# Tobacco Excise Tax in Kenya: An Appraisal

Jane Kiringai
Njuguna S. Ndung'u
Stephen N. Karingi

*Macroeconomics Division*
Kenya Institute for Public Policy
Research and Analysis

*KIPPRA Discussion Paper No. 21*
*November 2002*

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Published 2002

Bishops Garden Towers, Bishops Road
PO Box 56445, Nairobi, Kenya
tel: +254 2 2719933/4; fax: +254 2 2719951
email: **admin@kippra.or.ke**
website: http://www.kippra.org
ISBN 9966 949 33 X

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KIPPRA acknowledges generous support by the European Union (EU), the African Capacity Building Foundation (ACBF), the United States Agency for International Development (USAID), the Department for International Development of the United Kingdom (DfID) and the Government of Kenya (GoK).

## ABSTRACT

*Excise taxes form a substantial proportion of revenue for governments all over the world, and especially in low-income developing countries. Excise taxes are levied on a few goods characterised by low price elasticity of demand; there is minimal cutback in consumption of the good as price increases. Excise on tobacco falls under the category of sin taxes – taxes that are meant to discourage behaviour associated with inefficient decision-making. Using OLS, we determine both the long-run and short-run price elasticity for cigarettes which we then use to determine the tax rate that would maximise tax revenue for the government. The empirical results show that long-run responses are high, ranging between -1.78 for all cigarettes to -1.36 for filter cigarettes. Using the elasticity for all cigarettes, we find that the tax rate that would maximise tax revenue should be at 128%. This is fairly close to the current rate of 130% but the revenue maximising tax rate combines both excise tax and VAT. We conclude that in general, the price elasticity is not as low as authorities may have assumed. In the short run, the elasticity is low yet tax policy cannot be based on short-run responses but rather on long-run structural movements. Since tobacco excise tax is a sin tax, there is justification to impose high taxes, despite the high elasticity, to deter consumption. However, if set too high there will be evasion and smuggling, therefore defeating the revenue maximising goal. There is also a danger of substitution to more harmful substances.*

## ACKNOWLEDGEMENTS

We would like to thank Marie Claire Ngare and John Mutua for excellent research assistance. Financial support from the International Tax Centre is a gratefully acknowledged. We would also like to thank British American Tobacco (BAT) and Andrew Okello for availing to us the relevant data.

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## EXECUTIVE SUMMARY

There is increasing concern that taxes should adhere to the basic principles which include ease in administration, simplicity, compliance and minimal effect on resource allocation. Taxes should minimally affect the relative price structure. Excise taxes, especially luxury taxes, are progressive in the distribution of the tax burden and this makes them attractive. They complement other taxes in achieving vertical equity in a tax system. The objective of this paper is to determine the excise tax rate that would maximise tax revenue from tobacco products.

Specifically, the paper uses Ordinary Least Squares (OLS) to determine the revenue maximising tax rate for cigarettes. From economic theory, excise taxes are efficient, relatively high, and can be levied with minimal welfare loss. Excise taxes on tobacco are classified as sin taxes due to the high negative externalities. In addition to raising revenues, relatively high taxes are also used to deter consumption of the harmful product.

**Empirical Framework**

From basic microeconomic theory, the demand of a good is influenced by the price of the good, the individual's disposable income, and the price of complements and/or substitutes. Using Ordinary Least Squares, a demand function for cigarettes is formulated as a function of its own price, the price of substitutes, the price of all other goods and the disposable income.

To estimate the elasticity of demand for cigarettes we use a sample of five brands from British American Tobacco (BAT): SE 555 family, Embassy family, Sportsman family, Sweet Menthol and Crown Bird. These five brands account for about 45% of total sales of domestic production. We use monthly data from 1981 to December 2000 for quantity and prices, availed by BAT, to estimate the model.

The modelling strategy adopted works as follows; since we use high frequency data, we start with a partial adjustment model (PAM), with several lags. This is because other forms of dynamic specifications like autoregressive process failed to produce sensible results, perhaps due to the noise in the data. In estimating the PAM, we reduced the model until we arrived at significant results by marginalizing the density functions in the model-reduction process. Since the results had several significant lags in the process, the next stage was to solve the model so that the reported parameters reflect the elasticity when the adjustment is complete. Therefore, even though we start with a dynamic model, we solve the models so that the results reported are static, coming from a dynamic specification when the adjustment process is perceived to be complete. This is consistent with the long-run model postulated.

After a satisfactory long-run model is arrived at, a similar procedure is followed to re-estimate a short-run model given that the long-run model is already estimated. This strategy allows the short-run model to hinge on the long-run model and gives us a chance not only to analyse the short-run elasticity but also show how the short-run elasticity adjusts towards the long run elasticity. After determining the elasticity, we then adopt the methodology used by Haughton (1998) to determine the revenue maximising tax rate for cigarettes.

**Results**

The results indicate that the short-run price elasticity for all cigarettes is –0.49 while the long-run price elasticity is -1.784, a relatively high price elasticity. A one percent increase in the price of cigarettes results in a 1.78 percent reduction in the demand of cigarettes. In the long run, high prices deter potential smokers of ages 15-24 from starting the habit and reduces the number of ex-smokers who would want to resume the habit. The short-run price elasticity of filter cigarettes is –0.86 and the long-run demand for filter cigarettes is elastic with an own price elasticity of -1.36. This means that a one percent increase in the price of filter cigarettes will result in 1.36 percent reduction in consumption. The model estimates cross price elasticity with plain cigarettes at 0.29, meaning a one percent increase in the price of filter cigarettes results in a 0.3 percent increase in the consumption of plain cigarettes—a minimal substitution to lower quality cigarettes.

**Conclusion**

We conclude that in general, the price elasticity is not as low as authorities may have assumed when the policy was put in place. In the short-run, the elasticity is low yet policy cannot be based on short-run responses but rather on long-run structural movements. However, since tobacco excise tax is a sin tax, there is justification to impose high taxes, despite the high elasticity, to deter consumption. Since cigarette taxation is uniform (not differentiated by product), we used the elasticity for all cigarettes to arrive at the revenue maximising tax rate of 128%, which is very close to the current rate of 130%.

It is worth noting that the price used in the model estimation is all tax inclusive; that is it includes both excise and VAT and the revenue maximising tax rate should be interpreted as the effective rate—one that includes both excise and VAT.

# 1. INTRODUCTION

Excise taxes form a substantial proportion of revenues for governments all over the world and especially in low-income developing countries. Excise taxes are levied on a few goods characterised by low price elasticity of demand—there is minimal cutback in consumption of the good as price increases. The low elasticity makes the goods attractive for high taxation since the excess burden arising from the tax is minimal. However, the process of development is such that these goods develop substitutes in the long run and so the price elasticity increases. For this reason, tax policy should be constantly revised to take care of these changes and enhance tax revenue targets.

This paper is part of a tax project[1] that attempts to identify the current merits and demerits of the tax policy and the accompanying tax rates. There is increasing concern that taxes should adhere to the basic principles of taxation, including ease of administration, simplicity, compliance, and minimal effect on resource allocation. Taxes affect the relative price structure minimally. The argument in this paper is that the excise tax rate should be as close as possible to the rate that would optimize tax revenue from the product. Optimal tax rate should then be used to show that it would have minimal effect on the relative price structure. Furthermore, an argument gaining currency in other papers in this project is that once the actual tax rate is close to the optimal rate, switching to a specific tax has some specific advantages that should be explored with a view to shifting the tax policy. One of the advantages is to ensure stability and predictability of tax revenues.

