



Illicit/cheap cigarettes in South Africa

Kirsten van der Zee¹ · Corné van Walbeek¹ · Sibahle Magadla¹

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Abstract

Using wave 5 of the National Income Dynamics Study (conducted in 2017), this paper investigates the market for very low-priced cigarettes in South Africa, which, in all probability, are illicit. Since the sum of the excise tax and VAT in 2017 amounted to R16.30 (1.22 USD) per pack, any cigarettes selling for R20 (1.50 USD) per pack or less are likely to be illicit, assuming reasonable production costs. By this definition, approximately 30% of cigarettes consumed in South Africa in 2017 were illicit. Illicit cigarettes are found across all nine provinces. At the margin, the purchase of illicit cigarettes is associated with lower socio-economic characteristics, such as having lower levels of income and education. As illicit cigarettes undermine both the fiscal and health agendas of tobacco taxation policy, these results highlight the need for the South African government to implement urgently effective measures in order to curb illicit trade.

Keywords Cigarette prices · Tobacco control · Illicit trade · Tobacco industry · Tax enforcement

Introduction

The illicit trade in tobacco products poses a serious threat to public health because it increases access to tobacco by making cigarettes more affordable. People who otherwise might have quit smoking continue to smoke, and people who might never have started smoking initiate a habit that will cause them harm, and that they are likely to regret in the future (Pechacek et al. 2018). The illicit tobacco trade often has the biggest impact on individuals in low socio-economic groups, as these smokers are most sensitive to prices (International Agency for Research on Cancer 2011). The illicit

✉ Kirsten van der Zee
kirsten.vanderzee@uct.ac.za

¹ Research Unit on the Economics of Excisable Products (REEP), University of Cape Town, Cape Town, South Africa

trade also leads to a loss of government revenues, and often contributes to the funding of international criminal activities (Joossens and Raw 2012; World Health Organization 2013). It is therefore important to implement strong tobacco control policies, and to minimize the illicit trading of tobacco products.

For many years, South Africa was regarded as a model country in terms of tobacco control policy. In 1994, the country announced a strategy to increase excise taxes rapidly, with the explicit aim of reducing tobacco use, making it one of the first middle-income countries to do so (van Walbeek 2005). Between 1993 and 2003, aggregate cigarette consumption reduced by a third and adult smoking prevalence fell from roughly 33% to 24% (van Walbeek 2005). However, since 2004, the decrease in cigarette consumption and smoking prevalence has levelled off (Linegar and van Walbeek 2018).

The South African Revenue Service (SARS) is responsible for collecting excise taxes on locally produced and imported excisable products. For most of the post-2000 period, SARS was esteemed for its tax collection and enforcement capabilities, its use of modern technology, and its establishment of dedicated investigation units to pursue tax evaders (Judge Nugent 2018a, b). One of these investigation units was the High-Risk Investigative Unit (HRIU), which, together with other specialized units within SARS, collectively pursued tax evaders and those practising other forms of tax abuse in the tobacco industry. Under the codename “Project Honey Badger”, the then-head of the HRIU wrote to the two tobacco industry bodies (representing the majority of cigarette manufacturers) and other independent manufacturers in 2013 and 2014, warning them that SARS was aware of illicit activity in the industry, and that it would be intensifying its formal investigations into tobacco-tax evasion and other forms of tax abuse (Bailey 2013; Pauw 2017). By 2014, SARS had launched proceedings or was acting against at least 13 tobacco manufacturers for crimes including corruption, bribery, attempted murder, money laundering, racketeering, tax evasion and fraud (Pauw 2017).

In September 2014, then-president Jacob Zuma appointed a retired Commissioner of Correctional Services, Tom Moyane, as the new Commissioner of SARS. Within a month of becoming Commissioner, and following reports in the *Sunday Times*, South Africa’s largest newspaper, about the existence of a “rogue unit” within SARS, Moyane announced that he had no confidence in the SARS executive committee and disbanded it (Pauw 2017). The HRIU was identified as the “rogue unit” and was disbanded, together with a number of other specialized units in SARS. As a result, Project Honey Badger came to an abrupt end (Pauw 2017). In the months following Moyane’s appointment, many key executives and experienced officials, including the head of the HRIU, were suspended (Judge Nugent 2018a, b).

The appointment of Tom Moyane, a close ally of Jacob Zuma, is generally perceived as an integral part of “state capture”, which has cast a long shadow over Jacob Zuma’s presidency. State capture entails systemic and high-level political corruption, whereby the government’s decision-making processes and institutions are compromised in order to advance the interests of a small number of well-connected politicians and their allies. A judicial commission, under the chairmanship of Deputy Chief Justice Raymond Zondo, was established in 2018 to investigate state capture in South Africa. The report has not yet been published, but the evidence presented suggests that a large number of government departments and law enforcement agencies were “captured” by the

president and members in his circle (<https://www.sastatecapture.org.za/>). In the process, a number of private sector organisations have been accused of aiding and abetting the process of “state capture”.

In April 2016, the *Sunday Times* retracted its series of explosive articles—published between 2014 and 2015—about the SARS “rogue unit” (Pillay 2016; Siqoko 2016; van Loggerenberg 2016). It acknowledged that there were factual errors and omissions in its coverage of the story. In 2018, the *Sunday Times* again retracted these stories and acknowledged that they had allowed themselves to be manipulated by “a parallel political project aimed at undermining our democratic values and destroying state institutions and removing individuals who were seen as obstacles to this project” (Rupiah 2018). However, the damage to SARS and to the people implicated in the *Sunday Times* articles was irreversible.

The purging of SARS was so destructive to the organization that a dedicated Commission of Inquiry into the state of SARS was launched in 2018. The Nugent Commission, headed by Judge Robert Nugent, a retired judge of the Supreme Court of Appeal, found that “The restructuring of the organization displaced some 200 managerial employees from their jobs, many of whom ended up in positions that had no content or even job description, and in exasperation many skilled professionals have left. Others remain in supernumerary posts with their skills going to waste. Measures to counter criminality have been compromised and those who trade illicitly in commodities like tobacco operate with little constraint” (Judge Nugent 2018a, b). The final report by the commission also highlighted the growth in the illicit trade of cigarettes as one of the consequences of the institutional meltdown at SARS (van Walbeek et al. 2019).

