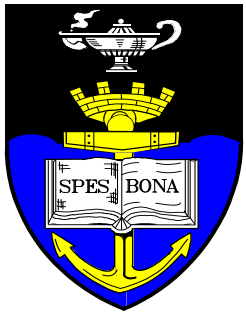

THE ECONOMICS OF TOBACCO CONTROL IN SOUTH AFRICA

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Thesis presented for the Degree of

DOCTOR OF PHILOSOPHY

in the Department of Economics

UNIVERSITY OF CAPE TOWN

October 2005

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ABSTRACT

Between the early 1990s and 2004 aggregate cigarette consumption in South Africa decreased by more than a third and per capita cigarette consumption decreased by about half. Smoking prevalence decreased from 32 per cent in 1993 to 24 per cent in 2003. The average number of cigarettes smoked by smokers decreased from 229 packs in 1993 to 163 packs in 2003. Africans, males, young adults and poorer people experienced the most rapid decreases in smoking prevalence, while the decrease was less pronounced among whites, females, and older and more affluent people.

The sharp decrease in smoking in South Africa was the result of an active and consistent tobacco control policy. The policy had two distinct pillars: (1) tobacco control legislation and (2) rapidly increasing excise taxes.

In 1993 the Tobacco Products Control Act was passed which introduced health warnings on cigarette packs and advertising material for the first time. A 1999 amendment to the original legislation banned tobacco advertising, prohibited smoking in all indoor public areas, and prohibited the sale of tobacco to minors. The degree of compliance to the legislation is high. While its direct impact on cigarette consumption is not clear, the legislation has helped to de-glamorise smoking and has transferred property rights from smokers to non-smokers. Previously, through social convention, the right to pollute the air with cigarette smoke rested with smokers. The 1999 legislation assigned non-smokers the right to air unpolluted by tobacco smoke.

In 1994 the government announced that it would increase the excise tax on cigarettes to 50 per cent of the retail price. This increase was phased in over a number of years. As a result of this policy the real excise tax per pack of cigarettes has increased by 256 per cent between 1994 and 2004, and the real price of cigarettes has increased by 127 per cent over the same period. Despite the sharp fall in cigarette consumption, real government revenue from tobacco excise taxes has increased by more than 140 per cent between 1994 and 2004.

The effectiveness of excise tax increases as a mechanism to decrease cigarette consumption depends crucially on the magnitude of the price elasticity of demand. The price elasticity of demand is estimated at about –0.4 for developed countries and between –0.4 and –0.8 for developing countries. In this study the price elasticity of demand for cigarettes in South Africa was estimated at –0.78. Cigarette consumption was found to be highly responsive to income changes. No statistically significant relationship was found between tobacco advertising expenditure and cigarette consumption.

Despite the sharp fall in cigarette consumption, the real revenue accruing to the cigarette industry (which includes the cigarette manufacturing industry, its suppliers and downstream service providers) has increased sharply. After decreasing moderately since the 1960s, the real industry price of cigarettes has more than doubled since the early 1990s. The industry price is the retail price net of excise tax and VAT. The increase in the real industry price cannot be attributed to a sharp increase in the real input

costs of producing cigarettes. The most plausible explanation is that the high degree of concentration in the cigarette manufacturing industry (British American Tobacco currently has a 93 per cent market share) enabled the industry to exploit its monopoly power. Whenever the excise tax on cigarettes was raised, the industry raised the real retail price of cigarettes by a significantly larger amount. This pricing strategy led to a more rapid decline of the cigarette market than would have been achieved by the excise tax increases alone. As such, the industry's pricing strategy has had very positive tobacco control consequences, but smokers might feel that the industry has taken advantage of its monopoly power at their expense.

It is sometimes argued that excise taxes on tobacco are misdirected, because they are regressive. While tobacco control economists acknowledge this, they contend that this should not be a reason for reducing the excise tax. Instead, they argue that increases in the excise tax tend to reduce the regressivity of the excise tax, because the poor's cigarette demand is more price sensitive than that of the rich. Using the 1990, 1995 and 2000 Income and Expenditure Surveys, it was found that the regressivity of the cigarette excise tax has decreased sharply in South Africa, for two reasons. Firstly, smoking prevalence among the poor has decreased more rapidly than among the rich. Secondly, the percentage of household income spent on cigarettes has increased by a greater amount among rich households than among poor households. However, there has been a significant shift towards roll-your-own tobacco among poor households, which tempers the results to an extent. However, this does not alter the primary conclusion that tobacco taxes have become significantly less regressive since 1990.

All tobacco advertising and sponsorship was banned in 2000. Cinemas, outdoor advertising agencies and the print media were more dependent on cigarette advertising than radio and television. Between the mid-1990s and 1999 the focus shifted from direct product advertising to sponsorship advertising, presumably because sponsorship advertisements were not subject to health warnings. Tobacco advertising expenditure had been decreasing consistently since 1994. Agencies dependent on tobacco advertising had a long period in which to adjust to the ban, which became operative in 2000.

CHAPTER 1

INTRODUCTION[1]

1.1 In the beginning…

Tobacco was first used by the Mayans and Aztecs in Central America. Christopher Columbus introduced it to the Western world in the late fifteenth century, after his pioneering voyage to the West Indies (Brooks, 1952). During the next three centuries tobacco use waxed and waned, depending on the habits of the ruling elites. Tobacco has certainly not been without controversy. The Church in Europe sporadically banned its use, declaring smoking a sin. Opposition to tobacco was based primarily on religious grounds. The first recorded, and often quoted, condemnation of tobacco was made by King James I in *Counterblast to Tobacco* (1604), in which he described the "filthy novelty"

> "a custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and in the black stinking fume thereof nearest resembling the horrible Stygian smoke of the pit that is bottomless."

Many European monarchs found tobacco a handy source of excise revenue, despite religious and moral objections to tobacco use. In fact, even King James I set aside his previous objections and sought ways for the crown to profit from the tobacco trade (USDHHS, 2000: 29). By the eighteenth century tobacco use, and tobacco taxation, were so entrenched in European and North American society that Adam Smith (1776[1937]: 889) argued that

> "sugar, rum, and tobacco, are commodities which are no where necessaries of life, which are become objects of almost universal consumption, and which are therefore extremely proper subjects of taxation."

Before the twentieth century tobacco was used predominantly for chewing, pipe smoking, inhaling (as snuff) and cigar smoking (Fourie, 1992: 55). Cigarettes were developed early in the nineteenth century but became popular only after the production

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[1]. A shortened version of this chapter has been published in the South African Journal of Economic History, entitled "Tobacco control in South Africa in the 1990s: A mix of advocacy, academic research and policy". This chapter has benefited much from comments from Yusuf Saloojee, Murray Leibbrandt, Simon Millson and a referee of the Journal.

process was mechanised in the 1880s. Large capital intensive companies, that were able to realise economies of scale by using cigarette-rolling machines, rapidly displaced cigarette companies that employed manual labour.

In the developed countries cigarettes rapidly replaced other forms of tobacco during the first quarter of the twentieth century. Some religious and civic groups strongly opposed cigarette smoking, and some states in the US even prohibited its use.[2] The anti-cigarette crusaders argued their case on moralistic and unsubstantiated and often exaggerated medical grounds. However, before the 1940s professional medical opinion was generally ambivalent about the health impact of cigarette smoking (USDHHS, 2000: 34).

The First World War provided a major impetus to cigarette smoking. Cigarettes were typically part of soldiers' rations, and when the war ended their use spread rapidly to the rest of society. Between 1920 and the mid-1960s per capita cigarette consumption increased about five-fold in the US and most other developed countries (USDHHS, 2000: 33).

The first epidemiological studies that linked smoking to lung cancer were performed in the 1930s (Brooks, 1952: 311-316). Using increasingly more sophisticated epidemiological research techniques, the evidence that smoking causes lung cancer mounted in the late 1940s and 1950s. The UK's Royal College of Physicians' report of 1962 and the US Surgeon-General's report of 1964 were the first comprehensive medical survey reports on the detrimental impact of cigarette smoking (Royal College of Physicians, 1962 and US Department of Health, Education and Welfare, 1964). The policy impact of these reports was immense and resulted in major tobacco control interventions in many developed countries.[3] Since these early studies were published, more than 50 000 articles on tobacco and health have been published in the biomedical literature (Davis, 1992:1). According to the US Surgeon-General "smoking represents the most extensively documented cause of disease ever investigated in the history of biomedical research" (USDHHS, 1990).

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2. An excellent account of the rise of the cigarette and the associated controversy is provided by Brooks (1952: 228-278). Amongst other things, he described how cigarette smoking by women, first regarded as abhorrent (to men), became more socially acceptable after the First World War, how advertising was used to increase the size of the market, create brand awareness and stimulate the social acceptance of cigarette smoking, and how the large international cigarette companies were established at the start of the twentieth century. By 1952 "the cigarette is popularly regarded as part of the normal standard of living almost everywhere on the globe. Its value as a nervine has been accepted by a large part of mankind. There need hardly be discussion about its social acceptability. Its permanence as a mode of smoking has largely been taken for granted…." (Brooks, 1952: 278).

3. The 1964 Surgeon-General report is often described as a pivotal point in the anti-tobacco movement. In recognition of the then Surgeon-General, Luther Terry, the Terry Awards are conferred on individuals or institutions that have made a significant contribution to tobacco control at the triennial World Conference on Tobacco or Health.

Primarily as a result of these medical findings, many developed countries introduced a range of tobacco control measures. These measures included the following: increases in the excise tax on tobacco; restrictions on smoking in public and work places; restrictions on advertising and sponsorship; publishing of health warnings on packaging and advertising material; disclosure of, and restrictions on, tar and nicotine contents; the broadcasting of anti-smoking messages; health promoting educational strategies; restrictions on access to tobacco; and even lawsuits at individual, class and state level. As a result, tobacco use in many developed countries has been decreasing since the 1970s, and especially the 1980s (World Bank, 1999: 14).

Tobacco use has, however, been increasing dramatically in the developing world. Per capita consumption in developing countries has increased from 900 cigarettes per year in the early 1970s to about 1 420 cigarettes per year in the early 1990s (Gajalakshmi et al., 2000: 21). The associated medical impact is substantial (see Peto et al., 1996). According to the World Bank (1999: 22-23), tobacco-related diseases in developing countries are likely to claim seven million lives annually by 2030, compared to two million lives in 2000.

The World Health Organisation (WHO) has made tobacco control one of its primary focus areas. As tobacco consumption has been decreasing in the developed world, the industry has shifted its attention to the developing world. In an attempt to curb global tobacco consumption, but particularly in developing countries, the WHO initiated discussions on a Framework Convention on Tobacco Control (FCTC) in 2000. The FCTC calls for international co-ordination of tobacco control and requires signatory governments to impose certain minimum tobacco control interventions in their countries. The Framework Convention was open to signature between June 2003 and June 2004, and has been signed by 168 countries. The FCTC came into force on 27 February 2005, 90 days after the fortieth country ratified the treaty.

Against this international background the focus now shifts to South Africa.

1.2 The rise of the tobacco industry in South Africa

Tobacco was first cultivated in South Africa after the arrival of the Dutch settlers in the seventeenth century (The Golden Leaf, 1970: 11). By the start of the twentieth century the main production area had shifted from the Western Cape to the Transvaal, with small production pockets in the Eastern and Western Cape, and in the Little Karoo. Currently most tobacco in South Africa is produced in the North-West and Limpopo Provinces.

Between 1937 and 1996 the Tobacco Board controlled the production and marketing of leaf tobacco through a single channel marketing arrangement. The Tobacco Board

formalised and gave legal power to a co-operative culture that had its genesis in 1909 when the first co-operative association was founded (Fourie, 1992: 32). By managing prices and production volumes, the Tobacco Board has helped to make South Africa more or less self-sufficient in the supply of leaf tobacco. Between 1930 and 1950 tobacco production increased from nearly 10 000 tons to 19 000 tons (The Golden Leaf, 1970: 11). Tobacco leaf production peaked at more than 40 000 tons in 1979 (Tobacco Board, various issues). By 1996, when the Tobacco Board was disbanded, tobacco production had decreased to 27 000 tons (Tobacco Board, 1996).

Nearly all tobacco grown in South Africa is of the Virginian type. A small and decreasing quantity of oriental tobacco (also known as Turkish tobacco) is grown in the Western Cape. The most common classification of leaf tobacco is by the type of curing of the product. The relative share of flue-cured tobacco, used nearly exclusively in the production of cigarettes, has increased from less than 1 per cent in the 1930s to nearly 50 per cent in 1950 and to about 90 per cent currently. The other 10 per cent of leaf tobacco is air-cured (Tobacco Board, various issues). Within the latter category, tobacco leaf can either be light air-cured (for use in cigarettes and some pipe tobacco mixtures) or dark air-cured (to manufacture dark pipe tobacco, snuff and roll tobacco) (The Golden Leaf, 1970: 17-18).

Flue-cured tobacco generally requires more intensive farming, and makes more exacting demands with regard to management, soil and nutritional and moisture requirements (The Golden Leaf, 1970: 14). The more stringent demands that flue-cured tobacco places on producers may explain the rapid decrease in the number of tobacco farmers in the past decades. According to the Tobacco Board, there were about 5000 tobacco farmers in the early 1970s, and less than 700 in 1995. During the same period the average tobacco yield has increased from about 800 kg/hectare to about 1800 kg/hectare. This suggests that more efficient tobacco growers have survived while less efficient growers have been forced out of the industry. Despite the decrease in total tobacco production during most of the 1980s and 1990s, the average acreage of tobacco farms has increased from 8 hectares in the early 1970s to about 25 hectares in the early 1990s. According to the annual reports of the Tobacco Board, the number of people directly employed by the tobacco industry (of which the majority are employed in the agricultural sector) has decreased from about 76 000 in 1985 to 35 000 in 1995.[4]

[4]. If one considers the annual employment data, the data seem unrealistic. For example, after remaining constant at around 60 000 for six years (1988-1993), the Tobacco Board suggested that the number of people employed by the industry dropped to 52 000 in 1994 and 35 000 in 1995. As is pointed out in chapter 5, the Tobacco Board has an incentive to highlight the economic importance of the tobacco industry, and may thus have exaggerated the employment figures. However, even though the absolute number of people employed by the tobacco

Compared to the cigarette manufacturing sector, many more people are employed on tobacco leaf farms, albeit at much lower wage and skills levels. However, judging by the number of media reports, tobacco farmers do not seem to have much political influence, especially compared to the cigarette manufacturing industry. The statistics indicate that the past twenty years have been tough for tobacco leaf farmers. However, it is important to note that tobacco production and the number of tobacco farmers had been decreasing long before the first tobacco control policies were mooted in the early 1990s. Tobacco control policies, and the associated decrease in smoking, simply added impetus to a process that had been initiated at least a decade earlier.

In South Africa the story of cigarette manufacturing is essentially the story of the Rembrandt Group. In 1940 Anton Rupert established the Voorbrand Tobacco Company in Johannesburg, the predecessor of Rembrandt. In 1948 the Rembrandt Group was incorporated, and in 1956 it was listed on the Johannesburg Stock Exchange (Rembrandt Group Limited, 2000: 14). Rembrandt quickly became Afrikaners' symbol of economic, and specifically industrial, liberation. Before the 1940s the mining and emerging industrial sectors were nearly exclusively owned and controlled by the white English-speaking community, and the economic influence of the white Afrikaans-speaking community was restricted primarily to the poor and underdeveloped agricultural sector.

The rapid growth of Rembrandt can be attributed solely to the business acumen of Anton Rupert. He forged many strategic partnerships, and was able to grow his company rapidly, not only in South Africa, but especially abroad. In the early years Rembrandt made an agreement with Rothmans in London to exchange technical knowledge (Esterhuyse, 1986: 45). Through "industrial partnerships" with a large number of foreign companies, the company was able to rapidly expand around the world.[5] This entailed the sale of half the shares to the local community in each country where the company established a new enterprise (Fourie, 1992: 61). Also, this expansion strategy usually meant that local citizens were appointed to serve as

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industry might be too high, even the Tobacco Board indicates that employment has decreased significantly in the past number of years.

5. In his many public appearances as the "self-made Afrikaner industrialist", Anton Rupert often spoke about "industrial partnerships" as a model for other South African businesses to enter the international arena (Rupert, 1967b). He based his business philosophy on the following doctrine:
    1. He who covets all, loses all;
    2. Help others to help themselves;
    3. Nobody can trade with paupers;
    4. Goodwill or wealth cannot be created by a give-away policy;
    5. Progress is contagious and shared prosperity leads to greater prosperity;
    6. Always place yourself in the other man's shoes;
    7. Confidence begets confidence. To trust is a risk, but to mistrust is an even bigger risk that can lead to disaster (Rembrandt, 1976).

chairmen and directors of boards. By 1961, Rembrandt was selling cigarettes in 120 countries (Rupert, 1967a: 19). According to Esterhuyse (1986: 45) the secret of the company's success was its strong emphasis on quality ("Each cigarette a masterpiece") and innovation. For example, Rembrandt was the first company, worldwide, to produce king-size filter cigarettes and menthol filter cigarettes (Rembrandt, 1976). The company became the fourth largest international cigarette company (i.e. excluding the state monopolies in countries like China and the former USSR) (Rembrandt, 1976: 4). Given the unprecedented amount of advertising of cigarettes in the first half of the twentieth century (Brooks, 1952: 269), it was very difficult for new companies to enter this market. According to Peter Drucker, author of *Innovation and Entrepreneurship* (cited in Esterhuyse, 1986: 45), "there has only been one major newcomer in the world's cigarette industry since the 1920s, the South African Rembrandt Group".