[1] The KIPPRA Tax Project was started in 2000 and the focus has mainly been on establishing the revenue maximising tax rates for excisable commodities. The project scope was later expanded in 2001 to encompass the research activities of the Tax Policy Unit (TPU) in which KIPPRA is a member. The TPU activities are both supply and demand-driven.

Excise taxes can be classified into three broad categories:

1. Sumptuary excise—to reduce consumption of goods like tobacco and alcoholic beverages which have negative externalities. These taxes are also referred to as sin taxes, and the most widely used goods in this category are cigarettes and alcohol.
2. Benefit excise—levied on goods like gasoline, vehicles, tyres, etc; the revenue raised is used for road construction and maintenance.
3. Luxury excise —levied on goods that are not considered essential for a minimum standard of living; the goods are mainly consumed by high-income groups. This class of goods is characterised by great variations in quality and price, and the tax is therefore levied on an *ad valorem* basis.

There are five issues to be considered in improving a tax system. These are:

- the impact on government revenue
- economic efficiency—the impact on incentives; it should not interfere with efficient allocation of resources
- fairness—the effect on welfare distribution; it should be seen to be fair
- the effects on patterns of production
- administrative simplicity—how the changes are to be enforced and at what cost.

The four main reasons that make excise taxes popular with governments in low-income countries compared to other taxes are that excise taxes are progressive, efficient, flexible and easy to administer.

For countries with weak administrative capacity, *progressive* income and wealth taxes are difficult to implement. Excise taxes, and especially luxury excise taxes, are progressive in the distribution of the tax burden.

This aspect makes them attractive and they complement other taxes in achieving vertical equity in a tax system. Squire and Shalizi (1989), using data from Malawi, found that supplementing the basic consumption tax with a limited number of *ad valorem* excise taxes resulted in a tax content of expenditure by the richest four income groups to be 18% while that of the poorest was only 9%. This finding confirms that excise taxes increase efficiency in a tax system.

The *efficiency* benefit in excise taxes is derived from the low price elasticity characteristic of excisable goods. Relatively high taxes can be levied with minimal welfare loss. The exemption from this argument is the case for tobacco where increase in price due to higher taxation increases the tax burden for the poor.

*Flexibility* in excise taxes is achieved through responsiveness to budgetary needs. Low elasticity means that sales volumes do not change and discretionary measures raise substantial revenue through excise taxes. However, with high elasticities, it implies that the targeted revenues may not be achieved due to the possibility of substitution.

The fourth characteristic is *simplicity and certainty*, which is essential in a tax system. This derives from the fact that the tax base for excisable goods is easily understood by both the tax officials and the taxpayer, and this leaves no scope for misinterpretation, and by extension rent seeking activities and collusion between the taxpayer and the tax official.

Excise taxes can be levied on specific or *ad valorem* basis. Jenkins and Khadka (2000) argue that although taxation on *ad valorem* basis is preferred—tax revenues are not eroded by inflation—it may change the incentive structure for firms to lower prices at the point of taxation through transfer pricing. However, like all other taxes, there will be evasion and smuggling if the tax rate is set too high, therefore defeating the revenue maximising goal. In the case of tobacco, there is also a legitimate danger of substitution to more harmful products.

Traditionally, taxes on tobacco were mainly a revenue-generating tool. Recently however, with the increased awareness of the health risks posed by tobacco, focus has changed to deterring consumption in addition to generating revenue. Excise on tobacco falls under the category of sin taxes—to discourage behaviour associated with inefficient decision-making. It is estimated that deaths resulting from tobacco consumption rank second after HIV/AIDS, and that most casualties die in middle age, therefore losing 20 to 25 years of life.

The third economic rationale arises from the harmful externalities associated with smoking—costs imposed on the rest of the society. The excise tax in this case functions like a Pigouvian tax forcing smokers to internalise the costs associated with smoking.

Unlike taxes on other sumptuary goods, empirical studies done in the US found taxes on tobacco to be regressive both in proportional and absolute terms (Viscusi, 1994). The study concluded that cigarette consumption is a decreasing function of income—the poor are more likely to smoke than the rich. The analysis based on a sample of smokers found that cigarette tax comprised 0.4% of the individual's income for the affluent, compared to 5.1% of the income of the poor.

Smoking has adverse externalities both for those who indulge in the habit and those around them. An excise tax on tobacco is therefore intended to raise government revenue and also act as a tool to control or limit smoking. Jha (1999) in a cross-country study found that raising taxes on tobacco could save millions of lives while increasing government revenue in the short and medium term. For purposes of deterring consumption, a specific tax—say tax per stick—is more effective than an *ad valorem* tax, which is preferable if the core function is generating revenue.

Determining the appropriate level of taxes for tobacco is a complex policy issue. Other than just the revenue maximising tax rate, there are three important issues to consider:

*(i) Substitution to more dangerous products*

If the rates are set too high, there is a danger of substitution to more dangerous products. In the case of tobacco for instance, demand is inelastic for those who are heavily addicted and there is a danger that when the taxes are fixed at very high rates there will be substitution to more dangerous products like Heroin or similar drugs. Moore and Hughes (2000) and several studies document that mortality increases with quantity of tar and nicotine. In this eventuality, the outcomes will defeat the intended purpose. However, evidence from the literature available on this subject is not conclusive.

One group of researchers[2] concluded that cigarettes, alcohol and marijuana are complements. Deterring the consumption of cigarettes would therefore also deter the consumption of other dangerous drugs. In this school of thought, cigarettes are considered to be a "gateway drug" (Chaloupka et al., 1999) where experimentation with other drugs starts.

The second group of researchers concluded that the products—cigarettes, alcohol and marijuana—are substitutes. This would legitimise the fear of substitution to more dangerous drugs.

*(ii) Cross border shopping*

With the introduction of trade blocs, cross-border shopping might be inevitable if rates are set much higher than those in neighbouring countries. Harmonizing the rates between countries in the regional bloc

[2] DiNardo and Lemieux (1992) conclude that the products are substitutes among youth. Farrelly et al (1998), Pacula (1998) and Saffer and Chaloupka (1999) conclude that alcohol, cigarettes and marijuana are complements.

might be more critical than setting it at the revenue maximising level. In the US for instance, states that had lower cigarette taxes than their neighbours in 1978 reported higher cigarette sales per capita than the national average. In 1977, cigarette sales per capita in New Hampshire were 278.8 packs compared to neighbouring Massachusetts with 118.9, where the prices were 90 cents higher per pack (Lewit and Coate, 1981).

*(iii) Smuggling*

Globally, cigarette smuggling is a serious problem. It is estimated that 30% of exported cigarettes are lost to smuggling. In addition to reducing excise revenues, smuggling has a spillover effect to VAT and income taxes, as illegal transactions replace legal ones. It is therefore in the interest of the government to keep smuggling at a minimum.