In March 2018, the incoming president, Cyril Ramaphosa, suspended Mr. Moyane as the SARS Commissioner (Petersen 2018). He was officially removed from his position in November 2018, on recommendation of the Nugent Commission (Brown 2018; Judge Nugent 2018a, b).

Developments in the tobacco industry in South Africa

While SARS was failing, there were also major developments in the tobacco industry in South Africa. The industry has traditionally been highly concentrated, with British American Tobacco (BAT) having a market share in excess of 90%, followed by other multinationals (primarily Philip Morris and Japan Tobacco) (van Walbeek 2005). Despite new tobacco control legislation and substantial increases in the excise tax after 1994, the multinationals were able to increase their net-of-tax turnover by raising retail prices substantially (Linegar and van Walbeek 2018). Thus, even though the number of cigarettes sold decreased by about a third between 1994 and 2009, the real (inflation-adjusted) net-of-tax price per cigarette doubled, allowing the multinationals to maintain their profitability (Linegar and van Walbeek 2018). The large profits earned by the incumbent multinationals attracted the attention of competitors, which ultimately caused substantial disruption in the tobacco industry.

The year 2010 marked a turning point for South Africa’s tobacco sector. The illicit market, which was previously too small to affect industry profitability or government revenue significantly, increased significantly in 2010, to about 10% of the total cigarette market (van Walbeek 2014). After 2010, the multinationals’ market power was

threatened by small and medium-sized local cigarette producers. The new entrants' strategy was to undermine the incumbents by offering cigarettes at substantially lower prices. A large proportion of these cigarettes were sold at prices that were so low that it was impossible for the full tax amount to have been paid (Liedeman and Mackay 2015). There was also a noticeable drop in government excise revenue in 2010 (Fig. 1).

Over the past 10 years, the South African tobacco market has become increasingly fragmented as new entrants have entered the market and have taken market share away from the multinationals. The Tobacco Institute of Southern Africa (TISA) represents the multinationals and other established players, while the Fair-Trade Independent Tobacco Association (FITA) represents the smaller, independent manufacturers. Most of the FITA-aligned manufacturers are based in South Africa, but a number are based in neighbouring countries. There is decided animosity between these two industry bodies.

Since its relaunch in 2006, TISA's main argument has been that the illicit market is substantial and growing (van Walbeek and Shai 2015). TISA made this claim despite the fact that, prior to 2009, they could offer no evidence to support this position (van Walbeek 2014; Vellios et al. 2019). Based on international precedents (Smith et al. 2013), it seems that the primary rationale for making this argument was to dissuade National Treasury from increasing the excise tax on cigarettes.

In the second half of 2018, TISA launched a major public relations campaign, called #TakeBackTheTax, in which members of the public were encouraged to sign a petition to “implore the South African Revenue Service, the Parliament of the Republic of South Africa and law enforcement agencies to act with urgency and take decisive steps in combatting the trade of illicit cigarettes” (TISA 2018). This campaign was triggered by an industry-funded survey which found that, in June 2018, 27% of cigarettes in South Africa were sold at a price below the excise tax and VAT amount (Ipsos 2018a,

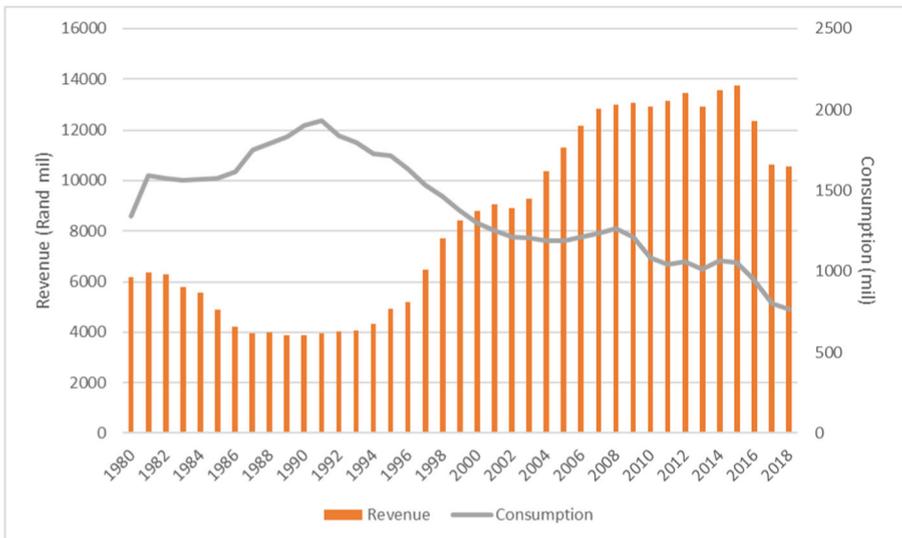


Fig. 1 Real excise revenue and legal cigarette consumption in South Africa, 1980–2018. Source: Author's own calculations, derived from various issues of the National Treasury Budget Review (1980–2018). Real excise revenue is displayed in millions of Rands, with 2016 as the base year. Consumption is in millions of 20-packs (Republic of South Africa 1980–2018)

b). Gold Leaf Tobacco Company was publicly identified as the major producer of these cigarettes. A subsequent round of data collection in September 2018 indicated that the illicit market had grown to 33% of the total cigarette market (Ipsos 2018a, b).

Estimates of the size of the illicit market in South Africa

A number of independent studies have estimated the size of the illicit market over the past decade (Blecher 2010; van Walbeek 2014; Liedeman and Mackay 2015; van Walbeek and Shai 2015; van der Zee et al. Forthcoming; Vellios et al. 2019). The techniques vary, but an overarching finding is that, until about 2015, the estimates of the independent studies were substantially lower than those of the tobacco industry. The consistently small illicit market between 2000 and 2014 coincides with a period when SARS was strengthening its capacity, particularly to fight illicit trade, for example with Project Honey Badger (Serrao 2014). Over this period there were also significant increases in the excise tax on cigarettes. Recent academic estimates suggest that illicit trade rose substantially after 2014 when SARS came under pressure, to as high as 35% of the market in 2017 (Vellios et al. 2019). Between 2015 and 2018, real (inflation-adjusted) government revenue fell by 23% (Fig. 1), the first substantial decrease in more than 25 years. The estimates of the size of the illicit market that are produced by the tobacco industry and recent estimates by independent researchers are converging.

