Often, nationally representative data comes from household surveys. Prices from these surveys are helpful and good, but can suffer from recall bias, and consumers might avoid stating illicit prices. Retail data avoids these issues.

REEP employs UCT students from African countries to collect tobacco prices in their home countries, both in urban and rural areas. The data collection happens during major university holidays (December/January and June/July) implying two rounds of data collection per year. The tobacco products collected include cigarettes, snuff, pipe tobacco, and cigars amongst

⁴ <https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/927>.

others. Before collecting data, fieldworkers are trained and given instructions on collecting and recording the prices. REEP also provides them with an Excel template to record the tobacco prices. The fieldworkers ask for permission to take photos of the storefront and prices from the store managers or owners. They then collect information including tobacco prices per unit, country, local currency, date of data collection, location (province/state, city/town/village, suburb, and GPS coordinates), outlet type, retail outlet subtype, name of outlet (if applicable), product type, brand, sub-brand, quantity per unit, storefront photo code, and product photo code. This information is organised into columns in the provided Excel template.

The data is collected from various outlets. The project defines three different outlet types: retail outlets (formal stores), spaza shops (micro-convenience stores, typically in permanent structures), and street vendors (small, informal stalls, with non-permanent structures). As a verification check, fieldworkers record the addresses and GPS coordinates of the stores they visit. To prevent multiple fieldworkers from collecting data in the same store, those in the same city or town must coordinate their shop visits. Fieldworkers must submit a photograph of each tobacco product alongside its corresponding price in the same photo, as well as a photograph of the storefront. REEP validates each recorded price using these photographs. Each fieldworker is required to collect a maximum of 1,500 prices to ensure the data review process remains manageable. An allowance of more than 1500 prices is given to fieldworkers in areas where little to no data has been collected in previous rounds (Van Der Zee & Mthembu, 2024).

I have a novel insight into this data and data collection process because I have been a fieldworker for multiple rounds of this project. This dataset aims to provide policymakers and tobacco control advocates with a source of tobacco prices in Africa where data are particularly scant. It can be used to assess changes in tobacco prices over time in the region, as well as price differentials between brands, packaging formats, locations (towns and districts), and outlet types (hereafter the ‘variables of interest’). 15 rounds of ACP data have been collected in Lesotho between 2016 and early 2024. Cigarettes make up the bulk of the data, with a total of 37,123 cigarette price data points in Lesotho, accounting for over 97% of the total prices in the sample. For this reason, I have limited the sample to cigarette prices only, removing any non-cigarette products.

3.2 Reporting errors and data cleaning

When analysing the ACP data, I encountered some discrepancies in the “province” variable which, in Lesotho, represents districts. The values such as "Lesotho", "Highlands", and "Lowlands" were erroneously included in the “province” as districts. The proper districts ought to be Mokhotlong, Butha-Buthe, and Maseru. To address this issue, I utilised the “city” variable, which indicates a city, town or village, to rectify the improper location recordings. This is because the correct districts for the province variable were recorded in this variable. Additionally, I cross-referenced the GPS coordinates with the photographs from each round of data collection to validate the locations and their names in the “suburb” variable. The suburb is the lowest geographic detail available in the dataset.

I also cleaned the brand and sub-brand variables. For the brand variable, the Rudland & George brand was recorded both as “RG” and “Rudland & George”. I renamed “Rudland & George” to “RG” for consistency, as most of these brand observations were recorded as RG. To ensure accuracy, I verified that no observations of “Remington Gold” (a separate brand) were mistakenly recorded as “RG,” as some fieldworkers might confuse the two brands. I checked this by reviewing the photographs. For the sub-brand variable, some values were misspelled while others were incorrectly recorded. For example, sub-brands for RG were recorded as "20Mentholeedge," "Me Nthol Edge," and "Mentholeedge," instead of "Menthol Edge." I cleaned this variable using the fieldworkers’ instruction pack, which provides guidelines for recording sub-brands for each brand.

Furthermore, an observation collected from Mokhotlong in 2016 recorded a price of M2.50 but had a missing quantity for the Dunhill brand. I replaced the missing quantity with one, as it reasonably corresponds to the price of a single stick. Overall, I cleaned and verified the following variables: price, brand, sub-brand, province/district, city, and suburb.

3.3 Study variables and descriptive statistics

The cigarette price differential across the variables of interest is examined by comparing prices of the same brands across different outlet types. That means the comparison is like-for-like, by controlling for brand. This is because in the sample, not all brands sold in formal retail outlets

are available in informal ones. However, there is a reasonable number of brands in each store to facilitate comparison.

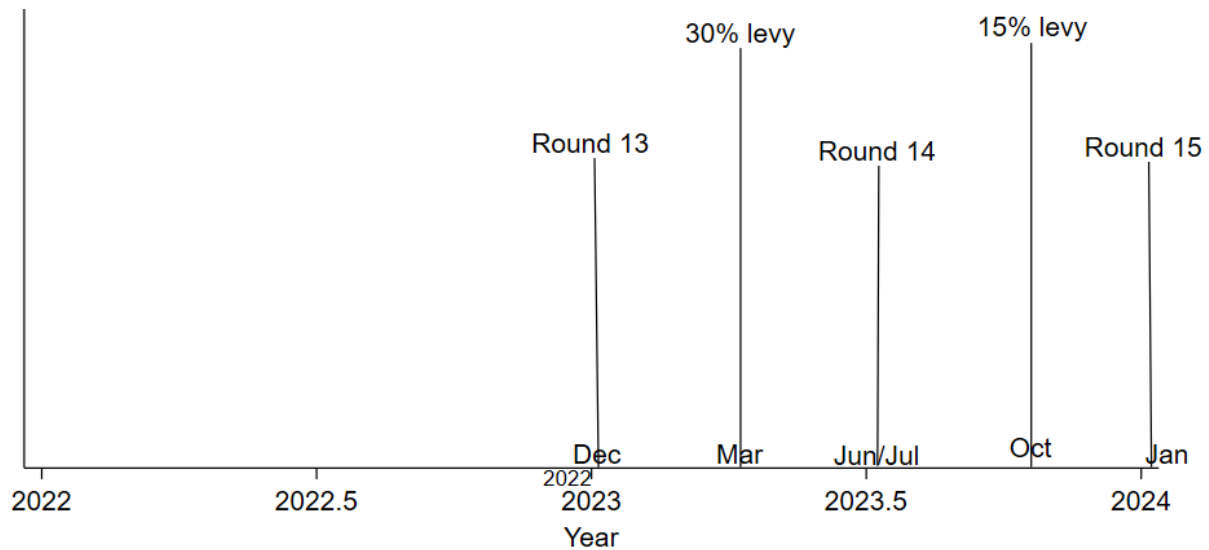
Of all the cigarette brands available in the dataset, the analysis focuses only on the 15 brands.⁵ I created a new brand variable containing these 15 brands, unlike the old variable with 88 brands. Each price collected in the ACP data has a brand (e.g., Dunhill, Peter Stuyvesant) and a sub-brand (e.g., Courtleigh Blend, Filter). These brands are used to allocate each cigarette brand to the owner (producer). Unfortunately, while most brands are produced by popular tobacco companies at regional and multinational levels, the producers of some brands cannot be traced. I therefore categorise these brands as “Local or Regional,” interchangeably.

The ACP cigarette prices are collected in local currencies for single sticks, packs of 10, 20, 30 and cartons (200). These prices are then converted to US dollar prices. To do this, the official exchange rate at the midpoint dates between the beginning and the end of the data collection period is used. A period usually spans over two months. For cigarettes sold in packs, the price per stick is derived by dividing the pack price by the number of cigarettes reported in the pack. The 20-pack equivalent price is determined by multiplying the price per stick by 20; this “20-pack equivalent price” is what is reported in the results, because packs of 20 sticks are very common. An exception to this occurs at later stages where I assess the cigarette price distribution per stick, limiting the price to those sold as single sticks only. To construct the real price variable using 2022 constant prices, I used the general Consumer Price Index (CPI) obtained from the International Monetary Fund (IMF) database.

The ACP data have been collected from 2016 to early 2024. These data were gathered in eight districts: Mokhotlong, Butha-Buthe, Leribe, Berea, Maseru, Mafeteng, Mohale’S Hoek, and Quthing. The collection was inconsistent across most districts over the years, as it depended on the fieldworkers’ home districts during each round.

⁵ These brands are: Dunhill, Peter Stuyvesant, Camel, Pall Mall, Craven A, Rothmans, Rudland & George (RG), Sun, Boss, Sahawi, Red & Black, Ossum, Chief, Blessing and Cape.

Figure 1: The levy and data collection timeline



Source: Own illustration. Notes: Round 13 has both 2022 and 2023 prices.

Figure 1 illustrates the closest data collection periods before and after changes in the levy. Before the government implemented the 30% levy on the 1st of March 2023, 13 rounds of data were collected in the sample (rounds 1 to 13). The closest round to this period is round 13, which occurred in December 2022 in the Maseru district and included 1568 prices. I use the periods before the levy (2016 to 2022 and in some cases 2017 to 2022 because of data inconsistencies) to assess parallel trends. While the prices were collected in eight districts, Maseru has been consistently surveyed throughout the ACP project with the exception of round 14, allowing for the observation of trends in prices over time. However, because it is always preferred to use a large sample size, I use prices in all the districts to analyse trends in prices. As mentioned earlier, the 30% levy was later reduced to 15% on the 1st of October 2023. Between these dates (1st March and 1st October), the data were collected only in the Leribe district (round 14, in June/July 2023). The latest data collection took place in early January 2024 (round 15) and included 1600 prices collected in Maseru. This was three months after the reduction of the levy from 30% to 15%.

The literature on the effect of tobacco taxes on tobacco prices suggests that it takes two to three months for the effects of tax changes to be fully passed on to consumers through retail prices (Linegar & Van Walbeek, 2018; Cevik, 2016). Round 15 aligns well with this time frame, during which tax effects ought to have been fully passed on. However, it is still possible that within this period, the full effects of the tax may not have been fully passed on to consumers.

This may be because some producers may not have known in advance that the levy is going to be reduced. Therefore, they might still have products sitting in warehouses that they have not sold yet by the time the levy was reduced to 15%, since prices are set when the levy is paid as goods leave the warehouse. This then implies the possibility that prices observed in January 2024 may still be impacted by the 30% levy that happened in March 2023. As a result, I define the data collected after the 30% levy as the post-data without differentiating the time frames. Therefore, this dissertation generally estimates the effect of the tax increase on cigarette prices between 2022 and post-2022, as one cannot be certain which prices captured the 15% effect. Thus, the pre-treatment period is 2022 and post-treatment period is after 2022. Overall, the collected prices in the year 2022 and post were 4583 and 2653 respectively.

3.3.1 An overview of the cigarette price landscape

Table 1 presents a detailed insight into the cigarette price observations from the selected brands that were most collected, vendor details and packaging types in the sample from 2016 to 2024. The table further disaggregates the observations into those that were collected before and after the levy. A total of 37078 prices in the ‘cleaned’ sample were collected across eight districts in Lesotho, ranging between 158 in Quthing and 28609 in Maseru.

The table also provides insight into the most collected brands. This is achieved by separating the price observations according to brand names with the corresponding frequencies of the six brands that were mostly collected. In terms of exposure across the entire sample, the most observed brands appear to be Dunhill (26.6%) and Peter Stuyvesant (23.9%). Before the levy, Dunhill was the most collected brand (27.6%), however, after the levy, Peter Stuyvesant was mostly collected (15.9%). The other four remaining brands that were also collected often are RG, Camel, Sun and Sahawi. Combined, these six brands account for about 86% of total price observations in the sample.

For outlet types within the sample, informal outlets were often visited: of the 37078 price observations, 26136 (70.5%) are from street vendors, 7488 (20.2%) from spaza shops, while the remaining 3454 (9.3%) observations are from retail outlets. This is also true for prices collected both before and after the levy. The table also provides insight into the packaging type cigarettes are sold in: as loose cigarettes, as packs of 10 sticks (10-pack), as packs of 20 sticks (20-pack), as packs of 30 sticks (30-pack), and as packs of 200 sticks (carton).

Table 1: An overview of the cigarette price observations in the sample from 2016 to 2024.

Variables	Pre-levy (before 2023)		Post-levy (after 2022)		Total	
	n	%	n	%	N	%
Top 6 common brands:						
Dunhill	9486	27.56	391	14.73	9877	26.64
Peter Stuyvesant	8442	24.52	422	15.90	8864	23.91
RG	8046	23.37	13	0.49	8059	21.74
Camel	1943	5.64	130	4.90	2073	5.59
Sun	1640	4.76	140	5.28	1780	4.80
Sahawi	1248	3.63	169	6.37	1417	3.82
Outlet type observations:						
Retail Outlet	3177	9.23	277	10.44	3454	9.32
Spaza Shop	6127	17.80	1361	51.28	7488	20.20
Street Vendor	25120	72.97	1016	38.28	26136	70.49
Observations by pack size:						
Single	30988	90.02	2313	87.15	33301	89.81
10-pack	181	0.53	37	1.39	218	0.59
20-pack	2973	8.64	245	9.23	3218	8.68
30-pack	113	0.33	22	0.83	135	0.36
Carton (200)	169	0.49	37	1.39	206	0.56
Observations by District:						
Maseru	27009	78.46	1600	60.29	28609	77.16
Butha-Buthe	1309	3.80	N/A		1309	3.53
Leribe	896	2.60	1054	39.71	1950	5.26
Berea	3309	9.61	N/A		3309	8.92
Mokhotlong	923	2.68	N/A		923	2.49
Mafeteng	363	1.05	N/A		363	0.98
Mohale's Hoek	457	1.33	N/A		457	1.23
Quthing	158	0.46	N/A		158	0.43

Source: Author's own computations from Lesotho African Cigarette Prices data, 2016 to 2024. N/A = No data. n = number of prices collected. N = total number of prices collected

Single cigarettes were the most collected packaging type (about 90%), followed by packs of 20 sticks (8.7%). Packs of 10 and 30 cigarettes were collected less often in the sample. Single sticks were mostly collected in informal stores. This is the case because under normal circumstances, vendors purchase cigarette packs from the formal retail stores in order to sell them in loose for a profit margin. This also explains the high availability of loose sticks as the data were collected largely in informal stores.