Smuggling is advantageous to the producer and the consumer; the consumer benefits from lower prices, the producer from higher sales volumes, while the government loses out on revenue. Jha (1999) found that during the 1990's, a 450% increase in excise taxes for cigarettes in South Africa increased smuggling from zero to about 6%. In Kenya, excise stamps were introduced in the year 2000 to curb smuggling, an indicator that it has been recognised as problem. However, smuggling is not a function of price alone; it also depends on the corruption index of a country. Chaloupka et al (1999) found a positive relationship between smuggling and the corruption index of a country.[3]

In setting the optimal tax level, two approaches can be used depending on the core motivation. If the study is motivated by health considerations, then the optimal rate would be set to achieve a specific reduction in cigarette consumption. On the other hand, if the motivation is revenue

[3] He estimated smuggling as a function of transparency index as $Y=-0.02X + 0.2174$ where Y is smuggling and X is the transparency index; the higher the transparency index the lower the level of corruption in a country. Note that X represents transparency and not corruption.

generation, then the rate will be set at the revenue maximising rate. This paper aims to determine the revenue maximising excise tax rate for tobacco in Kenya. The health concerns for determining the appropriate level of taxation for cigarettes is beyond the scope of this paper.

The rest of the paper is structured as follows: in section two, the paper examines the revenue importance of excises taxes in Kenya while section three forms the theoretical background. Section four presents the estimation of results while section five provides the conclusions to the study.

# 2. EXCISE TAXES IN KENYA

## 2.1 Tobacco Production, Trade and Industry[4]

In 1990, 0.2% of arable land—4,000 hectares—was used to produce tobacco. Between 1990 and 1992, Kenya accounted for 0.1% of total world production in tobacco. Production of cigarettes increased from 6,370 million in 1990 to 7,400 in 1994, accounting for 0.1% of world demand. Exports increased from 430 million to 530 million cigarettes per annum. In 1990, tobacco accounted for 0.2% of total export earnings at US$ 4.7 million. During the same period, import costs stood at US$ 850,000. The available data indicates that in 1993, tobacco manufacturing accounted for 0.51% of total manufacturing employment.

## 2.2 Consumption and Production

Cigarette consumption per capita has remained stable at around 500 cigarettes per adult (15+years). A 1987 survey found a prevalence of 18% with an average smoker taking 8 cigarettes per day and 4% of smokers taking 20 or more cigarettes per day. Table 1 below shows cigarette consumption per capita.

[4] Source: WHO (www.cdc.gov/tobacco/kenya).

Table 1: Cigarette consumption per capita

| Consumption of manufactured cigarettes[5] | |
|---|---|
| | **Annual average per adult (15+)** |
| 1970-72 | 420 |
| 1980-82 | 560 |
| 1990-92 | 500 |
| 1995[6] | 442 |

Cigarette production has been on the increase with a peak performance witnessed in 1997, but production has been declining since then (Table A5). This pattern was replicated in consumption. However, since 1994, the gap between consumption and production has been widening as consumption declined. It is worth noting that this period coincides with new entrants in the cigarette market and further analysis needs to be done in this area to see the exported quantities. Chart 1 shows cigarette production and consumption in Kenya from 1980 to 2000. It appears that prior to 1994, production was mainly for home consumption but production has since then exceeded consumption.

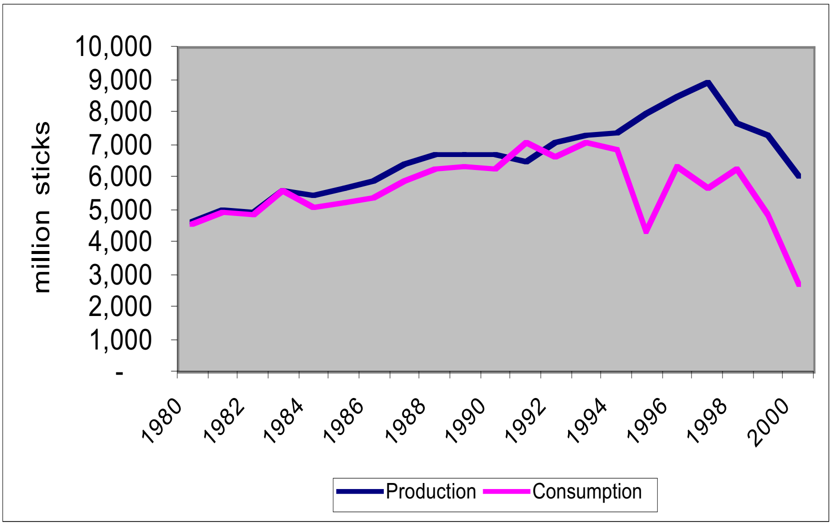
## 2.3 Revenue Trend

Indirect taxes comprise over 60% of total tax revenue (Chart 2). Of the indirect taxes collected during the period 1989/90 and 1997/98, the proportion of excise taxes to indirect taxes has been increasing steadily, rising from 12.1% in 1989/90 to 31.5% in fiscal year 1997/98.

[5] Source: WHO www.cdc.gov/tobacco/kenya

[5] Source: www.worldbank.org/tobacco/breiflist

Chart 1: Production and consumption of cigarettes: 1980-2000



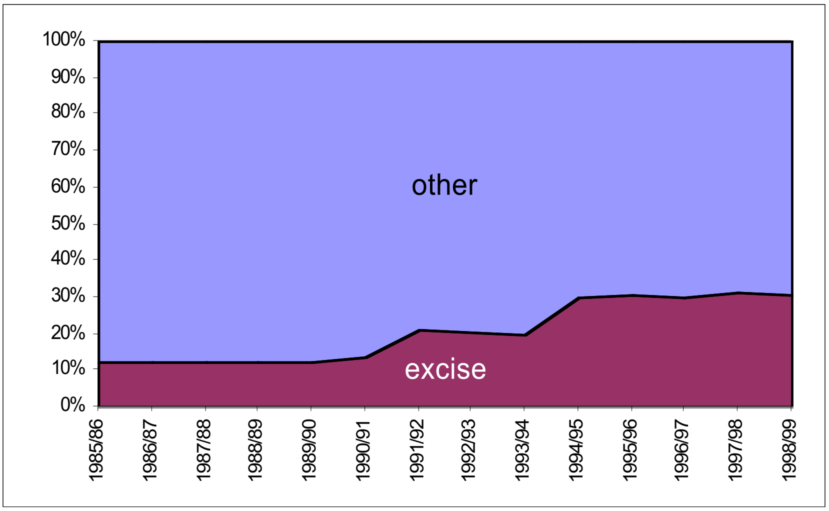

*Source: Statistical Abstract (various issues)*

The tax capacity—defined as excise duty as a proportion of GDP—for excise duty increased from 2.1% to 4.4 % in 1996/97; all other taxes had mixed results during this period. This steady increase elevated the significance of excise taxes from the bottom to the third position, after income tax and VAT with a capacity of 8.7% and 5.1% respectively[7].

This performance can be attributed to the reform efforts that increased the tax base by extension to cover imports, upward revision of tax rates, and the switch from specific taxation to *ad valorem* basis for some goods. Chart 2 below shows the change in the composition of indirect taxes during the period 1985/86 to 1998/99.

[7] These numbers are calculated from Okello (2001), Table 3.