Rupert held remarkably liberal views for a white Afrikaans-speaker of that period. He introduced minimum wages in his company in 1961 at much higher levels than the average wage at the time. His views on racial issues, especially in the labour context, placed him in occasional confrontation with the government, and especially Prime Minister HF Verwoerd (see Rupert, 1967b). However, during the 1970s and 1980s the relationship between Rembrandt and the government seems to have been much friendlier.

In due course Rembrandt diversified its interests away from tobacco, although tobacco remained the mainstay of the company. Currently the company, renamed Remgro in 2000, is classified as an investment holding company, and derives its income from its investments in tobacco products (about 48 per cent of the group's headline earnings in 2001), wine and spirits (2 per cent), mining (26 per cent), industry (12 per cent), financial services (7 per cent) and industries like medical services and telecommunications (5 per cent) (Remgro Limited, 2001).

By the late 1990s Rembrandt had 85 per cent of the cigarette market in South Africa, compared to 10 per cent in 1951, 30 per cent in 1958 and 60 per cent in 1962 (Fourie, 1992: 61). In the 1990s the only other competitor of any note was British American Tobacco, trading under the name of United Tobacco Company (UTC). UTC had been in South Africa since the 1880s and, although dominating the market in the first half of the twentieth century, had been rapidly losing its market share to Rembrandt after 1948 (Fourie, 1992: 56).

More consolidation in the cigarette manufacturing industry took place in 1999 when Rembrandt sold Rothmans International to the UK-based British American Tobacco plc (BAT), the world's second largest and geographically most diversified cigarette producer. Rothmans International had been listed on the London Stock Exchange in

1972 and represented Rembrandt's non-South African tobacco interests. In 1988 Rembrandt's local and overseas interests were further separated with the founding of Compagnie Financière Richemont AG (Richemont), a Swiss-based luxury goods group, which also had significant tobacco interests (http://www.venfin.co.za/comhistory.asp). As a result of the merger between Rothmans International and BAT, Remgro and Richemont currently hold slightly less than 30 per cent of BAT's shares (Remgro Limited, 2001: 7).

As a result of the Rothmans/BAT merger, BAT South Africa now has a 93 per cent share of the cigarette market in South Africa. The only other cigarette company with any influence in South Africa is Japan Tobacco International, whose main brand is Camel (Castillo, 1994: 3). In April 2004 the Marlboro brand, owned by the US Altria Group (formerly known as Philip Morris), was launched in South Africa. There are early indications that Marlboro has negatively affected the market share of Camel, more than any other brand, but significant changes in market shares would presumably require more time to develop.

1.3 Opposition to tobacco by the medical community in South Africa

As was the case internationally, the medical community drove the opposition against tobacco in South Africa. The first South African studies that linked smoking to lung cancer were by Oettlé (1963a, 1963b and 1963c). The *South African Medical Journal* (SAMJ) became the main vehicle for publishing tobacco-related research and opinions in South Africa. In 1963 the editor of the SAMJ argued that

> the educational campaign should be the main weapon in the fight against cigarette smoking, but some restrictive legislation will also be necessary. There should be no hesitation about banning smoking in public places and on public transport. Here the discomfort and disease of the non-smoker must be considered before the convenience of the smoker. The law about providing cigarettes to children must be more strictly enforced and automatic vending machines must be banned. Cigarette advertising should at first be restricted in quantity and content with a view to its eventual complete limitation. It might also be advisable to insist that each cigarette packet should carry a notice to the effect that the contents are potentially dangerous to health.
>
> The Minister of Health may also attempt further restrictions of smoking by increasing the taxation on cigarettes.... The matter is important and urgent (cited in Saloojee, 1994: 162)

The editorial stance of the SAMJ has been consistently, and sometimes aggressively, anti-tobacco (e.g. Seftel, 1981, MASA, 1981 and 1985, Brink, 1988). Together with

the Medical Research Council, they have called for the long-term abolition of the tobacco industry (Brink, 1988: 385 and SAMRC, 1988: 100). South African tobacco-related studies, published mainly, but not exclusively in the SAMJ, often focused on smoking prevalence. The SAMJ also published some studies on the relationship between smoking and the risk of contracting specific tobacco-related diseases, but these fall beyond the scope of this thesis and are not discussed here. Since the early 1980s, economic aspects regarding tobacco use started receiving more attention, even in the medical literature.

Prevalence studies can be categorised into two groups: (1) national surveys and (2) surveys on specific subpopulations. Table 1.1 provides a summary of national smoking prevalence among the adult population (generally 16 years and older), subdivided by race and gender. In nearly all instances a person would be classified as a smoker if he/she smoked at least one cigarette per day.[6] Overall, there is some evidence that smoking prevalence is decreasing for all population groups, and for males more than females. However, the trend is not monotonic, and irregularities in the trend (e.g. in February 1996) are more likely the result of survey design and statistical errors, than actual changes in smoking behaviour. In chapter 2 an analysis of smoking prevalence, based on a different methodology and data source, is presented. The results of that analysis confirm the trends in Table 1.1, namely that smoking prevalence has been decreasing over time.

Of the various racial groups, coloureds have by far the highest smoking prevalence, followed by whites, Indians and Africans, in that order. For all racial groups, smoking prevalence among males is higher than among females, but the gender difference is smaller for whites and coloureds than Africans and Indians. In fact, a typical comment in prevalence studies (e.g. Yach et al., 1992: 273, Steyn et al., 2002: 168-169) is that Indian and African women have a very low smoking prevalence, and that this makes them a specific marketing target of the tobacco industry. The low smoking incidence is generally ascribed to cultural factors (Steyn et al., 2002: 169). Despite an apparent increase in smoking among Indian women in the 1990s, smoking incidence among these two groups of females is still much lower than the population average.

During the 1990s a number of national prevalence surveys also investigated people's knowledge of the health implications of smoking and their attitudes towards tobacco

6. More recent studies (Martin et al., c.1992, Reddy et al., 1996, Meyer-Weitz et al., 1997) expressly defined a smoker as a person who smokes one or more cigarettes per day. The older studies (Van der Burgh, 1979, Coetzee, 1978, Yach, 1982, Yach and Townshend, 1988 and SAMRC, 1992) did not expressly define a smoker, although in most studies suggested that it referred to daily smoking. Only Steyn et al. (2002) used a different definition of "regular smoking". Regular smokers were defined as people who smoked "daily or occasionally" (Steyn et al., 2002: 162), which means that the smoking prevalence rates obtained from this study exaggerate smoking prevalence, when compared to the preceding studies.

control interventions (Martin et al., c.1992, Reddy et al., 1996 and Meyer-Weitz et al., c.1997). These studies generally found that most people, often more than 80 per cent of the population, knew that smoking is harmful to one's health, but that many people did not know which diseases are associated with smoking (Reddy et al., 1996: 1391). Furthermore, these surveys found that a majority of people supported tobacco control interventions.[7] Tobacco control advocates frequently cited the results of these studies when the Tobacco Products Control Amendment Bill was debated in the late 1990s.

Prevalence studies of subpopulations have focused on specific racial groups (Yach and Joubert, 1988a, Steenkamp et al., 1988, Strebel et al., 1989, and Steyn et al., 1994), occupations (Griffiths and Koa-Peng, 1980 (teachers), Coetzee, 1981 (doctors), and Callander and Rocke, 1986 (anaesthetists)), school children (Prout and Benatar, 1983, and Flisher et al., 1993), women (Martin et al., no date, and Marks et al., 2001) and specific communities (Yach and Joubert, 1988b).

7. Martin et al. (c.1992) found that nearly 60 per cent of respondents wanted tobacco advertising banned, 75 per cent wanted tobacco sales to children banned, 56 per cent believed that tobacco taxes should be increased and 44 per cent wanted sport sponsorships by tobacco companies banned.

   Reddy et al. (1996) found that 62 per cent of respondents believed that tobacco sales to children should be illegal, 61 per cent of respondents wanted tobacco advertising on radio banned (41 per cent for cinema advertising, 53 per cent for TV advertising, and 43 per cent for printed media advertising), 78 per cent of respondents supported the local authority regulations which prohibited smoking in public places, 54 per cent of respondents wanted smoking regulated in all public places, and 50 per cent of respondents supported an increase in the excise tax if the revenues were to be used for health promotion.

Table 1.1: Smoking prevalence in percentages of population in South Africa, based on a variety of prevalence studies

Year	White			Coloured			Indian			African			Total population		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Tota
1975/6/7 (1)	58	31	*44.5*	79	52	*65.5*	68	5	*36.5*	70	20	*45*	*69*	*25*	*47*
1977 (2)															29.3
1980/81 (3)	44	36	40	62	48	55	62	na	na	57	16	36.5	*55*	*23*	*39*
1984 (4)	40.6	29.3	34.9	49.7	33.0	41.1	55.4	3.2	29	49.5	6.2	27.7	*48*	*13*	*31*
1989/90 (5)			33.7			48.7			27.6			28.4			31.0
c.1992 (6)			31.0			52.1			37.1			28.3	49.0	17.5	31.5
Feb 1995 (7 & 8)	43	27	35	58	59	59	62	7	35	53	10	31	52	17	34
Feb 1996 (8)	37	35	36	53	51	52	61	9	35	42	13	27			31
Oct 1996 (8)	44	32	38	67	43	52	63	11	37	50	10	32			34
1998 (9)	39.0	26.6	*32.8*	57.0	40.0	*48.5*	54.2	9.0	*31.6*	40.0	5.3	*22.7*	42.3	10.7	*26.3*

Numbers in italics are not published in the original studies, but have been derived using the following principles: male: female ratio = 50:50 and appropriate racial composition is derived from the appropriate year's Statistics South Africa.

(1) Van der Burgh, 1979: 976 (Note: ages restricted to 20-59).

(2) Coetzee, 1978: 425-26.

(3) Yach, 1982: 168. Estimates provided by Rembrandt Tobacco Corporation.

(4) Yach and Townshend, 1988: 392 (The results are duplicated in SAMRC, 1988).

(5) SAMRC, 1992: 4 (The results are duplicated in Yach et al., 1992: 273).

(6) Martin et al., c.1992 (Note: age limit = 18 years).

(7) Reddy et al., 1996: 1390. (Age limit = 18 and older).

(8) Meyer-Weitz et al., 1997: 10-11 (Note: although there is nothing obviously wrong in the experimental design of this set of surveys, and the authors do not acknowledge any specific errors, other than pointing out that "the drop in smoking prevalence in the February 1996 survey can be attributed to the fact that it followed the introduction of tobacco control legislations and people might have been more reluctant to admit that they smoke" (1997: 3), the prevalence percentages are too unstable to be believable).

(9) Steyn et al., 2002: 164.

1.4 The medical community enters the economic debate

Yach (1982) was the first to attempt to quantify the economic costs of tobacco use in South Africa. Costs were limited to lost earnings from tobacco-related premature death and illness, and the direct cost of hospitalisation. The financial gain from tobacco was defined as the sum of tobacco excise revenue, the salaries of people employed in the tobacco sector, and the value of cigarettes sold. On the basis of his results, Yach contended that "when one compares the monetary and non-monetary costs that result from smoking, it becomes readily apparent that the 'benefits' are dwarfed by the total social and economic costs of the industry" (1982: 169). Interestingly, although he recommends that the tax on cigarettes be increased, he proposes that the government should "find alternative sources of excise revenue and decrease the reliance on tobacco/cigarette revenue" (Yach, 1982: 169). The reality, clearly demonstrated in South Africa and other countries in the following twenty years, is that an increase in the excise tax increases government revenue.

In 1988 the South African Medical Research Council published the first of two comprehensive reports on tobacco in South Africa, the second report being published

in 1992 (SAMRC, 1988 and 1992).[8] The 1988 report summarised most of the existing medical and epidemiological research that had been published to date[9], and provided updated estimates of the economic costs and benefits of tobacco, based on Yach's (1982) earlier study. Estimates of economic costs were again restricted to the direct health care costs of smoking-related diseases and the loss of productivity caused by smokers' increased illness and premature death. Other costs associated with tobacco, such as fire hazards, disability grants, and the medical and other costs of environmental tobacco smoke were acknowledged, but no estimates were provided. Given the methodological framework and the available data, the report clearly indicated that the costs of tobacco outweigh the benefits.

In 1992 the SAMRC updated its cost-benefit analysis of tobacco, using more recent data but essentially the same methodology. It found that the most conservative estimate of the cost of tobacco amounted to R3.64 billion (1.82 per cent of GDP), while the benefits of tobacco amounted to R0.99 billion (0.49 per cent of GDP) in 1988 (SAMRC, 1992: 11).

The 1992 report appealed for strong action by the government. It distinguished between what it called "popular" and "unpopular" interventions. "Popular" interventions were defined as low-key education programmes, posters, leaflets, and other "cosmetic" activities aimed at reducing smoking, but that are not effective and thus not opposed by the industry. On the other hand, "unpopular" interventions would entail the passing of tobacco control legislation and require the political will to take on a powerful industry. In the 1992 report the SAMRC urged the government to ban tobacco advertising[10] and to increase the excise tax on cigarettes, arguing that this would reduce cigarette consumption and raise government revenue at the same time.

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8. Large portions of the 1988 SAMRC report were published in the SAMJ under Yach and Townshend (1988), Townshend and Yach (1988) and McIntyre and Taylor (1989).

9. Amongst other things, the report noted that, in 1984, about 100 000 potential life years of people aged 35-64 were lost due to premature tobacco-related mortality, primarily as a result of ischaemic heart disease, followed by lung cancer and chronic obstructive lung disease. The report also summarised a number of prevalence studies, of which the most consistent results were the following: (1) smoking prevalence increased as people's incomes increased, but past a certain income level (which varied from one racial group to another) smoking prevalence decreased slightly, (2) people with post-matric training had lower smoking prevalence, and (3) there was wide support for tobacco control interventions from a diverse range of social groups.

10. The rationale for an advertising ban is based on the assertion that "the battle between these manufacturers of ill-health and health educators is an unequal one. The tobacco industry commands massive resources and has access to sophisticated techniques of persuasion in maintaining and promoting smoking as a desirable activity. They are effective because they tie risk behaviours such as smoking to dominant cultural themes and images. Consequently, it is inaccurate to talk of freedom of choice when considering such behaviours. Individual choice is shaped and limited by environmental factors and commercial interests which profit from unhealthy lifestyles. Because free choice does not operate in these situations, legislation is required to curb the activities of the manufacturers of illness" (SAMRC, 1992: 16).

Other than banning tobacco advertising and increasing the tobacco excise tax, the 1988 and 1992 reports made a large number of recommendations on how to decrease tobacco consumption, specifically through legislation. These recommendations are shown in Table 1.2. If one compares the situation in 1988 to that in 2004, it is obvious that the country has made some huge strides in its tobacco control strategy. Tobacco control advocates around the world regard South Africa as a model for tobacco control in the developing world (Ken Warner, Professor in Economics, University of Michigan, personal communication, 2003). As will be pointed out in chapters 2 and 4, tobacco consumption has decreased dramatically in the past decade. The medical benefits take longer to manifest themselves (Nkuchia, 1996: 74), but in due course one can expect a decrease in tobacco-related disease and death.

Table 1.2: Policy and legislative recommendations in the 1988 and 1992 SAMRC reports

Proposal	Situation in 1988	Situation in 2004
Control of advertising and sales promotion	No government-decreed ban; voluntary agreement that direct cigarette advertisements are not televised	Complete ban of all tobacco advertising and sponsorship (Tobacco Products Control Amendment Act of 1999)
Requirements for health warnings and statement of tar and nicotine contents	Packets carry a small health warning "Smoking is a health risk"; tar and nicotine contents are stated on packet by voluntary agreement	Eight rotating health warnings, covering 20 per cent of front and 30 per cent of back of packet; tar and nicotine contents are stated on packet (Tobacco Products Control Act of 1993). Pictorial health warnings are proposed in Amendment Bill of 2003
Limits on tar and nicotine contents	No legislation; in 1978 ranges were as follows: 12-39 mg tar/cigarette and 0.5-2.4 mg nicotine/cigarette	Restricted by law (TPCAA of 1999); current maximum tar = 15 mg/cigarette and maximum nicotine = 1.5 mg/cigarette, to reduce to 12 mg/cigarette and 1.2 mg/cigarette, respectively, by June 2006
Restrictions on sales	Sales to minors are not prohibited	Sales to children under 16 is prohibited (TPCAA of 1999). Age limit to increase to 18 years according to Amendment Bill of 2003.
Taxation and price policy	Cigarettes are taxed, but real tax level had been eroded by 70 per cent since 1970	Rapid increases in excise tax since 1994; excise taxes are increased annually to maintain a 50 per cent tax incidence
Economic incentives to substitute other crops for tobacco	None	None
Restrictions on smoking in public places	No national legislation; provincial and municipal by-laws prohibit smoking in certain public places	Prohibited in terms of the TPCAA of 1999; hospitality industry may set aside a maximum of 25 per cent of their floor space to smokers, provided it is separated from the main area of the establishment
Restrictions on smoking in the workplace	No dedicated national legislation; the Machinery and Occupational Safety Act (1983) may be applicable in certain instances	Prohibited in terms of the TPCAA of 1999
Mandating health education	No comprehensive national programme, but government does not want young people to smoke; educational material is made available to schools	Comprehensive health education is part of Life Skills curriculum
Establishing a national organisation for policy development and co-ordination	No government agency; voluntary anti-tobacco groups exist	Department of Health has strong tobacco control focus; NGO sector (especially National Council Against Smoking) actively supports the DoH

Source: SAMRC, 1988: 104-116; Townshend and Yach, 1988: 413; Yussuf Saloojee (Director: National Council Against Smoking), personal communication, 2004.

