

# Measuring changes in the illicit cigarette market using government revenue data: the example of South Africa<sup>1</sup>

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## ABSTRACT

**Background** The tobacco industry claims that illicit trade in cigarettes has increased sharply in the past decade and that government has lost substantial tax revenue.

**Objectives** (1) To determine whether cigarette excise tax revenue has been below budget in recent years, compared to previous decades. (2) To determine trends in the size of the illicit market since 1995.

**Methods** For (1), mean percentage errors and root mean square percentage errors were calculated for budget revenue deviation for three products (cigarettes, beer and spirits), for various sub-periods. For (2), predicted consumption changes, using actual cigarette price and GDP changes and previously published price and income elasticity estimates, were calculated.

**Results** Cigarette excise revenues were 0.4% below budget for 2000-2012 on average, compared to 3.1% below budget for beer and 5.5% below budget for spirits. There is no evidence that illicit trade in cigarettes in South Africa increased between 2002 and 2009. There is a substantial increase in illicit trade in 2010, probably peaking in 2011. In 2012 legal consumption of cigarettes increased by 6.3%, implying that the illicit market share decreased by an estimated 4.4 percentage points.

**Conclusions** Illicit tobacco trade in South Africa needs to be treated seriously. However, other than in 2010, there is no evidence that illicit trade is significantly undermining government revenue. The tobacco industry's claims that illicit trade has consistently increased over the past 15 years is not supported.

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## Introduction

South Africa was one of the first middle-income countries to adopt a strong tobacco control policy. The policy was initiated in the early 1990s, but was given much impetus in 1994 after the first democratic elections. It was anchored on rapid excise tax increases and strong legislation. Primarily because of excise tax-induced price increases, aggregate cigarette consumption in South Africa decreased by a third between 1994 and 2004, after which it stabilised.<sup>1 2</sup>

The tobacco industry opposed the tax increases from the start. The standard response was that tax increases would encourage the illicit trade in cigarettes. Illicit trade includes large-scale cigarette smuggling (typically run by criminal syndicates, where no tax is paid altogether), small-scale smuggling or bootlegging (where individuals buy cigarettes in low-tax countries and bring modest quantities into the high-tax country), illicit manufacturing (where production breaches taxation or other laws), and counterfeiting (where the product bears a trademark without the consent of the owner of the trademark).<sup>3</sup>

Illicit trade indeed undermines some of the benefits of an excise tax increase. Government would lose revenue. Some smokers, who may otherwise have quit smoking, would continue their habit by buying cheaper illicit cigarettes. Also, if illicit trade takes the form of illicit manufacturing or counterfeiting, established firms would have their brands and market shares unfairly undermined. Since 1996, when the CEO of the largest cigarette manufacturer wrote an open letter to the Minister of Health in which he warned her of the threat of cigarette smuggling,<sup>4</sup> the industry has argued that excise tax increases stimulate the illicit market. The South African fiscal authorities have apparently bought into this argument. Since 2004 the excise tax structure and rate (expressed as a percentage of the retail price) has remained unchanged. Despite appeals from the Ministry of Health and civil society to increase the excise tax, officials at the Treasury defend the current system on the grounds that it works well for all parties.<sup>5</sup>

Within this context, the paper investigates two claims by the tobacco industry: (1) that increases in illicit cigarette trade significantly undermine the Treasury's excise tax revenue and (2) that there has been a sharp increase in the illicit market in recent years. To investigate the first claim, the paper compares actual excise tax revenue from cigarettes to budgeted excise tax revenue over a long time period. To investigate the second claim, actual changes in legal cigarette consumption are compared to predicted changes in total cigarette consumption for the period after 1995. The predicted changes in cigarette consumption are based on well-established relationships between cigarette consumption and cigarette prices and income. If the actual change deviates significantly from the predicted change, this would be congruent with a change in the illicit market size.