Chart 2: Composition of indirect tax revenue

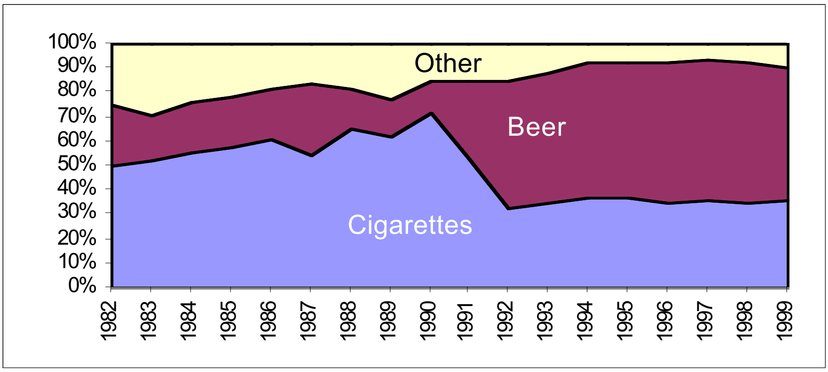



*Source: Statistical Abstract and Economic Survey (various issues)*

In Kenya, excise taxes are imposed on a limited list of sumptuary items that are assumed to be relatively price inelastic. The main excisable items are petroleum products, beer, cigarettes, spirits, matches and tobacco in order of importance. Currently, an excise tax of 130% is imposed on all types of cigarettes unlike in the beer industry where excise tax is differentiated by product.

Prior to the reform period, cigarettes made the biggest contribution in indirect taxes. This changed in 1990/91 when an 18% VAT was levied in addition to the excise tax and the rates for beer were revised from a high Ksh 10.48 per litre in 1989/90 to 18% VAT and excise tax of 100%. These reforms changed the significance of revenue contribution for the two products. The change in the composition of excise taxes is depicted in Chart 3 below.

Chart 3: Composition of non-oil excise tax revenue




*Source: Statistical Abstract (various issues); Economic Survey, 2000*

The discussion so far seems to point to the fact that excise taxes are one area that is available for the government to generate more revenue without being seen to increase the tax burden for the economy. However, it does increase the overall tax effort for the country, but the incidence is not widely felt as it would in other forms of direct and indirect taxes. Okello (2001) found the demand for cigarettes inelastic to price both in the long run and short run, and concluded that there is still scope for additional revenue from cigarettes and beer. His study, however, did not determine the revenue maximising levels for the two commodities.

# 3. LITERATURE REVIEW

There is evidence that in middle and low-income countries, elasticity of demand for tobacco is higher than in high-income countries (Jha, 1999). The elasticity for low-income countries is estimated to range between -0.6 and –1; current data estimate the average elasticity at –0.8 and that for high-income countries at –0.4.

Okello (2001), in a similar study for Kenya, estimated the price elasticity of demand at –0.36 for filter cigarettes and –0.26 for plain cigarettes; very close to that of high-income countries. Other studies have found that the elasticity varies by age and gender. A cross section study estimated elasticities ranging from –0.4 to –1.4 for teenagers. In a survey undertaken in 1981, Lewit and Coate (1981) report an elasticity of –1.4 for ages 12-17. In high-income countries, smoking starts in the teens (about 80% of all smokers) while in the low and middle income countries the habit starts in the early twenties.

Lewit and Coate (1981) found that the price effects are much larger for males than for females over 20 years old. They estimated an overall price elasticity of demand for cigarettes at –0.42.

The price of cigarettes impacts on the demand in two ways (Lewit and Coate, 1981):

(i) Participation decision—the decision to smoke or not to smoke – mainly for teenagers and young adults

(ii) Quantity adjustment—for those already in the habit

They conclude that these results have implications on excise tax policy. Using the estimated elasticity of –0.42 in the demand equation for cigarettes, they find that doubling excise tax and assuming that the whole tax is passed on to the consumer would increase the retail price by 13% and consumption would fall by 5.5%. They decomposed the fall in demand to 3.9% due to decline in participation and 1.3% decline in the quantity smoked. This shows that in the short run, the effect of a tax increase would be minimal but the effects will be substantial in the long run. Becker et al (1994) found the demand for cigarettes to be elastic and similar to that of many other goods, and long-run elasticity to be greater than short-run elasticity.

Other recent research findings have also disputed the theory that the demand for cigarette is inelastic. Jha et al (1999) found that between 1982 and 1992 in Canada, a tax increase led to a steep increase in the real price of cigarettes, and consumption fell substantially. Other research findings reveal that price increases dissuade potential smokers from starting; the high price elasticity encourages some to stop smoking and reduces the number of ex-smokers who resume the habit.

# 4. EMPIRICAL FRAMEWORK

This section draws heavily from the methodology used by Haughton (1998) and Karingi et al (2001). The main goal is to estimate a demand function for cigarettes, from which the elasticity will be derived. These will be plugged in the revenue maximising function.

The revenue maximising tax rate depends on two factors; first the form of the supply curve—perfectly elastic supply or relatively inelastic, and secondly on the form that the demand function assumed. Haughton (1998) argues that for most excisable goods, infinite elasticity of supply is a reasonable assumption. Theory is not helpful in terms of the functional form of the demand function.

A linear demand curve:[8]

$$Q = a + bP \qquad \text{......................}(1)$$

will yield a revenue maximising tax rate (t*) given by the following formula:

$$t^* = \frac{-1}{2k} \qquad \text{......................}(2)$$

On the other hand, a constant elasticity demand curve:

$$Q = cP^h \qquad \text{......................}(3)$$

will yield a revenue maximising tax rate given by

$$t^* = \frac{-1}{1+k} \qquad \text{......................}(4)$$

Equation (2) yields a higher revenue maximising tax rate, which would confirm that the demand curve of the excisable good is important in determining the revenue maximising rate[9].

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[8] See box 1&2 for the detailed derivation of 2&4. The two boxes draw from Haughton (1998).

[9] For constant elasticity demand curves, the revenue maximising tax rate is not defined—for certain values of elasticity—and in other cases the tax rate is negative or infinitely high.

**Box 1: Determining revenue maximising tax rate for a linear demand curve**

For the linear demand curve:

$$Q = a + bP \quad ..$$

The revenue R achieved after imposing a tax t is given by:

$$R = tQ_1P_o \quad ..................................................(1)$$

where $Q_1=a+b(P_o(1+t))$

Substituting for $Q_1$ , equation (1) becomes:

$$R=tP_o(a+bP_o(t+1)) = atP_o+bP_o^2t+bP_o^2t^2$$

To maximise the revenue we get the first level derivative with respect to t, set it to zero for maximization and solve for the optimal tax rate t*;

$$t^*=\delta R/\delta t$$

$$\delta R/\delta t = aP_o+bP_o^2+2bP_o^2t^2=0$$

$$t^*=\frac{-(a+bP_o)}{2bP_o}=\frac{-Q_o}{2bP_o}$$

Defining own elasticity as $K=\frac{[\delta Q}{[\delta P} \cdot \frac{P]}{Q]}$

$$=\frac{[P\delta Q]}{[Q\delta P]}$$

Then $$K=\frac{bP_o}{Q_o}$$

$$t^* = \frac{-1}{2K}$$

**Box 2: Determining revenue maximising tax rate for a constant elasticity demand curve**

The demand for a good with constant elasticity can be expressed as:

$$Q = cP^n$$

The revenue from the above function is given by

$$R = tP_0 Q_1$$

Where $Q_1$ is the quantity demanded after the slapping of a tax and is equal to:

$$Q_1 = c\{P_0(1+t)\}^n$$

$$R = tP_0 cP_0^n (1+t)^n = t(1+t)^n cP_0^{1+n}$$

The first derivative of the above equation yields the revenue maximising tax rate t*

$$\delta R/\delta t = cP_0^{1+n}\{(1+t^*)^n + t^*\eta(1+t^*)^{n-1}\} = 0$$

Therefore $(1+t^*)^n = -\, t^*\eta \dfrac{(1+t^*)^n}{1+t^*}$

$$\Rightarrow t^* = \frac{-1}{1+\eta}$$

# 5. DEMAND EQUATIONS FOR TOBACCO

From basic microeconomic theory, the demand of a good is influenced by the price of the good, the individual's disposable income, the price of complements and/or substitutes. A demand function for cigarettes can be formulated as follows:

$$Q_{dt} = f(P_{it}, P_{jt}, P_{kt}, Y_t) \qquad \text{.....................................} (5)$$

where:

$Q_{dt}$ is the quantity of cigarettes demand in time t

$P_{it}$ is the price of cigarettes in time t

$P_{jt}$ is the price of substitutes in time t

$P_{kt}$ is the price of all other goods in time t

$Y_t$ is the disposable income in time t.