1.5 Tobacco control policy in practice in the late 1980s and early 1990s[11]

Despite the medical evidence that tobacco was hazardous to people's health, and despite sporadic pleas from medical associations to impose effective tobacco control measures, the South African national government for many years did practically nothing to curb tobacco use. The only national tobacco control measures introduced before 1990 were a voluntary agreement not to directly advertise tobacco on television (1975), the introduction of a weak and very small health warning (1987), and the banning of smoking on domestic flights (1989). The turning point came in 1991 when the official opposition in Parliament accused the then newly-appointed Minister of Health, Rina Venter, of "protecting the vested interests of the powerful tobacco industry, and not the people of the country" (Malan and Leaver, 2003: 127). The background to this accusation was the SAMRC's 1988 report that highlighted the high cost of tobacco in terms of life years lost and the implied financial cost. In response to the opposition's attack, the Minister promised to look into the possibility of introducing tobacco control legislation.

The Minister was urged on in her tobacco control efforts by the Tobacco Action Group (TAG), an anti-tobacco alliance consisting of the Heart Foundation of Southern Africa, the Cancer Association of South Africa and the National Council Against Smoking. According to Saloojee (1994: 163) the role of TAG was to mobilise extra-parliamentary support for the proposed tobacco control bill. The Tobacco Products Control Bill was published for comment in March 1992 and provided for the control of smoking in public places, the printing of prominent rotating health warnings and nicotine and tar content on tobacco packaging and advertising, and the prohibition of sales to minors (Saloojee, 1994: 163). By international tobacco control standards, even at that time, the legislation was mild. For example, the bill did not contemplate a ban on tobacco advertising or promotions, nor did it intend to prohibit smoking in the workplace.

In 1992 a survey was conducted for the Minister of Health, which indicated that about two thirds of people acknowledged the harmful effects of active and passive smoking, and that most people supported the tobacco control measures that were being proposed (Martin et al., c.1992). The bill received the full support of Nelson Mandela, the president-in-waiting, in May 1992.

The tobacco bill was strongly opposed by the industry. Saloojee (1994: 165) argued that initially the industry tried to kill the proposed legislation, but after Mr Mandela's

[11]. For a detailed history of tobacco control in South Africa, see Malan and Leaver (2003: 121-153).

endorsement, changed tactics by trying to water down, rather than doing away with, the legislation. The industry might have argued, quite correctly, that the new government, which came to power in 1994, would have implemented much stronger tobacco control legislation, had there not been any legislation in place. They made a number of presentations to the Minister of Health and, together with some strong support in the cabinet, were able to water down the draft legislation (Saloojee, 1994: 164-165). When the bill was introduced into Parliament in March 1993 the clause restricting smoking in public places had disappeared and radio advertising was exempted from the need to broadcast health warnings. This was a major disappointment to the tobacco control lobby, and at one point they considered rejecting the bill completely (Saloojee, 1994: 165), but eventually decided to make representations to Parliament to strengthen the bill instead. As a result, even though the legislation did not explicitly prohibit smoking in public places, the Minister of Health and local government authorities were given the power to restrict smoking in public places. The Tobacco Products Control Act was approved by Parliament in June 1993, and became effective in May 1995.

Even though the legislation was comparatively weak, Yussuf Saloojee, who was actively involved in lobbying for strong tobacco control legislation, was very complimentary towards Rina Venter, the Minister of Health, on the way she handled the legislative process. She certainly had a difficult job. On the one hand, medical research and the tobacco control lobby groups persuaded her that tough legislation was required. On the other hand, she had to persuade her colleagues to take action against an industry with which the ruling party had historically had very close ties. Her strategy in getting the legislation through the legislative process was to be as "democratic" and "encompassing" as possible. She listened to the appeals of the tobacco industry, and there are strong indications that they were able to water down the proposed legislation. In retrospect, this "encompassing" approach might have been a mistake, although the political imperatives and the historical relationship between the industry and the ruling party may have forced her to take this line. In contrast, her successor, Nkosazana Zuma, did not engage much with the tobacco industry when the Tobacco Products Control Amendment Bill was debated in 1998, and the result was a much more comprehensive and rigid piece of legislation. Nevertheless, the Tobacco Products Control Act of 1993 represented the "first major dent in what has until now been a solid wall of vested interest" (Saloojee, 1994: 166).

The 1993 legislation had a major influence on the power of local government councils to impose restrictions on smoking in public places. Already in 1989 the Cape Town city council had attempted to restrict cigarette advertising and smoking in public places, but this attempt failed because the administrator of the then Cape Province refused to pass the necessary bylaws needed to enforce the council's plans (Malan and Leaver, 2003:123-125). Through its sponsorship of, amongst others, the Cape Town

Symphony Orchestra, Rembrandt was able to exert pressure on the Cape Town mayor and the administrator of the Cape Province to veto any attempt by the city council to restrict smoking.

In other metropolitan areas the anti-tobacco lobby was more successful than in Cape Town. In 1991 the city councils of Johannesburg and Port Elizabeth passed bylaws that restricted smoking in restaurants, despite fierce opposition from chambers of business and pro-tobacco groups (Malan and Leaver, 2003: 127). The success of Johannesburg, in particular, emboldened the Cape Town medical officer to launch a new offensive against smoking in 1992, but again the administrator of the Cape Province refused to pass the proposed bylaw, thus thwarting the attempt.

The Tobacco Products Control Act of 1993 effectively removed the administrator's veto power in tobacco-related matters. The Cape Town city council applied to the Department of Health for permission to promulgate their own laws controlling smoking (Leaver, 2003: 23-24). In 1995, the Cape Town city council passed a bylaw that restricted smoking in many public places, and public transport, despite vehement criticism by some people in the hospitality industry and a local newspaper *(Cape Times)*. With the benefit of hindsight, it is evident that the public generally complied with the restrictions on smoking in public places, but that the restrictions on smoking on public transport were often disregarded.

1.6 Professional economists enter the debate

During the 1990s the tobacco control debate in South Africa entered a new dimension with the entrance of professional economists. The first shots were fired by Reekie and Wang (1992) and Reekie (1994).

1.6.1 Reekie and Wang (1992)

Reekie and Wang (1992) criticised the cost-benefit analysis of the SAMRC (1988) report on the grounds that smokers have already discounted the hazards associated with smoking. They argued that a person's decision to smoke or not to smoke is influenced by the expected utility obtained from smoking and the probability of smoking-induced illness or death. On the basis of the perceived risk and benefits, people will then decide to smoke or not. Using a state dependent approach to standard decision making (i.e. where the outcome or consequence of an action is uncertain and dependent on the state of nature), they showed that, given people's different preferences, it is possible that smoking confers benefits on (some) consumers.

In a related article in *Business Day*, Reekie (1992) asserted that all costs associated with smoking are internalised by smokers. He argued that "public policy on smoking – or anything else – is necessary only if there are external costs which cannot be

internalised", implying that government intervention in the form of tobacco control policy was not necessary or desirable. He dismissed the notion that smoking was addictive, claiming that the large number of people who had successfully given up smoking suggests that smoking is no more than a bad habit.

In response, Saloojee and Yach (1992) argued that Reekie's claims that smoking is a "free choice" and that smoking is not addictive were untrue and at odds with scientific evidence. According to them, Reekie did "not take cognisance of the need to smoke to allay withdrawal symptoms, of the desire of most smokers to stop, and of their failed attempts to quit". They dismissed Reekie's analysis on the basis that it was based on false assumptions.

Abedian and Dorrington (1994) strongly contested Reekie and Wang's "façade of technical, empirical and scientific sophistication", arguing that the latter's theoretical approach and empirical research methodology were flawed. Abedian and Dorrington proposed that consumers are not as rational and capable of processing information as the standard theory would lead one to believe. They argued that this, together with the addictive nature of smoking, rendered Reekie and Wang's "contrived" results unacceptable.

1.6.2 Reekie (1994)

In a subsequent paper, Reekie (1994) set out to show that the cost benefit analysis performed by the SAMRC (1988 and 1992) was flawed, and that the benefits obtained from smoking, in fact, exceeded the costs. Firstly, he argued that the SAMRC understated the monetary benefits received from smoking. If total expenditure on tobacco is a cost (as the SAMRC assumes), then the equivalent amount, transferred to the factors of production, must be a benefit to society. He argued that, "the 'balance sheet', as presented, fails to meet the principles of double-entry bookkeeping and fails … to define social costs and benefits. It is tautological and provides scope for (false) policy inferences only because it is incomplete" (Reekie, 1994: 224). Should one apply this methodology to other goods and services, none would ever provide a net benefit to society, he argued.

Reekie contended that the "social costs" that the SAMRC ascribes to smoking are in fact *private* costs, and that when people decide to smoke, they weigh up and trade off the costs and benefits to *themselves* of their intended action (1994: 225, italics in the original). Included in the cost of cigarettes is the risk of disease-induced death. Reekie (1994: 232) argued that smokers carry the burden of smoking-induced medical costs and lost productivity from ill health or premature death, not society as a whole.

Secondly, according to Reekie (1994: 224), the SAMRC assumed that smoking provides consumers with zero satisfaction. While the SAMRC (1988: 87) grudgingly admits that smoking provides some satisfaction to smokers, it does not attempt to measure its magnitude, and thus this benefit did not enter the SAMRC's cost benefit analysis. This is a clear shortcoming in the SAMRC's analysis. Using the well-known concept of consumer surplus, Reekie's primary aim was to quantify the benefit that smokers derived from smoking.

Since the consumer surplus is the area below the demand curve, above the equilibrium price, Reekie started by estimating a relatively unsophisticated demand equation. Per capita quantity demanded was specified as a function of the real price of cigarettes and per capita real disposable income for the period 1970 to 1989. Advertising expenditure was excluded from the regression equation on the grounds that, firstly, it rendered an insignificant coefficient and, secondly, only twelve observations (1978-1989) were available. The regression equation was estimated in linear and logarithmic form, and the logarithmic model was chosen because it was "statistically superior to the linear 'fit'" (Reekie, 1994: 229), although this is not apparent from the paper, nor well explained. The price elasticity of demand was estimated at –0.88, which is high in comparison with most international studies performed up to that point.

In calculating the consumers' surplus, the logarithmic specification is problematic, because it results in an infinitely large consumers' surplus, which is clearly unrealistic. Using some fairly arbitrary assumptions about the shape of the demand curve at high prices[12], Reekie estimated the consumers' surplus at nearly R2 billion. Since the consumers' surplus is greater than the SAMRC's estimate of the health care cost of smoking, Reekie concluded that "on the most pessimistic of assumptions … the data suggested that consumers still receive substantial net benefits from smoking" (1994: 231).

1.6.3 Van Walbeek (1996)

Using Reekie's (1994) approach of measuring the consumers' surplus, Van Walbeek (1996) tried to determine how much additional revenue the government would be able to generate, should it set the tax rate at a revenue-maximising level. A product-specific tax reduces the consumer surplus of that product. Since the tax revenue potential depends on the magnitude of the consumer surplus, the crucial aspect in this study was

[12]. In order to get the demand curve to touch the price axis, he assumed a spliced demand curve: for prices above a certain value (58 per cent above the actual price of 1988), a linear demand curve is assumed, while for prices below that value a logarithmic specification is assumed. This gives a conservative estimate of the consumers' surplus, but the fact of the matter is that its magnitude is quite arbitrary. Had Reekie decided to use a linear specification – and there is no good statistical or econometric reason why he should not have – the size of the consumers' surplus would have been bigger (which would have enhanced his case) and the accusation of using an arbitrary approach would not have been made against him.

to get a realistic estimate of the consumers' surplus. Using a linear, rather than a logarithmic demand specification, he forced the consumer surplus to be finite and measurable. Data on tobacco consumption were obtained from three sources, and demand equations were estimated for each of these. The short-run price elasticity of demand (at the mean price and quantity) was estimated at between –0.32 and –0.99, depending on the data used.

On the assumption that the supply of tobacco products was perfectly elastic, he used the estimated demand equations to determine how increases in the excise tax would affect tobacco consumption, prices, and government revenue. His main conclusions were as follows:

1. The government can raise the excise rate to at least 110 per cent of the "producer price" of tobacco if it wishes to maximise its excise revenue.....[13]

2. The government can expect to double (at least) its revenues from tobacco if it increases the excise rate to these levels.

3. The analysis suggests that raising the tobacco excise rate to the proposed levels could lead to a reduction in consumption of between 41 and 46 per cent.

4. The real retail price of cigarettes should rise by between 44 and 122 per cent from their 1989 levels, if the government were to maximise excise revenues from tobacco (Van Walbeek, 1996: 35).

In June 1994 the newly-elected Government of National Unity announced that it would increase the excise tax on cigarettes to 50 per cent of the retail price, to be phased in over a number of years. This decision was the result of many years of lobbying by the medical community (e.g. Yach, 1982: 169, and SAMRC, 1988:120 and 1992: 20-21) and reversed the previous 25 years' trend of rapidly eroding tobacco excise taxes. As will be pointed out in more detail in chapter 4, the excise-induced increases in the real price of cigarettes have had a profound effect on cigarette consumption and on government revenue.

Since the policy prescriptions of Van Walbeek's (1996) study closely correspond to the actual policy imposed by the government, one can retrospectively evaluate his predictions against actual experience. The results are shown in Table 1.3. Van Walbeek did not attach a time dimension to his predictions, but a comparison of the actual

[13]. The "producer price" is defined as the "tax-free" or "pre-tax" price. Using a VAT rate of 14 per cent, this implies that the excise tax would comprise 46 per cent of the VAT-included retail price of cigarettes.

changes in the variables between 1989 (the year for which the study was done) and 2003 indicates that the predictions were generally quite accurate.

Table 1.3: Predicted and actual changes in some tobacco measures, based on Van Walbeek (1996)

Variable	Prediction by Van Walbeek (1996)	Actual outcome (1989-2003)	Comments
Excise tax as percentage of retail price	Revenue maximising excise tax rate = 46 per cent of retail price	2003: excise tax equalled 33 per cent of retail price; total tax incidence (i.e. VAT included) = 45 per cent of retail price	Despite claims by the Minister of Finance that its self-imposed target of 50 per cent tax incidence has been achieved, this is not so, for technical reasons. See chapter 4.
Real government revenue from tobacco	At least 100 per cent increase	139 per cent increase	Increases in the population and real disposable income increase tobacco consumption, which raised government revenue by more than the predicted amounts.
Consumption	Decrease of between 41 and 46 per cent	33 per cent decrease	Adult (15+) per capita consumption decreased by 51 per cent.[14] Other factors (especially legislation of 1993 and 1999) are likely to have had an additional depressing impact on tobacco consumption, over and above the price impact.
Real retail price	Increase by between 44 and 122 per cent	142 per cent increase	Retail price increased not only because of excise tax increases, but because the industry rapidly increased the "industry price" since the mid-1990s. See chapter 5.

Sources: Van Walbeek (1996), Republic of South Africa (various years)

1.6.4 Economics of Tobacco Control in South Africa Project (1996-1998)

In 1996 the Economics of Tobacco Control in South Africa (ETCSA) Project was established at the Applied Fiscal Research Centre of the University of Cape Town, funded by the International Tobacco Initiative. Whereas earlier economic studies with a tobacco control agenda (SAMRC, 1988 and 1992, Abedian and Dorrington, 1994 and Van Walbeek, 1996) were generally limited in focus, the aim of the ETCSA Project

[14]. As will be pointed out in chapter 6, some substitution towards roll-your-own tobacco has taken place in the latter half of the 1990s, especially among poor households. This would then imply that the reduction in tobacco consumption, as opposed to cigarette consumption, is smaller than the figures indicated here. Also, a representative of BAT points out that an increase in smuggling and other illicit trade would have caused true cigarette consumption to be higher than the official figures quoted here (Simon Millson, Director, Corporate and Regulatory Affairs, BAT South Africa, personal communication: 2004).

was to perform a comprehensive investigation into the economic impact of tobacco control policies.

The ETCSA Project steered clear of a full cost-benefit analysis of smoking, arguing that there are so many monetary and non-monetary costs associated with tobacco that it is near-impossible to come to a satisfactory conclusion. Rather they accepted tobacco as a fact of life, and similarly, accepted taxation as a fact of life (ETCSA, 1998: 48). The focus of the Project was on "finding the level of taxation that will best meet government's competing objectives, and not jeopardise the economy in any way" (ETCSA, 1998: 48). In line with international experience, the Project found that, of all tobacco control instruments available, rapid increases in the real price of cigarettes would be most effective in reducing cigarette consumption. Using cointegration analysis, the price elasticity of demand for cigarettes was estimated at about -0.6, which is typical for a developing country.

Other significant findings of the ETCSA Project were the following:

- An increase in the excise tax increases government revenue. Even though an increase in cigarette taxes reduces cigarette consumption, the decrease in consumption is much smaller than the increase in the tax per cigarette, with the result that government revenue increases.
- By allowing the real excise tax to decrease by about 70 per cent between the mid-1970s and the early 1990s, real government revenue decreased, despite a rapid increase in cigarette sales over this period. Using demand analysis, the opportunity cost (in the form of foregone government revenue) of not raising the level of excise tax in line with inflation was measured and found to be substantial.
- It was found that advertising expenditure has a small but positive impact on cigarette consumption. On the basis of this result, it was argued that an advertising ban would reduce cigarette consumption.
- Using a social accounting matrix, the researchers investigated the likely employment impact of a reduction in the demand for cigarettes. It was found that the decrease in employment in tobacco-related sectors would be more than compensated for by increased employment in other sectors, because consumers would switch their expenditure on cigarettes to other goods and services.
- In comparison with some Mediterranean and Eastern European countries, South Africa did not have a significant cigarette smuggling problem. The researchers speculated that, based on a court case between two major cigarette manufacturers, Rembrandt and Philip Morris, there are indications that the industry may be involved in cigarette smuggling.