## Method

To analyse the Treasury's ability to accurately budget for excise revenue the paper uses two summary statistics often used in analysing the accuracy of forecasts, namely the mean percentage error (MPE) and the root mean squared percentage error (RMSPE).<sup>6 7</sup> The MPE indicates whether forecasts/budgets are consistently too high or too low, compared to the outcome value. The MPE is defined as  $\frac{1}{n} \sum_{i=1}^n \left[ \frac{(A_i - B_i)}{B_i} \times 100 \right]$  where  $A_i$  is actual tax revenue,  $B_i$  is budgeted tax revenue and  $n$  is the number of years for which the summary statistic is calculated. A negative or increasingly negative MPE value is consistent with an increase in illicit trade.

Should illicit trade become structural, it seems reasonable that the Treasury would take the illicit trade into account and budget for lower legal (i.e. tax-paid) cigarette sales. Budgeting becomes more difficult and one would expect the deviations, on average, to become larger. The RMSPE considers the squared deviations from the budgeted tax revenue. The RMSPE is defined as

$\sqrt{\frac{1}{n} \sum_{i=1}^n \left[ \frac{(A_i - B_i)}{B_i} \times 100 \right]^2}$ . The RMSPE is a measure of dispersion, similar in interpretation to the standard deviation as a descriptive statistic.

By design, the MPE and the RMSPE consider deviations from budget for relatively long periods of time (typically at least five years). Large once-off deviations, possibly indicating a sudden spike in illicit trade, may not be captured by the MPE and/or the RMSPE. To determine whether there have been sizeable once-off deviations we graphically analyse the revenue deviations and the deviations in the implied quantities for the period since 1990.

To provide context and comparison, the study considers beer and spirits, other than cigarettes. All three products are subject to a specific tax (i.e. a tax based on quantity rather than value), easily enabling the Treasury to determine the quantity consumed in any particular year. Budgeted and actual excise tax revenue received are independent of the producers' pricing decisions. Since beer and cigarette producers are near-monopolies, and the supply of spirits is also very concentrated, the Treasury's excise revenue budgeting processes and budgeting methodologies for these three products are likely to be similar. Thus the MPE and RMSPE for these three products should be comparable.

In a simulation exercise the actual growth in legal cigarette consumption is compared to the predicted growth of total (i.e. legal and illicit) cigarette consumption. To the extent that actual legal cigarette consumption decreases by more than the predicted decrease in total cigarette consumption, this would be a rough indication of the growth of the illicit market.

## Data

Data on budgeted and actual excise revenue for beer, spirits and "cigarettes and cigarette tobacco") were taken from individual Auditor-General reports, published annually since 1910.<sup>8</sup> For the period after 1997 the data were taken from statistical tables in the Treasury's Budget Review.<sup>2</sup> "Cigarettes and cigarette tobacco" are referred to as "cigarettes" henceforth in this paper, since cigarette tobacco comprises a negligible proportion of the combined category.

The financial year for the government is from April to March the next year. The data is presented for financial years, removing any possible distortion had the data been converted to calendar year. However, for ease of reading, the years are not presented as  $t/t+1$  but rather as  $t$ . GDP data are derived from the SA Reserve Bank's database, and consider the second quarter to the first quarter of the following year, i.e. they coincide with the financial year.<sup>9</sup> Values for the real price of cigarettes were obtained by dividing the price index for tobacco with the CPI, based on Statistics South Africa's monthly P0141 publication.<sup>10</sup> The monthly year-on-year growth rates in the real price were averaged over the financial year.

Budgeted and actual excisable quantities were obtained by dividing the budgeted and actual revenue by the relevant excise tax.

## Results

### (i) Mean percentage error

The MPEs are shown in columns (1) to (3) in Table 1. For the post-war period (1945–2012) actual excise revenue from cigarettes were, on average, 0.1% above budget, compared to 1.7% above budget for beer and 1.4% below budget for spirits. During the 1960s, 1970s and 1980s beer excise revenue was generally well above budget, but in the past 13 years (2000-2012) beer revenue was below budget by an average of 3.1%. Spirits revenue has been below budget for most years since 1970, but the shortfalls have increased in the 1990s (average of 2.9% under budget) and especially since 2000 (average of 5.5% under budget). Cigarette excise revenue has been remarkably close to budget throughout the post-war period.