Against the background of institutional failure and dramatic changes in the tobacco industry, this paper aims to provide an estimate of the size of the market for very cheap, probably illicit, cigarettes in South Africa. This is the first independent study to use a nationally representative survey to estimate the illicit market in South Africa. Although TISA claims that its Ipsos study is nationally representative, Ipsos has not released the methodology or the raw data for public scrutiny, and therefore this claim cannot be verified (Lopez Gonzalez et al. 2018).

We also investigate various covariates of illicit trade. Using both descriptive statistics and regression analysis, we investigate which demographic, geographic and product-specific characteristics are associated with illicit trade.

Data and methodology

Data

The National Income Dynamics Study (NIDS) is a nationally representative panel survey of South Africans (Southern Africa Labour and Development Research Unit 2018). The first wave of the NIDS survey was conducted in 2008, with a sample of roughly 28,000 individuals, in 7300 households, most of whom have been re-interviewed approximately every 2 years since. Due to attrition amongst primarily White, Indian/Asian and high-income respondents, a top-up of 2775 individuals was added in wave 5 to maintain the representativeness of the sample.

In wave 5, NIDS also introduced questions for smokers about their most recent purchase of cigarettes. This paper uses these questions to estimate the proportion of cigarettes purchased at specific price points. The NIDS survey consists of several questionnaires: household, adult (age 15+), proxy, and child. Our analysis uses

responses from the adult questionnaire only, since the child questionnaire does not have tobacco-related questions.

Methodology

The focus of this study is the price of cigarettes, which is used to estimate the size of the illicit market. In the survey, smokers were asked to describe their most recent purchase of cigarettes, specifically the packaging type (which could include single sticks), the number of items/packs purchased, and the total amount that they paid for the cigarettes. We use the responses to these questions to calculate per-stick and equivalent per-pack prices. In South Africa, packs of 20 are the most popular packaging type, and therefore we report all prices as their 20-pack equivalent price. Price is expressed in nominal terms (data were collected between February and December 2017). To ensure that the data represent total cigarette consumption in the country, we weight each price observation by the respondent's smoking intensity (cigarettes per day), as well as by their NIDS population weight. For example, an individual who reports consuming 10 cigarettes per day at R2 per cigarette, and who has a population weight of 3000 (i.e. represents 3000 people in the population), accounts for 30,000 cigarettes consumed per day (10×3000), at R2 each.

Defining cheap cigarettes

For the majority of the survey period (April to December 2017), the excise tax on a pack of 20 cigarettes was R14.30 (approximately 1.07 USD at the time¹). Combined with the VAT rate of 14%, the full tax amount was R16.30 (1.22 USD). Any cigarettes sold at a price below this could not have met the full tax amount. Anecdotal evidence from personal communications with employees in the tobacco industry suggests that cigarettes can be manufactured for as little as R2.50 a pack. When distribution costs and retail margins are included, it is unlikely that fully tax-paid cigarettes would be sold for less than R20 (1.50 USD) per pack-equivalent. For comparison, BAT's Peter Stuyvesant, the most popular brand in South Africa, sold for about R35 per pack in 2017 (ACP 2019).

To account for the uncertainty regarding the minimum retail price of legal cigarettes, we define four price thresholds for an equivalent pack of 20 cheap cigarettes: less than R16.30; less than R20; R20 or less; and less than R23 (1.73 USD). The four definitions of cheap cigarettes allow us to estimate the illicit market with varying degrees of strictness for the minimum price of legal cigarettes; the estimate at R16.30 will be the most conservative, and that at R23 the least conservative, estimate. Although we present the data for all four thresholds, the discussion focuses on packs that are sold for R20 or less, because we believe that this is the most accurate estimate of illicit trade.

Since there is currently no legal minimum retail price for cigarettes in South Africa, we cannot be certain that prices observed below the thresholds are in fact illegal, and therefore refer to these cigarettes as “cheap” and “illicit”, using these terms interchangeably.

¹ The average exchange rate for 2017 was R13.32 to the US dollar (South African Reserve Bank 2017)

Reporting errors and data cleaning

There were a number of responses regarding ‘most recent cigarette purchase’ that yielded nonsensical prices. For example, an individual reports spending a total of R0.50 (0.035 USD) for 5 single sticks (per stick price of R0.10 (0.007 USD)); this is likely a data error, since there is no record of a single stick selling for less than R0.50 in South Africa in recent years, whereas there is extensive evidence of cigarettes being sold for R0.50 each by informal vendors (ACP 2019). Thus, it is reasonable to assume that this individual incorrectly reported spending R0.50 in total, and instead spent R0.50 per stick.

We used our knowledge of the South African cigarette market and the African Cigarette Prices (ACP) dataset (ACP 2019) to develop informed rules to correct obvious reporting errors. We assume that a single stick sells for between R0.50 and R4, a 10-pack sells for between R5 and R35, a 20-pack sells for between R8 and R60, a 30-pack sells for between R12 and R90, and a carton of 200 cigarettes sells for between R50 and R600. These rules are described in detail in Appendix 1. To the extent that the original data were, in fact, valid, we would have distorted the data. However, we believe that this distortionary effect is likely to be very limited, given the fact that the rules substantially reflect the reality of cigarette pricing in South Africa and are supported by other surveys (Liedeman and Mackay 2015; ACP 2019).

Of the 25,075 adults successfully interviewed in NIDS wave 5, 4224 indicated that they smoked cigarettes (Table 1), representing almost 6.7 million of the 34.6 million South African adults. This implies a smoking prevalence of 19.3%, with 6.9% of females and 34% of males smoking, which is in line with other national estimates (SADHS 2016; Mukong and Tingum 2018). The cleaned data gives a sample of 3507 smokers, representing approximately 5.6 million smokers (84% of smokers from the uncleaned data). Of the 4224 smokers in NIDS, 3002 observations were left unchanged, 717 were excluded due to missing data and/or complexities that we were unable to resolve with the rules described in the Appendix, and 505 observations were corrected using these rules.