The policy implications of the ETCSA Project's research were important. Together with inputs from the medical community and other anti-tobacco lobby groups, this

research was used to urge the South African Ministry of Health to impose more comprehensive tobacco control legislation than the Tobacco Products Control Act of 1993.

One of the ETCSA Project's most publicised findings was that "a 1 per cent increase in the growth in advertising expenditures will increase growth in demand for cigarettes by between 0.18 and 0.24 per cent" (ETCSA, 1998: 77). At first glance, this finding provides the empirical justification for an advertising ban: if advertising expenditure increases tobacco consumption, then a ban on tobacco advertising will, presumably, reduce tobacco consumption, ceteris paribus. The typical industry argument is that advertising has little, if any, impact on aggregate tobacco consumption, but that it has a marked impact on market shares (High, 1999: 18-22). The international literature on the determinants of demand for tobacco is split on this issue. Studies that have an apparent bias towards the industry tend to find insignificant relationships between advertising and consumption, while studies with an apparent bias towards tobacco control interventions tend to find a positive relationship (see surveys in High, 1999: 23-70 and Saffer and Chaloupka, 2000:1120).

The ETCSA Project's finding on the positive relationship between advertising expenditure and consumption was severely criticised by Leach (1998) and High (1999: 65-69). They pointed out that the consumption[15] and advertising expenditure[16] data were incorrect, that the relationship is only marginally significant, and only in certain sub-periods of the period being investigated. In the public hearings in October 1998, Leach and High submitted their reservations about the ETCSA Project's results to the Portfolio Committee on Health. Their submissions did not receive much media attention, possibly because of the technical nature of their reservations. Despite their criticism, the legislation was passed, but certainly not because of the rigor of the ETCSA Project's econometric work on this issue.

Given their large vested interests, it goes without saying that research perceived as a threat to the tobacco industry will be critically analysed and scrutinised, and discredited if possible. In their eagerness to support the proposed tobacco control legislation, the ETCSA Project made some serious errors for which they were justifiably criticised. Had the researchers been more circumspect and rigorous in their

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15. Leach (1998) and High (1999) point out that the ETCSA Project's data on cigarette consumption is much higher, and shows a much more rapid growth rate in the early 1990s, than is actually the case.

16. According to the ETCSA Project, "prior to 1990, reliable data [on advertising expenditure] was only available for 1980, 1986 and 1989. However, tobacco advertising for these years was a consistent 5 per cent of total advertising expenditure. Therefore, for the remaining observations, total advertising spend was multiplied by 0.05" (1998: 57). This implies that for 17 of the 25 observations on which the analysis was based, the values for cigarette advertising were "basically made up" (Leach, 1998). As is pointed out in chapter 7, data on cigarette advertising in the 1970s and 1980s did exist; it just had to be collected.

data collection and more modest in presenting their results, it would have saved them this embarrassment.

Despite these criticisms, the overall impact of the ETCSA Project, both nationally and internationally, was profound. Nationally, it provided the anti-tobacco lobby, and the Minister of Health in particular, with the empirical research to show that the economic impact of the proposed tobacco control legislation was not as detrimental to the economy as the tobacco and related industries wanted people to believe.

Internationally, the Project had a significant impact as well. In February 1998 an international conference on the economics of tobacco control, organised by the ETCSA Project, was held in Cape Town. At this conference the main research results of the ETCSA Project, together with international research into the economics of tobacco control, were presented (Abedian et al., 1998). This conference also provided additional impetus to World Bank officials to review their policy on tobacco and tobacco control. The World Bank's official stance on tobacco control was published the following year, and in this document the Cape Town conference was acknowledged as an important catalyst in the development of this document (World Bank, 1999: xi).

1.6.5 Economics of Tobacco Control in South Africa Project, Phase II (2000-2003)

After the first phase of the ETCSA Project was completed in 1998, a second phase was initiated in 2000, and completed in 2003 (ETCSA, 2002 and 2003). Whereas the first phase of the Project had much impact on local tobacco control policy, the second phase has had a much stronger international focus. The aim of the second phase was to extend the economic analysis and policy implications of the original study, based on the idea that South Africa could act as a role model in tobacco control for other developing countries.

One of the main focus points in the second phase of the Project was to consider the impact of excise tax increases on the regressivity of the excise tax. This thesis is based to a large extent on the research performed for the second phase of the ETCSA Project.

1.7 Tobacco control policy in practice after the democratic transition in 1994

In April 1994 the first democratic elections were held in South Africa, after a turbulent transition period that was initiated when the African National Congress was unbanned and Nelson Mandela was released from prison in February 1990. After the 1994 elections the ANC became the dominant party in the Government of National Unity.

In contrast to the outgoing National Party (NP) government, the ANC had no historical ties with the tobacco industry. The long and close relationship between the NP and the tobacco industry had resulted in a hesitant and cautious tobacco control policy. Coming

into power with a clean slate, the ANC was not bound by the informal agreements of the past. Even before assuming power, the ANC made its position clear on tobacco control. In May 1992, on World No-Tobacco Day, Nelson Mandela committed the ANC to a strong tobacco control policy and publicly supported the Tobacco Products Control Bill that was being debated at the time. In November 1993, at the All Africa Conference on Tobacco or Health, Nkosazana Zuma, the future Minister of Health, confirmed the ANC's anti-tobacco stance. She argued that a comprehensive tobacco control programme would be an important component of the new government's commitment to improve the health of the population (Yach and Harrison, 1994: 9).

It did not take long for the new government to start implementing its tobacco control policy. In June 1994, less than two months after the ANC took power, the Minister of Finance announced that

> "The increase in the excise duty on tobacco products is a special case [compared to other excisable products]. Arguments from the health community indicated a preference for an increase in the excise duty to fifty per cent of the retail price, which is the order of impost in many other countries. After consultations with all interested groups and taking into account industry-specific limitations and market conditions, Government has opted for a phased approach, which is reflected in the announced increase. Future budgets will have to deal with the remainder of the issue" (Republic of South Africa, 1994: 5.7).

This announcement was a clear victory for the health community, even though they were disappointed with the size of the tax increase in that year and the following two years. However, in 1997 the new Minister of Finance, Trevor Manuel, announced a 52 per cent increase in the excise tax, which would, he claimed, raise the expected total tax incidence to 50 per cent of the average retail price (Republic of South Africa, 1997: 7.16). Since 1997, the annual increases in the excise tax on cigarettes have been quite predictable, with the government adjusting the excise tax in line with the average cigarette price increase, so as to maintain the 50 per cent tax incidence.[17] In the 2004 budget speech the tax incidence was increased to 52 per cent of the retail price, to be maintained for at least the following three years.

As one would expect, the "excessive" excise tax increases were strongly opposed by the tobacco industry (Leaver, 2003: 20). They argued that they were a legitimate industry and that the excise tax increases unfairly discriminated against them. Also, they claimed that the rapid excise tax increases would exacerbate the smuggling

[17]. As will be pointed out in chapter 4, the ex post tax incidence is much less than 50 per cent, because, in calculating the excise tax increase, the government does not take into account the fact that the change in the tax will result in a change in the retail price of cigarettes. The retail price is the denominator in calculating the tax incidence, and when this increases, the tax incidence, of necessity, will decrease.

problem, which, in their opinion, was already out of control, and that this would negatively affect government revenue (Rembrandt Group, 1996).

As will be pointed out in chapter 4, a long-term view of cigarette taxation indicates that the rapid tax increases in the mid- and late 1990s were simply a reversal of a 20-year trend of decreasing excise taxes. Between 1970 and the early 1990s the real level of excise tax fell by 70 per cent. This happened because the government allowed inflation to erode the real value of the excise tax. Despite the rapid increases of the preceding years, the level of real excise tax on cigarettes in 1998 was still about a third less than in the 1960s and early 1970s.

As will be pointed out in chapters 4 and 6, the rapid increase in the real price of cigarettes, more than anything else, has driven the decrease in cigarette consumption in South Africa in the past decade.

Other than a war of words between the tobacco industry and the Ministry of Health about health warnings on advertising material in 1996 (Malan and Leaver, 2003: 143), the next major tobacco control move came in January 1998 when the Minister of Health announced that a Tobacco Products Control Amendment Bill would be tabled in Parliament that year. The rationale, she argued, was to "protect children and to prevent them from being bombarded with pro-smoking messages" (Leaver, 2003: 25). The two most important and controversial provisions of the bill were the banning of all tobacco advertising and sponsorship, and the prohibition on smoking in all public and work places. The other provisions of the bill – prohibiting the free distribution of cigarettes and the sale of single cigarettes, and the prescription of the maximum yields of tar, nicotine and other constituents in tobacco products – were relatively uncontroversial and did not receive much attention.

The cabinet approved the bill six months after the Minister had announced her plans. Shortly after the bill was published for public comment a few weeks later, the tobacco industry applied for an urgent interdict to stall the legislation, citing "a lack of consultation" in the bill's drafting process and wanting access to the documents on which the legislation was based (Malan and Leaver, 2003: 148). Throughout the legislative process, the industry complained that the Minister of Health would not consult with them. In what the Minister described as a "victory in the parliamentary and legislative process", the industry's application was dismissed a few days later (Leaver, 2003: 28). The National Council of Provinces approved the bill in October 1998. Public hearings into the proposed legislation were held later that month. The hearings before the Portfolio Committee on Health attracted much media attention and were the climax of many weeks of intense lobbying by both supporters and opponents of the proposed legislation.

Opponents of the proposed legislation were against the banning of tobacco advertising and sponsorship on the grounds that: (1) advertising for products that have achieved the "mature" stage of the product life cycle (like cigarettes) is aimed primarily at increasing and maintaining a brand's market share, rather than increasing the overall size of the market (High, 1999: 20), (2) there is no empirical evidence to support the hypothesis that advertising increases tobacco consumption, (3) the ban on advertising is an infringement of the right to free speech, (4) the ban on advertising would have a very detrimental impact on the advertising business, and, similarly, the ban on sponsorships would jeopardise many sports bodies, and (5) should the government decide to ban tobacco advertising on the grounds that it is potentially harmful, before long the advertising of other products, like alcohol, cars and unhealthy foods, would be prohibited as well (the so-called slippery slope argument) (Van Walbeek, 2001).

Proponents of the legislation, on the other hand, argued that tobacco advertising falsely presents smoking as a pleasurable and glamorous activity. They argued that advertising distorts the consequences of smoking and, rather than informing, prohibits people, and especially children, from making an informed choice about it (Seidel Marks, 1998). It was argued that tobacco advertising, rather than being an expression of free speech, in fact creates its own censorship; many magazines and newspapers are so dependent on tobacco advertising that they would not publish anything that would anger the industry, out of fear of losing their tobacco accounts. Furthermore, they argued that, despite the tobacco industry's claims that they do not target children in their marketing endeavours, secret documents reveal the opposite.[18]

Arguments against the prohibition of smoking in public places and workplaces were primarily based on financial grounds. The hospitality industry claimed that, should this bill become law, they would lose a large proportion of their customers. According to the International Hotel & Restaurant Association, a survey among Cape Town restaurant operators indicated that the proposed legislation would decrease their turnover by 32 per cent (cited in Van Walbeek, 2001). They argued that the government should not be allowed to decide how hospitality establishments should run their businesses, and that this decision should be left to each individual operator. On a technical point, opponents argued that the definitions of "public places" and "workplaces" were vague and unclear, and that it could possibly be interpreted that people would not be allowed to smoke in their own homes (Van Walbeek, 2001).

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[18]. In 1997, a US court ordered that millions of tobacco documents be made available for public scrutiny. Numerous anti-tobacco organisations have trawled through these documents and have compiled summary reports that indicate that the tobacco industry has, over a long period of time, been guilty of dishonest and unethical conduct. A particularly thorough report, "Trust us, we're the tobacco industry", can be accessed at http://www.ash.org.uk/html/conduct/html/trustus.html (Hammond and Rowell, 2000).

Proponents of the "clean indoor air" legislation argued that the rights of non-smokers had to be protected. They argued that medical science had shown beyond reasonable doubt that environmental tobacco smoke (ETS) is more than just a nuisance, but is in fact harmful to non-smokers. Whereas previously smokers had the right to pollute the air with ETS, this legislation would grant non-smokers the right to smoke-free air. Proponents of the legislation rejected the claims that the legislation would have a detrimental impact on the turnover of hospitality establishments. They quoted the research from the US, which indicated that the passing of clean indoor air legislation had had no detrimental effect, and may even have had a positive effect, on the revenues of restaurants and other hospitality establishments[19] (Van Walbeek, 2001).

Despite strong opposition – about three quarters of the submissions at the public hearings were against the proposed legislation – the Minister of Health was undeterred. After the Portfolio Committee on Health approved the bill, it was presented to Parliament's House of Representatives, where it was approved with 213 votes in favour and 106 against (Leaver, 2003: 30). The ANC and the African Christian Democratic Party voted in favour of the legislation. The final hurdle was for President Mandela to sign the bill into law. However, the bill was subject to an unexpected delay when President Mandela requested that some definitions in the bill be rephrased because they were too vague, and might be subject to a legal challenge. This was done and after both houses of Parliament had approved the amendments, the President signed the Tobacco Products Control Amendment Act (Act 12 of 1999) in April 1999 (Leaver, 2003:30).

If one compares the legislative process followed by the Amendment Act of 1999 to the original Tobacco Products Control Act of 1993, a number of differences are clearly evident. Firstly, the 1999 legislation was much more comprehensive than the 1993 legislation. The industry was easily able to exploit loopholes in the 1993 legislation. For example, advertisements that promoted tobacco-sponsored events were not required to carry health warnings, on the grounds that this was "indirect" advertising. Predictably, after 1993 there was a rapid increase in the advertising of sponsored events (see chapter 7). Having learnt from her predecessor's experience of the 1993 legislation, the Minister of Health took a much harder line in 1998. Despite industry pleas for "appropriate" and "reasonable" legislation (which could, presumably, be easily circumvented) the Minister made the restrictions on smoking in public places and on tobacco advertising as watertight as possible.

The second difference was the way in which the two Ministers allowed the industry to influence the legislative process. In 1993, the Minister of Health, Rina Venter, allowed

[19]. Unfortunately, references to these studies were not provided. However, Glantz and Charlesworth (1999) show that bans on indoor smoking have not had a negative impact on the hospitality business in the cities where these regulations have been implemented.

the industry to make representations to her, and they successfully slowed down the process and watered down the legislation. In 1998 the new Minister, Nkosazana Zuma, largely ignored the industry's pleas to consult with her, arguing that they had no constructive role to play. At one point she remarked: "What is consultation? We did consult them, but consultation does not mean consulting until they agree. They will never accept tobacco restrictions no matter how long we speak to them" (*The Star*, 7 August 1998, cited in Leaver, 2003: 32). Even though this "non-consultative" approach allowed her to push the legislation through Parliament, it reinforced the public opinion that she was arrogant and autocratic.

The third difference was the support that the two Ministers of Health received from their colleagues in the cabinet. Rina Venter had the odds stacked against her: many colleagues, including the President, FW de Klerk, were chain smokers and only grudgingly supported her tobacco control efforts; the Minister of Agriculture openly supported tobacco farmers in their fight against the proposed legislation (Leaver, 2003: 14-15); and by "buying favour" with the governing party, the industry was able to place a "moral indebtedness" on the government (Malan and Leaver, 2003: 123). On the other hand, Nkosazana Zuma was operating in a much more favourable environment: President Mandela openly supported tobacco control measures, the ANC's focus on primary health care implied a strong focus on tobacco control, and the ANC did not have any long-term relationship with the tobacco industry that could possibly influence its policy decisions.

After a delay of more than a year, during which period the Department of Health experienced a number of personnel changes, the regulations enforcing the Act were published in September 2000. The Act came into effect in January 2001. As a result of continuous pressure, the new Minister of Health, Mantombazana Tshabalala-Msimang, allowed the hospitality industry to set aside a maximum of 25 per cent of their floor space to smokers, provided the smoking area was enclosed and separately ventilated. According to Saloojee (personal communication, 2004) this was a reasonable compromise to "guarantee non-smokers the right to clean air, while taking account of the need of smokers".

The degree of compliance with the new legislation has been relatively high. All visible tobacco advertising and sponsorship has disappeared, although there has been an apparent increase in "below the line" cigarette advertising. According to a small survey performed in October 2002 in three of the nine provinces, more than 90 per cent of respondents indicated that their workplaces have some form of smoking restrictions; 30 per cent of hospitality establishments are completely smoke-free, 30 per cent have a separate smoking section, and 40 per cent (mainly small and rural establishments) do not comply with the legislation (Steyn et al., 2003: 45 and 48).

In October 2003 the Ministry of Health announced further amendments to the legislation. Other than closing some loopholes in the Amendment Act of 1999 (e.g. by disallowing "below the line" advertising in the form of cigarette parties, and product stacking at the point of sale) and increasing penalties, the amendment bill aims to, amongst other things, (1) introduce pictorial health warnings, as has been done in Canada and Brazil, (2) ban "misleading" descriptors like "mild", "light" and "low tar", (3) ban the sale of "Duty-Free" and "Tax-Free" tobacco products, and (4) ban smoking in certain outdoor public places and within five metres of doorways and entrances (http://www.doh.gov.za/docs/pr/2003/pr1016.html). According to the Minister of Health this amendment will bring the country in line with the provisions of the Framework Convention on Tobacco Control, of which South Africa is a signatory.

To conclude, what has been the impact of these legislative changes? Empirically, it is very difficult to measure their impact on tobacco consumption. Given the paucity of appropriate tobacco data in South Africa and the fact that it is practically impossible to separate the effects of the various legislative interventions, one cannot determine accurately by how much cigarette consumption has decreased as a result of these legislative interventions, *ceteris paribus*. Even the international literature suggests that the direct impact of legislative interventions is much smaller than changes in the tax on and price of cigarettes.