In contrast to beer and spirits excise revenue, cigarette excise revenue has been only 0.4% below budget in the 2000-2012 period. In the shorter and recession-effected 2005-2012 period cigarette excise revenue was, on average, only 2.1% below the budgeted revenues, compared to average shortfalls of 2.5% and 6.4% for beer and spirits respectively. For the 4-year period 2009-2012 cigarette excise revenue was 5.6% below budget, compared to 0.9% below budget for beer and 1.5% below budget for spirits. This recent weak performance of cigarette excise revenue is problematic and is discussed in more detail below.

**Table 1: Mean percentage error and root mean square percentage error of the deviation from budget revenue**

Time period (financial years)	Number of years	Mean percentage error (MPE)			Root mean square percentage error (RMSPE)		
		Beer (1)	Spirits (2)	Cigarettes (3)	Beer (4)	Spirits (5)	Cigarettes (6)
1910 to 1944 (pre-WW2)	35	5.0	2.7	6.4*	17.4	15.3	12.8*
1945 to 2012 (post-WW2)	68	1.7	-1.4	0.1	8.8	10.1	5.2
1945 to 1959	15	-1.3	-0.2	-0.1	7.3	9.1	5.0
1960 to 1969	10	5.4	3.6	0.3	12.4	4.9	4.4
1970 to 1979	10	4.3	-2.8	1.1	10.4	14.0	4.8
1980 to 1989	10	6.0	-0.3	0.7	9.9	10.5	3.4
1990 to 1999	10	1.7	-2.9	-0.9	6.3	9.0	8.5
2000 to 2012	13	-3.1	-5.5	-0.4	6.2	11.1	4.2
2005 to 2012	8	-2.5	-6.4	-2.1	6.0	10.3	5.0
2009 to 2012	4	-0.9	-1.5	-5.6	7.2	8.0	6.6

\*For tobacco the period is 1913 to 1944

Source: derived from Auditor-General, various reports, and Budget Review, various reports

### (ii) Root mean square percentage errors

RMSPEs are presented in the columns (4) through (6) in Table 1 for beer, spirits and cigarettes respectively. The RMSPEs quantify the magnitude of the deviation from budgeted revenue, irrespective of whether it is positive or negative. RMSPEs in the post-WW2 period (1945-2012) are much lower than in the pre-WW2 period (1910-1944) for all three products. For the post-war period as a whole the RMSPE for cigarette excise revenue was 5.2%, compared to 8.8% for beer and 10.1% for spirits.

Of particular relevance for the current study are the magnitudes of the RMSPEs for the period in which illicit trade is alleged to have increased. One would expect an increase in illicit trade to increase the RMSPE, because illicit trade increases uncertainty in the budgeting process. Previously stable relationships between tax, price and consumption break down and Treasury officials have to guess, rather than plan for, the excise revenue, resulting in much larger deviations. The RMSPE for cigarette excise revenue for 2000-2012 is 4.2%, substantially lower than the 8.5% for 1990-1999, and also lower than the 5.2% for the post-war period. For the shorter eight-year period 2005-2012, the RMSPE for cigarette revenue was 5.0%, marginally lower than the post-war RMSPE of 5.2%. For the very short 4-year period 2009-2012 the RMSPE is 6.6%, somewhat higher than the post-war value, but still lower than the 1990-1999 period.

In contrast, the RMSPE for spirits excise revenue for 2000-2012 was 11.5%, much higher than that of cigarettes (4.2%) and also higher than the post-war RMSPE of 10.1%. For beer excise revenue the RMSPE was 6.2%. For the shorter 8-year period (2005-2012) and the even shorter 4-year period 2009-2012 the RMSPEs of beer and spirits excise revenue was larger than that of cigarettes.

The long-term analysis clearly shows that cigarette excise revenue has been more predictable than the revenues from beer and spirits in all sub-periods in the 21<sup>st</sup> century. There is no statistical evidence that the alleged increase in illicit trade in cigarettes has had a substantial negative impact on cigarette excise revenue. Despite this, it is disconcerting that both the MPE and the RMSPE indicate that cigarette excise revenue has not been as predictable in the past four years (2009-2012) as in the preceding period (2000-2008). This requires further analysis, presented below.