For the purposes of this study, all the data will be transformed into real variables by dividing by the Consumer Price Index (CPI) to adjust for inflation. In the absence of incomes of the informal sector, M0 will be used as a proxy for disposable income. Smoking is prevalent among teenagers and young adults who have no income and would therefore not be captured if income were used. The CPI will be used as a proxy for the price of all other goods. Deflating other prices with CPI will then imply that we are dealing with relative prices.

Another variable that could be included in the demand function is the demographic structure of the country. The proportion of the population in the smoking age bracket increases the demand of tobacco.

Cigarettes and beer are complements; in this case then, smoking would tend to increase with beer consumption especially during holiday seasons. Due to this, it may be necessary to model these episodes using some seasonal-centred dummies, or some impulse dummies to take into account some influential periods.

Using the above variables, a log linear demand function will be estimated:

$$\ln(Q_{dt}) = \alpha_0 + \alpha_1 \ln(P_{it}) + \alpha_2 \ln(P_{jt}) + \alpha_3 \ln(Y_t) + \alpha_4 POPS_t + \varepsilon_t \qquad \text{.......} (6)$$

where

All prices are real

$\alpha_0$ is a constant

$\alpha_1$ is own price elasticity of demand

$\alpha_2$ is the cross price elasticity of demand

$\alpha_3$ is income elasticity of demand

$\alpha_4$ is the effect of population on smoking

$\varepsilon_t$ is the error term

So far, this model will provide us with long-run elasticities. To have some feel about short-run elasticities we reparameterize this equation into:

$$\Delta\ln(Q_{dt}) = \beta_0 + \beta_1 \Delta\ln(P_{it}) + \beta_2 \Delta\ln(P_{jt}) + \beta_3 \Delta\ln(Y_t) + \beta_4 \Delta POPS_t + \beta_5 EC_{t-1} + \mu_t \qquad \text{.......} (7)$$

where:

$$EC_{t-1} = \ln(Q_{dt-1}) - \alpha_0 - \alpha_1 \ln(P_{it-1}) - \alpha_2 \ln(P_{jt-1}) - \alpha_3 \ln(Y_{t-1}) - \alpha_4 POPS_{t-1}$$

where $\beta_i$ are now short-run elasticities while the $\alpha_i$ are long run elasticities. When this equation is estimated dynamically, it will produce a set of results where the short-run elasticities will show adjustment towards the long-run elasticities. The amount of error encountered each period will reflect how much speed of adjustment takes place or is required. This will be given by $\beta_5$. An important assumption made in this reformulation is that the variables are cointegrated. This implies that the log linear demand function adequately reflects correct specification of the demand model. This is not a strong assumption and in any case it requires empirical verification before the final model is estimated.

## 5.1 OLS Estimation of Demand for Filter Cigarettes

### 5.1.1 Long-run model

To estimate the elasticities of demand for cigarettes, a sample of five brands from BAT—SE 555 family, Embassy family, Sportsman family, Sweet Menthol, and Crown Bird—was used. These five brands account for about 45% of total sales of domestic production. Monthly data (from 1981 to December 2000 for quantity and prices) availed by BAT was used to estimate the model.

The modelling strategy adopted works as follows: since we use high frequency data, we start with a partial adjustment model (PAM), with several lags (this is because other forms of dynamic specifications like autoregressive process failed to produce sensible results perhaps due to the noise in the data). In estimating the PAM we reduced the model until we arrived at significant results by marginalizing the density functions in the model-reduction process. Since the results had several significant lags in the process, the next stage had to solve the model so that the reported parameters reflect the elasticities when the adjustment is complete. Therefore, even though we start with a dynamic model, we solve the models so that the results reported are static, coming from a dynamic specification when the adjustment process is perceived to be complete. This is consistent with the long-run model postulated.

After a satisfactory long-run model is arrived at, a similar procedure is followed to re-estimate a short-run model given that the long-run model is already estimated. This strategy allows the short-run model to hinge on the long-run model and gives us a chance not only to analyse the short-run elasticities but also show how these short-run elasticities adjust towards the long-run elasticities.

Following the model specification in equation (7), the results of the demand equation for filter cigarettes is:

$$\ln q_{ft} = 8.373 - 1.364\ln P_{ft} + 0.29\ln P_{pt} + 0.92\ln M0_{t} - 2.05\mathrm{SEAS} - 1.466\mathrm{POPS}_{t}$$

$$(9.4) \quad (-9.71) \quad (11.68) \quad (8.3) \quad (-4.18) \quad (-1.16)$$

(t-statistic in parenthesis)

Diagnostic tests:

$R^2$= 0.88; RBAR$^2$=0.85; Jarque-Bera Normality test: $\chi^2(2)$ =0.15; RESET test F(1,198)=3.95(0.0482); WALD test $\chi^2$ (10)=243.53(0.000); AR 1-7 F(7,192)=2.08(0.0475); ARCH 1-7 F(7,185)=0.77(0.6119); n=288.

The results indicate that the demand for filter cigarettes is elastic with an own price elasticity of –1.36. This means that a one percent increase in the price of filter cigarettes will result in a 1.36 percent reduction in consumption. The model estimates cross price elasticity with plain cigarettes at 0.29. As the price of filter cigarettes increases, a one percent increase in the price of filter cigarettes results in a 0.3 percent increase in the consumption of plain cigarettes—a minimal substitution to lower quality cigarettes. One of the ideas thought feasible was to introduce the price of a complimentary good, like an average lager beer. However, data was not available for the whole sample (1981-2000) for this complimentary product. This could have perhaps improved the elasticities and ensured faster convergence.

In order to proxy for current income, we used currency in circulation, M0. It has a positive sign, as expected. Cigarette consumption is likely to be influenced by an individual's liquidity given that the price of filter cigarettes ranges from Kshs 40–100 per packet of 20. This argument is strengthened by the fact that it is also possible to buy cigarettes per stick, which translates to a price range of Kshs 2-5 per stick. Therefore, it is liquidity which drives consumption, and therefore the quantity demanded, rather than the level of disposable income; although the level of disposable income determines the level of liquidity.