So why are tobacco control advocates so partial to legislative interventions? Primarily because it creates a social environment where tobacco use is no longer regarded as normal and acceptable. There is nothing glamorous about smoking in the cold outside or between the pigeon droppings. When smoking is denormalised, it creates a platform where economic disincentives to smoke (i.e. price increases) are more effective in encouraging people to quit smoking and in preventing youngsters from starting to smoke. Also, through "clean indoor air" policies property rights are transferred from smokers to non-smokers. Whereas previously the right to pollute the air with environmental tobacco smoke rested, by social convention, with smokers, non-smokers have now been granted the right to smoke-free air. Even though the legislation allows for fines to be imposed on offenders of the "clean indoor air" legislation, this is not the primary point. The point is that non-smokers can now demand smoke-free air, and have a law to back up their demand.

1.8 Structure of the thesis

The thesis consists of eight chapters. Chapter 2 aims to measure some recent trends in smoking prevalence in South Africa. Although it is difficult to measure the impact of the various tobacco control instruments (e.g. advertising bans, no indoor smoking, banning sales to minors, increased taxes, and social pressure) individually, the overall strategy has clearly been extremely effective. In this chapter it will be shown that there

has been a significant decrease in smoking prevalence for most demographic groups during the 1990s.

Chapter 3 reviews the substantial international literature on the demand for cigarettes. Despite major differences in countries' smoking histories, data sets, time periods, and research methodologies, most studies conclude that the demand for cigarettes is price inelastic, but certainly not perfectly inelastic. This literature underpins the strategy to use excise tax increases as an effective tobacco control policy. It also forms the theoretical base on which this thesis is built.

In chapter 4 the focus is on the relationship between the price of cigarettes and the quantity demanded. The government can influence the retail price of cigarettes by increasing the excise tax. In order to investigate these relationships, econometric techniques are used to investigate the demand for cigarettes in South Africa, and to determine the future cigarette excise tax potential for the government. It will be shown that the government has dramatically increased its revenue from cigarette taxation over the past decade.

The external environment has become quite hostile to the tobacco industry since the early 1990s, and especially after 1994. Rapid excise tax increases, for example, succeeded in considerably reducing cigarette consumption. Such external threats significantly altered the marketing strategy of the cigarette manufacturing industry. In chapter 5 the pricing strategy of the cigarette manufacturing industry is analysed. The real retail price of cigarettes has generally increased at a much more rapid pace than the increase in the tax rate, or any of the main input costs. This suggests that the industry has increased its profitability despite the fact that cigarette consumption has decreased. In the circumstances it was a clever and appropriate strategy, but may lead to a more rapid long-run decline of the industry than would otherwise have been the case. From a tobacco control perspective this is a positive development.

While tax increases are extremely effective in reducing cigarette consumption, a point of concern is that, because poor households generally spend a higher proportion of their income on cigarettes vis-à-vis the rich, cigarette tax hikes might increase the tax burden on the poor. In chapter 6 the focus is on the regressivity of cigarette taxes. While it is generally agreed that cigarette taxes are regressive (i.e. that they fall disproportionately heavily on the poor), it has been argued by some tobacco control economists (Chaloupka and Warner, 1999) that tax increases may decrease the regressivity of the tax. The reason is that the poor are more likely to change their smoking habits in response to a change in the price of cigarettes than the more affluent. In this chapter these arguments are investigated empirically, and it will be shown that price increases in the period 1990-2000 have in fact reduced the regressivity of the cigarette excise tax.

Around the world, cigarette advertising is a contentious issue in the tobacco control debate. As indicated in this introductory chapter, the industry argues that cigarette advertising is not meant to persuade non-smokers to start smoking, but to persuade smokers to either switch brands or to remain loyal to their brand. Tobacco control advocates reject this argument, claiming that cigarette advertising is meant to enhance the social acceptability of smoking, and is often focused on "vulnerable groups", especially the youth. The government has rejected the industry's argument and passed the Tobacco Products Control Amendment Act of 1999, to, *inter alia*, ban tobacco advertising in South Africa. The aim of chapter 6 is to analyse historical trends in cigarette advertising. Factors that will be analysed include (1) the relative importance of different media in cigarette advertising, (2) changes in advertising strategies, and (3) changes in the relative importance of the most important brands. Among other things, it will be shown that cigarette advertising was already in the process of being phased-out over a number of years, before it was formally banned at the end of 2000. This would presumably have given advertising agencies enough opportunity to find replacements for the lost cigarette business.

Chapter 8 is the concluding chapter, presenting the main policy conclusions, as well as potential avenues for future research.

CHAPTER 2

RECENT TRENDS IN SMOKING PREVALENCE IN SOUTH AFRICA[20]

2.1 Introduction

The primary aim of a tobacco control strategy is to curb tobacco use and improve public health. As pointed out by Warner (1987: 2081) and Peto et al. (1996), the public health benefits from reduced tobacco consumption take many years to manifest themselves.[21] This is a result of the fact that there is such a long delay between smoking initiation and the onset of tobacco-related diseases. Evidence from the US and other developing countries indicate that the prevalence of tobacco-related diseases started decreasing between 20 and 30 years after tobacco consumption started to decrease. However, the short-term goal of a tobacco control strategy is to reduce smoking prevalence and tobacco consumption. This can be measured relatively easily.

As was pointed out in the previous chapter, South Africa has been actively implementing a tobacco control strategy since the early 1990s, and especially after 1994. The international tobacco control community has acknowledged South Africa's efforts in this regard,[22] and according to eminent tobacco control economists South Africa is regarded as a role model for other developing countries in the area of tobacco control (Ken Warner and Frank Chaloupka, personal communication: 2003). Has the strategy worked?

As was pointed out in chapter 1, numerous studies have investigated aggregate smoking prevalence in South Africa, and one can safely conclude that there has been a pronounced decrease over the past 30 or 40 years. In this chapter, changes in smoking prevalence for various demographic and socio-economic groups for the period 1993 to 2003 are investigated, since this could (and should) direct future tobacco control interventions. A consistent data set (the All Media and Products Survey) has been used, which will ensure that the data are comparable over time. The focus here is on smoking prevalence, rather than on the quantity of cigarettes consumed. The latter is analysed in depth in chapter 4.

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20. This chapter is an extension of a paper published in the South African Medical Journal (Van Walbeek, 2002a). The original paper benefited from comments by Iraj Abedian, Yussuf Saloojee, Nick Wilkins, Tania Ajam, Kalie Pauw, Conrad Barberton and an anonymous referee of the SAMJ.

21. While this is generally true, some health benefits from reduced smoking can be realised in the short term. For example, a sharp reduction in smoking in Poland resulted in a rapid decrease in the incidence of stroke and lung cancer, especially among young males (Joy de Beyer, personal communication, 2005).

22. In 2000 the South African Ministry of Health was awarded the Luther L Terry Award for exemplary leadership in tobacco control by a government ministry at the 11th World Conference on Tobacco or Health in Chicago.

In section 2.2 the data set, as well as its strengths and limitations, is discussed. Some aggregate trends in smoking prevalence are discussed in section 2.3. This is followed by an analysis of smoking prevalence by demographic and socio-economic groups in section 2.4. Some implications of the findings are presented in section 2.5 and the chapter is concluded in section 2.6.

2.2 Data on smoking prevalence

Without meaningful data it is very difficult to evaluate policy of any sort. Tobacco control is no exception. To develop an effective and focused tobacco control strategy, the Department of Health requires data on smoking prevalence, tobacco consumption and people's attitudes towards smoking and smoking restrictions. Internationally, organisations like the World Health Organisation have been instrumental in compiling and collating statistics on smoking prevalence in numerous countries (see Shafey et al., 2003). In South Africa the Medical Research Council has conducted regular surveys on smoking prevalence and other smoking-related aspects, such as opinions about tobacco advertising bans, tax increases, health warnings, etc. (see Yach and Townshend, 1988; Martin et al., c.1992; Reddy et al., 1996; and Steyn et al., 1997). As was pointed out in chapter 1, this information was useful in determining the public's attitude towards tobacco control policies prior to the passing of the Tobacco Products Control Act of 1993 and the subsequent Tobacco Products Control Amendment Act of 1999. However, these prevalence studies suffer from two weaknesses. Because of budgetary considerations, the surveys are often not performed annually. Also, because of changing research priorities, the format of the questionnaire can change from one year to the next. These factors weaken the ability of researchers to analyse trends.

This chapter is based on an analysis of trends obtained from a commercially generated database, known as the All Media and Products Survey (AMPS). It is compiled by the South African Advertising Research Foundation (SAARF), an organisation funded by the Marketing Industry Trust, whose main objective is to direct and publish media and product research.[23] Regular surveys are conducted on between 14 000 and 30 000 respondents.[24] The present study covers the period 1993 to 2003. The primary aim of the AMPS data is to provide businesses with management information regarding consumer trends in advertising and the mass media, as well as product usage of a variety of products. To investigate trends in smoking patterns, the AMPS database has three major advantages:

(1) it is much cheaper than generating data by means of large-scale national surveys that are focused on smoking issues;

23. The SAARF website can be accessed at http://www.saarf.co.za/. Specialised runs from the AMPS database can be ordered from Interactive Market Systems (tel. +27-11-4477843).

24. In this study, the prevalence figures for the years 1993 to 1996 were based on the annual surveys for those years (biennial surveys were apparently only introduced in 1997); for 1997 to 2000 they were based on the first of the two surveys for those years, for 2001 they were based on the second of the two surveys for that year, and for 2002 and 2003 they were based on the average of the two surveys for these years. While this inconsistency in data is unfortunate, these were the only data available. Also, there is no a priori reason to believe that this would have a significant impact on the results.

(2) because the questions regarding product usage do not change from one year to the next, trends in smoking prevalence can be meaningfully investigated; and

(3) the survey is performed regularly – at least once a year.

The disadvantage of the AMPS database is that the focus is limited. The only relevant information concerns "product usage"; aspects such as opinions about smoking and tobacco control policies, smoking initiation and people's perceived exposure to cigarette smoke are not incorporated into the surveys.

The survey is done by means of personal in-home interviews. The sample is chosen using a multi-stage area-stratified probability sampling methodology. The stratification variables include province and community size. The latter variable is subdivided into the following categories: metropolitan areas, cities and large towns, small towns, villages of less than 500 people, and dispersed rural communities. The data are weighted to represent the South African adult population, based on the most recent Population Census published by Statistics South Africa, and annual adjustments performed by the University of South Africa's Bureau for Market Research. These adjustments take cognisance of mortality and fertility rates, and incorporate the impact of net migration at both macro and micro levels. The weightings ensure that both urban and rural areas are proportionately represented in the resulting data. As such the data are not biased towards any particular population group. However, AMPS's technical director, Piet Smit, points out that more affluent groups may have a higher risk for biases because of high substitution rates due to unavailability, security measures, lack of time, etc. (personal communication, 2001).

Because of sampling and measurement error, the data are subject to random short-term variations. Depending on the size of the sample and subsamples, the standard error of the prevalence percentage variable varies from 0.3 percentage points to 2.4 percentage points.[25] However, for most subsamples, shown in the subsequent tables, the standard error lies between 0.5 and 0.8 percentage points. Graphing the point estimates of the smoking prevalence percentage against time (not shown here) generally reveals a decreasing trend, with some random variations around the trend. Because the observed trend in the smoking prevalence percentage is linear for most socio-economic and demographic categories, the following model was employed:

$$Y_t = a + bt + e_t, \qquad (2.1)$$

where Y_t = smoking prevalence percentage of the socio-economic indicator under surveillance,

a = constant, equal to the regressed value of the smoking prevalence percentage for the relevant socio-economic indicator in the base year (1993, unless otherwise stated),

[25]. For any demographic or income category, the smoking prevalence percentage is defined as the number of respondents who declare cigarette usage, expressed as a percentage of the population in that category.

b = trend coefficient, i.e. the average annual increase in the smoking prevalence percentage,

t = trend variable, equal to 0 in the first year, 1 in the second, 2 in the third, etc., and

e_t = error term.

In each case the statistical significance of the trend coefficient was calculated.

2.3 Overall smoking prevalence

Annual data for some of the most important aggregate measures of smoking prevalence and intensity are shown in Table 2.1.[26] Recorded aggregate cigarette consumption decreased by 33 per cent between 1993 and 2003.[27] As will be pointed out in chapter 4, the sharp increase in real cigarette prices was found to explain most of the decrease in aggregate cigarette consumption. In fact, between 1993 and 2003 the real price of cigarettes has increased by more than 100 per cent, which means that, on average, cigarette price increases exceeded the inflation rate by about 8 percentage points each year.

26. Throughout this dissertation, prices of cigarettes sold in South Africa are expressed in South African Rand (R). The Rand/US dollar exchange rate has been extremely volatile during the period under discussion, depreciating consistently between 1993 and December 2001, and appreciating sharply subsequently. The R/USD exchange rates were as follows:

Year	R/USD	Year	R/USD	Year	R/USD
1993	3.27	1997	4.61	2001	8.60
1994	3.55	1998	5.53	2002	10.52
1995	3.63	1999	6.11	2003	7.56
1996	4.30	2000	6.94	2004	6.45

Source: South African Reserve Bank Quarterly Bulletin.

27. The consumption of smuggled cigarettes is not reflected in the consumption figures. The consumption figures are derived from excise tax revenue data (see ETCSA, 2003: 121-122). Thus, to the extent that cigarette smuggling has increased since 1993, the consumption figures represent an under-reporting of actual consumption. However, as is pointed out later, the evidence does not suggest that cigarette smuggling has increased to the extent that it significantly distorts the official consumption figures.

Table 2.1: Trends in cigarette consumption, prevalence and prices

Year	Aggregate cigarette cons.	Population aged 15+[28]	Per capita consumption (pop. aged 15+)	Estimated smoking prevalence	Estimated smoking prevalence (smoothed data)	Estimated number of smokers (smoothed data)	Average cons. of smokers (smoothed data)	Nominal retail price of cigaretts	Real retail price of cigaretts
	(Mill. packs)	(Millions)	(Packs p.a.)	(Perc.)	(Perc.)	(Millions)	(Packs p.a.)	(R/pack)	(R/pack in 2000 prices)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1993	1802	24.83	72.6	32.6	31.7	7.9	229	2.55	4.17
1994	1769	25.42	69.6	28.8	31.0	7.9	225	2.84	4.26
1995	1708	26.03	65.6	30.2	30.2	7.9	217	3.48	4.81
1996	1690	26.66	63.4	30.3	29.4	7.8	215	3.87	4.98
1997	1577	27.40	57.6	28.4	28.7	7.9	201	4.97	5.89
1998	1495	28.15	53.1	28.5	27.9	7.9	190	6.08	6.74
1999	1422	28.93	49.2	27.9	27.1	7.9	181	7.30	7.69
2000	1334	29.52	45.2	27.1	26.4	7.8	171	8.03	8.03
2001	1276	30.12	42.4	24.5	25.6	7.7	165	8.89	8.41
2002	1234	30.56	40.4	24.8	24.9	7.6	162	9.87	8.55
2003	1210	30.89	39.2	23.8	24.1	7.4	163	10.98	8.99
2004	1208*	31.24	38.7*	Na	Na	Na	Na	12.13*	9.70*
Percentage change 1993-2003	-32.9	24.4	-46.0	-26.4	-24.0	-5.5	-28.9	330.6	115.6

Note: * Forecasts, based on Republic of South Africa, 2004.
Sources: Auditor-General, Republic of South Africa, Central Statistical Service, Statistics South Africa, AMPS

According to the original AMPS data, overall smoking prevalence among adults decreased from 32.6 per cent in 1993 to 23.8 per cent in 2003 (see column 4). To mitigate the impact of random errors in the overall smoking prevalence percentage, a linear trend line, as discussed in section 2.2, was fitted to the data, and the fitted trend values are shown in column 5.[29] Based on the fitted values, overall smoking prevalence among adults has decreased from 31.7 per cent in 1993 to 24.1 per cent in 2003.[30]
Despite the fact that the adult population has grown by 24 per cent between 1993 and 2003, the sharp decrease in overall smoking prevalence has decreased the estimated number of smokers from 7.9 million to 7.4 million over that period. The decrease in the number of smokers was particularly pronounced in the period 2001 to 2003. Table 2.1 also indicates that the average cigarette consumption of smokers has decreased from 229 packs in 1993 to 163 packs in 2003, a decrease of 29 per cent.

28. Midyear estimates of the whole population were used as the base data. The proportion of the population aged 15+ were obtained from the census data in 1991, 1996 and 2001 and from the 2004 midyear estimates. For other years the proportion of the population aged 15+ was interpolated, by gender, and these proportions were applied to the whole population.
29. The regression equation was as follows: $Y_t = 31.7 – 0.76t$, $R^2 = 0.88$, and Student's t-value on the trend coefficient is -8.09.
30. With the exception of 1994 and 2001, the fitted smoking prevalence rates differ by no more than one percentage point from the actual rates, suggesting that the trend line follows the actual values quite closely. The following paragraphs are based on the fitted smoking prevalence rates.

The relationship between smoking *prevalence* (the percentage of people who smoke cigarettes) and smoking *intensity* (the average number of cigarettes smoked by smokers) requires some investigation. As will be pointed out in chapter 3, a number of studies employing individual-level data have focused on the impact of tobacco price changes on smoking prevalence and smoking intensity. Teenage smoking behaviour has been investigated in detail in the US, and most recent studies have found that the impact of a change in cigarette prices on consumption is divided more or less equally between smoking prevalence and smoking intensity (see Chaloupka and Warner, 1999). Some earlier US studies have found that increases in cigarette prices tend to have a more pronounced effect on smoking prevalence, while the impact on smoking intensity is less pronounced (e.g. Lewit and Coate, 1981). For developing countries, recent studies that attempted to quantify the relative importance of changes in smoking prevalence and smoking intensity in explaining changes in tobacco consumption have not yielded a consistent picture (see section 3.4 of chapter 3).