### ***(iii) Graphical analysis***

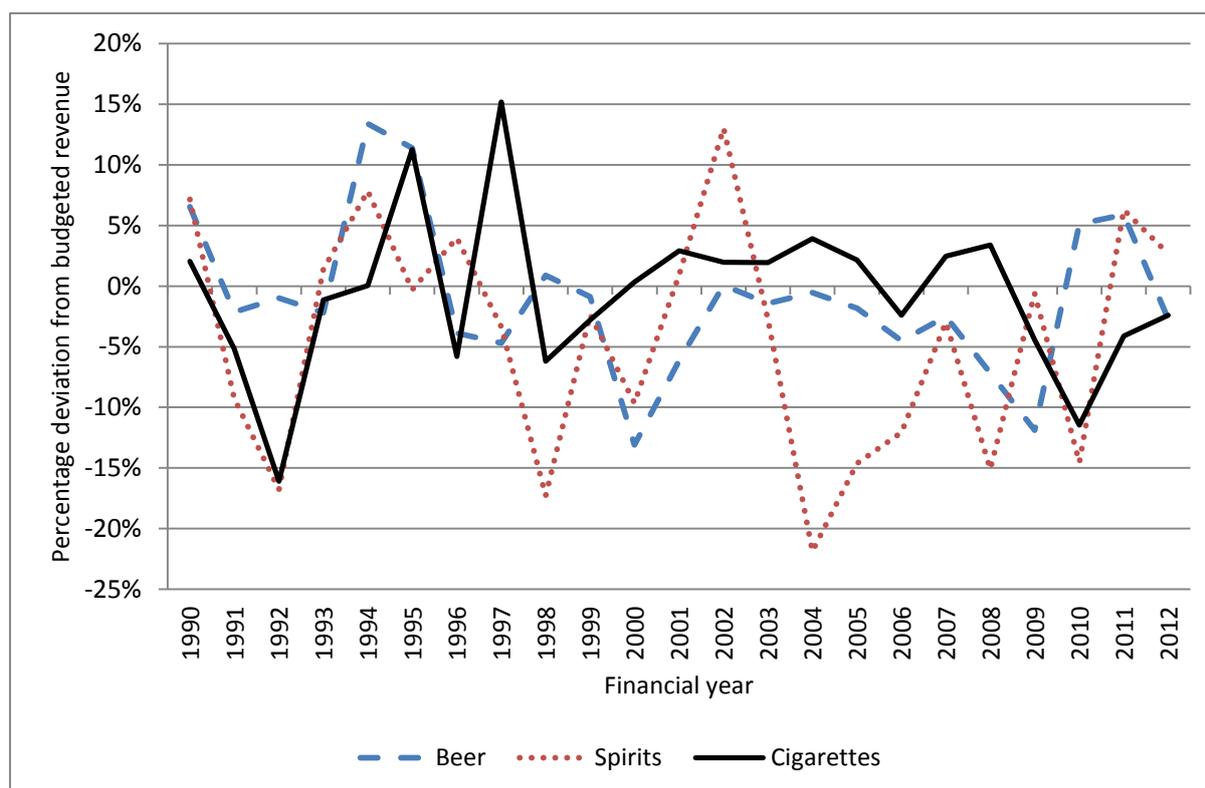
The percentage deviations from budgeted excise revenue for beer, spirits and cigarettes are shown in Figure 1 for 1990-2012. A positive value indicates that actual revenue was above budget, while a negative value indicates that actual revenue was below budget.

Three periods can be identified for cigarettes. In the first period (1990-1999) the budget deviations for cigarettes were substantial and broadly similar in magnitude to those of beer and spirits. During this period, and especially after 1994, the government substantially raised the excise tax on cigarettes. In fact, between 1994 and 1999 the excise tax per pack was increased by an average of 17% in real terms each year. Despite these large tax increases, which would have complicated the budgeting process, actual revenue was above budgeted revenue in three of the six years.

The 2000-2008 period was particularly stable and predictable in terms of cigarette excise revenue. Actual cigarette revenue exceeded budget by modest percentages in seven of the nine years. In contrast, actual tax revenues for beer and spirits were typically below budget over this period. If actual revenues were consistently exceeding budget, one cannot credibly argue that the Treasury was losing significant amounts of revenues due to illicit trade.