Table 1 Summary of data cleaning

Action	Detail	Observations
Initial Data Collected		4224
Data Removed During Cleaning	No Packaging Reported	191
	No Price Information Reported	94
	No Consumption Reported	91
	Consumption >100 Cigarettes per day	3
Removed Due to Price Reporting Errors	Price per Stick <R0.50 (could not be corrected)	45
	Price per Stick >R4.00	293
Remaining Sample Including Corrections		3507

NIDS wave 5 (2017). We altered 505 prices using the rules described in Appendix 1

Model specification

We assess the socio-economic correlates of smoking cheap cigarettes using the following specification:

$$\text{SmokerCheap}_{ip} = \beta_0 + \beta_1 \text{Packaging}_i + \beta_2 \text{Ind} + \beta_3 \text{HH} + \varepsilon_i \quad (1)$$

Where SmokerCheap_{ip} is an indicator variable for whether smoker i purchases cigarettes at price threshold P , where $P < R16.30$, $P < R20$, $P \leq R20$, or $P < R23$. Packaging is the packaging type purchased by the smoker (including single stick, 10-pack, 20-pack, 30-pack and carton of 200 cigarettes). Ind is a vector of individual characteristics including gender, race, age, education, employment status, marital status, the importance of religion, and the number of cigarettes smoked per day. HH is a vector of household characteristics, including the natural logarithm of household income per capita, location type (urban or rural), and province. Since SmokerCheap_{ip} is a dichotomous variable, eq. (1) is specified as a logit regression model, and we report the marginal effects.

Results

Characteristics of cigarette prices and cheap cigarettes

The average price of cigarettes is almost R31 per 20-pack (Table 2). Packs with 10 cigarettes are the most expensive at R38.20 per 20-pack equivalent, followed by single sticks at R37.17. These two packaging types also have the greatest variation in price. For all packaging types, the median price is above the mean, suggesting left-skewed distributions, with lower prices pulling down the average. Cartons are the cheapest at R19.81 per 20-pack equivalent.

Overall, 19.6% of cigarettes were bought for less than R16.30, which was the tax amount at the time of the survey (Table 3), and 30.7% of cigarettes were bought for R20 per pack or less.

Table 2 Average cigarette prices, expressed in price per 20-pack equivalent

	Mean (Confidence Interval)	Median	St. Dev	N
Overall Price	30.73 (30.24; 31.22)	30	14.82	3507
Packaging Type				
Single	37.17 (36.20; 38.14)	40	17.48	1253
10-Pack	38.20 (36.93; 39.48)	40	14.49	498
20-Pack	28.01 (27.40; 28.62)	29	12.16	1541
30-Pack	25.37 (22.79; 27.96)	26.67	11.44	78
Carton	19.81 (18.05; 21.57)	22.5	10.42	137

NIDS wave 5 (2017). 95% confidence intervals in brackets. Data are weighted using the NIDS wave 5 population weights. Prices are also weighted for consumption. All prices are normalized to a pack of 20 cigarettes

Table 3 Percentage of cheap cigarettes bought at various price cut-offs

	<R16.3	<R20	≤R20	<R23	N
Overall	19.6 (18.3; 21.0)	20.9 (19.5; 22.2)	30.7 (29.2; 32.2)	32.8 (31.3; 34.4)	3507
Packaging Type					
Single	11.8 (10.0; 13.6)	12.1 (10.3; 14.0)	32.0 (29.4; 34.6)	32.3 (29.7; 34.9)	1253
10-Pack	3.4 (1.8; 5.0)	3.4 (1.8; 5.0)	13.0 (10.0; 16.0)	13.4 (10.4; 16.4)	498
20-Pack	23.0 (20.9; 25.1)	24.1 (22.0; 26.3)	31.4 (29.0; 33.7)	33.9 (31.6; 36.3)	1541
30-Pack	29.1 (18.8; 39.4)	32.1 (21.6; 42.8)	34.1 (23.3; 44.8)	38.3 (27.3; 49.4)	78
Carton	42.8 (34.4; 51.2)	48.7 (40.2; 57.2)	49.3 (40.8; 57.8)	55.7 (47.3; 64.1)	137

NIDS wave 5 (2017). 95% confidence intervals in brackets. Data are weighted using the NIDS wave 5 population weights. Prices are also weighted for consumption

For all price thresholds, cartons and 30-packs are most likely to be cheap. For example, 43% of cigarettes sold in cartons, and 29% of cigarettes sold in 30-cigarette packs, were sold at less than R16.30 per 20-pack equivalent, compared to 23% of packs of 20, 12% of single sticks and 3% of packs of 10 cigarettes. The finding that a greater percentage of cigarettes sold in cartons and 30-cigarette packs are cheaper than other packaging types holds for all price thresholds.

About 20% of all single sticks are sold at R1 per stick (i.e. R20 per pack), indicating that this is a common price point. Surveys of cigarette prices in South African townships indicate that cheap single sticks are sold mostly for R0.50 or R1.00 (Liedeman and Mackay 2015; ACP 2019). Few are sold for an amount between R0.50 and R1.00. Therefore, it comes as no surprise that the estimates of the volumes sold between <R16.30 and <R20 per pack are very similar (especially for single sticks). There is a spike in the volume of cigarettes at the R20 or less threshold, since this includes all R1 single sticks.

Characteristics of smokers who buy cheap cigarettes

Table 4 describes some of the characteristics of smokers who buy cheap cigarettes at the various price thresholds, as well as smokers overall. Although there is some variation in the proportion of smokers buying cheap cigarettes, an important finding is the widespread prevalence across all demographic and socio-economic groups.

A higher proportion of females purchase cheap cigarettes than males at all price thresholds. The largest prevalence gradient is for education, where 40.4% of smokers with little to no education purchase cigarettes priced at R20 or less per pack, compared to 16% of smokers with tertiary education. For the other demographic and socio-economic characteristics, the difference in the prevalence of cheap cigarette use is smaller.