Geographically, the most collected prices in the entire sample were from the Maseru district (77.2%), followed by those collected in Berea (8.9%). The least price observations were from Quthing (0.43%). Before the levy, prices were collected in all the districts. However, after the levy, the table shows that the only visited districts were Maseru and Leribe with 60.3% and 39.7% prices collected respectively.

Table 2 provides the average nominal prices of brands for a standardised pack of 20 cigarettes, across price segments, districts, outlet types and packaging types. I use nominal prices because I am comparing these prices to the nominal MLP later. The selected brands in this table are sold in all outlet types. The table shows that, over time, there were inconsistencies in data collected across districts. For example, data were collected in a particular district in one year, while the next collection happened after two or more years. Because of this, I therefore aggregated the price observations at two-year intervals. However, in 2016 the ACP project was in its infancy and there were relatively few prices in the sample. As a result, I decided to combine these observations with those of 2017 and 2018 to establish the 2016 to 2018 period. Post this period, the table shows cigarette prices at two-year intervals. Given that the levy was implemented in 2023, the period 2023 to 2024 represents average prices after the levy.

The table shows consistent differences in prices of brands over time in the respective segments. Post the year 2022 in the levy period, the table shows that the average prices in this period increased. First, the average nominal price of a premium brand increased by about 29% (from M60.03 to M77.30). For mid-priced brands, the table shows that prices increased by an average of about 27% for both Peter Stuyvesant and Camel. While the average price of a Blessing brand increased by 22% after the levy, the average price of a domestic brand Sun declined by about 21%.

Table 2: Nominal average prices for a standardised pack of 20 cigarettes

	2016 – 2018 n Mean (CI)	2019 – 2020 n Mean (CI)	2021 – 2022 n Mean (CI)	2023 – 2024 n Mean (CI)
Price tiers				
Premium				
Dunhill	3755 53.21 (53.0; 53.5)	3471 56.18 (55.9; 56.3)	2260 60.03 (59.7; 60.3)	391 77.30 (76.6; 78.8)
Mid-Priced				
Peter Stuyvesant	2923 50.86 (50.5; 51.0)	3189 52.10 (51.8; 52.3)	2330 58.05 (57.7; 58.3)	422 73.59 (72.6; 74.5)
Camel	846 51.81 (51.3; 52.3)	539 52.72 (52.1; 53.3)	558 58.54 (57.9; 59.1)	130 74.58 (72.4; 76.5)
Economy				
Sun	506 23.67 (23.0; 24.2)	968 25.88 (25.5; 26.2)	166 34.84 (33.6; 36.0)	140 27.44 (26.3; 28.5)
Blessing/Sahawi	135 21.52 (20.6; 22.4)	98 24.71 (23.6; 25.8)	50 27.66 (26.1; 29.0)	169 33.82 (32.7; 34.9)
District				
Maseru	6435 50.77 (50.4; 51.0)	5534 51.02 (50.7; 51.4)	4439 58.47 (58.1; 58.7)	666 66.75 (65.2; 68.3)
Berea	904 47.71 (47.0; 48.5)	955 50.75 (50.0; 51.4)	394 57.03 (56.3; 57.8)	N/A
Leribe	63 40.20 (36.8; 43.6)	349 47.14 (45.9; 48.3)	223 55.23 (54.1; 56.2)	586 61.55 (59.8; 63.3)
Butha- Buthe	207 42.86 (41.7; 43.8)	522 46.37 (45.3; 47.3)	308 53.32 (52.4; 54.1)	N/A
Mokhotlong	466 46.81 (45.7; 47.9)	209 52.32 (50.8; 53.8)	N/A	N/A
Mafeteng	90 47.8 (14.4) (44.8; 50.9)	180 49.4 (14.1) (47.3; 51.5)	N/A	N/A
Quthing	N/A	137 49.8 (12.9) (47.6; 52.0)	N/A	N/A
Mohale’S Hoek	N/A	379 49.0 (12.0) (47.8; 50.2)	N/A	N/A
Store type				
Retail store	1132 41.03 (40.4; 41.6)	621 43.57 (42.9; 44.2)	414 47.04 (46.3; 47.7)	178 61.48 (59.4; 63.7)
Spaza Shop	789 48.76 (48.0; 49.6)	2030 50.25 (49.8; 50.8)	1350 57.2 (56.7; 57.6)	613 63.75 (62.0; 65.6)
Street Vendor	6244 51.64 (51.3; 51.8)	5614 51.21 (50.9; 51.5)	3600 59.46 (59.1; 59.7)	386 66.02 (64.1; 67.9)
Packaging type				
Single sticks	7401 51.39 (51.0; 51.5)	7448 51.53 (51.3; 51.8)	4745 59.40 (59.2; 59.6)	1077 65.44 (64.1; 66.7)
10-pack	28 40.26 (39.3; 41.1)	56 44.13 (42.9; 45.4)	94 48.81 (47.8; 49.7)	34 64.57 (61.9; 67.4)
20-pack	694 35.77 (35.3; 36.4)	714 40.42 (39.7; 41.0)	441 46.11 (45.4; 46.8)	100 55.06 (51.9; 58.2)
30-pack	29 35.52 (34.5; 36.4)	23 39.54 (37.4; 41.5)	58 43.01 (42.0; 44.0)	22 57.37 (55.6; 59.1)
Carton (200)	13 32.02 (26.9; 37.2)	24 33.93 (29.3; 38.4)	26 43.55 (41.7; 46.0)	19 59.03 (52.7; 65.2)
Overall	8165 49.75 (49.6; 50.1)	8265 50.45 (50.2; 50.7)	5364 57.93 (57.6; 58.1)	1252 64.37 (63.1; 65.5)

Source: Author’s own computations using African Cigarette Prices data. N/A = No data. Notes: Numbers in parenthesis are confidence intervals (CI).

Table 2 further disaggregates prices geographically by district. It is important to re-emphasise that Mokhotlong is located within Lesotho's Highlands which is considered a rural region, Quthing and Mphahlele districts are located within the Senqu Valley and are considered as semi-rural locations. For comparing prices across the districts, I consider the period 2019 to 2020 because the price data were collected in most districts hence this facilitates the comparison. In the period 2019 - 2020, the average prices irrespective of the brand and packaging type were significantly higher in Mokhotlong at M52.32 compared to the rest of the districts. The test of equality of means rejects the hypothesis of equal means at 1% level.

This indicates significant differences in prices across districts in the sample. In addition, this shows that prices in rural areas tend to be relatively higher than those in urban areas, as expected. The lowest average price in the 2016 - 2018 period was for Leribe at M40.20. In the 2019 - 2020 period, the lowest average price was for Butha-Butha at M46.37 per pack.

As indicated in the methods section, the cigarette price data were collected in two districts after the tax increase: Leribe and Maseru. After the levy, the average prices in these districts increased. Specifically, prices in Maseru were 14.2% higher after the levy. For Leribe, the average prices were 11.4% higher.

By store types before 2022, the average price is higher in street vendors than at spaza shops and retail stores. Cigarettes sold at retail stores appear to be relatively cheap before the levy, compared to the informal stores. This is explained by the fact that retail stores often sell cigarettes in packs, while informal stores purchase from formal stores to sell in loose. After the levy, average prices were still higher in informal than formal outlets.

Lastly, looking at the prices by packaging type, the average prices of single sticks are consistently higher, both in the periods before and after the levy, compared to other packaging types. These are followed by the average prices of packs of 10 cigarettes. The average price of a pack of 30 sticks is lower than that of 20 sticks. Relative to all packaging types, the table shows that the average price of a carton is the lowest in the periods before 2020. This shows that the average price of cigarettes becomes cheaper when purchased in larger quantities. After the levy in the 2023- 2024 period, the average price of a carton seems to be higher than those of cigarettes sold in 20 packs. This may be explained by the fact that in the sample for this period, the prices of cartons collected were mostly for premium and mid-priced brands. In the previous periods, cartons were collected even on the economy brands, implying that the average price was inclusive of each price segment.

Table 3 presents the trends in the nominal and real average prices for premium, mid-priced and economy segments in formal outlets for cigarettes sold in packs only. From 2016 to 2022, premium prices show a nominal increase of about 31%. This corresponds to the average annual increase of 4.4%. The average nominal prices for mid-priced and economy segments increased by 17.5% and 10.3%. In terms of real prices, all price segments reveal an overall continuous decline in the same period. Specifically, the real prices decreased by 5.6%, 15.3% and about 21% for premium, mid-priced and cheap cigarettes.

Table 3: Trends in nominal and real cigarette prices for price segments in formal outlets

Year	Price Premium (Nominal)	Price Mid-priced (Nominal)	Price Economy (Nominal)	Price Premium (Real, 2022 base)	Price Mid-priced (Real, 2022, base)	Price Economy (Real, 2022 base)
	(1)	(2)	(3)	(4)	(5)	(6)
2016	38.64	36.62	21.80	53.60	50.80	30.24
2017	39.14	36.09	19.85	51.98	47.94	26.37
2018	35.99	33.65	N/A	45.64	42.66	N/A
2019	43.43	38.43	25.64	52.35	46.32	30.91
2020	42.85	38.36	21.72	49.20	44.05	24.94
2021	49.93	41.16	23.28	54.06	44.56	25.20
2022	50.62	43.04	24.05	50.62	43.04	24.05
Post 2022	66.96	53.97	20.59	61.60	49.66	18.95

Source: Author's own computations from African Cigarette Prices data, 2016-2024. N/A = No data. *Notes:* prices are represented in standardised 20-packs.

Post the year 2022, the prices significantly increased for premium and mid-priced segments, while they declined for the economy segment. Overall, the nominal and real prices for premium brands increased by 32.3% and 21.7% respectively, while the mid-priced brands increased by 25.4% and 13.3% respectively.

Table 4 shows the trends in prices in informal outlets of the same brand segments used in Table 3 for premium and mid-priced brands. However, in this table, I considered only the prices for single sticks as they are most prevalent in informal stores. Also, for the economy category, I used prices for selected brands that are only sold in informal stores since cheap brands sold in both formal and informal stores were less common. The nominal average price from 2016 to 2022 indicates that, in informal outlets, prices increased by an average of 11.7%, 11.3% and 5.8% for premium, mid-priced and economy brands respectively. For real prices, the average prices declined by 19.5%, 19.8% and 20.4% for premium, mid-priced and economy categories. Post tax increase, the real prices substantially increased for premium and mid-priced brands by 18.5% and 17.2% respectively. Real prices of economy brands decreased by 24.5%.

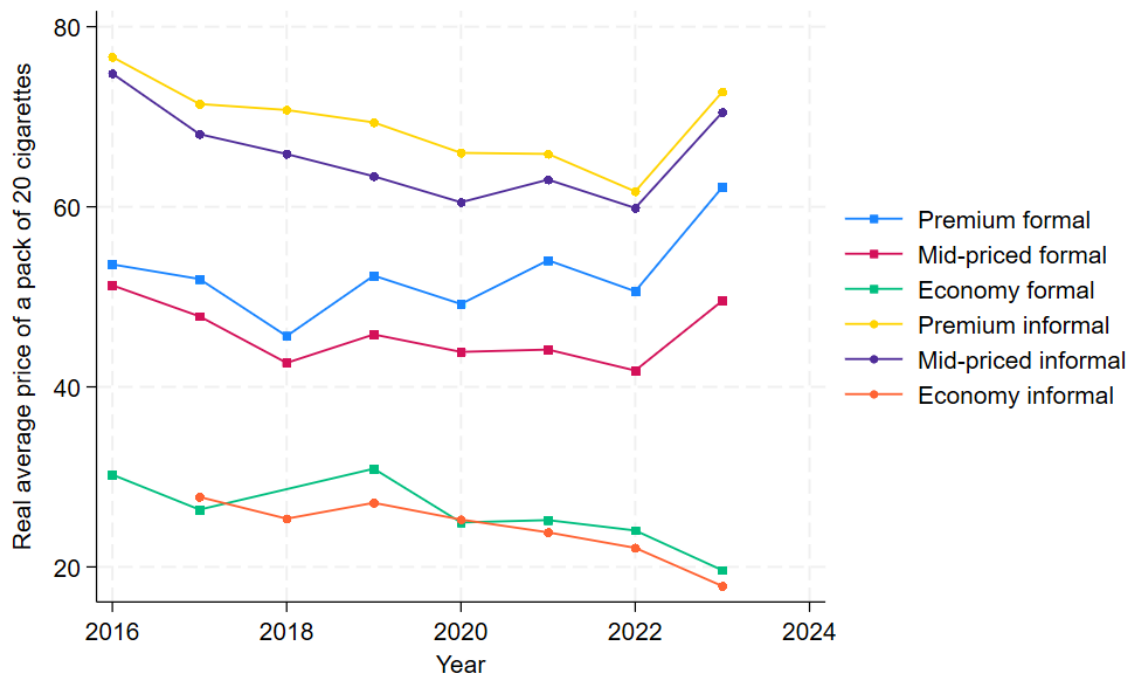
Table 4: Trends in nominal and real single stick prices for price segments in informal outlets

Year	Price Premium (Nominal)	Price Mid-priced (Nominal)	Price Economy (Nominal)	Price Premium (Real, 2022 base)	Price Mid-priced (Real, 2022, base)	Price Economy (Real, 2022 base)
	(1)	(2)	(3)	(4)	(5)	(6)
2016	55.24	53.92	N/A	76.64	74.80	N/A
2017	53.77	51.46	20.91	71.42	68.34	27.77
2018	55.80	52.32	20.00	70.75	66.34	25.36
2019	57.55	52.82	22.50	69.37	63.67	27.12
2020	57.47	52.62	22.00	65.99	60.42	25.26
2021	60.84	58.42	22.02	65.87	63.25	23.84
2022	61.71	60.01	22.12	61.71	60.01	22.12
Post 2022	79.45	76.47	19.62	73.11	70.35	17.87

Source: Author's own computations from African Cigarette Prices data, 2016-2024. N/A = No data. Notes: prices are represented in standardised 20-packs.