Despite the lack of evidence from the Treasury's revenue data, TISA vehemently claimed that the illicit market had increased from being practically non-existent in the mid-1990s to 20% of the total market in 2006.<sup>11</sup> TISA kept to this number for five years. TISA claimed that the share of illicit trade had increased to 26% in 2011, and to 30% in 2012.<sup>12</sup>

**Figure 1: Budget deviations for beer, spirits and cigarettes, financial years 1990-2012**



Source: Author’s calculations based on Auditor-General (various years) and Budget Reviews (various years)

A structural break, alluded to in the discussion of Table 1, occurred in 2009. Actual cigarette excise revenues have been below budget in each of the four years between 2009 and 2012, strongly suggesting that over this period the illicit market share has increased. For these four years, budgeted tobacco tax revenue was 5.6% below budget on average. The shortfall of actual tobacco tax revenues (relative to budget) peaked at 11.5% in 2010, but improved to shortfalls of 4.1% in 2011 and 2.4% in 2012.

**(iv) Simulation analysis based on budgeted and actual quantities**

Since the excise taxes on cigarettes are levied as a specific tax, budgeted (and actual) consumption are easily derived by dividing the budgeted (and actual) excise revenue by the budgeted tax per unit. For example, in fiscal year 2012 the Treasury’s budget for cigarette revenues was R11 735 million (about 1676 million USD), based on an excise tax of R10.32 (about 1.47 USD) per pack. Actual revenue was R11 460 million. Thus the budgeted quantity was 1137 million packs (= 11 735/10.32) and the actual quantity was 1110 million packs (= 11 460/10.32).

In the simulation, one compares the actual growth in consumption of legal cigarettes with the predicted growth in total cigarette consumption (i.e. legal and illicit). If actual consumption growth of legal cigarettes is less than the predicted growth in total cigarette consumption (and ignoring random variations), the illicit market is becoming larger by approximately the difference between the two growth rates. For example, if actual legal cigarette consumption decreases by 5%, and predicted consumption decreases by only 2%, this would imply that the illicit market increases by approximately 3 percentage points of the total market.

The predicted growth rate in total cigarette consumption is crucial in determining changes in the size of the illicit market. The literature (both South African and international) clearly indicates that the two main determinants of cigarette consumption are income and cigarette prices.<sup>1 13 14 15 16 17 18</sup> South African estimates of price and income elasticities of demand are all based on time series data, and with one exception<sup>18</sup> consider the period from 1970 to somewhere between 1989<sup>14</sup> and 2002.<sup>1</sup> The price elasticity estimates for South Africa are all in the inelastic range and centre on about -0.6, which corresponds with elasticity estimates in other low- and middle-income countries.<sup>13</sup> The income elasticity estimates are also in the inelastic region and centre on about 0.6, in line with international experience.<sup>13</sup> In the simulation below a price elasticity of -0.6 and an income elasticity of 0.6 is assumed. Sensitivity analysis with different price and income elasticity values yield qualitatively similar results to the ones presented here.

Percentage changes in budgeted and actual quantity, both relative to the previous year's actual quantity, are shown in columns 1 and 2 in Table 2. The simulation exercise is presented for the period 1995 onwards. Changes in the average real price, based on a monthly survey of cigarette prices, are shown in column 3. The survey includes some very low price (and possibly illicit) brands. Changes in real GDP are shown in column 4. The predicted quantity change, shown in column 5, is the growth in the real price, multiplied by the price elasticity, plus the growth in real GDP, multiplied by the income elasticity. The change in the illicit market share is the difference between the predicted change in the quantity (column 5) and the actual change (column 2).