Table 4 Descriptive statistics of smokers of cheap cigarettes, compared to smokers overall

	Overall	<16.30	<20	≤20	<23
Observations	3507	601	658	1115	1182
Average Age	37.1 (36.7; 37.5)	39.8 (38.7; 40.8)	39.8 (38.8; 40.8)	38.9 (38.1; 39.7)	39.0 (38.3; 39.8)
Average Household Income Per Capita	4136 (3848; 4424)	2924 (2610; 3239)	3020 (2713; 3328)	2695 (2469; 2922)	2911 (2677; 3144)
Average Consumption (Sticks per day)	8.0 (7.7; 8.2)	9.7 (9.2; 10.3)	9.6 (9.1; 10.2)	9.1 (8.7; 9.5)	9.0 (8.7; 9.4)
	Relative Share of Sub-Group	Proportion of Smokers who Smoke Cheap Cigarette, by Sub-Group			
Male	80.2 (78.9; 81.5)	15.0 (13.6; 16.3)	16.1 (14.7; 17.5)	25.6 (23.9; 27.3)	27.4 (25.7; 29.1)
Female	19.8 (18.5; 21.1)	20.5 (17.9; 23.1)	21.8 (19.2; 24.5)	32.6 (29.6; 35.6)	35.1 (32.0; 38.1)
Race					
African	66.4 (64.8; 67.9)	13.5 (12.0; 15.0)	14.6 (13.0; 16.2)	24.3 (22.4; 26.2)	25.8 (23.8; 27.7)
Mixed Race	19.6 (18.3; 20.9)	19.6 (17.3; 21.9)	20.6 (18.3; 22.9)	33.9 (31.2; 36.6)	35.4 (32.7; 38.1)
Indian/Asian	2.8 (2.3; 3.4)	10.4 (3.1; 17.6)	10.6 (3.3; 18.0)	17.2 (8.2; 26.2)	19.0 (9.7; 28.4)
White	11.2 (10.1; 12.2)	26.7 (21.5; 31.8)	28.7 (23.4; 34.0)	33.5 (28.0; 39.0)	38.6 (32.9; 44.3)
Education					
None to Primary School Completed	16.5 (15.3; 17.7)	22.4 (19.6; 25.2)	24.0 (21.1; 26.9)	40.4 (37.1; 43.8)	41.7 (38.3; 45.0)
Grades 8–11 (Incomplete Secondary School)	53.9 (52.2; 55.5)	17.0 (15.3; 18.8)	18.3 (16.5; 20.1)	28.6 (26.5; 30.6)	30.7 (28.6; 32.8)
Secondary School Completed	16.9 (15.6; 18.1)	11.3 (8.5; 14.0)	11.8 (9.0; 14.6)	17.7 (14.4; 21.0)	19.4 (16.0; 22.9)
Some or Completed Tertiary Education	12.8 (11.6; 13.9)	10.5 (7.2; 13.8)	11.8 (8.4; 15.3)	16.0 (12.0; 19.9)	18.2 (14.0; 22.3)
Employment Status					
Employed	81.5	15.2	16.8	24.5	26.9

Table 4 (continued)

	Overall	<16.30	<20	≤20	<23
	(79.9; 83.1)	(13.5; 16.8)	(15.1; 18.5)	(22.5; 26.5)	(24.8; 28.9)
Unemployed	18.5 (16.9; 20.1)	16.5 (13.3; 19.7)	16.8 (13.6; 20.0)	28.9 (25.0; 32.8)	29.4 (25.5; 33.3)
Geographic Location					
Urban	77.7 (76.4; 79.1)	16.9 (15.4; 18.4)	18.2 (16.7; 19.7)	27.2 (25.4; 28.9)	29.0 (27.2; 30.7)
Rural	22.3 (20.9; 23.6)	13.1 (11.0; 15.3)	14.0 (11.8; 16.2)	26.4 (23.6; 29.1)	28.7 (25.9; 31.5)
Province					
Western Cape	19.5 (18.2; 20.9)	14.4 (12.0; 16.9)	14.9 (12.4; 17.4)	24.7 (21.7; 27.7)	26.0 (22.9; 29.0)
Eastern Cape	8.5 (7.6; 9.4)	15.7 (11.8; 19.6)	16.0 (12.1; 19.9)	24.9 (20.3; 29.5)	26.8 (22.1; 31.5)
Northern Cape	4.6 (3.9; 5.3)	19.3 (15.9; 22.8)	20.6 (17.1; 24.1)	37.9 (33.7; 42.1)	40.2 (35.9; 44.4)
Free State	4.2 (3.5; 4.9)	16.7 (11.4; 22.0)	16.7 (11.4; 22.1)	27.0 (20.7; 33.4)	30.6 (24.0; 37.2)
KwaZulu-Natal	12.1 (11.0; 13.2)	8.9 (6.5; 11.3)	10.8 (8.2; 13.3)	22.8 (19.3; 26.3)	24.3 (20.7; 27.8)
North West Province	5.6 (4.8; 6.4)	16.3 (11.3; 21.3)	17.6 (12.4; 22.7)	25.4 (19.5; 31.4)	34.0 (27.5; 40.4)
Gauteng	30.9 (29.4; 32.4)	18.8 (15.5; 22.1)	20.5 (17.1; 24.0)	29.1 (25.2; 32.9)	30.5 (26.6; 34.4)
Mpumalanga	8.6 (7.6; 9.5)	20.3 (14.9; 25.7)	21.2 (15.7; 26.7)	27.5 (21.5; 33.5)	29.0 (22.9; 35.1)
Limpopo	6.0 (5.2; 6.8)	12.8 (7.4; 18.2)	14.3 (8.7; 20.0)	27.5 (20.3; 34.7)	27.9 (20.7; 35.1)

NIDS wave 5 (2017). 95% confidence intervals in brackets. Data are weighted using the NIDS wave 5 population weights. The “overall” column gives the average characteristics and proportions for smokers overall, while the following four columns give the shares of smokers buying cheap cigarettes, within each subgroup. Income is reported in March 2017 Rands

Cheap cigarettes are purchased in significant proportions in all nine provinces. While there are some differences in the point estimates across the different price thresholds and provinces, an analysis of the 95% confidence intervals shows that they overlap in most cases, indicating that the prevalence of buyers of cheap cigarettes in the different provinces is, mostly, not statistically different. For example, for cigarettes sold at $\leq R20$, a 26% proportion lies in the 95% confidence interval for eight provinces; the only exception is the Northern Cape, where the confidence interval lies above 26%. The implication is that one cannot reject the null hypothesis that 26% (in fact, anything between 25.2% and 26.3%) of smokers in each of the eight provinces, other than the Northern Cape, buy cigarettes at a price of $\leq R20$.