Figure 2 shows a graphical representation of the trends in real prices between formal and informal outlets. The figure shows that the real prices of premium and mid-priced brands are higher in informal outlets than in formal outlets over time. Real prices of cheap brands both in formal and informal outlets are always declining over time in the sample. All prices drop slowly until the levy comes in, except cheap cigarettes.

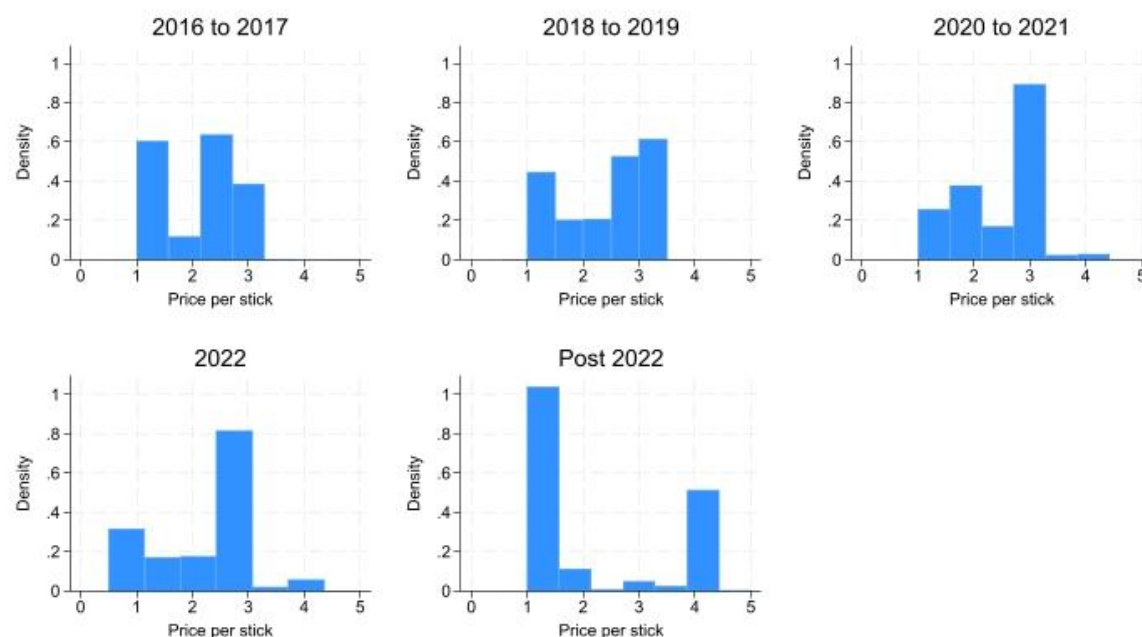
Figure 2: Trends in real prices for each price segment, by outlet type



Source: Author's own illustration using African Cigarette Prices data, 2016-2024

Figure 3 illustrates potential reasons behind the real cigarette price movements observed in informal outlets for single sticks. The distribution of prices from 2016 to 2024 shows that prices have been between M0.50 and M3.00 of the local currency units. Specifically, it shows that single stick cigarettes are sold at prices of M1.00, M1.50, M2.00, M2.50, etc., with the M1.00, M2.50 and M3.00 prices being particularly noticeable. The figure also indicates that prices of single sticks show an indication of currency denomination. That is, prices of single cigarettes tend to cluster around round values of currency denomination and are constrained by the availability of smaller currency units. Prices are sticky because people often pay with cash, so retailers do not change prices at the same rate as inflation. Also, the inflation rate is fairly low. This may explain why even the real prices of premium brands decline over time, as loose cigarette prices tend to remain sticky around certain currency values. This makes the cigarette pricing dynamics of formal and informal outlets differ in terms of the long run price movements.

Figure 3: Distribution of nominal prices for single cigarettes in informal outlets



Calculated from ACP data, 2016-2024

3.3.2 Mean characteristics of control and treatment groups

Tables 5 and 6 present the average cigarette prices before and after the levy in Lesotho, South Africa and Namibia. As indicated in the literature, this dissertation adopts a difference-in-differences methodology. Therefore, Lesotho is regarded as a treatment because it implemented the levy, while South Africa and Namibia are control groups as no levy was implemented. The Tables 5 and 6 indicate the average prices of the respective brands before and after the levy across the specified countries, which will be explained more in the next section. It can be seen from these Tables 5 and 6 that before the tax increase, there were no substantial differences between the real average prices of multinational brands in the two outlet types. Overall, the tables show that indeed the tax increase massively increased the prices of cigarettes in the treatment group. However, the price of regional brands significantly declined after the tax in informal outlets.

Table 5: Mean characteristics of treatment and control groups in formal outlets

Formal Outlets	Lesotho (treated)		South Africa (control)		Namibia (control)	
Premium Brand	Pre-tax	post-tax	Pre-tax	post-tax	Pre-tax	post-tax
Number of observations	75	57	1512	2943	142	285
Average price (M)	50.62	62.89	51.44	48.83	53.28	56.87
Upper Mid-priced Brand						
Number of observations	122	88	2272	3066	367	769
Average price (M)	46.48	55.02	44.79	45.25	45.96	48.00
Lower Mid-priced Brand						
Number of observations	48	44	904	1747	117	293
Average price (M)	34.88	42.07	32.27	31.58	33.51	37.28

Source: Own calculations using African Cigarette Prices data, 2022 - 2024. M = Currency (Maloti).

Table 6: Mean characteristics of treatment and control groups in informal outlets

Informal Outlets	Lesotho (treated)		South Africa (control)	
Premium Brand	Pre-tax	post-tax	Pre-tax	post-tax
Number of observations	1038	324	472	992
Average price (M)	61.16	74.42	60.56	59.50
Mid-priced Brand				
Number of observations	1327	451	613	1081

Average price (M)	59.84	72.12	52.03	52.24
Regional Brand				
Number of observations	277	851	123	256
Average price (M)	22.10	18.45	13.74	14.23

Source: Own calculations based on African Cigarette Prices data, 2022 to 2024. M = Currency (Maloti).

3.4 Methodology

This dissertation uses descriptive and summary statistics to understand the differences in cigarette prices and how they vary over time. It also employs histograms to assess the distribution of single cigarette prices. I use the Minimum Legal Price approach to investigate the availability of illicit prices in the sample from Lesotho. Lastly, I apply the tax pass-through analysis and the difference-in-differences (DID) approach to estimate the effect of tobacco levy on the prices of brands produced by multinational and regional/local producers. The brands are used to allocate each cigarette brand to the owner (producer). The DID analysis controls for other variables to isolate the effects of the tax policy on cigarette prices, which is the outcome of interest. I focus on the commonly used standardised pack of 20 cigarettes.

3.4.1 Minimum legal price approach

This section evaluates the presence of illicit cigarettes in the sample. Following Van Der Zee et al. (2020a) and Van Der Zee et al. (2020b), I define illicit packs as those with prices that are low enough that it is unlikely that the full tax has been paid for them. Assessing the availability of these prices is crucial, as their presence undermines tobacco control efforts and fiscal policies. Research indicates that the presence of illicit cigarette prices is associated with lower intentions to quit smoking, as they encourage uptake among users (IARC, 2011). This undermines the public health benefits of increasing taxes, as smokers may switch to illicit products that are relatively cheap (Partos et al., 2018). In addition, government revenue is lost due to tax evasion.

The majority of cigarettes sold in Lesotho originate from South Africa. Lesotho only has one local producer (Sun Tobacco) (Sheikh et al., 2025), but they have a fairly small market share 2% (World Bank, 2017). This, along with the fact that Lesotho is part of SACU, and thus has

similar tobacco taxation, means that the market for cigarettes in Lesotho looks similar or is highly influenced by the market in South Africa.

To investigate the availability of illicit prices, I employ the Minimum Legal Price (MLP) approach. The price threshold method, MLP, has been used to measure the size of the illicit cigarette market (Van Der Zee et al., 2020a; Van Der Zee et al., 2020b). The logic of this approach is that producers have to cover non-tax and tax elements. One can assume some very low non-tax (production) costs. Then on top of that, producers have to pay the tax. Due to taxes and input costs, prices cannot be too low (equal to or lower than, for example, the tax amount), or else producers would be running at a loss. In other words, they cannot afford to pay the tax. If prices are too low (below the minimum price), they are likely to be illicit because the producer could not have paid the tax. Therefore, the method classifies prices below the MLP as cheap or illicit.

In terms of packs from South Africa, if the packs are legal, at the point of production, they will have the cost price, plus the excise tax and VAT (in South Africa). Then the packs get to the border to enter Lesotho, and they must have the levy paid. South African cigarettes will not pay customs, because they are part of SACU (customs tax exempt). If they are illicit and coming from South Africa, they will leave the factory at a cost price. Presumably, they are smuggled over the border, so no levy is paid.

The ACP data in the sample was collected from 2016 to early 2024. The input costs and taxes that make up the MLP for each year are derived from the equation below.

$$MLP_t = Excise\ tax_t + Excise\ tax_t * VAT_t + Manufacturing\ cost_t + Manufacturing\ cost_t * VAT_t + Excise_t * Levy_t + Manufacturing_t * Levy_t \quad (1)$$

Where t is time in years and $t = 2016, 2017, \dots, 2024$

Specific excise tax changes annually, therefore the MLP also varies from year to year. A more detailed illustration of this analysis is provided in Table 7.

The most recent round of data collection in the ACP data occurred in January 2024 (round 15). During this period, the applicable excise tax is that which was announced in the 2023/2024 South African budget speech, typically delivered in February each year. Specifically, the Minister announced an excise tax of M20.80⁶ (or R20.80⁷) which is based on a pack of 20

⁶ Lesotho's local currency is the Loti (singular) or Maloti (plural), denoted by the symbol 'M'.

⁷ The currency is pegged at par to the South African Rand (Rand), denoted by the symbol 'R'.

cigarettes, regardless of the brand or any cigarette feature. Additionally, a 15% VAT is applied to the excise tax, resulting in a minimum tax amount of M23.92 (1.15 of M20.80). Besides these excise duties, REEP estimated that the lowest production cost for a pack of 20 cigarettes was M3.50 in 2023 (Van Der Zee, 2023).

Table 7: Nominal minimum legal price by financial year

Price element	Financial year								
	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24 Mar-Sept	2023/24 Oct-Feb
Excise tax (specific)	13.24	14.30	15.52	16.66	17.40	18.78	19.82	20.80	20.80
VAT rate	14%	14%	15%	15%	15%	15%	15%	15%	15%
VAT on excise	1.85	2.00	2.33	2.50	2.61	2.82	2.97	3.12	3.12
VAT on manufacturing	0.35	0.35	0.38	0.45	0.45	0.45	0.53	0.53	0.53
Levy (<i>ad valorem</i>) (%)	0	0	0	0	0	0	0	30%	15%
Levy on excise	0	0	0	0	0	0	0	6.24	3.12
Levy on manufacturing	0	0	0	0	0	0	0	1.05	0.53
Total taxes	15.44	16.65	18.23	19.61	20.46	22.05	23.32	31.74	28.1
Manufacturing cost	2.50	2.50	2.50	3.00	3.00	3.00	3.50	3.50	3.50
MLP	17.94	19.15	20.73	22.61	23.46	25.05	26.82	35.24	31.6

Source: The taxes are from the South African Revenue Service (SARS).⁸ *Notes:* The VAT for 2016 and 2017 was 14% and increased to 15% from 2018. The levy was implemented at 30% in March 2023 and reduced to 15% in October 2023. The Minister of Finance in South Africa announces the new excise taxes in February each year. Therefore, the excise tax is the same for 2023 and 2024 because the most recent data were collected in January 2024 where the 2023 excise tax was still applicable. To get the levy on excise, I multiplied the excise tax by the levy rate. Table 1 has zeros in the years without the levy.