Table 2: Budgeted, actual and predicted changes in cigarette consumption and in the illicit market share

Financial year	Percentage change in quantity		Percentage change		Simulation: Percentage changes	
	Budgeted (1)	Actual (2)	Real price (3)	Real GDP (4)	Quantity (5)	Change in illicit market share (6)
1995	-9.1	1.2	8.8	3.1	-3.4	-4.6
1996	-0.9	-6.6	7.9	4.2	-2.2	4.4
1997	-18.2	-5.8	18.8	2.1	-10.0	-4.2
1998	2.0	-4.3	15.9	0.5	-9.3	-5.0
1999	-4.0	-6.7	14.1	3.0	-6.7	0.0
2000	-5.2	-4.9	5.4	4.2	-0.7	4.1
2001	-5.9	-3.1	4.7	2.7	-1.2	1.9
2002	-5.5	-3.7	0.5	3.6	1.9	5.5
2003	-1.2	0.7	7.8	3.1	-2.8	-3.5
2004	-6.0	-2.3	6.7	5.0	-1.0	1.3
2005	-1.1	1.0	5.7	5.2	-0.3	-1.3
2006	4.7	2.2	2.7	6.0	2.0	-0.3
2007	-0.4	2.1	2.2	4.8	1.6	-0.5
2008	-1.4	2.0	-1.5	2.5	2.4	0.4
2009	-1.7	-6.0	9.1	-0.8	-5.9	0.1
2010	-0.8	-12.2	6.7	3.4	-2.0	10.2
2011	3.9	-0.3	-0.4	3.1	2.1	2.5
2012	8.9	6.3	-0.6	2.7	2.0	-4.4
2013	3.4					

Source: Author's calculations based on Auditor-General (various years), Budget Reviews (various years), SARB Quarterly Bulletin (2013) and Statistics South Africa CPI (various years)

By the tobacco industry's own admission, there was no illicit trade before the mid-1990s.<sup>19</sup> Within the constraints of random variation and a fairly parsimonious regression equation, Table 2 indicates the following broad trends. Between 1995 and 1998 the data was quite noisy. In those four years the actual decrease in cigarette consumption was less pronounced than predicted by the model. This does not suggest an increase in illicit trade at all. In the three years 2000-2002 actual legal consumption decreased by substantially more than predicted by the model. While this would be congruent with an increase in illicit trade, the decrease in cigarette consumption could at least partially be explained by the legislation that came into effect in that period. Cigarette advertising was being phased out in 2000 and banned altogether in January 2001 and comprehensive smoke-free legislation became effective in July 2001.

In the subsequent 7-year period from 2003 to 2009 there is no evidence to suggest that the illicit market has grown. In fact, it is likely that the illicit market has shrunk during this period.

In 2010 there was a very definite spike in the illicit market, with its market share growing by about 10 percentage points. However, the spike was not the start of a trend. In 2011 the illicit market increased only marginally and in 2012 it decreased by 4.4 percentage points.

The sharp turnaround is illustrated by the fact that legal cigarette consumption in 2012 increased by 6.3%. This high growth rate is unprecedented. In a legislative and societal environment actively against smoking, and with anaemic economic growth, it is impossible that the legal market can grow at such a rate without displacing a sizeable proportion of the illicit market.

The 2013 budget indicates that Treasury is confident (or at least hopeful) of reducing the size of the illicit market, because the projected GDP growth rate of less than 3% does not justify a growth in total cigarette consumption of 3.4%. The only way that the Treasury can get close to this growth rate in legal consumption is if illicit consumption is reduced further.

## **Discussion**

There is a consensus in the literature that increasing the excise tax on tobacco products is the single most effective means of reducing tobacco use.<sup>13</sup> Increasing the excise tax also increases government tax revenue. South Africa, like many other countries, has been extremely successful in reducing cigarette consumption and increasing government revenue by substantially raising the excise tax on tobacco products over a number of years.

It is obvious that an increase in the excise tax, and the associated retail price, increases the incentive to trade in illicit cigarettes. Should the illicit market expand sharply it will undermine the legal market and have detrimental fiscal consequences. However, an increased incentive for illicit trade does not mean that it translates into illicit trade. Numerous studies have shown that illicit trade is driven by a multitude of factors of which the excise tax is only one.<sup>20</sup> In fact, many countries with very high excise rates have a much smaller illicit trade problem than countries with much lower excise taxes (reference).