For other price thresholds, a similar pattern holds. For prices $< R16.30$, one cannot reject the null hypothesis that the proportion of smokers buying cigarettes at this price or lower is between 15.9% and 16.9% for all provinces, other than KwaZulu-Natal, where the prevalence is slightly lower. For prices $< R20$, one cannot reject the null hypothesis that the relevant proportion of buyers is between 17.1% and 17.4% for all provinces other than KwaZulu-Natal.

Regression analysis: Correlates of cheap cigarette smoking

Table 5 presents the marginal effects at the average, taken from the logit regression, for smokers purchasing cigarettes at the four price thresholds ($< R16.30$, $< R20$, $\leq R20$ and $< R23$).

Some packaging types are more likely to be cheap than others. Compared to single sticks, packs of 10 cigarettes are less likely, while cartons (200 cigarettes) are substantially more likely, to be cheap for all price thresholds. Packs of 20 cigarettes are more likely to be cheap than single cigarettes, but only for very low price thresholds (less than R20 per pack).

With regard to individual-level characteristics, the likelihood of purchasing cheap cigarettes varies substantially by race. White and Mixed Race smokers are more likely to purchase cheap cigarettes than African smokers (who make up about 70% of the smoking population) at all price thresholds. There is a strong and consistent age gradient, with older smokers more likely to purchase cheap cigarettes. Smokers with more education (especially those who have completed secondary school or have tertiary education) are significantly less likely to purchase cheap cigarettes than smokers with little or no education. Smokers who have never married are more likely to purchase cheap cigarettes than married smokers, at all price thresholds. The number of cigarettes smoked per day is insignificantly associated with the purchase of cigarettes for less than R20 per pack, but is significantly positively associated with cigarettes for between R20 and R23 per pack.

Individual-level characteristics that have an insignificant association with the purchase of cheap cigarettes, when all else is held constant, include gender, employment status, and the importance of religion to the respondent.

For household characteristics, there is a consistent negative relationship between household income per capita and the likelihood of purchasing cheap cigarettes. The marginal effect of around -0.04 for all price thresholds indicates that a 10% increase in per capita household income decreases the likelihood of purchasing cheap cigarettes (at the chosen price threshold) by 0.4%. For the individual provinces and the urban/rural

Table 5 Characteristics of smokers of cheap cigarettes, marginal effects from logit regression

VARIABLES	<R16.3	<R20	≤R20	<R23
<i>Packaging (Base = Single Sticks)</i>				
10-Pack	-0.0740*** (0.0209)	-0.0791*** (0.0212)	-0.1527*** (0.0319)	-0.1532*** (0.0324)
20-Pack	0.1083*** (0.0280)	0.1177*** (0.0286)	0.0131 (0.0332)	0.0392 (0.0343)
30-Pack	0.1442 (0.1447)	0.1545 (0.1369)	0.0041 (0.1388)	0.0383 (0.1354)
Carton of 200	0.3446*** (0.0724)	0.3968*** (0.0745)	0.2603*** (0.0782)	0.2806*** (0.0766)
<i>Individual Level Characteristics</i>				
<i>Gender (Base = Male)</i>				
Female	-0.0021 (0.0227)	0.0015 (0.0235)	0.0013 (0.0289)	0.0025 (0.0295)
<i>Race (Base = African)</i>				
Mixed Race	0.0859*** (0.0325)	0.0837** (0.0339)	0.1495*** (0.0433)	0.1459*** (0.0436)
Asian/Indian	0.0520 (0.0543)	0.0193 (0.0494)	0.0256 (0.0688)	0.0244 (0.0678)
White	0.1479** (0.0696)	0.1377** (0.0681)	0.1564** (0.0707)	0.1844*** (0.0685)
<i>Age Category (Base = Age 15–29)</i>				
30–44	0.0613*** (0.0237)	0.0626** (0.0245)	0.0559* (0.0301)	0.0503 (0.0313)
45–59	0.1091*** (0.0375)	0.0936** (0.0375)	0.1135*** (0.0433)	0.1073** (0.0440)
60 and older	0.1453*** (0.0524)	0.1465*** (0.0530)	0.1523*** (0.0564)	0.1498*** (0.0575)
<i>Education (Base = None to Primary School Completed)</i>				
Grades 8–11 (Incomplete Secondary School)	-0.0316 (0.0301)	-0.0418 (0.0309)	-0.0900*** (0.0346)	-0.0776** (0.0351)
Secondary School Completed	-0.1125*** (0.0368)	-0.1343*** (0.0381)	-0.2084*** (0.0454)	-0.2068*** (0.0461)
Some or Completed Tertiary Education	-0.0992** (0.0472)	-0.1142** (0.0482)	-0.2070*** (0.0534)	-0.2071*** (0.0530)
<i>Employment (Base = Not Economically Active)</i>				
Unemployed	0.0218 (0.0290)	0.0209 (0.0293)	0.0199 (0.0364)	0.0143 (0.0370)
Employed	-0.0011 (0.0230)	0.0099 (0.0236)	-0.0058 (0.0297)	-0.0001 (0.0306)
<i>Marital Status (Base = Married)</i>				
Living with Partner	0.0713** (0.0304)	0.0475 (0.0325)	0.0533 (0.0378)	0.0427 (0.0399)

Table 5 (continued)