As mentioned in a previous section, most cigarettes in Lesotho are imported from South Africa. The tobacco industry keeps information relating to input costs well hidden, exactly because of tobacco control advocates who interrogate their pricing and tax compliance.⁹ For this reason, I base my estimated input costs on those conducted in South Africa. Previous research in South Africa (Van Der Zee et al., 2020a) has estimated input costs at R2.50. The sources of this component include an academic article quoting communications with the tobacco industry (Vellios & Van Walbeek, 2024), and an online report commissioned by the tobacco industry itself.¹⁰ Van Der Zee et al. (2020a) analysed cigarette price data from 2017 to 2018. They used M2.50 as the production costs of cigarettes. As an assumption, I update this cost to account for increasing input costs over time. For the period between 2019 and 2021, I use M3.00. Post this period, I use M3.50. These costs closely align with the reported price per pack of 20 cigarettes by the tobacco industry (Ipsos, 2024). As a sensitivity analysis, I determine if the share of prices

⁸ <https://www.sars.gov.za/wp-content/uploads/Ops/Guides/Legal-Pub-Guide-Gen02-Guide-for-Tax-Rates-Duties-Levies.pdf>.

⁹ <https://www.tobaccotactics.org/article/price-and-tax/>.

¹⁰ <https://www.dailymaverick.co.za/article/2023-02-27-british-american-tobacco-fears-profits-will-go-up-in-smoke-as-illegal-trade-devours-the-market/>.

below MLP is sensitive to the use of a specific production cost. This analysis entails fixing the production cost at M2.50, M3.00 and M3.50 for the entire period (2016 to 2024) and determining the share of illicit products. The results are shown in Appendix A.

Lesotho has the SACU excise tax (i.e., South Africa's tax) which is specific. The country added a separate tax called the Tobacco and Alcohol Products Levy. While Lesotho and South Africa have identical excise taxes, Lesotho has an additional health levy on tobacco, which South Africa does not have. For this reason, the minimum legal price is higher in Lesotho than in South Africa. This levy is applied to the selling price which excludes VAT for domestically produced cigarettes. For imported cigarettes, the levy is applied to the total carton cost including other duties payable upon importation into Lesotho.

Having provided this background, this section therefore assesses the share of illicit products in the sample by allocating prices to either below MLP or equal and above MLP. Then, I determine which producers (multinational versus regional) and specific brands have the most illicit products. I put a caveat that the classification of brands to their producers might have changed, or I might have it wrong in some cases.

Lastly, Van Der Zee (2023) emphasises the possibility that, while unlikely, some products below the MLP might still be taxed (producers might be running at a loss). It is unlikely that producers would do this at scale, as this would be unsustainable business practice. Likewise, it is not guaranteed that products priced above the MLP are fully tax-paid. Despite these limitations, the MLP method has been used widely to study illicit trade, where other methods are not viable (Vellios et al., 2022).

3.4.2 Tax pass-through analysis

The extent to which taxes are passed onto consumers (from 2022 to 2023) through the retail price (known as the tax pass-through) depends on the tobacco industry response. The industry may employ a strategy where:

- (1) Prices increase by the exact tax amount (known as perfect-shifting)
- (2) Prices increase by more than the tax increase (overshifting),
- (3) Prices increase by less than the tax increase (undershifting).

They could also employ a mix of these strategies. To understand how the industry shifted an additional levy (of 30%) in the sample, I calculate the tax pass-through parameter. This is defined as the change in the real net-of-tax (NoT) price over the change in the real tax. If the pass-through parameter is equal to one, it means the taxes were fully passed on to consumers (a tax increase was equal to an increase in NoT price). If the parameter is above one, it means that the industry overshifted the tax increase (NoT price increased more than the tax). Lastly, if the parameter is less than one, then the industry undershifted the tax (NoT increased by less than the tax).

In line with previous studies in this area (Linegar & Van Walbeek, 2018; Sheikh et al., 2024; Sheikh et al., 2025), I calculate the tax levy paid per pack of a standardised 20 cigarettes in each price segment. The tax is applied to the retail selling price of each segment because the ACP data is a retail survey. The mean net price which is earnings of the industry after all the taxes have been paid is calculated by subtracting the tax from the average selling price. This analysis uses prices and taxes for the years 2022 (before tax) and 2023 (after tax).

3.4.3 Difference-in-Differences approach

To isolate the effect of the levy on cigarette prices, I employ the Difference-in-Differences (DID) identification strategy. The DID approach is well-suited for repeated cross-sections or panel data from the same population before and after some treatment (in this case, the tax increase). The key assumption behind the DID is the idea of parallel trends. Prices are changing all the time. One might observe a change in price following the tax change, but it is hard to know whether this was due to the tax change or other factors. To account for this, I find a counterfactual: a group with similar trends to the treatment group (e.g., the cigarette market in Namibia and South Africa, in my case), which did not have a tax change (levy), and see if there was a deviation in the trends between the two groups (control and treatment group). The parallel assumption is that the two groups had a similar trend, before the treatment (the implementation of the levy).

In the absence of treatment, the trend in the variable of interest for the treated group over time would be similar as for the comparison group. In other words, the control group serves as a good counterfactual to the treated group. If the parallel trend assumption holds, any changes in the trend after the treatment occurs can be attributed to the treatment itself. In our case, the levy

implementation is the treatment, so this approach requires that the control group not be influenced by the levy to ensure a valid comparison with the treatment group.

To also ensure that the counterfactual used is appropriate, it is important to investigate if the countries chosen as control group never implemented tax increases or other tobacco control policies just prior to Lesotho's tax increase in 2023. This is because, although minimal, the effect on price could equally be experienced in 2023. As a result, I conducted a thorough search and found that this was never the case, indicating that the selected control group is appropriate.

For this specification, I define the treatment group as the selected Lesotho cigarette brands produced by the multinational companies and regional or local producers in the sample. The response of prices between multinational and local brands is interesting as one might wonder whether the pass-through was the same. In the sample, the multinational brands comprise lower mid-priced, upper mid-priced and premium brands. I classify the regional brands as those that are not produced by multinational companies. Because identifying the counterfactual requires the treatment and control group to be similar, I therefore chose two countries that I thought of being a control group depending on data availability. These countries are Namibia and South Africa.

Various factors make these countries good control groups. First, they are all members of SACU with Lesotho. That is, they share the same tobacco excise taxes, and common monetary policy. Their markets are almost identical, almost all supplied by BAT South Africa (BATSA) and a few smaller local producers. No levy has been implemented in Namibia and South Africa. Lesotho's economy is small, so it is unlikely that the levy in Lesotho would have a material impact on those markets. The ACP data indicates that these three countries sell similar cigarette brands (Table 8), mostly imported from BATSA, or sourced from similar regional producers.

In terms of brand segments, Euromonitor (a global market research company) classifies brands into premium, standard (upper or lower mid-priced), and economy brands.¹¹ Lesotho imports the majority of its cigarettes from South Africa. Euromonitor has information on the South African cigarette market and classifies Dunhill as a premium brand, Peter Stuyvesant and Camel as upper mid-priced brands and Pall Mall as a lower mid-priced. Later in this section, I use regression analysis to quantify the effect of the levy on the prices of these brands. I specifically chose these brands because they are widely available before and after the levy in

¹¹ <https://www.euromonitor.com/insights/euromonitor>.

the treatment and control groups. The regional category contains the following brands: Chief, Ossum, Cape, Boss and Red & Black.

Table 8: Brands available in Lesotho, South Africa and Namibia.

Brand	Country		
Multinational	Lesotho	South Africa	Namibia
Dunhill	9873	15083	4412
Peter Stuyvesant	8860	14752	2869
Camel	2071	7401	4770
Craven	931	2246	826
Rothmans	384	2688	618
Pall Mall	520	6712	3256
Regional			
Chief	197	133	N/A
Boss	579	262	N/A
Ossum	241	108	N/A
Red & Black	424	178	N/A
Cape	238	137	N/A

Source: Own calculations from African Cigarette Prices data, 2016-2024, N/A = No data. The numbers are frequencies.

Most of the price data collected in Namibia and South Africa comes from formal outlets, while the majority of data in Lesotho is from informal outlets in the sample between the periods of interest (2022 to 2024). Even though prices are largely collected in formal outlets in South Africa, quite a number of informal prices are available. REEP encourages fieldworkers to try to get at least one-third of the data from retail outlets. However, this is largely dependent on the type of stores available where fieldworkers collect data. In some cases, fieldworkers may prefer to go to retail stores because it is quicker to collect many prices within a short period of time compared to informal outlets. At the extreme, some outlet owners just refuse to provide data.

For multinational brands in formal outlets, I compare the impact of the levy on separate brand segments, with South Africa and Namibia as separate control groups. Regional brands are only available in Lesotho and South Africa, so I only use South Africa as a control when assessing regional brands and multinational brands in informal outlets. Thus, using these two countries as controls enables us to estimate the tax effects from different angles. This also takes into account different dynamics that may prevail in formal and informal outlets.

Using the price data for these periods, I model the DID specification to determine the effect of the tax increase on real cigarette prices in Lesotho in the sample. I hypothesise that the cigarette prices would increase in Lesotho, but this increase would be higher in Lesotho than in the control groups. This hypothesis is made based on one important assumption that there are no spillovers of the levy into the control group. That is, the treatment does not affect the outcome of the other group.

The specifications using each control group separately are as follows:

Specifications using South Africa as a control group for multinational brands in formal outlets:

$$(\log Price_i | \text{segment} = \text{premium}) = \beta_0 + \beta_1 \text{Lesotho} + \beta_2 \text{Post}_i + \beta_3 \text{Lesotho} * \text{Post}_i + \beta_4 \text{Packging_type}_i + \beta_5 \text{District}_i + \varepsilon_i \quad (1)$$

$$(\log Price_i | \text{segment} = \text{upper_mp}) = \alpha_0 + \alpha_1 \text{Lesotho} + \alpha_2 \text{Post}_i + \alpha_3 \text{Lesotho} * \text{Post}_i + \alpha_4 \text{Packging_type}_i + \alpha_5 \text{District}_i + \varepsilon_i \quad (2)$$

$$(\log Price_i | \text{segment} = \text{lower_mp}) = \gamma_0 + \gamma_1 \text{Lesotho} + \gamma_2 \text{Post}_i + \gamma_3 \text{Lesotho} * \text{Post}_i + \gamma_4 \text{Packging_type}_i + \gamma_5 \text{District}_i + \varepsilon_i \quad (3)$$

Where *upper_mp* and *lower_mp* mean upper mid-priced and lower mid-priced segments respectively.

Specifications using Namibia as a control group for multinational brands in formal outlets:

$$(\log Price_i | \text{segment} = \text{premium}) = \beta_0 + \beta_1 \text{Lesotho} + \beta_2 \text{Post}_i + \text{Lesotho} * \text{Post}_i + \beta_6 \text{District}_i + \varepsilon_i \quad (4)$$

$$(\log Price_i | \text{segment} = \text{upper_mp}) = \alpha_0 + \alpha_1 \text{Lesotho} + \alpha_2 \text{Post}_i + \alpha_3 \text{Lesotho} * \text{Post}_i + \alpha_6 \text{District}_i + \varepsilon_i \quad (5)$$

$$(\log Price_i | \text{segment} = \text{lower_mp}) = \gamma_0 + \gamma_1 \text{Lesotho} + \gamma_2 \text{Post}_i + \gamma_3 \text{Lesotho} * \text{Post}_i + \gamma_4 \text{District}_i + \varepsilon_i \quad (6)$$

Where *upper_mp* and *lower_mp* mean upper mid-priced and lower mid-priced segments respectively.

Specifications using South Africa as a control group for multinational and regional brands in informal outlets:

$$(\log Price_i | \text{segment} = \text{premium}) = \beta_0 + \beta_1 \text{Lesotho} + \beta_2 \text{Post}_i + \beta_3 \text{Lesotho} * \text{Post}_i + \beta_4 \text{Outlet_type}_i + \beta_5 \text{Packging_type}_i + \beta_6 \text{District}_i + \varepsilon_i \quad (7)$$

$$(\log Price_i | \text{segment} = \text{upper_mp}) = \alpha_0 + \alpha_1 \text{Lesotho} + \alpha_2 \text{Post}_i + \alpha_3 \text{Lesotho} * \text{Post}_i + \alpha_4 \text{Outlet_type}_i + \alpha_5 \text{Packging_type}_i + \alpha_6 \text{District}_i + \varepsilon_i \quad (8)$$

$$(\log Price_i | \text{brand} = \text{regional}) = \delta_0 + \delta_1 \text{Lesotho} + \delta_2 \text{Post}_i + \delta_3 \text{Lesotho} * \text{Post}_i + \delta_4 \text{Outlet_Type}_i + \delta_5 \text{Packging_type}_i + \delta_6 \text{District}_i + \varepsilon_i \quad (9)$$

Where *upper_mp* and *lower_mp* mean upper mid-priced and lower mid-priced segments respectively.

In all specifications, the dependent variable $\log Price_i$ is the natural logarithm of the real price of a standardised pack of 20 cigarettes for price observation i . The main explanatory variables are defined as follows: *Lesotho* takes on one for brands in Lesotho (treatment group) and zero for the same brands in the control country (Namibia and South Africa). *Post_i* is a dummy variable taking one for price observations after the levy (post 2022) and zero for prices before the levy (year 2022). The interaction term (the DID estimator) $\text{Lesotho}_i * \text{Post}_i$ represents the change in price between brand segments (premium, mid-priced and regional) after the tax increase in the treatment group compared to the control group. The control variables are defined as follows: *Outlet_type_i* is a categorical variable for the type of retail outlet. *Packging_type_i* is a categorical variable for single sticks and packs. *District_i* is also a categorical variable for the district where prices were collected in the sample. *District_i* does not apply to the control groups as it is country specific. ε_i is an unobserved individual idiosyncratic error term.