The tobacco industry acknowledges that illicit trade may have other causes as well, but they emphasise the link between illicit trade and the excise tax.<sup>12</sup> According to the tobacco industry the solution to illicit trade is clear: reduce, or, at the minimum, do not increase the excise tax. The tobacco industry has a vested interest in emphasising and exaggerating the magnitude and the growth of the illicit market.<sup>20</sup>

What is not said is that, in South Africa, the quantum of the excise tax is largely determined by the tobacco industry. Since 2004 the excise tax, which is levied as a specific tax, is set such that the total tax burden (i.e. excise tax plus VAT) is 52% of the recommended retail price of the most popular brand. Between 1994 and 2003 the total tax burden was targeted at 50% of the recommended retail price. The system has been in place for nearly 20 years and has been consistently applied. The government passively adjusts the excise tax on an annual basis in order to keep the total tax burden at the set threshold. The industry controls the retail price of cigarettes through its control of the net-of-tax price. The absolute amount of the tax increases in response to retail price increases in the previous year. For the tobacco industry to claim that illicit trade in cigarettes is out of control and linking it to excise tax increases, while at the same time effectively setting the quantum of the excise tax, is hypocritical.

The tobacco industry has been very effective at putting the threat of illicit trade in cigarettes in the minds of the public and Treasury officials. In 2010 TISA launched a public relations campaign, warning the public against smoking illicit cigarettes and linking illicit cigarettes with organised

crime.<sup>21</sup> In South Africa, with its very high rates of violent and organised crime, this campaign struck a sensitive chord with the public. Informal discussions between the author and officials at the Treasury indicate that the real or perceived threat of illicit trade prevents them from significantly increasing the excise tax.<sup>5</sup>

In a presentation by BAT to the National Treasury in June 2012, BAT claimed that the illicit market had grown from 7.9% in 2008 to 10.4% in 2009, 21% in 2010 and 26% in 2011.<sup>22</sup> Recently TISA indicated that the illicit market comprised 30% of the total cigarette market in 2012 and that it had risen towards 35% in the first quarter of 2013.<sup>12</sup> While the current study finds a substantial increase in the illicit market in 2010, there is no support for such large increases in 2011 and 2012. Also, the tobacco industry's illicit trade estimates suffer from time inconsistency. As far back as 2006 TISA claimed that illicit trade comprised 20% of the total cigarette market. The estimates for 2008 and 2009 presented to the Treasury are much lower than 20%, and cast doubt on the credibility of the industry to advise the government on the size of the illicit market.

Illicit tobacco trade is a problem and should be taken seriously. In fact, the South African Revenue Services, together with TISA, the South African Police Services, the National Prosecuting Authority and other law enforcement agencies have been actively involved in efforts to reduce the illicit trade and there is evidence that this has paid off in the past two years. The adoption of the Protocol to Eliminate Illicit Trade in Tobacco Products at the November 2012 Conference of the Parties to the WHO-FCTC in Seoul is indicative of the seriousness of the problem. However, the industry's rhetoric about the magnitude of the problem should be examined critically. If previous estimates of the size of the illicit market proved to be hugely exaggerated, on what grounds are current estimates accurate?

The current study is a novel and inexpensive way of measuring trends in the illicit market and evaluating whether increases in illicit trade, real or imagined, have had negative fiscal consequences. The methodology is based crucially on the assumption that there exists a stable and predictable relationship between cigarette consumption and cigarette prices and income. As indicated above, numerous studies have demonstrated this relationship.

The paper comes to a nuanced conclusion with respect to changes in the illicit market. Excise revenues from cigarettes have, on average, been closer to budget and more predictable than revenues from beer and spirits. With the possible exception of 2000-2002, there is no evidence that there has been an increase in the illicit market until 2010. However, in 2010 there was a sharp increase in illicit trade and this has had a detrimental impact on excise revenues. The illicit market probably peaked in 2011, but has decreased substantially in 2012.

With minor modifications this methodology could be applied in other countries, especially where credible estimates of trends in the illicit market do not exist. What it does require, however, is a stable relationship between tobacco consumption and its determinants, relatively accurate time series data for the relevant variables, and an excise tax that is levied as a specific rather than an ad valorem tax.

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