To estimate the relative contributions of changes in smoking prevalence and smoking intensity on overall cigarette consumption in South Africa, the following identity is considered:

$$PCCons = SPP * ACons, \quad (2.2)$$

where PCCons = Per capita cigarette consumption of the population aged 15+ (column 3),

SPP = Smoking prevalence percentage among people aged 15+ (column 5), and

ACons = Average cigarette consumption of smokers (column 7).

By transforming equation (2.2) into natural logarithms and differentiating the resultant equation with respect to time, the relative contribution of each component of the change in per capita consumption (PCCons) can be estimated. Using the logarithmic form of equation (2.2), one calculates the differences between 1993 and 2003 as follows:

$$\{\ln(PCCons_{2003}) - \ln(PCCons_{1993})\} = \{\ln(SPP_{2003}) - \ln(SPP_{1993})\} + \{\ln(ACons_{2003} - \ln(ACons_{1993}) \quad (2.3)$$

Equation (2.3) provides an indication of the growth rates of each element defined in equation (2.2). In order to estimate the relative contribution of the change in SPP and the change in ACons to the change in PCCons, the right hand side elements in equation (2.3) are divided by $\{\ln(PCCons_{2003}) - \ln(PCCons_{1993})\}$. The sum of these two contributions will, by definition, equal 100 per cent. Using this method, 55 per cent of the decrease in per capita cigarette consumption between 1993 and 2003 is explained by a reduction in the average consumption of smokers, whereas a reduction in the smoking prevalence percentage accounts for the other 45 per cent.

2.4 Demographic and socio-economic characteristics

2.4.1 Gender

Internationally, smoking prevalence is higher among males than among females, even though female smoking prevalence has been increasing rapidly, especially in developed countries. According to Table

2.2, approximately 52 per cent of South African males smoked in 1993, decreasing to about 39 per cent in 2003. Smoking prevalence among females was only 13 per cent in 1993 and decreased to 10 per cent in 2003. Between 1993 and 2003 the "prevalence gap" between males and females decreased from about 39 per cent to 29 per cent. The narrowing of the "prevalence gap" is consistent with international experience. In many countries the "prevalence gap" is closing because women are smoking more, while smoking prevalence among men has stabilised. In South Africa, however, the prevalence gap is closing despite the fact that women are smoking less.

2.4.2 Race[31]

It is evident that coloured people have the highest smoking prevalence percentages, followed by whites, Indians and Africans, in that order.[32] Smoking prevalence is dropping rapidly among coloureds (at about 0.7 percentage points per annum for the 1993-2003 period), while the decrease in smoking prevalence among whites and Indians is less pronounced. Africans' smoking prevalence of about 28 per cent in 1993 was the lowest of all race groups and it decreased sharply to less than 20 per cent in 2003. It suggests that cigarette manufacturers have been unable to increase their sales to the African market in the past decade, despite the fact that the political transformation and rapid urbanisation have created new marketing opportunities. Given that Africans comprise about three-quarters of the South African population this is good news for tobacco control advocates.

These race-based smoking prevalence percentages for the different race groups are consistent with most previous findings (see Table 1.1 in chapter 1). Previous studies indicate that smoking prevalence has been decreasing (albeit erratically) since the 1980s. The current findings confirm the decreasing trend, and suggest that the rate of decrease has accelerated since 1993, especially for Africans and coloureds.

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31. Under the apartheid government people were divided into four racial groups: "whites" (previously also termed Europeans), "Africans" (also termed "blacks"), "coloureds" and "Indians". *Whites* are of European origin, have by far the highest standard of living, speak either English or Afrikaans and live predominantly in urban areas. They comprise about 13 per cent of the population. *Africans* comprise about three quarters of the population. A large proportion of Africans live in extreme poverty in rural areas. However, since the 1970s there has been rapid urbanisation. There are nine official traditional African languages. Given the similarities between many of these, they are categorised into either Nguni or Sotho groups. Generally, *coloureds* are of mixed ancestry. Their forebears comprise original inhabitants of South Africa (specifically San and Khoikhoi people), slaves from the former Dutch East Indies, and white settlers. Most coloureds live in the Western Cape, but small numbers also live in the Northern Cape and the Eastern Cape. Afrikaans is the predominant language, but English seems to be gaining ground. *Indians* were brought to South Africa at the end of the nineteenth century and the start of the twentieth century in order to work on the sugar plantations in what was then known as the colony of Natal. The vast majority of Indians are currently still found in KwaZulu-Natal. They are nearly completely urbanised and enjoy relatively high standards of living. Most Indians speak English.

32. Smoking intensity is investigated in section 2.4.4. It will be shown that whites have the highest smoking intensity (with average smoker smoking 16.6 cigarettes per day in 2002), followed by Indians (9.9 cigarettes), coloureds (8.8 cigarettes) and Africans (6.3 cigarettes).

Table 2.2: Smoking prevalence percentages by demographic characteristics

Description	Proportion of population (1993)	Constant (Prevalence in 1993)	Annual trend	t-stat	R^2-value	Prevalence in 2003
Sex						
Male	48.0	51.8	-1.27***	-10.21	0.921	39.0
Female	52.0	13.2	-0.31***	-4.32	0.675	10.1
Race						
White	15.7	36.0	-0.04	-0.27	0.008	35.6
African	73.2	28.4	-0.89***	-9.21	0.904	19.5
Coloured	8.5	50.9	-0.70***	-3.64	0.595	43.9
Indian	2.6	31.5	-0.29	-1.39	0.177	28.6
Age group						
16-24	28.0	23.7	-0.68***	-5.52	0.772	17.0
25-34	25.7	39.0	-1.11***	-12.68	0.947	27.9
35-49	25.5	39.6	-0.91***	-5.62	0.778	30.6
50+	20.8	23.9	-0.32**	-2.75	0.457	20.7

Notes: *** Significant at the 1 per cent level
** Significant at the 5 per cent level (all tests are two-sided).
Source: AMPS (various years)

2.4.3 Age

Since 1994, and especially since 1997, the price of cigarettes has increased rapidly in South Africa. As will be pointed out in chapter 3, the international (mainly US) empirical literature has consistently shown that young people are more responsive to changes in cigarette prices than older people (e.g. Lewit and Coate, 1981; Chaloupka and Grossman, 1996; Chaloupka and Wechsler, 1997). Many countries' tobacco control strategies are premised on the fact that the youth should be discouraged from smoking. Given youths' relatively price elastic demand, increases in the price of cigarettes are held to be a particularly effective means of reducing youth smoking.

The South African empirical evidence shows that smoking prevalence among young adults (aged 16-24) decreased from about 24 per cent in 1993 to 17 per cent in 2003. The smoking prevalence among people aged 25 to 49 decreased from 39 per cent in 1993 to 28 per cent for the 25-34 age group and to 31 per cent for the 35-49 age group in 2003. Smoking prevalence among people aged 50 and older decreased modestly from 24 per cent to 21 per cent over the same period.

In a previous study which covered the period 1993 to 2000, Van Walbeek (2002a) found that there was some tentative evidence to suggest that the decrease in smoking prevalence is inversely related to age, which would imply that a relatively greater percentage of young people are able to quit smoking, or do not start. While the decrease in smoking prevalence has continued for all age groups in the 2001-2003 period, it seems that most rapid decreases have been achieved in the 25-49 age group. However, at current levels of 17 per cent, smoking prevalence among South Africa's young adults is lower than that of most developed and many developing countries (Shafey et al., 2003), which suggests that smoking has lost some of its allure for this age group.

In 1999 and 2002 comprehensive surveys of the smoking behaviour of school children (grades 8-11) were undertaken under the auspices of the Global Youth Tobacco Survey

(GYTS). The survey found that the prevalence of smoking (defined as having smoked on one or more of the 30 days preceding the survey) among school children decreased from 23 per cent in 1999 to 18.5 per cent in 2002. The percentage of "frequent smokers" (defined as having smoked cigarettes on 20 or more of the preceding 30 days) decreased from 10.1 per cent in 1999 to 5.8 per cent in 2002 (Reddy and Swart, 2003 and Swart et al., 2004). While the GYTS and AMPS data are not directly comparable (different age categories and different definitions of product usage), they both come to the conclusion that youth smoking has decreased over time.

2.4.4 Smoking intensity by demographic features

The AMPS survey generally does not investigate how many cigarettes are smoked. The typical question is whether respondents use a product at all, and if they do, whether they are "light", "medium" or "heavy" users of that product. It is then left to the respondent to decide how he/she wishes to categorise his/her usage of the product. However, in 2002 the AMPS survey explicitly included questions on smoking intensity.[33] The results are shown in Table 2.3.

A number of observations follow from the table. Firstly, even though smoking prevalence among females is much lower than among males, on average females smokers smoke slightly more cigarettes per day than men. Secondly, smoking prevalence among whites is higher than that of Indians and Africans, and the average number of cigarettes smoked by smokers is much higher than any other race group. The high smoking intensity of whites is not unexpected, given the fact that their average income is so much higher than any other race group.[34] Thirdly, smoking intensity is positively related to age, i.e. average cigarette consumption per smoker increases with age. Given that younger people generally have less disposable income than middle-aged and older people, that young smokers are generally less addicted than older smokers, and that young people are more likely to smoke occasionally to be "sociable", this finding makes intuitive sense.

Table 2.3: Cigarette consumption by demographic characteristics, 2002

Description	Zero cigarettes	Smoked 1-5 cigarettes per day	Smoked 6-10 cigarettes per day	Smoked 11-20 cigarettes per day	Smoked more than 21 cigarettes per day	Average cigarette use for smokers only
Total	75.2	10.1	8.6	5.2	0.9	9.2
Sex						
Male	59.2	17.1	14.7	7.6	1.4	8.8

[33]. Using appropriate data from Tables 2.1 and 2.3, total cigarette consumption based on smoking intensity data is estimated at 1457 million packs for 2002 (calculated as 9.2 cigarettes/day x 28.4 per cent of adult population smoking x 30.56 million adults x 365 days/year) / 20 cigarettes/pack. According to official sources total cigarette consumption in 2002 was 1234 million packs. The discrepancy is most probably attributed to illicit sales and measurement error. Regarding the latter, smokers often report the quantity smoked in multiples of five or ten. The most common modes are at 10, 15 and 20 cigarettes per day.

[34]. Based on the smoking intensity percentages provided in Table 2.3, and the composition of the South African population in Table 2.2, it can be calculated that, of all cigarettes sold in South Africa in 2002, 29 per cent were sold to whites, 51 per cent to Africans, 17 per cent to coloureds and 3 per cent to Indians. These four population groups comprise approximately 14, 74, 9 and 3 per cent of the total population, respectively.

Female	89.6	4.0	3.0	2.8	0.6	10.5
Race						
White	63.9	3.4	8.5	19.1	5.1	16.6
African	79.3	11.0	7.4	2.1	0.2	6.3
Coloured	55.3	16.2	19.4	8.2	0.9	8.8
Indian	70.3	7.8	12.3	8.7	0.9	9.9
Age group						
16-24	82.5	8.9	5.6	2.7	0.3	7.4
25-34	70.4	12.2	10.5	6.1	0.8	8.9
35-49	68.7	11.7	11.3	7.0	1.3	9.7
50+	78.5	8.0	7.2	4.9	1.4	10.3

Source: AMPS (2002)

2.4.5 Social characteristics

Trends and levels in smoking prevalence were investigated for four social characteristics: education, language group, type of community and marital status. The salient features of Table 2.4 are the following:

Smoking prevalence is highest among people with (some) primary and secondary education, followed by people with tertiary education. People with no education have the lowest cigarette smoking prevalence. Smoking prevalence has decreased sharply among all educational groups (by about one percentage point per year). The only exception is people with secondary education, where the decrease was about 0.4 per cent per year.

Smoking prevalence among English and Afrikaans speakers has decreased moderately at the rate of less than 0.4 percentage points per annum between 1993 and 2003. On the other hand, smoking among Nguni and Sotho speakers has decreased significantly (at between 0.7 and 0.9 percentage points per year) between 1993 and 2003. In 2003 smoking prevalence among Nguni (at 20 per cent) and Sotho speakers (at 21 per cent) is significantly lower than that of English and Afrikaans speakers.

Smoking prevalence is significantly higher in urban areas (metropolitan areas, cities and large towns) (about 29 per cent in 2003) than in small settlements and rural areas (18 per cent in 2003). Between 1993 and 2000 smoking prevalence has decreased significantly in all four community types.

Smoking prevalence among single women (at 7 per cent in 2003) is lower than among married women (at 13 per cent) and divorced or widowed women (at 11 per cent). All three groups were subject to moderate decreases in smoking prevalence over the 1993-2003 period. In 1993 smoking prevalence among men was above 50 per cent, irrespective of marital status. While smoking prevalence among divorced and widowed men did not change much between 1993 and 2003, significant decreases

were achieved for married and single men. For the latter two groups, smoking prevalence decreased by more than one percentage point each year.

Table 2.4: Smoking prevalence percentages by social characteristics

Description	Proportion of population (1993)	Constant (Prevalence in 1993)	Trend	t-stat	R^2-value	Prevalence in 2003
Education						
No education	11.4	28.3	-1.03***	-3.66	0.598	18.0
Primary education	26.8	35.1	-1.18***	-5.40	0.764	23.3
Secondary education	52.8	30.7	-0.36**	-2.82	0.469	27.1
Tertiary education	9.0	30.7	-0.97***	-6.28	0.814	21.0
Language group						
English	10.7	35.8	-0.36*	-1.99	0.306	32.3
Afrikaans	16.2	43.6	-0.38**	-2.45	0.399	39.8
Nguni	42.0	26.9	-0.73***	-3.82	0.870	19.7
Sotho	31.1	29.9	-0.94***	-4.06	0.881	20.5
Community						
Metropolitan areas	32.1	36.8	-0.78***	-5.85	0.792	29.0
Cities & large towns	14.9	36.7	-0.86***	-5.54	0.773	28.1
Small towns & villages	11.5	33.6	-0.74***	-5.28	0.756	26.1
Settlements & rural areas	41.5	25.6	-0.77***	-5.16	0.748	17.9
Marital status						
Single women	20.0	9.4	-0.26**	-2.70	0.448	6.9
Married women	24.4	15.8	-0.27***	-3.48	0.573	13.1
Widowed/divorced women	7.6	13.7	-0.24**	-2.53	0.416	11.2
Single men	22.5	49.9	-1.25***	-9.91	0.916	37.4
Married men	23.4	53.7	-1.39***	-7.84	0.872	39.8
Widowed/divorced men	2.1	50.5	-0.12	-0.50	0.027	49.4

Notes: *** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level (all tests are two-sided).
Source: AMPS (various years)

Given the highly stratified nature of South African society, many of the smoking prevalence levels and trends presented in this section can be traced back to demographic characteristics. For example, the relatively low cigarette smoking prevalence percentage among people with no education, Nguni and Sotho speakers and people living in settlements and rural areas, is directly correlated with the fact that Africans, as shown in section 2.4.2, have a relatively low cigarette smoking prevalence percentage. Given that demographic characteristics are usually more easily identified than social characteristics, these would probably be more effective targets for tobacco control policies than social characteristics.

2.4.6 Economic characteristics

In South Africa, which has one of the most unequal distributions of income in the world, about a third of the population lived on less than 2 US dollars per day in 2000 (Hoogeveen and Ozler, 2004). People living in absolute poverty generally do not have any discretionary income for cigarettes, and thus one would expect smoking prevalence among the poor in South Africa to be low.[35] Yet in most developed and developing countries smoking prevalence is higher among the poor than among the rich (Bobak et al., 2000: 45). Townsend and colleagues have found that, in the UK, smoking prevalence among the rich has been decreasing sharply over the past three or four decades, while the decrease among the poor has been less pronounced (Townsend, 1987; Townsend et al., 1994).[36] A similar pattern has been found for other developed countries (Bobak et al., 2000: 50-51).

The situation in South Africa is very different. From Table 2.5 it is evident that most income groups in South Africa had similar smoking prevalence rates in 1993. Only households with monthly incomes of less than R900 had somewhat lower smoking prevalence rates. However, by 2003 the picture had changed dramatically. Smoking prevalence among poorer households was much lower than among more affluent households, as a result of a rapid decrease in smoking among low and middle income households. The decrease in smoking prevalence among high income households (R7000+) was much less pronounced.

The fact that cigarette smoking has become a "high-income group" activity in South Africa and a "low-income group" activity in many other countries requires some clarification. A possible explanation is provided in section 2.5.

35. Of course, an alternative view would be that cigarettes are one of the few "pleasures" that the poor can afford.

36. In the 1960s more than 50 per cent of males smoked and more than 40 per cent of females in the UK smoked, irrespective of income level (Townsend et al., 1994: 923). By the early 1990s smoking prevalence among highly-paid professional men had decreased to less than half that of unskilled working men.

Table 2.5: Smoking prevalence percentages by monthly household income

Description	Proportion of population (1993)	Constant (Prevalence in 1993)	Trend	t-stat	R^2-value	Prevalence in 2003
R1 - R499	21.0	29.4	-0.82***	-5.98	0.799	21.2
R500 – R899	20.0	30.7	-1.09***	-5.49	0.770	19.8
R900 – R1399	17.6	32.1	-0.99***	-7.99	0.877	22.2
R1400 - R2499	14.5	33.2	-0.84***	-4.37	0.680	24.8
R2500 - R3999	9.0	34.6	-0.89***	-4.79	0.718	25.7
R4000 - R6999	9.2	35.6	-0.82***	-7.24	0.853	27.4
R7000 - R11999	5.8	34.4	-0.29	-1.13	0.125	31.5
R12000+	2.9	29.2	-0.01	-0.03	0.000	29.1

Notes: *** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level (all tests are two-sided).
Source: AMPS (various years)

2.4.7 Geographic dispersion

Smoking prevalence levels and trends by province are shown in Table 2.6. The highest smoking prevalence is found in the more affluent provinces and those with a relatively high proportion of coloured people: the Western Cape, Northern Cape and Gauteng. The provinces with the lowest smoking prevalence percentages are Limpopo Province, Eastern Cape and KwaZulu-Natal – poor provinces with a high proportion of African people. As indicated in Section 2.4.2, Africans have the lowest smoking prevalence percentage of all population groups.