If the tax increase significantly impacted price as the outcome variable, then this effect will be captured by the DID estimator (the interaction term coefficient on each specification, from (1) to (9)). They capture the difference in the outcome variable for the treated group, relative to the control group in the post-tax period. The DID coefficient will be interpreted as a percentage difference in real cigarette prices in the treatment group before and after the tax increase because the dependent variable is in logarithm. The precise coefficient is given by $(e^m - 1)100\%$, where m represents different DID coefficients based on the outlined specifications. The appropriateness of using the DID method with the specifications outlined above is

documented in Appendix B, which shows trends in prices over time between the control and treated groups.

The regressions for formal outlets (specifications (1) to (6)) do not have outlet type as a control since they are only based on retail outlets. The regressions when using Namibia as a control group do not control for packaging type because the collected prices were mostly for 20-pack cigarettes in Namibia. For informal outlets (specifications (7) to (9)) using South Africa as a control group, the specifications are only limited to premium and upper mid-priced brands and regional brands. This excludes a lower mid-priced brand, Pall Mall, which had relatively few price observations in informal stores. The regression controls for the outlet type which represents spaza shop and street vendor as informal outlets.

4. RESULTS

This chapter presents findings on two key areas: the availability of illicit cigarettes, analysed using the minimum legal price (MLP) approach, and the impact of the levy on real cigarette prices, assessed through both a tax pass-through analysis and a difference-in-differences (DID) econometric model.

4.1 The availability of illicit cigarettes

This section provides the context needed to understand the dynamics of illicit cigarettes in relation to brands, producers, and tax effects. It begins by assessing the price shares by cigarette brands and their corresponding producers, followed by estimates of the share of prices below the minimum legal price (MLP). A comparison is then made between the share of overall prices by producer and those below the MLP. Lastly, the section illustrates the share of prices below the MLP before and after the levy by producer.

4.1.1 The share of prices by producer

In this section, I assess the share of prices according to the identified producers of the cigarette brands. In the ACP data, each price collected has a brand (e.g., Dunhill, Peter Stuyvesant) and a sub-brand (e.g., Courtleigh Blend, Filter). These brands are used to allocate each cigarette brand to the owner (producer).

Table 9: Share of data by Producer

	Share (%)	95% Confidence Interval		Frequency
		Lower bound	Upper bound	
Producer				37078
British American Tobacco (BAT)	55.90	55.39	56.40	20726
Gold Leaf Tobacco Corporation (GLTC)	25.99	25.54	26.43	9635
Japan Tobacco International (JTI)	5.67	5.44	5.91	2103
Sun Tobacco	4.80	4.58	5.02	1780
Local	4.84	4.62	5.05	1794
Phillip Morris International (PMI)	0.48	0.41	0.55	179
Mastermind Tobacco	0.16	0.12	0.20	59
Best Tobacco	0.07	0.04	0.10	26
Other	2.09	1.95	2.24	776

Source: Own calculations using African Cigarette Prices data, 2016 - 2024.

Table 9 shows the share of prices by the cigarette producer. Of all prices collected across the entire sample, the cigarette producer that features the most is a multinational producer British American Tobacco (BAT), with a share of 55.90% which equates to 20726 prices in the sample.

4.1.2 The share of prices by brand and producer

Table 10: The price share and mean 20-stick pack nominal prices of top 15 brands by producer

95% Confidence Interval					
Brand	Share (%)	Lower bound	Upper bound	Mean (M)	Frequency
Premium segment					
Dunhill (BAT)	26.64	26.19	27.09	77.32	9877
Mid-Priced segment					
Peter Stuyvesant (BAT)	23.91	23.47	24.34	73.54	8864
Camel (JTI)	5.59	5.36	5.82	74.48	2073
Craven A (BAT)	2.51	2.35	2.67	57.99	932
Pall Mall (BAT)	1.40	1.28	1.52	47.70	520
Rothmans (BAT)	1.04	0.94	1.14	49.33	385
Economy segment					
RG (GLCT)	21.74	21.31	22.16	39.23	8059
Sun (Sun Tobacco)	4.80	4.58	5.02	27.37	1780
Sahawi (GLTC)	3.82	3.63	4.02	33.80	1417
Boss (Local)	1.56	1.44	1.69	22.10	579
Red & Black (Local)	1.15	1.04	1.25	19.76	425
Ossum (Local)	0.65	0.57	0.73	19.66	241
Cape (Local)	0.64	0.56	0.72	19.43	238
Chief (Local)	0.53	0.46	0.61	19.36	197
Malimbo (Local)	0.31	0.25	0.36	19.78	114
Other	3.75	3.08	3.44		1377
Total	100				37078

Source: Own calculations using the African Cigarette Prices data, 2016-2024. Notes: The average prices are for the period after the levy. M = Currency (Maloti)

It is followed by a regional producer, Gold Leaf Tobacco Corporation, which accounts for 25.99% of all collected prices. Lastly, the domestic (Lesotho) producer Sun makes up 4.8% of the data. The table shows that the dominant cigarette producers in the sample are BAT and GLTC. The local category represents brands which, despite a thorough search, their producers could not be identified. This category is important because it contains a large portion of brands that seem to have featured in the Lesotho cigarette market in recent years, although their producers are unknown. The other category represents all prices with relatively fewer observations in the sample.

Table 10 ranks the top 15 brands that were mostly collected in the sample by producer. It also shows the recent average prices of these brands in the sample. The table shows that brands owned by multinational producers dominate the top 15. Brands owned by GLTC follow this prevalence. Japan Tobacco International (JTI) brand Camel makes it to the top five with the local brand Sun. 4.8% of prices in the entire sample from the top 15 come from local producers with Boss and Red & Black making it to the top 10, with the eighth and tenth rank respectively. Blessing, Ossum, Cape, and Chief are other brands from local producers.

Table 10 further illustrates the average price of brands by price segment after the levy. From the table, the average price of Dunhill is 3.8% higher than the most expensive brand, Camel, in the mid-priced segment. The average prices in the mid-priced segment range from the lowest at M47.70 (Pall Mall) to the highest of M74.48 (Camel). The economy segment is mostly dominated by local brands, with 6 in 9 brands belonging to local producers. The average price of local brands ranges from M19.36 to M22.10 per pack of 20 cigarettes. This equates to the average price of about M1.00 per stick. While the average price of a premium brand is 62% (1.62 times) higher than the cheapest brand in the mid-priced segment, it is about 300% (4 times) higher than the least expensive brand in the economy segment.

4.1.3 Estimates of the share of prices below the minimum legal price (MLP)

Table 11 assesses the size of likely illicit cigarettes in the sample. These are prices that are below the minimum legal price constructed for each year from 2016 to 2024. This was discussed in detail in the methods section with the accompanying table for the respective yearly MLPs.

Table 11 reveals that, overall, 19.3% of all prices collected were below the MLP. The prices with brands made by Mastermind Tobacco have the highest proportion of prices below MLP. However, this producer had relatively few price observations, as indicated by the wide confidence interval. The high availability of illicit prices is followed by the brands owned by Sun Tobacco with a share 47.4% of prices. Local brands make up 21.1% of illicit prices in the sample.

Table 11: Estimates of the share of prices below the minimum legal price

	Share below MLP (%)	95% Confidence Interval	
		Lower bound	Upper bound
Overall	19.3	18.9	19.7
Producer			
British American Tobacco	0.2	0.1	0.2
Gold Leaf Tobacco Corporation	44.0	43.0	45.0
Japan Tobacco International	0.1	- 0.04	0.2
Sun Tobacco	47.4	45.0	49.7
Mastermind Tobacco	89.8	81.9	97.8
Best Tobacco	46.2	25.6	66.7
Phillip Morris International	0	0	0
Local	21.1	20.2	22.1
Other	27.6	26.5	28.6

Source: Author's own computations using African Cigarette Prices data, 2016-2024.

The producer with the lowest share of illicit prices is BAT at 0.2%. The results of the sensitivity analysis are shown in Appendix A when using a single specific production cost on the entire analysis. They indicate that the overall share of prices below MLP is not sensitive to the use of M2.50 and M3.00 manufacturing costs but becomes sensitive when the cost is M3.50 in all the years. The results are also not sensitive when the levy is 15% in the 2024 data. This suggests that prices in 2024 were significantly below the 2023 MLP.

Compared to international brands, local brands retail at cheaper prices. For instance, Sun Tobacco consists of about 47.36 % of likely illicit prices. Of the prices with brands made by GLTC, 44.02% are illicit. Even though the brands made by Philip Morris International (PMI)

are not prevalent, they show an extreme case of no prices below the MLP. Lastly, the estimates for JTI appear to be insignificant.

Table 12 considers the estimates of illicit prices from another angle. Specifically, the table shows what share comes from each producer, for all prices that are below the MLP. It illustrates that despite GLTC ranking second among producers with the highest share of prices in the sample (25.99%), GLTC has relatively the highest share of illicit prices (59.26%). Sun Tobacco is also among the top producers with a relatively large share of prices below the MLP (11.48%). The “other” category holds the second highest portion of illicit prices (27.56%).

Table 12: Comparison of the overall share of prices in the sample to those below the minimum legal price, by producer

Producer	95% CI			95% CI		
	All Cigarettes (%)	Lower bound	Upper bound	Prices below MLP (%)	Lower bound	Upper bound
BAT	55.9	55.39	56.40	0.46	0.30	0.62
JTI	5.7	5.44	5.91	0.03	-0.01	0.07
PMI	0.5	0.41	0.55	0		
GLTC	26.0	25.54	26.43	59.26	58.13	60.40
Sun Tobacco	4.8	4.58	5.02	11.78	11.03	12.53
Best Tobacco	0.1	0.04	0.10	0.17	0.07	0.26
Mastermind	0.2	0.12	0.20	0.74	0.54	0.94
Local	4.8	4.62	5.05	21.1	20.2	22.1
Other	2.1	6.67	7.19	27.56	26.52	28.59

Source: Author’s own computations using African Cigarette Prices data, 2016-2024.

Lastly, I investigate changes in the share of prices before and after the levy using Table 13. The table includes only the producers of cigarette brands observed before and after the levy. Overall, it is apparent from the table that the share of prices below the MLP increased for all producers after the levy. In addition, the table reveals the three most interesting aspects. First, the multinational producers’ share of prices below the MLP increased by 30 and 71 percentage points for BAT and JTI respectively. At the extreme, 90% and 98.8% of all prices produced by Sun Tobacco and local producers were below the MLP after the levy.

This represents a significant increase of about 46 percentage points (105%) for Sun Tobacco prices and 41.33 percentage points (73%) in the prices of brands with unknown producers. On the other hand, GLTC reflected an increase of 3.36 percentage points, the lowest increase in the sample.

Table 13: Producer share of prices below minimum legal price before and after the levy

a) Before the levy		b) After the levy				
Producer	Share (%)	95% CI		Share (%)	95% CI	
		Lower bound	Upper bound		Lower bound	Upper bound
BAT	0.15	0.09	0.20	0.45	0.01	0.90
JTI	0.05	-0.05	0.15	0.76	-0.75	2.27
GLTC	43.96	42.96	44.96	46.32	39.84	52.80
Sun Tobacco	43.72	41.32	46.12	90.00	84.97	95.03
Best Tobacco	0.07	0.04	0.10	0.17	0.07	0.26
Local	54.11	50.06	58.16	98.84	98.24	99.45
Other	58.82	55.27	62.36	69.70	53.15	86.25

Source: Author's own computations using African Cigarette Prices data, 2016-2024. CI = Confidence Interval

4.2 The impact of the levy on the real cigarette prices

4.2.1 Tax pass-through in formal and informal outlets

Table 14: Average real prices, Levy and Net-of-Tax prices by outlet type

	Pre-tax increase (2022)			Post-tax increase (2023)			Pass-through
	Price (M)	Levy (M)	NoT (M)	Price (M)	Levy (M)	NoT (M)	Parameter
Formal Outlets							
Premium	50.86	N/A	50.86	64.84	15.26	49.58	- 0.08
Mid-priced	46.55	N/A	46.55	57.92	13.97	43.95	- 0.19
Economy	25.75	N/A	25.75	17.06	7.73	9.33	- 2.12
Informal Outlets							
Premium	61.19	N/A	61.19	74.79	18.36	56.43	- 0.26
Mid-priced	59.84	N/A	59.84	71.94	17.95	53.99	- 0.33
Economy	24.56	N/A	25.56	20.77	7.37	13.40	- 1.65

Notes: NoT = Net-of-Tax price, M = Currency (Maloti), N/A = No data

Table 14 displays the average real prices, tax and net-of-tax prices for a standardised pack of 20 cigarettes before and after the levy. In formal outlets, the reported price of a premium brand increased by M13.98 from M50.86 to M64.84. The price of Mid-priced brands increased by M11.37 from M46.55 to M57.92. For economy brands, the price decreased by M8.69 from M25.75 to 17.06. The net-of-tax (NoT) price for premium, mid-priced and economy brands decreased by M1.28, M2.60 and M16.42. In all the price segments in formal outlets, the average price increased by less than the increase in the tax amount. For instance, the tax increased by M15.26 with an average increase in the price of M13.98 for premium brands in formal outlets. The tax increase is larger than the change in the NoT price and hence the change in the average price. The tax pass-through parameter is less than zero in all brand segments and outlet type. This indicates that the levy has been undershifted. The undershifting behaviour is more pronounced in the economy brands.