VARIABLES	<R16.3	<R20	≤R20	<R23
Widow/Widower	−0.0216 (0.0293)	−0.0376 (0.0325)	−0.0425 (0.0424)	−0.0232 (0.0464)
Divorced or Separated	0.0039 (0.0306)	−0.0180 (0.0328)	−0.0322 (0.0425)	−0.0460 (0.0447)
Never Married	0.0816*** (0.0296)	0.0620* (0.0326)	0.0894** (0.0371)	0.0724* (0.0391)
Importance of Religion (Base = Not Important)				
Important	−0.0046 (0.0338)	−0.0076 (0.0339)	0.0303 (0.0342)	0.0346 (0.0347)
Intensity (Sticks/day)	0.0013 (0.0014)	0.0010 (0.0015)	0.0042** (0.0019)	0.0037* (0.0019)
<i>Household Characteristics</i>				
Log of Household Income Per Capita	−0.0391*** (0.0113)	−0.0388*** (0.0116)	−0.0490*** (0.0141)	−0.0469*** (0.0149)
Geographical Type (Base = Urban)				
Rural	−0.0023 (0.0235)	−0.0137 (0.0236)	0.0111 (0.0282)	0.0176 (0.0295)
Province (Base = Eastern Cape)				
Western Cape	−0.0396 (0.0274)	−0.0374 (0.0274)	−0.0444 (0.0391)	−0.0543 (0.0409)
Northern Cape	−0.0121 (0.0357)	−0.0019 (0.0358)	0.0473 (0.0450)	0.0532 (0.0471)
Free State	0.0670 (0.0486)	0.0594 (0.0483)	0.0722 (0.0522)	0.0978* (0.0554)
KwaZulu-Natal	−0.0699** (0.0280)	−0.0462 (0.0293)	−0.0194 (0.0397)	−0.0241 (0.0416)
North West Province	0.0328 (0.0445)	0.0484 (0.0459)	0.0266 (0.0503)	0.0967 (0.0620)
Gauteng	0.0381 (0.0358)	0.0515 (0.0359)	0.0748* (0.0427)	0.0655 (0.0445)
Mpumalanga	0.0630 (0.0434)	0.0697 (0.0432)	0.0550 (0.0476)	0.0446 (0.0492)
Limpopo	−0.0195 (0.0568)	−0.0027 (0.0578)	0.0405 (0.0640)	0.0143 (0.0643)
Pseudo R Squared	0.1490	0.1488	0.1048	0.1036
Observations	3444	3444	3444	3444

NIDS wave 5 (2017). Data are weighted using the NIDS wave 5 population weights. The dependent variable is equal to one if the individual smokes cigarettes below R16.30, R20, R20 or less, and R23, and zero if not. Robust standard errors are given in parentheses, with significance stars defined as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

divide, the majority of the marginal effects are not statistically significant. In fact, of the

32 provincial coefficients (nine provinces less the base province, multiplied by the four price thresholds), only three are significant (two at the 10% level and one, KwaZulu-Natal, for the <R16.30 threshold, at the 5% level), consistent with the hypothesis that there is no significant spatial variation in the prevalence of illicit cigarettes. The regression results support the descriptive statistics of Table 4 which showed that there is limited provincial variation in the prevalence of cheap cigarettes.

Discussion

The substantial increase in the illicit cigarette trade in South Africa since 2010 and especially since 2015 is cause for concern. Illicit trade undermines the country's fiscal and public health agendas, and supports organized crime (Pauw 2017; Judge Nugent 2018a, b; Vellios et al. 2019). At least three academic studies, using different methodologies and survey techniques, have estimated the size of the illicit market since 2015 and find that the illicit market comprises between 30% and 40% of the total market (Liedeman and Mackay 2015; van der Zee et al. Forthcoming; Vellios et al. 2019). The best estimate of the size of the illicit market for the present study is 30.7%, which is in line with the range of estimates in the other studies.

Although industry estimates of illicit trade should be treated with care, the most recent TISA-funded study found that 33% of cigarettes are sold at a price that does not cover the tax (Ipsos 2018a, b). Historically, academic estimates of the size of the illicit market in South Africa have differed substantially from those of the tobacco industry (Blecher 2010; van Walbeek 2014; van Walbeek and Shai 2015), but in the past few years there has been a convergence in these estimates. Whereas past industry studies have “talked up” the illicit trade problem (van Walbeek and Shai 2015), presumably to alarm National Treasury and discourage them from raising the excise tax (Smith et al. 2013), the fact that industry estimates and independent researchers' estimates of the size of the illicit market are converging indicates that the problem is real.

Other than being the first nationally representative independent study to estimate the size of the illicit market, this paper quantifies and describes the characteristics of smokers of illicit cigarettes. From the regression results we find that specific socio-economic groups are more likely to purchase illicit cigarettes than others, specifically smokers who are White or Mixed Race, smokers who are older, have low levels of education, and have low household income per capita. An important finding is that the prevalence of illicit cigarettes does not differ much between the nine provinces of South Africa.

Although our data does not allow us to investigate the source of the illicit cigarettes, we can make inferences from the provincial data. KwaZulu-Natal, the province with the lowest prevalence of illicit cigarette purchases, has the country's busiest seaport. This indicates that it is unlikely that large quantities of illicit cigarettes are imported from overseas. The prevalence of illicit cigarettes in Limpopo, the province neighbouring Zimbabwe, is similar to that of most other provinces, which suggests that cross-border trade with Zimbabwe is not driving the illicit trade. Of the nine provinces, Gauteng, the economic heartland of South Africa and the province where most cigarettes are manufactured, has the second-highest prevalence of illicit trade. This finding, read in conjunction with the well-publicized information about the institutional breakdown at

SARS, as well as data identifying a large proportion of local brands selling for below the tax price (Liedeman and Mackay 2015; ACP 2019), suggests that the problem of illicit trade in South Africa is not primarily one of smuggling, but rather of undeclared local production.

This undeclared local production poses an enormous challenge for the country. The illicit trade has not only caused much revenue loss to the government, but it has greatly undermined the country's public health agenda.

The new president, Cyril Ramaphosa, has made the rebuilding of SARS a priority. In 2018, SARS established an Illicit Economy Unit that focuses on tax enforcement relating to industries where illicit trade is a problem, including tobacco (Khumalo 2018).