Smoking prevalence has been decreasing in all nine provinces, by between 0.4 and 1.2 percentage points per annum. Other than in Mpumalanga and the Northern Cape, the decreases have been statistically significant at the 5 per cent level.

Table 2.6: Smoking prevalence percentages by province (1994-2003)

Description	Proportion of population (1994)	Constant (Prevalence in 1994)	Trend	t-stat	R^2-value	Prevalence in 2003
Eastern Cape	12.4	24.5	-0.40***	-3.37	0.586	20.5
Free State	7.1	35.9	-1.20***	-4.99	0.757	23.9
Gauteng	18.6	38.0	-1.03***	-5.70	0.803	27.8
KwaZulu-Natal	20.5	24.4	-0.42***	-3.85	0.649	20.1
Mpumalanga	6.0	27.4	-0.42	-1.16	0.143	23.2
Northern Cape	1.7	38.2	-0.85*	-2.12	0.361	29.7
Limpopo Province	9.1	18.4	-0.65***	-4.87	0.748	11.9
North-West Province	7.8	32.8	-0.89***	-4.91	0.751	23.8
Western Cape	8.8	43.4	-0.52**	-2.58	0.454	38.2

Notes: *** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level (all tests are two-sided).
Source: AMPS (various years)

2.5 Policy implications

As was discussed in chapter 1, the South African government has followed a remarkably consistent tobacco control policy since the early 1990s. The Tobacco Products Control Act of 1993, followed by the Tobacco Products Control Amendment Act of 1999, clearly indicated the government's intentions with regard to tobacco control. Furthermore, since 1994 the government has dramatically increased the cigarette excise tax, causing the real price of cigarettes to increase by, on average, about 8 per cent per annum.

As a result, aggregate cigarette consumption decreased by about a third. International evidence and simple logic suggests that (1) fewer people would smoke, and (2) smokers would reduce their average consumption of cigarettes. Concerning (1), overall smoking prevalence decreased from 32 per cent in 1993 to 24 per cent in 2003. Despite 24 per cent growth in the adult population, the number of cigarette smokers has decreased by about 500 000 within the 10-year period. Furthermore, average cigarette consumption among smokers has decreased by more than 25 per cent over the period. It was found that 55 per cent of the decrease in cigarette consumption in South Africa between 1993 and 2003 is ascribed to a decrease in smoking intensity (i.e. the average number of cigarettes smoked by smokers) and the remaining 45 per cent is ascribed to a decrease in smoking prevalence.

The decrease in overall smoking prevalence can be investigated further. Firstly, cigarette smoking prevalence among Africans is relatively low and is decreasing at a significant rate. This suggests that cigarette manufacturers have been largely unsuccessful in penetrating this large and potentially lucrative market. Secondly, smoking prevalence among young adults (people aged 16 to 24) is significantly lower than the national average, and has been decreasing rapidly over the 1993-2003 period. This may suggest that tobacco is losing its appeal among adolescents. Thirdly, smoking prevalence among males, which was at a level of more than 50 per cent in 1993, has been decreasing at a rate of more than one percentage point each year. Females have not experienced a similar rate of

decrease, although it must be said that female smoking prevalence (at 10 per cent in 2003) is much lower than that of males.

Regarding the relationship between income factors and smoking prevalence, the evidence for South Africa is contrary to the experience in the UK and high-income countries.[37] In the UK smoking prevalence among the rich has decreased rapidly over the past four decades and is currently significantly lower than that of the population average. In contrast, in South Africa smoking prevalence among the *poor* has decreased sharply in the past decade and is currently significantly lower than that of the rich. Given that smoking prevalence levels and trends by income levels in South Africa differ so significantly from those of the UK, some further analysis seems appropriate.

High per capita income and a good social security system in the UK mean that few Britons live in absolute poverty. Thus the poor can generally afford to buy cigarettes. The real price of cigarettes has remained relatively constant during the 1960s and 1970s, and rose only moderately during the 1980s.[38] During the 1960s and 1970s the UK government did not increase real tobacco excise taxes, and as a result changes in the real price of cigarettes did not serve as an effective deterrent to smoking. The British government used an information, education and communication ("IEC") campaign to warn people of the dangers of smoking. As has been pointed out in a number of studies (Bobak et al., 2000: 50 and Jha et al., 2000: 168), this strategy is effective in reducing smoking among the rich and the more educated sections of society, but is ineffective in reducing smoking among the poor. Thus, because of the relative stability of the cigarette price, but different reactions to anti-smoking publicity, smoking prevalence percentages in the UK diverged between rich and poor.

Smoking prevalence in South Africa has never been as high as UK levels. Given much lower per capita income, an unequal distribution of income and an underdeveloped national social security network, many people simply cannot afford to buy cigarettes. For them, cigarette smoking is not an option. However, given that cigarette consumption in South Africa is relatively responsive to changes in income (see chapter 4), there is a distinct possibility that, should the very poor be able to increase their income above a certain threshold, a sizeable proportion would consider taking up cigarette smoking. It is contended, therefore, that the high incidence of absolute poverty in South Africa explains the relatively low prevalence of cigarette smoking among the poor.

Cigarettes, despite the fact that they are more expensive in the UK, are generally more affordable, given that income levels are much higher than in South Africa. As indicated in column 9 of Table 2.1, the real price of cigarettes in South Africa has increased dramatically since 1993, implying that cigarettes have become less affordable. A rapid increase in the price of cigarettes is believed to have a

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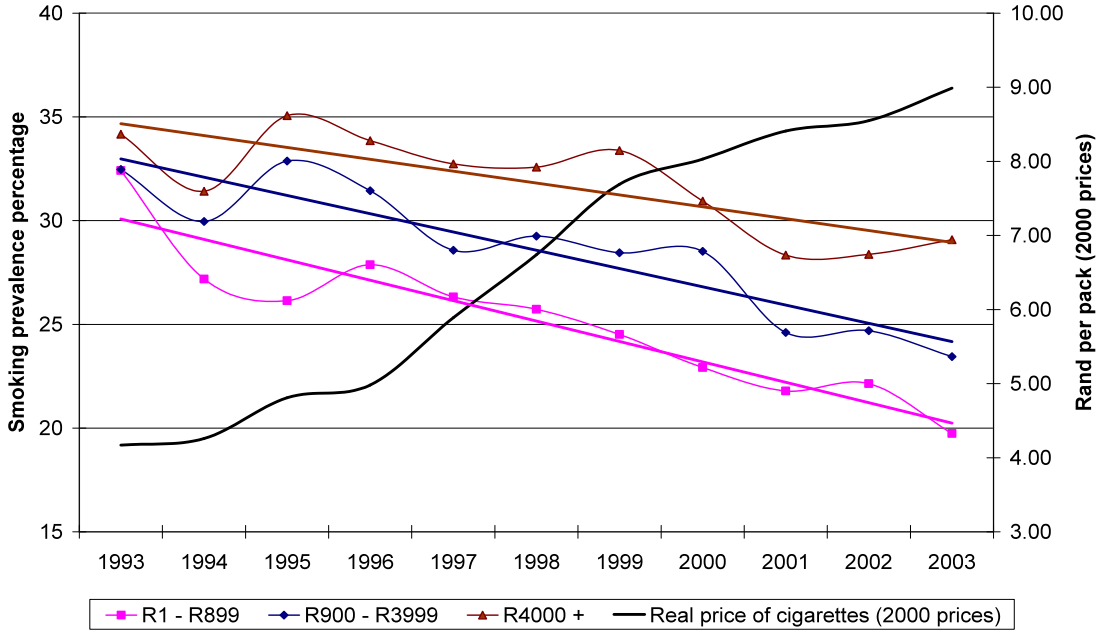
37. Even though the focus in the following paragraphs is on the UK, it applies to most other developed countries as well. The reason for choosing the UK is because (1) the UK experience is well known and well described and (2) because the difference in smoking prevalence between lowest and highest income earners is currently greater than in any other developed country (Bobak et al., 2000: 45).

38. The UK real price of cigarettes rose sharply during the 1990s as part of the country's tobacco control strategy, but this period was not considered by Townsend (1994).

more pronounced effect on poor people's consumption of cigarettes, compared to the rich, since they spend a relatively larger proportion of their income on tobacco (see chapter 6). Their incentive to quit or to reduce their consumption is much stronger. Smoking prevalence percentages among three categories of income, together with linear trend lines, and the real price of cigarettes (on the secondary Y-axis) are shown in Figure 2.1. The decrease in smoking prevalence has been most rapid for low-income households, followed by middle-income households. This graph lends support to the widely held thesis that low-income earners are more sensitive to changes in the price of cigarettes than high-income earners.[39]

Figure 2.1: Smoking prevalence by household income



Source: AMPS (various years), Statistics South Africa (1998)

The differential response of different income groups to changes in the real price of cigarettes has implications for the regressivity of the cigarette excise tax. As will be pointed out in chapters 3 and 6, cigarette excise taxes are often regressive, because of the comparatively high smoking prevalence among the poor, and because the poor often spend a greater proportion of their income on cigarettes than the rich. However, because an increase in the real cigarette price causes a greater percentage decrease in smoking among the poor vis-à-vis the rich, increases in the real excise tax decreases the regressivity of the excise tax. However, because appropriate data on the numbers of cigarettes consumed by individuals over time are not available, this issue cannot be investigated in more detail here. In chapter 6 the potential regressivity of the excise tax is investigated more fully. Using a

[39]. While the negative relationship between smoking prevalence and the real price of cigarettes is generally supported by Figure 2.1, the sharp decrease in smoking prevalence among all income groups between 1993 and 1994 requires some explanation. While this transitory decrease could be ascribed to sampling error, an alternative explanation is that it reflects the impact of better health information. Health warnings were only introduced in August 1995, but were preceded by substantial press coverage about the impending regulations.

different theoretical model and data set, it will be shown that the regressivity of excise taxes in South Africa has decreased since 1990.

Even though the comment that increases in the real price of cigarettes reduces the regressivity of the excise tax is made in the context of a group ("the poor"), one should differentiate between those people that quit smoking completely as a result of the price increase and those that merely reduce their consumption. For the first group, the price increase was the critical point that caused them to quit. As a result, their cigarette tax burden reduced to zero. The second group, unless they are able to *significantly* reduce their cigarette consumption, are burdened with a higher tax burden and would thus be worse off as a result. Most smokers find themselves in the second group, since, as was pointed out in section 2.3, the main impact of cigarette price increases is to cause people to reduce their average consumption, not to quit smoking.

The policy implications of this chapter are as follows: if the government wants to reduce smoking prevalence and aggregate cigarette consumption, it should increase the tax rate. However, if the government wants to reduce smoking prevalence *and* improve the economic position of the poor, it should actively encourage smokers to quit, rather than to simply reduce their cigarette consumption.

2.6 Conclusion

Since 1993 the prevalence of cigarette smoking in South Africa has decreased sharply. This is true for aggregate smoking prevalence and for the prevalence in each demographic and socio-economic subgroup investigated in this chapter. From a tobacco control perspective, this is a very positive finding, and suggests that the government's strategy of discouraging smoking has been successful.

However, while the prevalence of cigarette smoking has decreased, there is the possibility that people switch from smoking cigarettes to other tobacco products, such as roll-your-own (RYO) cigarettes. Should this be the case, it would exaggerate the decrease in the prevalence of cigarette smoking. Unfortunately the current data does not allow one to investigate the possibility of substitution, but it is examined in chapter 6 using a different data set. It will be shown that there has been some switching towards RYO cigarettes, especially among the poor, but the switch has not been large enough change the conclusion that the prevalence of tobacco use has decreased sharply since the early 1990s.

In this chapter, the causes of the decrease in smoking prevalence were not investigated, although mention was made of the fact that the rapid increase in the real price of cigarettes presumably played an important role. In the following chapters the demand for cigarettes is investigated in some detail. In chapter 3 an overview of the existing empirical literature is provided, while the demand for cigarettes in South Africa is investigated in chapter 4.

CHAPTER 3

INTERNATIONAL LITERATURE REVIEW

3.1 Introduction

Ever since the detrimental health impact of tobacco smoking was scientifically established in the 1950s and 1960s, the medical and public health community has called for interventions aimed at reducing smoking. This call was particularly strong in the US, the UK, Canada, Australia and New Zealand, and since the 1960s, and especially the 1970s, these countries have implemented strong and effective tobacco control strategies. Most other developed countries have subsequently implemented similar strategies, with the result that per capita tobacco consumption in the developed world has been decreasing since the early 1980s (Gajalakshmi, 2000: 21). Generally, developing countries have lagged developed countries in tobacco control, but since the early 1990s a number of developing countries, among them South Africa, Poland, Thailand and Bangladesh, have implemented effective tobacco control strategies (see De Beyer and Waverley Brigden, 2003 for accounts on how these strategies were implemented). In order to place tobacco control higher on the public health agendas of developing countries, the World Health Organisation initiated the Framework Convention on Tobacco Control (FCTC) in 2000. The convention was opened for signature in 2003 and was ratified in February 2005.

A number of tobacco control interventions exist. Some (e.g. health warnings, restrictions on tar and nicotine content) have limited economic content, and, as such, economists have little to say about these interventions. Other interventions (e.g. restrictions on smoking in hospitality establishments, advertising bans and restrictions of sales to minors) have a definite economic impact. However, the popular debate on the acceptability of such interventions often focuses on non-economic aspects, such as freedom of choice and freedom of expression.[40] Two tobacco control interventions are essentially economic; namely, incentives to reduce the supply of tobacco and interventions aimed at reducing tobacco demand by increasing the price of tobacco.

Amongst tobacco control economists there is a growing consensus that supply-based economic interventions, such as subsidies not to produce tobacco and restrictions on youth access to tobacco, are

[40]. The main objection to restrictions on smoking in the hospitality industry is that they might decrease the industry's turnover and profitability. Glantz and Charlesworth (1999) and Weber et al. (2003) have investigated this in substantial detail and came to the conclusion that such restrictions do not have a significantly negative impact on hospitality industry. See Scollo et al. (2003) for a review of studies that investigated the impact of "clean indoor air" policies on hospitality industry revenue and profitability. The relationship between cigarette advertising and demand has caused much heat in the literature and is discussed in more detail in section 3.3.2.

misdirected (World Bank, 1999: 57-63 and Ling et al., 2002). While this argument was regularly mooted in the past (e.g. Yach, 1982: 169), the current thinking is that if there is a demand for the product, someone is going to produce it.[41] Thus, rather than reducing the supply of tobacco, the focus among tobacco control advocates is primarily on reducing the demand for tobacco products. The belief is that, should the demand for tobacco products fall, market forces will ensure that the supply will automatically follow.

Therefore, the focus of this chapter is on the demand for cigarettes, and specifically on the price elasticity of demand. The impact of advertising and anti-smoking publicity on cigarette demand will also be reviewed and the tobacco control policy implications will be highlighted.

If the demand for cigarettes is not perfectly inelastic, cigarette excise tax increases will decrease cigarette consumption. There was a time when some theorists believed that, given the addictive nature of nicotine, the price elasticity of demand is zero (see USDHHS, 2000: 322). According to this view, addicted smokers would continue to smoke, irrespective of the cost. However, there is practically no empirical support for this view.

The empirical literature on the demand for cigarettes is sizeable, and it is impossible to provide a comprehensive review of that literature in one chapter. The focus in this chapter is on major themes, rather than the intricacies of individual studies. In this review studies are categorised by geographical area: (1) the US, (2) other developed countries and (3) developing countries. The rationale for this categorisation is that studies from each of these geographic regions have tended to focus on different themes in the tobacco control literature.

3.2 The United States

In terms of methodological complexity, the US-based studies are generally the most advanced, and have addressed issues that have not been addressed by researchers in any other country. Tobacco control researchers in the US have a number of significant advantages over their colleagues in other countries. Firstly, tobacco control is high on the authorities' agendas and attracts large financial resources from government and private institutions.[42] Consider the following examples. In 2000 the 11th World Conference on Tobacco or Health, held in Chicago, received a US$ 10 million sponsorship from two US health societies and a private foundation. This is more than ten times any previous World Conference.[43] In 2002 the Fogarty International Centre made US$ 18 million available for tobacco control research around the world. One of the requirements was that the research teams in other

41. However, one supply-side measure that is strongly supported by tobacco control advocates is the curbing of cigarette smuggling. Should smuggling become a significant problem, it would undermine attempts by governments to reduce the demand for cigarettes by raising the excise tax. Cigarette smuggling has been researched in depth (e.g. Cunningham, 1996, Joossens, 1998 and Joossens and Raw, 1995 and 1998) and will not be investigated in this thesis.

42. This is generally true for most states and particularly true for states like California and New York State. However, the tobacco-growing states like Kentucky and the Carolinas do not have a strong tobacco control focus.