Looking at informal outlets, the table also indicates that taxes increased more than the increase in the average price in all price segments. That is, the net-of-tax price declined in each price segment when the tax increased. Thus, even in informal outlets, the results indicate that the tax increase was undershifted in all price segments.

4.2.2 Econometric analysis

As described in the methodology section, this part of the dissertation uses regression analysis to isolate the impact of the tax increase on the real price of cigarettes across different brand segments. The DID specifications outlined in the method section are presented. First, the treatment and control DID estimation is presented for formal retail outlets using South Africa and Namibia as controls for multinational brands. Secondly, the results for specification on informal stores are presented but, in this case, using South Africa as a control. This specification further provides an extension of the tax effect that also includes regional brands that seem to be prevalent only in informal outlets. Overall, all these specifications estimate the effect of the tax increase on real cigarette prices of multinational and regional brands.

Table 15 presents the classic treatment versus control regression results with the natural logarithm of the real price as the dependent variable. The table columns are defined as follows: columns (1) and (2) represent the coefficients for the premium brand; columns (3) and (4) represent the coefficients for upper mid-priced brands while columns (5) and (6) present results for lower mid-priced brands. Each table presents two specifications: a baseline model with the key explanatory variables and an extended model that incorporates the full set of controls. In Table 15, the analysis focuses only on multinational brands.

All the regression coefficients are interpreted with the assumption of holding all else equal. Overall, the results of these specifications indicate that, compared to the control groups, the real prices of these respective brand segments in the treated group were significantly higher than their post-tax levels. The DID interaction coefficient in columns (1) and (2) suggests that the real price of a pack of standardised 20 cigarettes significantly increased in the post-levy period in Lesotho, compared to South Africa (in the post-levy period). Specifically, the premium brand prices were between $(e^{0.256} - 1)100\% = 29.18\%$ and 31% on average higher after the tax.

A significant increase in prices is also observed in the upper and lower mid-priced brands. Precisely, on average, the prices of upper mid-priced brands significantly increased by between 17.56% and 19.96 % after the tax, while the lower priced mid-brands increased by 16.53% higher than before the tax in Lesotho compared to South Africa. These results suggest that the tax effect is differentiated among brand segments, with relative prices of expensive brands

responding more on average to tax increases compared to those in the middle and lower brand segments.

Table 15: Tax effect using South Africa as a control for multinational brands in formal outlets

Variables	Premium brand	Premium brand	Upper MP brand	Upper MP brand	Lower MP brand	Lower MP brand
	(1)	(2)	(3)	(4)	(5)	(6)
Post	-0.056*** (0.005)	-0.051*** (0.005)	0.011** (0.004)	0.013*** (0.005)	-0.028*** (0.004)	-0.029*** (0.004)
Lesotho	-0.009 (0.008)	-0.064** (0.028)	0.042*** (0.012)	0.030 (0.033)	0.078*** (0.016)	0.077*** (0.019)
Lesotho*Post	0.270*** (0.016)	0.256*** (0.034)	0.162*** (0.016)	0.182*** (0.026)	0.219*** (0.025)	0.153*** (0.029)
<i>Packaging (Base=10 pack)</i>						
20-Pack		-0.007 (0.007)		0.007 (0.005)		
30-Pack				-0.016*** (0.005)		
Carton(200)		-0.055*** (0.019)		-0.022 (0.028)		
<i>District (Base=Berea)</i>						
Butha-Buthe		0.037 (0.029)		0.052 (0.040)		0.010 (0.021)
Leribe		0.058 (0.046)		-0.006 (0.042)		
Maseru		0.050* (0.028)		0.0083 (0.035)		-0.010 (0.034)
Constant	3.932*** (0.004)	3.952*** (0.009)	3.788*** (0.003)	3.783*** (0.008)	3.469*** (0.003)	3.472*** (0.002)

Observations	4,563	4,563	5,548	5,548	2,206	2,206
R-squared	0.054	0.061	0.027	0.039	0.186	0.195

Source: Author's own computations from African Cigarette Prices data, 2022-2024. *Notes:* MP represents mid-priced. Robust standard errors are in parentheses. The asterisk ***,** and * indicate the level of significance at 1%, 5% and 10% respectively.

Another estimate of the effect of tax increase on the prices of multinational brands is presented in Table 16 below, with Namibia as a control group for the same brands used in Table 15. This Table shows the estimated effect only on the packs of 20 cigarettes as there were no other packing types in the sample in Namibia for the retail outlets. The overall results in this table indicate similar outcomes to Table 15, that the real prices of multinational brands when using Namibia as a control group significantly increased in the sample in Lesotho after the levy. Specifically, the real price of the premium brand was between 15.14% and 16.77% significantly higher in Lesotho compared to in Namibia after the levy. On the other hand, the prices of upper and lower middle brands were between 8.60% and 16.65%, significantly higher on average in Lesotho, compared to in Namibia after the levy. Again, these results indicate that incremental changes in prices are higher, on average, for premium brands than other less expensive segments.

Table 16: Tax effect using Namibia as a control for multinational brands in formal outlets

VARIABLES	Premium brand	Premium brand	Upper MP brand	Upper MP brand	Lower MP brand
	(1)	(2)	(3)	(4)	(5)
Post	0.067*** (0.010)	0.072*** (0.011)	0.049*** (0.011)	0.053*** (0.012)	0.109*** (0.014)
Lesotho	-0.055*** (0.012)	-0.091*** (0.034)	0.030* (0.018)	0.024 (0.050)	0.044** (0.028)
Lesotho*Post	0.141*** (0.023)	0.155*** (0.042)	0.103*** (0.024)	0.154*** (0.036)	0.083*** (0.028)
<i>District (Base=Berea)</i>					
Butha-Buthe		0.044 (0.033)		0.072 (0.059)	
Leribe		0.016 (0.054)		-0.062 (0.060)	
Maseru		0.059* (0.032)		0.001 (0.050)	
Constant	3.970*** (0.009)	3.956*** (0.014)	3.810*** (0.010)	3.798*** (0.015)	3.502*** (0.012)
Observations	513	513	1,250	1,250	497
R-squared	0.239	0.247	0.044	0.048	0.217

Source: Author's own computations from African Cigarette Prices data, 2022-2024. *Notes:* Robust standard errors are in parentheses. The asterisk ***, ** and * indicate the level of significance at 1%, 5% and 10% respectively.

Overall, the tax effect on multinational brands from the perspective of formal retail outlets illustrate a significant increase in the real price of a pack of 20 cigarettes. However, the price effects are much higher when using South Africa as a control group than Namibia. Indeed, this is dependent on the changes in prices of the control groups in the post-tax period. The use of these two control groups provides the case where changes in prices in the post-period were different, although the trends were parallel in the pre-tax period. In sum, tables 15 and 16 show that in formal outlets, the DID estimates for the premium brand were at least 16.77% higher on average, followed by the upper and lower mid-priced brands that were at least 16.65% and 8.60% significantly higher than before tax in the sample in Lesotho, taking into account both control groups.

Table 17: Tax effect using South Africa as a control for multinational and regional brands in informal stores

Variables	Premium brand (1)	Premium brand (2)	Upper MP brand (3)	Upper MP brand (4)	Regional brand (5)	Regional brand (6)
Post	-0.021 (0.013)	-0.024** (0.011)	0.009 (0.011)	-0.012 (0.010)	-0.033 (0.028)	0.016 (0.018)
Lesotho	0.014 (0.011)	-0.082*** (0.016)	0.153*** (0.019)	0.069*** (0.012)	0.362*** (0.030)	0.052 (0.052)
Lesotho*Post	0.218*** (0.014)	0.248*** (0.012)	0.175*** (0.013)	0.214*** (0.012)	-0.110*** (0.035)	-0.199*** (0.026)
Street Vendor		0.093*** (0.006)		0.061*** (0.005)		0.002 (0.012)
<i>Packaging type (Base = Single Sticks)</i>						
20-Pack		-0.229*** (0.009)		-0.236*** (0.008)		-0.367*** (0.015)
30-Pack				-0.304*** (0.015)		
Carton (200)						-0.614*** (0.040)
<i>District (Base=Berea)</i>						
Butha-Buthe		-0.039*** (0.008)		-0.045*** (0.010)		0.004 (0.146)
Leribe		0.003 (0.010)		-0.010 (0.011)		0.144*** (0.054)
Maseru		-0.010 (0.007)		-0.012** (0.005)		0.111** (0.050)
Constant	4.097*** (0.011)	4.135*** (0.015)	3.935*** (0.010)	3.992*** (0.011)	2.684*** (0.023)	2.938*** (0.022)

Observations	2,702	2,681	3,337	3,314	1,953	1,952
R-squared	0.153	0.512	0.331	0.611	0.193	0.475

Source: Author's own computations using African Cigarette Prices data, 2022-2024. *Notes:* MP= Mid-priced brands. Robust standard errors are in parentheses. The asterisk ***,** and * indicate the level of significance at 1%, 5% and 10% respectively.

Table 17 presents the regression results of the tax increase on both multinational and regional brands in informal outlets using South Africa as a control group. Columns (1) and (2) represent the regression coefficients for premium brands with and without controls. Columns (4) and (6) present results for mid-priced and regional brands with controls. The table shows that in informal outlets, the real price of a pack of 20 cigarettes increased significantly on average, by between 24.36% and 28.15% in Lesotho, compared to South Africa after the levy. For mid-priced brands, the real prices were on average between 19.12% and 23.86% higher than the pre-tax levels in Lesotho than in South Africa.

Looking at the regional brands, the change in prices moved in the opposite direction compared to that of multinational brands. The results indicate that the average prices of regional brands were between 11.63% and 22.02%, significantly lower in Lesotho than in South Africa after the levy. Indeed, this indicates that there are brands in informal outlets whose prices did not rise with the tax increase. This result is particularly interesting because this set of brands is not available in formal outlets. Also, this finding is not surprising as it has been well documented that, after tax increases, the tobacco industry may either introduce new brand varieties, fix prices of cheap brands, or even reduce them to maintain the consumer base of these brands.

5. DISCUSSION

This chapter discusses the empirical findings of this study. The discussions are made in light of the study's objectives and compared with relevant theoretical and empirical literature to provide context and draw meaningful conclusions. The discussion begins with the results of the cigarette price landscape, followed by an examination of the availability of illicit cigarettes. Furthermore, a discussion of the results on the effect of the levy on cigarette prices is presented – analysed using the tax pass-through and the difference-in-differences (DID) approaches. The chapter concludes with the study's limitations.

5.1 On the cigarette price differences by brand, packaging type, stores and district

Cigarette prices in the sample vary significantly by brand, store type, packaging type, and location. The differences in prices persist over time. The results (Table 2) show that the difference between premium and mid-priced brands is less pronounced than between mid-priced and economy brands. These results suggest that there is a wide price gap between cheap and expensive brands, with expensive brands being more than two times the price of economy brands. This is in line with Chinembiri (2018) who found similarly large differences between brands in the sample from Lesotho. These results are also in line with other studies in Zambia (Salloum et al., 2015), Minnesota in the US (Toomey et al., 2009), and those in the five Southeast Asian countries (Indonesia, Cambodia, Lao PDR, Philippines and Vietnam) (Liber et al., 2015)

In terms of packaging type, the results show that the average price of a standardised pack of 20 single cigarettes is consistently higher than those sold in packs of 10, 20, 30 and 200 (cartons). This suggests that cigarette prices are cheaper when sold in larger quantities. This is consistent with the findings of Van Der Zee et al. (2020) and Gallien et al. (2024) in South Africa, although Van Der Zee et al. (2020) found the highest prices being those sold in a pack of 10 cigarettes instead of single sticks. This may be explained by the fact that packs of 10 cigarettes are sold for brands Dunhill and Peter Stuyvesant, which are relatively expensive. Whereas packs of 20 sticks are sold for the majority of brands which comprise both very cheap and expensive brands. Thus, the more prices of single sticks collected for cheap brands may pull down the average price. In addition, informal store owners purchase cigarettes in packs in order to sell them as

single sticks for a profit margin. This also explains why the average prices in retail outlets are significantly lower than those in street vendors and spaza shops which mostly sell loose cigarettes.

Regarding cigarette price differences by district, the results indicate that average prices are higher in rural areas compared to urban areas in the sample. For instance, average prices in Mokhotlong (rural) were M52.30 between 2019 and 2020, compared to M47.10 for those in Leribe (urban). Higher prices in rural areas could be a result of retailers incurring large distribution costs of purchasing bulky cigarettes in urban areas. The higher average prices could also depend on the type of brands (i.e., expensive or cheap) that are sold, given the levels of poverty that exist in those areas, in line with the results by Keller-Hamilton et al. (2020) in Ohio.

The trends in real cigarette prices between price categories in formal and informal outlets reveal that the real prices in price segments, both in formal and informal outlets decreased between 2016 and 2022 except for the premium segment in formal outlets. For informal outlets, this may be explained by the sale of single sticks that tend to be clustered around currency denominations. This suggests that small incremental changes in the excise taxes may not be passed on to the retail prices because of the stickiness of loose cigarette prices. Thus, it may require large changes in the excise taxes for changes in prices to be larger than inflation and income growth. The decline in prices over time is in line with Stoklosa et al. (2019) who found that the real prices of factory-made cigarettes in Zambia decreased from 2002 up to 2016.