Working with high frequency data entails dealing with noisy elements which come from abrupt quantity or price changes not captured by the fundamentals. To solve the problem, five impulse dummies were introduced to capture shocks: D971, D2001, D972, D978, D20012- they were included on the basis of outliers in the process. These dummies were necessary to stabilize the regression coefficients and improve the diagnostic tests. It does appear that the equation estimated seems to have stochastic shocks quite frequently and price changes behave like step jumps. The full results are reported in Annex Table A1. A trend variable was introduced in the model but was dropped, as it was not significant. Introducing seasonal dummies (SEAS) improved the model results. The seasonal dummies are significant and have a negative sign; smoking peaks during the Christmas season and drops even more substantially in January.

### 5.1.2 Short-run model

To have a feel about short-run elasticities, the model was re-parameterized as per equation (7) and where $EC_{t-1}$ is the deviation from the long-run model estimated lagged one step and serves as an error correction term in the short-run model. This is because as argued, the long-run model is solved to provide an anchor or steady state for the short-run model. The diagnostic test results are shown below. The model results tentatively reflect the data used and are reported below:

$$\mathrm{Dln}q_{ft} = \underset{(1.59)}{0.0035} \underset{(-7.4)}{-0.86}\mathrm{Dln}P_{ft} \underset{(-0.17)}{- 0.019}\mathrm{Dln}CPI \underset{(6.14)}{+0.54}\mathrm{Dln}M0_{t} \underset{(-0.29)}{- 0.107}EC_{t-1} \underset{(0.3)}{+0.558}DPOPS_{t}$$

(t statistic in parenthesis)

Diagnostic tests:

$R^2$= 0.89; RBAR$^2$=0.88; DW =2.03; Jarque-Bera Normality test: $\chi^2(2)$ =2.64; RESET test F(1,198)=3.8381 (0.0515); WALD $\chi^2$ (11)=138.98 (0.000); AR 1-7 F(7,189)=0.25(0.973); ARCH 1- 7 F(7,182)=1.66(0.120); n=227.

In the short-run model, the cross price elasticity for plain cigarettes was not significant and was dropped. The impulse dummies were also retrieved as in the long-run model and were also important in the short-run model.

The results indicate that in the short run, filter cigarettes have an own price elasticity of –0.86; a one percent increase in the price of filter cigarettes will result in a 0.86 percent reduction on the consumption of filter cigarettes. This elasticity is close to the elasticity estimated for developing countries at -0.8. This shows that in the short run, demand for filter cigarettes is relatively inelastic. It implies that it is in the long run that consumers effect plans either to downgrade in the case of a price increase or to upgrade in the case of a price fall. This may seem plausible and justifiable. Price increases in the short run should not dramatically affect quantity demanded; the short rigidity is also related to habit emanating from addiction. As the budget constraint starts to bite and substitution possibilities seem feasible, consumers start adjusting their demand in line with the elastic long-run demand. The adjustment speed is found to be 10.7%. This is consistent with empirical regularities of such models.

The cross price with the price of all other goods—proxy by CPI— has a negative sign, is very low and not significant. This implies that in the short run the cross-price of other goods does not matter and this is consistent with the argument above that in the short run, own price is inelastic. The results for long-run and short-run elasticities are summarised below:

Table 2: Elasticities of demand for filter cigarettes in Kenya

| | **Short run** | **Long run** |
|---|---|---|
| Own price elasticity | -0.86 | -1.36 |
| With respect to price of plain cigarettes | - | 0.29 |
| With respect to income | 0.54 | 0.92 |
| With respect to price of other goods | - | - |

## 5.2 OLS Estimation of Demand for all Cigarettes

### 5.2.1 Long-run model

The demand model for all cigarettes were estimated using monthly data from BAT for the period January 1981 to December 2000 following a similar modelling strategy as above. However, two brands of filter cigarettes, Champion and Score, were excluded from the sample due to lack of data for the period 1981 to 1994. The quantity and price of the brands in the sample, both filter and plain, are then used to calculate a weighted average price $P_{ct}$, which is used as the price for all cigarettes The results are as follows:

$$\ln q_{ct} = 14.52 - 1.784 \ln P_{ct} + 0.63 \ln CPI_t + 0.775 \ln M0_t - 3.1 SEAS - 7.04 POPS_t + 0.005T$$

(6.54) (-4.57) (2.1) (3.1) (-3.87) (-2.77) (2.5)

(t-statistic in parenthesis )

Diagnostic tests:

$R^2$= 0.88; $RBAR^2$=0.77; DW =1.98; Jarque-Bera Normality test: $\chi^2$ (2)=2.56 (0.2777); RESET test F(1,195)=0.050 (0.8223); WALD test $\chi^2$ (13)=98.9; AR 1-7 F(7,189)=0.25(0.973); ARCH 1-7 F(7,182)=1.66(0.120); n=228.

The variables have expected signs except for population with a negative sign, which seems to act as a deterrent to smoking instead of what is established in the literature. To stabilize the model, impulse dummies were introduced: D971, D2001, D972, D974, D978, D991, D20012. The dummies captured influential points that the postulated variables could not capture. These points looked like outliers and were quite sporadic. The detailed results are reported in Annex Table A2. The long-run price elasticity of demand for all cigarettes is –1.784; a high price elasticity. A one percent increase in the price of cigarettes results in a 1.78 percent reduction in the demand of cigarettes. In the long run, high prices deter potential smokers of ages 15-24 from starting the habit and reduces the number of ex-smokers who would want to resume the habit.

In this model, the cross price elasticity in respect to the price of all other goods (proxied by CPI) is positive. This is as expected because as the demand for cigarettes falls, the demand for other goods increases. Income has a positive effect on the demand for cigarettes; again this coefficient is as expected. It shows that a one percent increase in cigarette prices results in 0.63% substitution to other goods so that in the long run, consumers seem to substitute away from smoking. This result may seem to suggest that there may be a secular decline of smoking as price increases and the population seems to quit smoking. The seasonal dummies have a strong effect on the quantity of cigarettes demanded over some cycles or months; this is consistent with festive periods.

### 5.2.2 Short-run model

The short-run demand model for all cigarettes was estimated following the same procedure as in the model for filter cigarettes. The following results were obtained:

$$\mathrm{Dln}q_{ct} = 0.0046 - 0.496\mathrm{Dln}P_{ct} - 0.032\mathrm{Dln}CPI + 0.145\mathrm{Dln}M0_{t} - 0.11EC_{t-1} + 1.43DPOPS_{t}$$

(1.84) (-4.13) (-0.26) (1.11) (-3.14) (1.14)

(t-statistic in parenthesis)

Diagnostic tests:

$R^2$= 0.90; RBAR$^2$=0.82; DW =2.05; Jarque-Bera Normality test: $\chi^2$ (2)=7.89; RESET test F(1,194)=3.838(0.0515); WALD test $\chi^2$ (12)=139.46; AR 1-7 F(7,192)=1.495(0.1711); ARCH 1-7 F(7,185)=2.6063(0.0137); n=227.

The results are consistent with those estimated in the short-run demand for filter cigarettes. The own price elasticity of -0.5 is however lower than the long-run elasticity as would be expected, confirming that in the short run, the demand for cigarettes is price inelastic but fairly elastic in the long run. The cross price with respect to the price of all other goods is negative but not significant, and income has a positive but weak impact. In this short-run model, the change in proportion of the population between 15-75 has a positive impact on the demand for cigarettes, similar to the short-run demand for filter cigarettes. It seems to reflect the fact that in the short run, demand for cigarettes is high among those entering this age group every period but they tend to quit in the long run as price increases and the budget starts to bite. But this is also the age group where smoking is highest in the short run. We tried to run the estimation with a different age group, 15-24, but did not get significant results. This variable (DPOPS) would reflect new entrants into this age category and therefore potential smokers. This could therefore be used to explain the short-run positive effects of this variable in both models and provide the intuition for the reverse effects in the long run.