The World Health Organization's Protocol to Eliminate Illicit Trade in Tobacco Products (ITP), which became effective on 25 September 2018, includes recommended best practices for curbing illicit trade. Although South Africa has not ratified the ITP, the Minister of Finance in 2018 committed the government to "extend the use of 'fiscal markers', which are required under the tracking and tracing obligations of the World Health Organization's Protocol to Eliminate Illicit Trade in Tobacco Products" (National Treasury 2018). South Africa's problem with illicit trade is real, and it requires a coordinated and comprehensive response.

Caveats and data limitations

Data cleaning

The sample has been reduced as a result of data cleaning and the removal of price reporting errors. Table 6 below presents the packaging distribution for the original and final samples. The last column indicates that a larger proportion of smokers who purchased single cigarettes was excluded in the cleaning process, compared to broadly similar proportions of smokers who purchased other packaging types. To the extent that

Table 6 Comparison of original and final samples, by packaging type

	Original Sample		Final Sample		Ratio of Final to Original Percentage
	Number of Smokers	Percentage	Number of Smokers	Percentage	
Single	2,527,054	39.16	1,931,119	34.58	0.88
10-Pack	826,656	12.81	738,710	13.23	1.03
20-Pack	2,707,006	41.95	2,542,545	45.53	1.09
30-Pack	157,990	2.45	149,489	2.68	1.09
Carton of 200	234,929	3.64	222,193	3.98	1.09
Total	6,453,635	100	5,584,056	100	1.00
Pack Type not Reported	216,888	3.25	–	–	–

NIDS wave 5 (2017). Data are weighted using the NIDS wave 5 population weights. The ratio represents the ratio of the final sample percentage share to the original sample percentage share

the excluded smokers of single cigarettes are systematically different from those included in the sample, this could create some bias in the sample.

Measurement error

Individuals may not answer truthfully about whether they are smokers, or the number of cigarettes they smoke, because there may be stigmas associated with smoking, especially for specific demographic and cultural groups (Pérez-Stable et al. 1990; Roth et al. 2009; Dietz et al. 2011).

The one instance in which an under-reporting of smoking or smoking-intensity would have implications for our results is if smokers of cheap (illegal) cigarettes are more likely to under-report than smokers of more expensive cigarettes, for fear of being caught out for buying illegal cigarettes. If this is the case, then our estimates will understate the size of the illicit market.

Conclusion

Other than the obvious fiscal impact, illicit cigarettes are more affordable and accessible than taxed cigarettes, thus exposing more people to the harms of smoking, particularly those who are most vulnerable. The tax-collecting authority plays a crucial role in ensuring that tobacco companies pay the excise taxes that are due to the government. The institutional failure at SARS since 2015 has helped the illicit cigarette market to flourish. This study has shown that the illicit trade in cigarettes has become widespread in South Africa, at 30% of the overall market. Smokers in low socio-economic subgroups are most likely to purchase illicit cigarettes, and although there is some spatial variation in prevalence, there is a sizable share of smokers buying illicit cigarettes in all provinces.

Decisive action needs to be taken. The establishment of the Illicit Economy Unit at SARS is a step in the right direction. South Africa also needs to ratify the World Health Organization's Protocol to Eliminate Illicit Trade in Tobacco Products and to implement an effective, independent track and trace system for cigarettes. The matter is serious and urgent.

Other notes for publishers

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Data availability The data used in this paper are publicly available and can be accessed at <https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/712>.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Research involving human participants and/or animals This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent As no individual participants were involved in the study, no informed consent was required.

Appendix 1

Price Correction Rules

We applied *price correction rules* where obvious reporting errors were identified. For example, if an individual reports spending a total of R0.50 for 5 single sticks (resulting in a per stick price of R0.10); this is likely a data error, since there is no record of a single stick selling for less than R0.50 in South Africa, whereas there is evidence of single cigarettes being sold for R0.50 by informal vendors. Thus, it is reasonable to assume that this individual incorrectly reported spending R0.50 in total, and actually spent R0.50 per stick.

The formal rules applied to the data are:

Reported purchasing singles:

$$Pr/Cig_i = TotExp_i \text{ if } 1 \leq TotExp_i \leq 4 \quad \frac{TotExp_i}{Sticks_j} < 0.5 \quad (1)$$

Reported purchasing 10-packs:

$$Pr/Cig_i = \frac{TotExp_i}{10} \text{ if } 5 \leq TotExp_i \leq 35 \& \quad \frac{TotExp_i}{Sticks_j} < 0.5 \quad (1)$$

$$Pr/Cig_i = \frac{TotExp_i}{NumItems_i}, \text{ if } 0.5 \leq \frac{TotExp_i}{NumItems_i} \leq 4 \quad TotExp_i \geq 5 \quad (2)$$

Reported purchasing 20-packs:

$$Pr/Cig_i = \frac{TotExp_i}{20} \text{ if } 8 \leq TotExp_i \leq 60 \& \quad \frac{TotExp_i}{Sticks_j} < 0.5 \quad (1)$$

$$Pr/Cig_i = \frac{TotExp_i}{NumItems_i} \text{ if } 0.5 \leq \frac{TotExp_i}{NumItems_i} \leq 4 \quad TotExp_i \geq 8 \quad (2)$$

Reported purchasing 30-packs:

$$Pr/Cig_i = \frac{Tot\ Exp_i}{30} \text{ if } 12 \leq Tot\ Exp_i \leq 90 \& \frac{Tot\ Exp_i}{Sticks_j} < 0.5 \quad (1)$$

$$Pr/Cig_i = \frac{Tot\ Exp_i}{NumItems_i} \text{ if } 0.5 \leq \frac{Tot\ Exp_i}{NumItems_i} \leq 4 \text{ } Tot\ Exp_i \geq 12 \quad (2)$$

Reported purchasing cartons (200 sticks):

$$Pr/Cig_i = \frac{Tot\ Exp_i}{200} \text{ if } 50 \leq Tot\ Exp_i \leq 600 \& \frac{Tot\ Exp_i}{Sticks_j} < 0.5 \quad (1)$$

Where Pr/Cig_i is the price per cigarette for smoker i , $Tot\ Exp_i$ is the reported total expenditure for the most recent purchase, $Sticks_j$ is the number of sticks given the reported packaging type j , where $j = 1, 10, 20, 30, 200$, and $Num\ Items_i$ is the number of items (singles, packs or cartons) purchased.

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