The increase in the premium brand price over time may indicate the possibility that increases in taxes are differentially imposed across different price segments, with taxes being shifted more on premium brands. This may lead to prices increasing higher than inflation. This finding is consistent with those of Gilmore et al. (2013) who found increasing real prices of premium, mid-priced and economy brands in the UK, while real prices of ultra cheap brands remained unchanged. These findings suggest that if a similar trend of declining real prices over time could occur even after the government's implementation of a tax increase in 2023 (which increased the real prices), the public health efforts of reducing cigarette use will be undermined. This is because cigarettes would be more affordable over time and become more accessible to young people.

5.2 On the availability of illicit cigarettes

Overall, 19.3% of all cigarette prices in the sample from 2016 to early 2024 were below the MLP, thus probably illicit. In 2016 and 2017, the share of prices below MLP was below 0.7%. In 2018, this share substantially increased to 41.9% because of the introduction of less expensive brands in the sample. Before the tax increase in 2022, the proportion of prices below MLP was 21.7%. After the tax increase, the share of illicit prices substantially increased to 50.3% in 2023 and to 57.9% in early 2024. These results suggest that prices collected after the tax increase were substantially below the MLP. The increase in the size of illicit prices is in line with the study by Van Der Zee (2023) who found that, for the Zimbabwean Pacific Cigarette Company, the size of illicit prices increased over time.

As shown in Table 4.2.2, the majority of local brands in the economy segment had a pack of 20 cigarettes selling for about M20.00 (an equivalent of M1.00 per stick) in 2024. These average prices are far below the estimated MLP of M31.74 for 2023 and M28.10 for 2024 per pack of 20 cigarettes. Therefore, the wide availability of these illicit cigarettes after tax may have contributed to a large increase in the size of illicit prices.

The multinational cigarette producers had among the lowest share of prices below the MLP. BAT had 0.2%, JTI had 0.1% and PMI had close to zero. Local producers had among the highest shares. When comparing the share of illicit prices before and after the levy, the results indicate an increase in the share of illicit prices for the multinationals (except PMI) and local brands after the levy. However, the increase was more pronounced for local brands. This may indicate that multinational companies are more obedient to tax increases compared to local producers. In addition, they may want to cover increased distribution costs.

Most notably, the local brands were only sold in informal outlets. Alarming, the data indicates that some informal stores even go as far as selling these brands of cigarettes in packs of 20 and cartons, which runs counter to the common understanding that informal outlets usually sell single cigarettes. This then suggests that there is a possibility that these cigarettes are smuggled and/or bootlegged from neighbouring countries.

5.3 On the effect of the levy on real cigarette prices in formal and informal outlets

On one hand, the results show that the real prices of multinational brands increased with increases in the levy, both in formal and informal outlets, although it appears that the industry undershifted the tax increase. On the other hand, prices of regional brands in informal outlets declined in response to tax increases. For instance, the real price of a premium brand significantly increased by at least 15.5% in formal and informal outlets, considering Namibia and South Africa as control groups. The real price of mid-priced (upper and lower) brands increased by at least 8.3% in the formal and informal outlets. These results suggest that the tax increase resulted in increases in prices of premium brands that are higher than for mid-priced brands. This is consistent with other studies that found that increases in prices were lower for lower priced cigarettes and higher for the higher priced cigarettes in the UK, US and New Zealand (Gilmore et al., 2013; Ma & Golden, 2024; Marsh et al., 2016).

In informal outlets, the real average price of multinational brands significantly increased while the real price of regional brands significantly decreased after the tax. In Lesotho, this may be explained by the introduction of new regional brands that are only available in informal outlets and are probably illicit. This also indicates that sellers of these brands are not worried about the excise tax. This result contradicts that of Mengesha and Ross (2024) who found that after the tax increase in Ethiopia, the real prices of illicit brands increased faster than those of legal cigarettes. However, the results are consistent with Saenz-de-Miera et al. (2010) in Mexico who used a sample from informal convenience stores and found that price increases were higher for international brands than domestic brands.

5.4 On the limitations of the study

The results in this dissertation are not nationally representative because the ACP data is a non-nationally representative survey of retail outlets. However, because the retail survey data in African countries is scarce, the sample ACP data in Lesotho provides relatively large price observations as the data have been collected over multiple years. This is helpful as the data provides some time series variation in cigarette prices which is absent in most studies as longitudinal surveys are usually costly. The findings of this dissertation are similar to most of the studies conducted in this area.

The ACP data in Lesotho was mostly collected in informal outlets. In the econometric analysis, the use of two countries as the control group was mainly due to the lack of informal cigarette price data in Namibia in the periods of interest. This may be because the fieldworkers in Namibia (a smaller country similar to Lesotho) were only interested in collecting data mostly in formal outlets. The use of South Africa as a control group was because of the presence of similar cigarettes to Lesotho, hence facilitating comparison. South Africa has a problem of massive illicit trade in cigarettes. However, the prices in the sample for Lesotho were responsive to tax increases while others were not. The fact that most brands in formal and informal outlets responded to tax increases indicates some form of independence in price-setting behaviour of retailers in the sample in Lesotho.

6. CONCLUSION AND POLICY RECOMMENDATIONS

This dissertation provided a landscape of cigarette prices in the sample in Lesotho, over the years 2016 to 2024, looking at both legal and illicit cigarettes. In addition, the government of Lesotho implemented a tobacco levy in 2023. The dissertation also investigated how the price landscape changed in response to this levy. The results revealed that cigarette prices significantly differ by brand, outlet types, packaging formats and districts. Real cigarette prices seem to decline over time in formal and informal outlets. Results also indicate that the tobacco industry's response towards an increase in excise tax showed that among formal and informal outlets, the industry undershifted the tax increase in all price segments. The undershifting behaviour was even more pronounced in economy brands. Research shows that this is common in LMICs.

Further, the results indicated that illicit prices are largely available, and their size is increasing over the years. These prices are far below the estimated minimum legal price, which may reduce the incentive to quit smoking by the youth. Even worse, very cheap cigarettes may lure non-smokers to start smoking, or quitters to relapse back to smoking. Again, cheap cigarettes are bad for health. They are also very bad for the government – they indicate lawlessness and possible organised crime. The government is missing out on revenues that they should be collecting.

The findings on the proportion of brands priced below the minimum legal price are particularly interesting. Illicit trade remains a significant issue and is often portrayed as separate from the legal tobacco industry. However, these results highlight that the problem is more interconnected than commonly assumed. The presence of brands priced below the minimum legal price suggests that illicit activity may be occurring within or alongside the formal industry, undermining government efforts to enforce levies and taxation.

The regression results revealed that the real cigarette prices of multinational brands in formal and informal outlets significantly increased in response to tax while the real prices of regional brands significantly declined.

The results of this dissertation lead to several policy recommendations. First, each brand that operates in Lesotho should have a registered owner and the Revenue Services Lesotho (RSL) should keep track of these brands. This could be done through the government implementing a track and trace system to prevent and counter the likely illicit brands. The RSL's recent

momentum of destroying unknown brands in Maseru, which are similar to those found in this dissertation (i.e., Boss, Ossum, Red & Black, Chief, and Cape) and are probably illicit should be maintained and extended to all other districts.

Lesotho did well by implementing the TAPL Act in 2023 in an attempt to improve public health and hence reduce tobacco use. However, given that the results indicate a wide availability of illicit prices, Lesotho should further ratify the Protocol to Eliminate Illicit Trade in Tobacco Products in recognition of the importance of combating illicit trade. This will not only protect public health but also ensure that the revenue generation is maximised and used for the nation's development.

Lastly, results highlight a widely available and accessible sale of single sticks. The sale of loose cigarettes has been associated with lower intentions to quit smoking, particularly by youth. The government should take strong action to control this problem. Therefore, this dissertation recommends that Lesotho ban the sale of single sticks to reduce their availability and accessibility as they are also affordable. This will require strong political will by the government if it takes public health seriously.

Botswana is in a very similar position to Lesotho – a SACU member, imports cigarettes from South Africa and has implemented a health levy. Botswana managed to implement strong border controls, and they do not suffer from the same illicit trade that Lesotho has (Van Der Zee & Van Walbeek, 2019). There is not much research, but the same situation seems to be the case for Namibia – there are barely any singles or cheap cigarettes in the Namibia data, suggesting they might be doing something right. Just because Lesotho is a trade partner and neighbour of South Africa does not mean that Lesotho needs to give up their tobacco control fight.

REFERENCE LIST

- African Tobacco Control Alliance. (2018). *Sale of Single Sticks of Cigarettes in Africa: Survey Report from 10 Capital Cities*. <https://www.atca-africa.org/wp-content/uploads/2021/04/Report-Sale-of-Single-Sticks-in-Africa.pdf>. [2024, December 6].
- Anderson, P. L., McLellan, R. D., Overton, J. P., & Wolfram, G. L. (1997). Price elasticity of demand. *McKinac Center for Public Policy*. Accessed October, 13(2).
- Anderson, S. P., de Palma, A., & Kreider, B. (2001). Tax incidence in differentiated product oligopoly. *Journal of Public Economics*, 81(2), 173–192.
- Becker, G. S., Grossman, M., & Murphy, K. M. (1990). An Empirical Analysis of Cigarette Addiction. NBER Working Paper No. w3322. Available at SSRN: <https://papers.ssrn.com/abstract=226658>.
- Berthet Valdois, J., Van Walbeek, C., Ross, H., Soondram, H., Jugurnath, B., Chan Sun, M., & Mohee, D. (2019). Tobacco industry tactics in response to cigarette excise tax increases in Mauritius. *Tobacco Control*, 29, e115-e118. <https://doi.org/10.1136/tobaccocontrol-2019-055196>
- Blecher, E., & Drope, J. (2014). The rewards, risks and challenges of regional tobacco tax harmonisation. *Tobacco Control*, 23, e7–e11. <https://doi.org/10.1136/tobaccocontrol-2013-051241>
- Brock, B., Choi, K., Boyle, R. G., Moilanen, M., & Schillo, B. A. (2016). Tobacco product prices before and after a statewide tobacco tax increase. *Tobacco Control*, 25(2), 166–173. <https://doi.org/10.1136/tobaccocontrol-2014-052018>
- Cevik, S. (2016). *Smoke Screen: Estimating the Tax Pass-Through to Cigarette Prices in Pakistan*. (IMF Working Paper No. WP/16/179). International Monetary Fund. <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Smoke-Screen-Estimating-the-Tax-Pass-Through-to-Cigarette-Prices-in-Pakistan-44246>
- Chaloupka, F. J., & Warner, K. E. (1999). *The Economics of Smoking*. NBER Working Paper No. w7047). National Bureau of Economic Research. <https://doi.org/10.3386/w7047>.
- Chaloupka, F. J., & Tauras, J. A. (2020). Taxation of emerging tobacco products. *Journal of Medicine*, 373, 594-597
- Chang, K., Mayne, E., Laverty, A. A., Agaku, I., & Filippidis, F. T. (2021). Cigarette prices in eight sub-Saharan African countries in 2018: A cross-sectional analysis. *BMJ Open*, 11(10), e053114. <https://doi.org/10.1136/bmjopen-2021-053114>
- Chinembiri, T. (2018). An analysis of cigarette prices and affordability in Africa: Evidence from African Cigarette Prices (ACP) Data. Master's Thesis. University of Cape Town.
- Dare, C., Boachie, M. K., Tingum, E. N., Abdullah, S. M., & van Walbeek, C. (2021). Estimating the price elasticity of demand for cigarettes in South Africa using the Deaton approach. *BMJ open*, 11(12), e046279.

- Delipalla, S., & Keen, M. (1992). The comparison between ad valorem and specific taxation under imperfect competition. *Journal of Public Economics*, 49(3), 351–367. [https://doi.org/10.1016/0047-2727\(92\)90073-O](https://doi.org/10.1016/0047-2727(92)90073-O)
- De Ojeda, A., Barnoya, J., & Thrasher, J. F. (2013). Availability and costs of single cigarettes in Guatemala. *Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco*, 15(1), 83–87. <https://doi.org/10.1093/ntr/nts087>.
- Drope J, Schluger N, Cahn Z, Drope J, Hamill S, Islami F, Liber A, Nargis N, Stoklosa M. (2018). The Tobacco Atlas. Atlanta: American Cancer Society and Vital Strategies. https://theunion.org/sites/default/files/2020-12/TobaccoAtlas_6thEdition_LoRes.pdf
- Drope, J., Oo, S. M. T., Dorokhina, M., Guerrero, C., Rodriguez-Iglesias, G., Mugosa, A., Mirza, M., Bontu, A., & Chaloupka, F. (2024). *Tobacconomics cigarette tax scorecard* (3rd ed.). www.tobacconomics.org
- Filby, S., Van Walbeek, C., & Pan, L. (2024). Cigarette excise tax structure and cigarette prices in nine sub-Saharan African countries: Evidence from the Global Adult Tobacco Survey. *Tobacco Control*, 33(2), 208–214. <https://doi.org/10.1136/tc-2022-057414>
- Filby, S. (2025). A Cross-Country Study of Cigarette Affordability and Single-Stick Purchases Using Survey Data From African Countries. *Nicotine & Tobacco Research*, 27(4), 611–619. <https://doi.org/10.1093/ntr/ntae097>
- Gallien, M., Occhiali, G., & Ross, H. (2024). An overlooked market: Loose cigarettes, informal vendors and their implications for tobacco taxation. *Tobacco Control*, 33: 720–726 <https://doi.org/10.1136/tc-2023-057965>.
- Gilmore, A. B., Tavakoly, B., Taylor, G., & Reed, H. (2013). Understanding tobacco industry pricing strategy and whether it undermines tobacco tax policy: The example of the UK cigarette market. *Addiction*, 108(7), 1317–1326. <https://doi.org/10.1111/add.12159>.
- Hall, M. G., Fleischer, N. L., Reynales-Shigematsu, L. M., Arillo-Santillan, E., & Thrasher, J. F. (2015). Increasing availability and consumption of single cigarettes: Trends and implications for smoking cessation from the ITC Mexico Survey. *Tobacco Control*, 24, iii64–iii70. <https://doi.org/10.1136/tobaccocontrol-2014-051690>
- Hanson, A., & Sullivan, R. (2009). The Incidence of Tobacco Taxation: Evidence from Geographic Micro-Level Data. *National Tax Journal*, 62(4), 677–698. <https://doi.org/10.17310/ntj.2009.4.05>
- Hiscock, R., Branston, J. R., McNeill, A., Hitchman, S. C., Partos, T. R., & Gilmore, A. B. (2018). Tobacco industry strategies undermine government tax policy: Evidence from commercial data. *Tobacco Control*, 27(5), 488–497. <https://doi.org/10.1136/tobaccocontrol-2017-053891>.
- Hiscock, R., Branston, J. R., Partos, T. R., McNeill, A., Hitchman, S. C., & Gilmore, A. B. (2019). UK tobacco price increases: Driven by industry or public health? *Tobacco Control*, 28, e148–e150. <https://doi.org/10.1136/tobaccocontrol-2019-054969>