The error correction term is consistent with postulated arguments. Short-run coefficients adjust towards long-run coefficients at a speed of 11%. This shows that short-run elasticities adjust to long-run elasticities and with a moderate speed of 11%. This again shows success in the modelling strategy adopted here, where the short-run adjusts to the long-run elasticities. This may also be used to explain the differential of elasticities in the long run and short run. It would appear therefore that a full-fledged model should encompass both short-run and long-run aspects of consumer response. The results for the demand of all cigarettes are summarised below:

Table 3: Elasticities of demand for all cigarettes in Kenya

| | **Short run** | **Long run** |
|---|---|---|
| Own price elasticity | -0.49 | -1.78 |
| With respect to income | 0.145 | 0.775 |
| With respect to price of other goods | -0.032 | 0.63 |

Given the two sets of models, we can conclude that the long-run price elasticity of demand for cigarettes lies between –1.78 and –1.36 while the short-run elasticity is between –0.4 and –0.8. The conclusion then is that long-run price elasticities are fairly elastic, due to possibilities of either substitution or quitting, but addiction in the short-run does not provide an effective room for manoeuvre so that smokers do not respond to prices fairly fast in the short run.

## 5.3 Revenue Maximising Tax Rate for Cigarettes

To determine the revenue maximising tax rate for cigarettes, the long-run elasticities will be used and substituted in equation (4):

$$t^* = \frac{-1}{1+K}$$

since the elasticities are estimated using a constant elasticity demand model. The results are as follows:

Table 4: Revenue maximising tax rates for cigarettes

| | Own price elasticity | Rate |
|---|---|---|
| Filter cigarettes | -1.36 | 278% |
| All cigarettes | -1.784 | 128% |

Since cigarette taxation is uniform (not differentiated by product), the revenue maximising tax rate for all cigarettes at 128% is a more plausible rate to work with.

It is worth noting that the price used in the model estimation is all tax inclusive, that is it includes both excise and VAT. The revenue maximising tax rate should be interpreted as the effective rate; one that includes both excise tax and VAT.

# 6. CONCLUSION

In this study, a model of consumer demand for tobacco is postulated and estimated. It has used high frequency data from 1981 to 2000. Using this set of data, it was possible to link the objectives of the paper with empirical results generated.

The results seem to show that:

- It is possible to generate both short and long-run responses of quantity of cigarettes demanded when prices change. This response (elasticity) is grouped into elastic or high response when the value is high and inelastic, minimal response, when the value is low.
- Using these arguments, and the empirical results, it has been shown that long-run responses are high. They range between –1.78 for all cigarettes to -1.36 for filter cigarettes. In theory, the response to price changes will be high if a product has close substitutes. Even though this may be the case, there is an added imperfect substitute—quitting smoking—which might be thought of as a superior alternative of welfare enhancing so that it may be seen to compete with smoking as a substitute. This, however, can be considered as a long-run response and alternative. In the results reported, this justifies why the price is high.
- The short-run responses have been found to be lower, and even very low for all cigarettes. This reflects rigidities in the short run and is consistent with short-run behaviour with no possibilities of or ease of substitution, either to other products (the range is minimal) or quit. Therefore, short-term rigidities provide us with reason to believe that addiction is hard to fight and reverse in the short run, and substitution, if there are possibilities, takes time to be effected.

- An interesting empirical regularity was to link the short-run and long-run responses. This was done through an adjustment process that accounts for an error correction process for each period. It shows that short-run elesticities adjust towards long-run elasticities at an average speed of 10%, which can be considered fast for a consumption item with repeat purchases.
- Finally, the results do indicate that we can solve for a tax revenue maximizing tax rate. It is shown that the tax rate that would maximise tax revenue should be at 128%. This combines excise tax rate and VAT. We can move back and compute the required maximum excise tax rate that would guarantee maximum tax revenue. We can use these results together with the analysis in the other papers to make a case for a switch to a specific tax.

The results show that in general, the elasticities are not as low as authorities may have assumed when the tax policy was put in place. The results show that it is in the short run that elasticities are low, yet tax policy cannot be based on short-run responses but rather on long-run structural movements. The paper therefore collaborates results in beer tax (Karingi et al, 2001) and supports further discussions for future policy research into the possibility of a shift to specific tax rates rather than *ad valorem.*

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# Appendix

Table A1: Long-run OLS estimates of demand for filter cigarettes

| Variable | Coefficients | Standard error | T value |
|---|---|---|---|
| Constant | 8.37 | 0.88 | 9.40 |
| *Ln* Pfilter | -1.36 | 0.14 | -9.71 |
| *Ln* Pplain | 0.29 | 0.077 | 11.68 |
| *Ln* M0 | 0.92 | 0.11 | 8.3 |
| SEAS | -2.05 | 0.49 | -4.18 |
| D971 | -2.13 | 0.27 | -7.88 |
| D2001 | -0.53 | 0.15 | -3.53 |
| D972 | -0.56 | 0.15 | -3.73 |
| D978 | -0.41 | 0.14 | -2.92 |
| D20012 | -0.39 | 0.14 | -2.78 |
| DPOPS 15-75 | -1.47 | 1.26 | -1.16 |

| | |
|---|---|
| n | = 288 |
| $R^2$ | = 0.88 |
| WALD $\chi^2(10)$ | = 243.53(0.000) |
| AR 1-7 F(7,192) | = 2.08(0.0475) |
| ARCH 1-7 F(7,185) | = 0.77(0.6119) |
| Normality $\chi^2(2)$ | = 0.156(0.925) |
| $\chi^2(40,158)$ | = 0.96(0.5388) |
| RESET F(1,198) | = 3.95(0.0482) |

Table A2: Long-run OLS estimates of demand for all cigarettes

| Variable | Coefficients | Standard error | T value |
| --- | --- | --- | --- |
| Constant | 14.52 | 2.22 | 6.54 |
| *Ln* Pallcig | -1.784 | 0.39 | -4.57 |
| *Ln* CPI | 0.63 | 0.3 | 2.1 |
| *Ln* M0 | 0.775 | 0.25 | 3.1 |
| SEAS | -3.1 | 0.8 | -3.87 |
| D971 | -3.1 | 0.63 | -4.92 |
| D2001 | -0.79 | 0.23 | -3.43 |
| D972 | -1.087 | 0.27 | -4.02 |
| D974 | 0.838 | 0.31 | 2.7 |
| D978 | -0.61 | 0.21 | -2.9 |
| D991 | 0.53 | 0.21 | 2.5 |
| D20012 | -0.54 | 0.22 | -2.45 |
| Trend | 0.005 | 0.002 | 2.5 |
| DPOPS 15-75 | -7.04 | 2.54 | -2.77 |

| | |
| --- | --- |
| n | = 228 |
| $R^2$ | = 0.88 |
| WALD $\chi^2(13)$ | = 98.9(0.000) |
| AR 1-7 F(7,189) | = 0.25(0.973) |
| ARCH 1- 7 F(7,182) | = 1.66(0.120) |
| Normality $\chi^2(2)$ | = 2.56(0.2777) |
| $\chi^2(40,158)$ | = 0.55(0.9894) |
| RESET F(1,195) | = 0.050(0.8223) |

Table A3: Short-run OLS estimates of demand for filter cigarettes

| **Variable** | **Coefficients** | **Standard error** | **T value** |
|---|---|---|---|
| Constant | 0.0035 | 0.0022 | 1.59 |
| *DLn* Pfilter | -0.866 | 0.117 | -7.4 |
| *DLn* M0 | 0.54 | 0.088 | 6.14 |
| *DLn* CPI | -0.019 | 0.11 | -0.172 |
| EC | -0.107 | 0.36 | -0.297 |
| D971 | -0.388 | 0.04 | -9.7 |
| D2001 | -0.11 | 0.027 | -4.07 |
| D974 | 0.139 | 0.032 | 4.34 |
| D979 | 0.084 | 0.025 | 3.36 |
| D837 | -0.077 | 0.024 | -3.21 |
| DPOPS 15-75 | 0.558 | 1.788 | 0.312 |

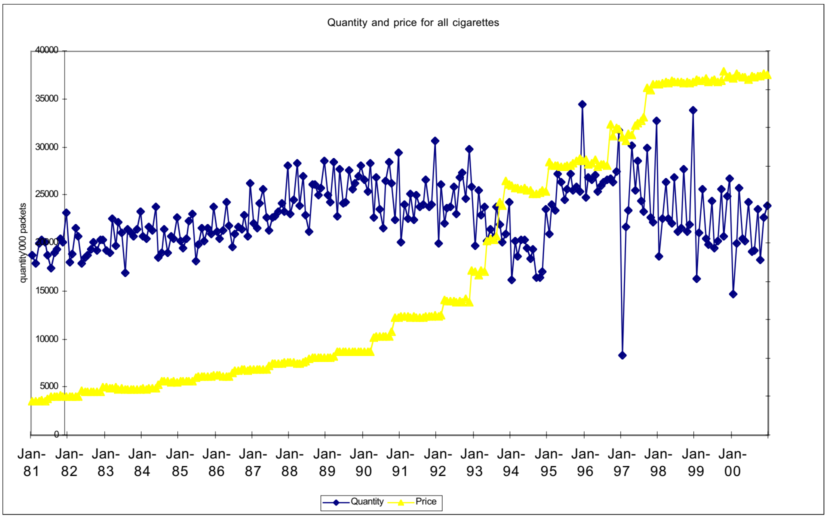
| | |
|---|---|
| n | = 227 |
| $R^2$ | = 0.89 |
| WALD $\chi^2(11)$ | = 138.98(0.000) |
| AR 1-7 F(7,192) | = 1.495(0.1777) |
| ARCH 1-7F(7,185) | = 2.6063(0.0137) |
| Normality $\chi^2(2)$ | = 2.6412(0.26) |
| $\chi^2(48,150)$ | = 0.9242(0.6151) |
| RESET F(1,198) | = 3.8381(0.0515) |

Table A4: Short-run OLS estimates of demand for all cigarettes

| Variable | Coefficients | Standard error | T value |
|---|---|---|---|
| Constant | 0.0046 | 0.0025 | 1.84 |
| *DLn* Pallcig | -0.496 | 0.12 | -4.13 |
| *DLn* CPI | -0.032 | 0.12 | -0.26 |
| *Dln* M0 | 0.145 | 0.13 | 1.11 |
| EC | -0.11 | 0.035 | -3.14 |
| D971 | -0.39 | 0.036 | -10.83 |
| D2001 | -0.10 | 0.026 | -3.85 |
| D837 | -0.076 | 0.024 | -3.16 |
| D974 | 0.16 | 0.032 | 5 |
| D978 | -0.056 | 0.024 | - 2.33 |
| D9911 | 0.064 | 0.024 | 2.66 |
| D949 | -0.078 | 0.024 | -3.25 |
| DPOPS 15-75 | 1.43 | 1.25 | 1.144 |

| | |
|---|---|
| n | = 227 |
| $R^2$ | = 0.90 |
| WALD $\chi^2(12)$ | = 139.46 |
| AR 1-7 F(7,192) | = 1.495(0.1711) |
| ARCH 1-7 F(7,185) | = 2.6063(0.0137) |
| Normality $\chi^2(2)$ | = 2.6412(0.0267) |
| $\chi^2(48,150)$ | = 0.924(0.615) |
| RESET F(1,198) | = 3.838(0.0515) |

## Chart A1: Quantity demanded and price for cigarettes: 1981-2000




## Chart A2: Cigarettes excise revenue (real)

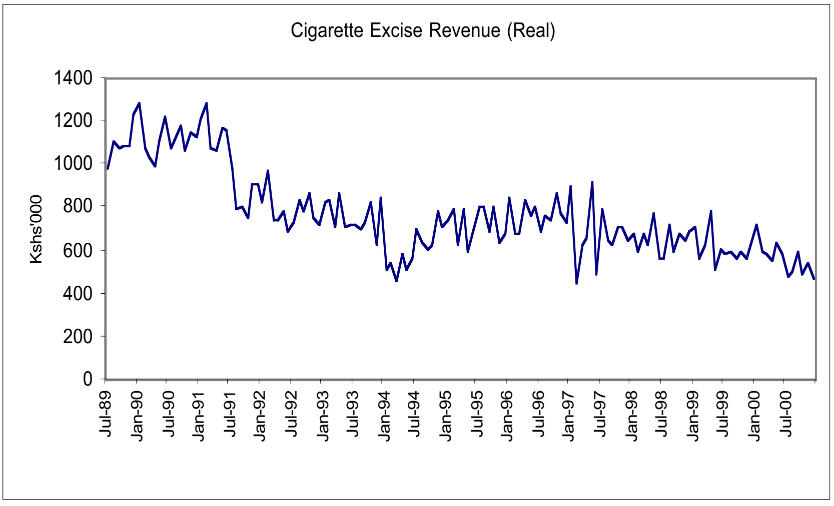


Table A5: Cigarette production and consumption in million sticks

| Year | Production | Consumption |
|---|---|---|
| 1980 | 4,556 | 4,532 |
| 1981 | 4,971 | 4,900 |
| 1982 | 4,904 | 4,828 |
| 1983 | 5,584 | 5,584 |
| 1984 | 5,391 | 5,052 |
| 1985 | 5,661 | 5,180 |
| 1986 | 5,822 | 5,329 |
| 1987 | 6,372 | 5,816 |
| 1988 | 6,642 | 6,192 |
| 1989 | 6,661 | 6,291 |
| 1990 | 6,648 | 6,187 |
| 1991 | 6,473 | 7,059 |
| 1992 | 7,031 | 6,570 |
| 1993 | 7,266 | 7,001 |
| 1994 | 7,319 | 6,786 |
| 1995 | 7,932 | 4,320 |
| 1996 | 8,436 | 6,291 |
| 1997 | 8,898 | 5,662 |
| 1998 | 7,599 | 6,254 |
| 1999 | 7,231 | 4,799 |
| 2000 | 6,009 | 2,645 |

*Source: Statistical Abstract (various issues)*

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*Report of the proceedings of the AERC-KIPPRA World Trade Organization (WTO) Workshop*, 2000.

*Report of the proceedings of the International Conference on Finance and Development: Evidence and Policy Issues, 2001.*

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