- Husain, M. J., English, L. M., & Ramanandraibe, N. (2016). An overview of tobacco control and prevention policy status in Africa. *Preventive Medicine*, 91S, S16–S22. <https://doi.org/10.1016/j.ypmed.2016.02.017>.
- IARC. (2011). *Handbooks of Cancer Prevention, Tobacco Control, Vol. 14: Effectiveness of Tax and Price Policies for Tobacco Control*. Lyon: World Health Organisation.
- Ipsos. (2024). *Cigarette retail & wholesale price research*. British American Tobacco South Africa. [https://www.batsa.co.za/content/dam/endmarkets/za/en/download/media/press-releases/2024/Report - Ipsos Cigarette Retail Wholesale Price Research.pdf](https://www.batsa.co.za/content/dam/endmarkets/za/en/download/media/press-releases/2024/Report_-_Ipsos_Cigarette_Retail_Wholesale_Price_Research.pdf). [2025, November 25]
- Keller-Hamilton, B., Ferketich, A. K., Berman, M., Conrad, E., & Roberts, M. E. (2020). Cigarette Prices in Rural and Urban Ohio: Effects of Census Tract Demographics. *Health Promotion Practice*, 21, 37S–43S. <https://doi.org/10.1177/1524839919881141>
- Kostova, D., Chaloupka, F. J., Yurekli, A., Ross, H., Cherukupalli, R., Andes, L., Asma, S., & on behalf of the GATS Collaborative Group. (2014). A cross-country study of cigarette prices and affordability: Evidence from the Global Adult Tobacco Survey. *Tobacco Control*, 23(1), e3–e3. <https://doi.org/10.1136/tobaccocontrol-2011-050413>.
- Lal, P., Kumar, R., Ray, S., Sharma, N., Bhattacharya, B., Mishra, D., Sinha, M. K., Christian, A., Rathinam, A., & Singh, G. (2015). The Single Cigarette Economy in India—A Back of the Envelope Survey to Estimate its Magnitude. *Asian Pacific Journal of Cancer Prevention*, 16(13), 5579–5582. <https://doi.org/10.7314/APJCP.2015.16.13.5579>.
- Lesotho Revenue Authority. (2018). *LRA Confiscates cigarettes worth over a million*. <https://www.rsl.org.ls/sites/default/files/201811/RG%20confiscated%20at%20Maseru%20Bridge.pdf> [2024, November 5].
- Liber, A. C., Ross, H., Ratanachena, S., Dorotheo, E. U., & Foong, K. (2015). Cigarette price level and variation in five Southeast Asian countries. *Tobacco Control*, 24(e2), e137–e141. <https://doi.org/10.1136/tobaccocontrol-2013-051184>.
- Licht, A. S., Hyland, A. J., O'Connor, R. J., Chaloupka, F. J., Borland, R., Fong, G. T., Nargis, N., & Cummings, K. M. (2011). How do price minimising behaviours impact smoking cessation? Findings from the International Tobacco Control (ITC) Four Country Survey. *International Journal of Environmental Research and Public Health*, 8(5), 1671–1691. <https://doi.org/10.3390/ijerph8051671>.
- Linegar, D. J., & Van Walbeek, C. (2018). The effect of excise tax increases on cigarette prices in South Africa. *Tobacco Control*, 27(1), 65–71. <https://doi.org/10.1136/tobaccocontrol-2016-053340>.
- Ma, H., & Golden, S. D. (2024). Impact of New York City Cigarette Floor Price Policy on Reducing Smoking Disparities. *Nicotine & Tobacco Research*, 26(11), 1504–1511. <https://doi.org/10.1093/ntr/ntae122>
- Marsh, L., Cameron, C., Quigg, R., Hoek, J., Doscher, C., McGee, R., & Sullivan, T. (2016). The impact of an increase in excise tax on the retail price of tobacco in New Zealand.

- Tobacco Control*, 25(4), 458–463. <https://doi.org/10.1136/tobaccocontrol-2015-052259>
- Mengesha, S. D., & Ross, H. (2024). Response of legal and illegal cigarette prices to a tax increase in Ethiopia. *Tobacco Control*, 33(5), 648–653. <https://doi.org/10.1136/tc-2023-057931>
- Partos, T. R., Gilmore, A. B., Hitchman, S. C., Hiscock, R., Branston, J. R., & McNeill, A. (2018). Availability and Use of Cheap Tobacco in the United Kingdom 2002–2014: Findings From the International Tobacco Control Project. *Nicotine & Tobacco Research*, 20(6), 714–724. <https://doi.org/10.1093/ntr/ntx108>
- Saenz-de-Miera, B., Thrasher, J. F., Chaloupka, F. J., Waters, H. R., Hernandez-Avila, M., & Fong, G. T. (2010). Self-reported price of cigarettes, consumption and compensatory behaviours in a cohort of Mexican smokers before and after a cigarette tax increase. *Tobacco Control*, 19(6), 481–487. <https://doi.org/10.1136/tc.2009.032177>
- Sáenz De Miera Juárez, B., Thrasher, J. F., Reynales Shigematsu, L. M., Hernández Ávila, M., & Chaloupka, F. J. (2014). Tax, price and cigarette brand preferences: A longitudinal study of adult smokers from the ITC Mexico Survey. *Tobacco Control*, 23, i80–i85. <https://doi.org/10.1136/tobaccocontrol-2012-050939>
- Salloum, R. G., Goma, F., Chelwa, G., Cheng, X., Zulu, R., Kaai, S. C., Quah, A. C. K., Thrasher, J. F., & Fong, G. T. (2015). Cigarette price and other factors associated with brand choice and brand loyalty in Zambia: Findings from the ITC Zambia Survey. *Tobacco Control*, 24, iii33–iii40. <https://doi.org/10.1136/tobaccocontrol-2014-051878>
- Sheikh, Z. D., Branston, J. R., Van der Zee, K., & Gilmore, A. B. (2025). How has the tobacco industry passed tax changes through to consumers in 12 sub-Saharan African countries? *Tobacco Control*, 34(1), 48–58. <https://doi.org/10.1136/tc-2023-058054>
- Sheikh, Z. D., Branston, J. R., Llorente, B. A., Maldonado, N., & Gilmore, A. B. (2024). Tobacco industry pricing strategies for single cigarettes and multistick packs after excise tax increases in Colombia. *Tobacco Control*, 33(1), 59–66. <https://doi.org/10.1136/tobaccocontrol-2022-057333>
- Shortt, N. K., Tunstall, H., Mitchell, R., Coombes, E., Jones, A., Reid, G., & Pearce, J. (2021). Using point-of-sale data to examine tobacco pricing across neighbourhoods in Scotland. *Tobacco Control*, 30(2), 168–176. <https://doi.org/10.1136/tobaccocontrol-2019-055484>
- Singh, M., Dogra, V., Kumar, R., & Kumar, A. M. V. (2017). “Loose” cigarettes association with intensity of smoking: A secondary data analysis from Global Adult Tobacco Survey, India, 2009–10. *Journal of the Scientific Society*.
- Stoklosa, M., Goma, F., Nargis, N., Drope, J., Chelwa, G., Chisha, Z., & Fong, G. T. (2019). Price, tax and tobacco product substitution in Zambia: Findings from the ITC Zambia Surveys. *Tobacco Control*, 28, s45–s52. <https://doi.org/10.1136/tobaccocontrol-2017-054037>

- Sullivan, R. S., & Dutkowsky, D. H. (2012). The Effect of Cigarette Taxation on Prices: An Empirical Analysis Using Local-Level Data. *Public Finance Review*, 40(6), 687–711. <https://doi.org/10.1177/1091142112442742>
- Sunday Express. (2015). *Tobacco Control Bill*. <https://sundayexpress.co.ls/tobacco-control-bill> [2025, January 10].
- The Post. (2019). *Storm over tobacco. Alcohol, levy*. <https://mobi.thepost.co.ls/storm-over-alcohol-tobacco-levy/> [2024, March 6]
- Tobaconomics. (2019). Health Taxes to Save Lives: Employing Effective Excise Taxes on Tobacco, Alcohol, and Sugary Beverages [Report]. <https://www.tobaconomics.org/files/research/512/Health-Taxes-to-Save-Lives-Report.pdf>. [2025, November 1]
- Toomey, T. L., Chen, V., Forster, J. L., Van Coevering, P., & Lenk, K. M. (2009). Do cigarette prices vary by brand, neighborhood, and store characteristics? *Public Health Reports (Washington, D.C.: 1974)*, 124(4), 535–540. <https://doi.org/10.1177/003335490912400410>
- Van Der Zee, K. (2023). *The Pacific Cigarette Company in the South African and Zimbabwean Cigarette Markets*. Cape Town: Research Unit on the Economics of Excisable Products (REEP), University of Cape Town.
- Van Der Zee, K., & Van Walbeek, C. (2019). Botswana, Lesotho and South-Africa: An analysis of Alcohol and Cigarette Prices in Maseru, Gaborone, and Neighbouring South African Towns. In (name of Editor (Ed)) *Confronting Illicit Tobacco Trade: A global review of country experiences*.
- Van Der Zee, K., Van Walbeek, C., & Magadla, S. (2020a). Illicit/cheap cigarettes in South Africa. *Trends in Organized Crime*, 23(3), 242–262. <https://doi.org/10.1007/s12117-019-09372-9>
- Van Der Zee, K., Vellios, N., Van Walbeek, C., & Ross, H. (2020b). The illicit cigarette market in six South African townships. *Tobacco Control*, 29(Suppl 4), s267–s274. <https://doi.org/10.1136/tobaccocontrol-2019-055136>
- Van Der Zee, K., & Mthembu, S. (2024). Description of the African Cigarette Prices Project Data. *Data in Brief*, 54, 110434. <https://doi.org/10.1016/j.dib.2024.110434>.
- Van Walbeek, C., & Shai, L. (2015). Are the tobacco industry's claims about the size of the illicit cigarette market credible? The case of South Africa. *Tobacco Control*, 24(e2), e142–146. <https://doi.org/10.1136/tobaccocontrol-2013-051441>
- Vellios, N., Ross, H., & Perucic, A.M. (2018). Trends in cigarette demand and supply in Africa. *Plos One*, 13(8). <https://doi.org/10.1371/journal.pone.0202467>

- Vellios, N., Van Walbeek, C., & Ross, H. (2022). Measuring the illicit cigarette market in the absence of pack security features: A case study of South Africa. *Tobacco Control*, 31(4), 580–585. <https://doi.org/10.1136/tobaccocontrol-2020-056117>
- Von Lampe, K., Kurti, M., & Johnson, J. (2018). “I’m gonna get me a loosie”: Understanding single cigarette purchases by adult smokers in a disadvantaged section of New York City. *Preventive Medicine Reports*, 12, 182–185. <https://doi.org/10.1016/j.pmedr.2018.09.016>
- WHO. (2008). *WHO report on the Global Tobacco Epidemic, 2008: The MPOWER package*. Geneva: World Health Organization.
- WHO. (2019). *Tobacco Control playbook*. Geneva: World Health Organization. Available: <https://www.who.int/europe/publications/i/item/WHO-EURO-2019-3700-43459-61071> [2025, October 30]
- WHO. (2023). *WHO Report on the Global Tobacco Epidemic, 2023: Protect people from tobacco smoke*. Geneva: World Health Organization.
- World Bank. (2017). *Lesotho: Estimated Revenue Impact of Proposed Tobacco and Alcohol Levy*. Washington D.C: World Bank.

Appendix

Appendix A: Results of the sensitivity analysis for the overall share of illicit cigarettes

	Main analyses			Sensitivity analyses		
	Share (%)	LB	95% CI UP	Share (%)	LB	95% CI UP
	19.30	18.90	19.70			
MC = M2.50				19.24	18.83	19.64
MC = M3.00				19.30	18.90	19.70
MC = M3.50				23.09	22.67	23.52
Levy = 15%				19.30	18.90	19.70

MC = Manufacturing cost, LB=Lower bound, UP=Upper bound, CI = Confidence Interval

Appendix B: Parallel trends