43. The World Conference on Tobacco or Health is held every three years and is the premier meeting of tobacco control experts, researchers and lobbyists.

countries be linked to established research bodies in the US. Furthermore, more than forty working papers have been published by the prestigious National Bureau for Economic Research (NBER) on matters relating to the economics of tobacco control (see Bibliography). There is a pool of researchers who specialise in the economics of tobacco control research, unmatched in any other country.[44]

Secondly, the existence of more than fifty states, each with separate legislative, excise tax and retail pricing systems, often creates a research design environment that allows researchers to test phenomena that would have been virtually impossible to test otherwise. For example, changes in state-specific excise taxes were used to obtain quasi-experimental price elasticities of demand (Baltagi and Goel, 1987). Also, studies that employ individual level data to determine price elasticities of demand for specific demographic groups can take advantage of the fact that there is a large degree of variation in individual states' tobacco excise tax regimes and other tobacco control interventions.[45]

Thirdly, there are some very large survey data sets that specifically investigate smoking behaviour, especially among the young. Because these surveys are often repeated year after year, changes in smoking behaviour over time can be monitored. For example, a number of waves of the Monitoring the Future Surveys have been used to estimate the price elasticity of demand for cigarettes among secondary school pupils, and various demographic groups within this sample (e.g. Chaloupka and Grossman, 1996, and Chaloupka and Pacula, 1998).

Chaloupka and Warner (1999) and the US Surgeon-General (USDHHS, 2000) have surveyed the US (and most of the non-US) literature in substantial detail. In this section, a sizeable but incomplete sample of US studies is briefly reviewed. As was done in Chaloupka and Warner (1999), a distinction is made between studies that investigated the price elasticity of demand for cigarettes based on aggregate data and individual level data.

3.2.1 Studies based on aggregate data

The demand for cigarettes is typically specified as a function of price, income and some tobacco control interventions. For most US studies, the prime focus of the study was on the impact of cigarette prices on quantity consumed. However, some studies focused primarily on the effect of a non-price determinant of the demand for cigarettes (such as advertising, health publicity or other tobacco control interventions), and in such cases the price would enter the regression equation as a control variable.

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44. As an example, of the 39 authors that contributed to the most comprehensive book on the economics of tobacco control in developing countries to date (Jha and Chaloupka, 2000), 19 were from academic and/or governmental institutions in the US, while another eight were from the World Bank, World Health Organisation or the IMF. Of the remaining twelve authors, ten were from developed countries (especially the UK and Australia), and two were from developing countries.

45. For example, see Chaloupka and Wechsler, 1995, Chaloupka and Pacula, 1998, Tauras and Chaloupka, 1999, and Tauras et al., 2001.

The studies differed in many respects, including the following: (1) the frequency of data,[46] (2) the use of econometric or non-econometric estimation techniques,[47] (3) the use of single equation vs. multiple equation regression techniques,[48] and (4) the use of national or state-specific data.[49]

Despite the many differences in research methodology, there are a number of generalisations that follow from these studies. Firstly, studies that investigated "health scares" and anti-smoking publicity which resulted from the Fairness Doctrine of 1968-1970,[50] generally found that they reduced the demand for cigarettes (e.g. Hamilton, 1972, Baltagi and Levin, 1986, and Kao and Tremblay, 1988). However, the relative magnitude of the publicity effect is unclear. Hamilton (1972), Warner (1977, 1981 and 1989), Kao and Tremblay (1988), found evidence of a sizeable long-term effect, while Fujii (1980) and Bishop and Yoo (1985) concluded that the impact was small and transitory. In more recent studies, anti-smoking publicity as a determinant of consumption seems to have received little attention in the empirical literature.

Secondly, there is no consensus on the impact of advertising expenditure on the demand for cigarettes. A number of studies (e.g. Hamilton, 1972,[51] Wilcox and Vacker, 1992 and Duffy, 1995),[52] found no significant relationship between advertising expenditure and cigarette consumption, while other studies found a positive relationship. However, even where a positive relationship was found, it was small (see Fujii, 1980, Bishop and Yoo, 1985, Abernethy and Teel, 1986,[53] Holak and Reddy, 1986, Kao and

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46. Most studies made use of annual data. Flewelling et al. (1992), Wilcox and Vacker (1992), Duffy (1995) and Hu et al. (1995a) used quarterly data, while Keeler et al. (1993), Hu et al. (1994 and 1995b) and Gruber and Köszegi (2000) used monthly data.
47. Studies that have estimated price elasticities without using econometric techniques include Baltagi and Goel (1987) and Peterson et al. (1992). In these studies the researchers assessed the magnitude changes in cigarette consumption following state-specific cigarette tax increases.
48. The criticism against single equation models of demand is that they may produce biased parameter estimates because they do not take the supply side of the market into account. In order to address this shortcoming, one has to specify supply and demand equations and estimate them jointly, using a technique like two-stage least squares. Studies that have adopted this approach include Bishop and Yoo (1985), Tremblay and Tremblay (1995) and Keeler et al. (1996).
49. Of all US states, California (closely followed by New York) has the most stringent tobacco control legislation. Published studies that have investigated the impact of tobacco control interventions on the demand for cigarettes in California include Flewelling et al. (1992), Hu et al. (1994 and 1995b) and Weber et al. (2003). Most US studies that investigate the demand for cigarettes focus on the country as a whole. Some studies take cognizance of differences in taxes between states and try to account for the bootlegging and smuggling between low-tax and high tax states (e.g. Baltagi and Levin, 1986, Baltagi and Goel, 1987 and Thursby and Thursby, 1994).
50. According to the Federal Communication Commission's Fairness Doctrine, companies advertising "controversial goods" (which, after the publication of the 1964 Surgeon-General's report, included cigarettes) had to pay for advertisements that presented the alternative view. This resulted in substantial anti-tobacco advertising between 1967 and 1970.
51. See Hamilton (1972: 401) for some early empirical results on the impact of advertising on the demand for tobacco in the US. Generally the relationships were weak or insignificant, and where they were significant, they were dismissed as being "suspect".
52. Andrews and Franke (1991) cite five more US studies which found insignificant relationships between cigarette advertising and cigarette consumption.
53. Abernethy and Teel (1986) found a significant positive relationship for print advertising but not broadcast advertising.

Tremblay, 1988, Seldon and Doroodian, 1989 and Seldon and Boyd, 1991).[54] The advertising-consumption controversy is discussed in more detail in section 3.3.2.

Thirdly, most studies incorporate an income variable in the demand equation as a control variable. There is no consensus on the value of the income elasticity of demand for cigarettes, other than that it lies between zero and one (Andrews and Franke, 1991). This suggests that cigarettes are a normal good, which is intuitively reasonable. However, this result has little policy impact, since no tobacco control advocate would argue that the government should try to slow down economic growth because of the detrimental tobacco control consequences of a growth in income.

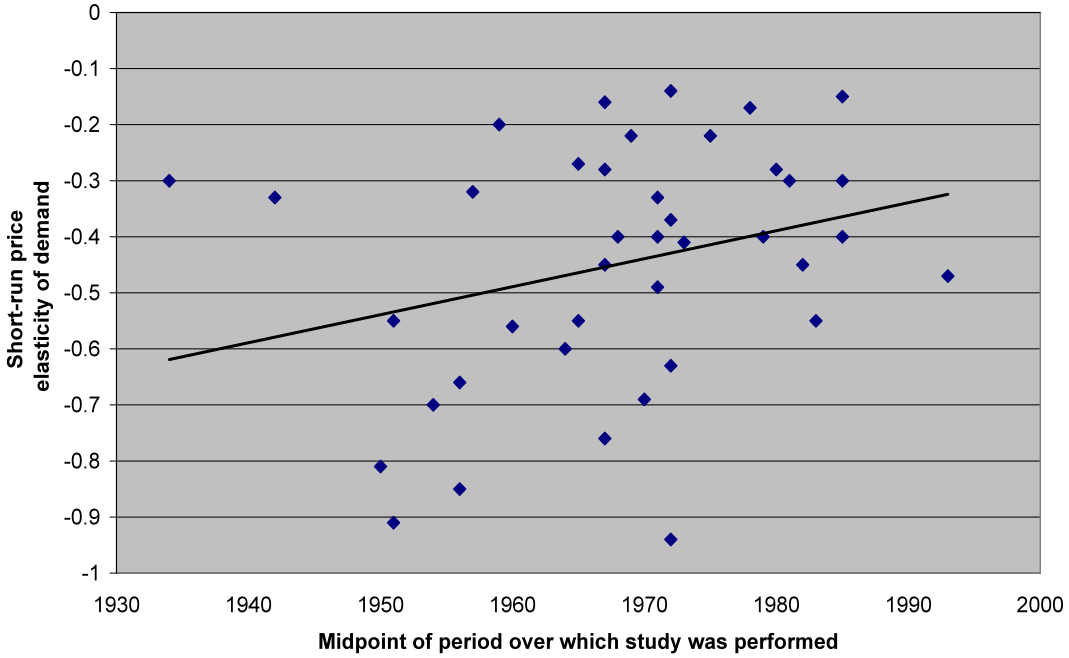
Fourthly, all empirical studies include the cigarette price as a determinant of cigarette consumption, and evidence for a strong negative relationship between these two variables is overwhelming. The price elasticity estimates generally vary between -0.15 and -0.90, but seem to concentrate in the -0.20 to -0.60 range (Andrews and Franke, 1991, USDHHS, 2000 and Chaloupka et al., 2000a: 250). This implies that the demand for cigarettes is relatively price inelastic, but certainly not perfectly price inelastic. From a tobacco control perspective this result provides the rationale for using excise tax increases as a tool to reduce cigarette consumption. An increase in the excise tax increases the retail price of cigarettes, which in turn decreases cigarette consumption.

Baltagi and Goel (1987) and Tegene (1991) used estimation techniques that allowed the price elasticity to change over time and found that the demand for cigarettes in the US became less elastic over time. Andrews and Franke (1991), using a meta-analysis of published studies came to a similar conclusion. In Figure 3.1 a scatter plot of the estimated price elasticity of demand, against the midpoint of the period for which the study was performed, is shown. The studies included in this scatter plot have been taken primarily from Andrews and Franke (1991) and USDHHS (2000).[55]

[54]. See Andrews and Franke (1991) for a more complete list.

[55]. For studies listed in USDHHS (2000), the price elasticity estimates as published in USDHHS were used in Figure 3.1. For studies listed in Andrews and Franke (1991), an average price elasticity is calculated if more than one price elasticity estimate was published in any particular study. Long-run price elasticities are not shown.

Figure 3.1: Price elasticity estimates for the US, based on time series studies



Sources: Andrews and Franke, 1991 and USDHHS, 2000

On the basis of these studies there is some evidence (at the 10 per cent, but not the 5 per cent level of significance), that the demand for cigarettes has become less elastic over time. More recent studies suggest that the range of estimated price elasticities has narrowed somewhat, centring around -0.35.

In the late 1980s Becker and Murphy (1988) introduced the concept of "rational addiction". According to Gruber and Köszegi (2000) the model of rational addiction has become the standard approach to modelling the consumption of goods such as cigarettes. It has become established not only in the US, but also in other developed countries (e.g. Cameron, 1997, and Bardsley and Olekalns, 1999) and developing countries (e.g. Da Costa e Silva, 1998 and Onder, 2002). Furthermore, the idea that smokers are not only influenced by previous consumption, but also by future consumption – which is central to the concept of rational behaviour – has been used in studies based on individual level data. For this reason, it is discussed in some detail here.

As pointed out by Chaloupka and Warner (1999: 10) and Grossman et al. (1998: 633), the idea of addictive behaviour has been investigated by economists since 1920, but usually within the context of what has subsequently been called "myopic addiction". According to this view previous consumption of an addictive good has an impact on current consumption (e.g. Warner, 1977, Fujii, 1980 and Baltagi and Levin, 1986). However, in the "myopic addiction" framework consumers are assumed to ignore the effects of current consumption on future utility when they determine the optimal quantity of the addictive good in the present period.

In contrast, the rational addiction model assumes that rational consumers plan to maximise a lifetime utility function, defined as the discounted sum of net utility at each age (Grossman et al., 1998: 634).

Thus, a rational addict's current consumption of an addictive good is not only determined by past consumption, but also by how their current consumption influences their discounted lifetime utility. Of course, the degree to which a person discounts the future has an important bearing on his/her current consumption. If an addict's time preference is such that he/she places no value on the future (i.e. the person's discount rate is infinitely large) this would be consistent with myopic behaviour. Becker and Murphy (1988) and Becker et al. (1994) showed that a myopically addicted person's current consumption is dependent on the current and past price of the addictive good. However, if the person is forward looking, he/she considers not only the current and past price, but also the future price in determining the optimal quantity of current consumption.

Becker and Murphy (1988) point out some important interactions between time preference and addiction. Firstly, people who discount the future more heavily are more likely to become addicted. Secondly, addicts with higher discount rates will be relatively more responsive to changes in the price than those with lower discount rates.[56] Thirdly, the long-run price elasticity of demand will be greater, in absolute terms, than the short-run price elasticity. Fourthly, the impact of an expected change in the price of the addictive good will be greater than the impact of an unanticipated price change.

Becker et al. (1994) used a large aggregate data set of more than 1500 observations (50 states over 31 years) to investigate empirically whether cigarette smokers are "rational" in the way that rational addiction is defined. Overall, the results rejected the myopic model of addiction, and provided evidence that consumers do consider future prices in their current consumption decisions (Becker et al., 1994: 404). Using the Becker-Murphy framework and time series data, Chaloupka (1990a and 1991), Keeler et al. (1993), Sung et al. (1994) and Grossman and Chaloupka (1997) all found evidence of rationally addictive behaviour for cigarettes.

More recently Gruber and Köszegi (2000) have expanded the Becker-Murphy model by allowing consumers to have time-inconsistent preferences. This typically occurs when smokers would like to smoke less in the future, but are unable to do so when the future arrives because their short-term preference is to maintain their smoking habits, since this provides them with instant pleasure. Empirical evidence from other disciplines, laboratory experiments and a variety of real-world evidence on smoking decisions indicate that smokers are time inconsistent (see Chaloupka et al., 2000b: 122). When Gruber and Köszegi (2000) adapted the Becker-Murphy framework to incorporate time-inconsistent preferences, the estimated price elasticities were similar to those delivered by the original model, but the implications for taxation policy were very different. Since time-inconsistent preferences result in substantial "internalities" with smokers, this would justify a much higher excise tax than one that focuses only on the externalities of smoking. Gruber and Köszegi (2000: 38) suggested that the additional taxes required to account for these "internalities" would amount to US$ 1 per pack or more.

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[56]. Poorer, less educated and younger people tend to discount the future more than richer, more educated and older people. These two implications of the rational addiction model are consistent with the empirical findings that poorer, less educated and younger people reduce their cigarette consumption in reaction to a price increase, but are relatively unresponsive to non-price interventions, such as health warnings, vis-à-vis richer, more educated and older people (Grossman et al., 1998: 635).

The rational addiction hypothesis has not gone unchallenged. According to Chaloupka and Warner (1999: 14-15), the most criticised aspect of the model is the assumption of perfect foresight. The model assumes that people rationally decide that they will maximise their discounted lifetime utility by consuming an addictive product. According to Akerlof (quoted in Chaloupka et al., 2000b: 120) the rational addiction model does not allow the possibility that people regret that they ever started smoking, given that they are assumed to be fully aware of the consequences of their consumption of a potentially addictive good when making these decisions. This is unrealistic, because surveys have shown that a majority of smokers indicate that they want to quit and regret that they started smoking (see references in Gruber and Köszegi, 2000: 17).

A recent study (Auld and Grootendorst, 2002) attacked the rational addiction model on a different level. While the rational addiction model has been successfully applied to a number of addictive products, such as cigarettes, alcohol, cocaine, opium and coffee (see Grossman et al., 1998: 635-637 and Auld and Grootendorst, 2002), presumably the strength of the theory should lie in the fact that it would find that people are *not* addicted to things that clearly are not addictive. Becker and Murphy (1988: 676) attempted to pre-empt this comment by pointing out that their model also applies to "non-detrimental" addictions, such as work, eating, music, television, a certain standard of living, other people, and religion. Until recently, no empirical study has indicated that the rational addiction model can distinguish between addictive and non-addictive products. Recently Auld and Grootendorst (2002) came to the conclusion that the standard methodology is generally biased in the direction of finding rational addiction. Using aggregate time series data, they found that milk, eggs and oranges were rationally addictive, and, specifically, that milk was more addictive than cigarettes. This result implied that the estimable rational addiction model tends to yield spurious evidence in favour of the rational addiction hypothesis when aggregate data are used.

3.2.2 Studies based on individual level data

Since the 1980s a large number of studies have investigated the price elasticity of demand based on individual level data. These studies have been able to examine issues that cannot be examined with aggregate time series data. Whereas aggregate data typically allows one to estimate the overall price elasticity of demand, individual level data makes it possible to consider separately the effect of a price change on the probability of smoking (the price elasticity of smoking participation) and, secondly, the effect on the average consumption of smokers (the conditional price elasticity of demand) (Chaloupka and Warner, 1999: 7).[57] Another advantage of using individual level data is that price elasticities of demand can be estimated for separate subpopulations. As a result of the availability of increasingly sophisticated and comprehensive individual level surveys, a sizeable literature on the determinants of youth smoking has developed in the US in the past two decades.

[57]. The price elasticity of smoking participation is generally estimated using a logit or a probit model. The conditional price elasticity of demand measures by what percentage smokers are likely to reduce (increase) their cigarette consumption in reaction to a one per cent increase (decrease) in the price of cigarettes. The conditional price elasticity applies only to smokers and is generally estimated with standard econometric techniques like OLS. The sum of these two effects is termed the total or unconditional elasticity of demand.

The first study to use individual level data found that "an increase in the price of cigarettes would reduce cigarette consumption primarily through reductions in the smoking participation rate, while having a much smaller impact on the quantity of cigarettes demanded by smokers" (Lewit and Coate, 1981: 22). This was especially true for young adults. For people over age 35 the impact of an increase in cigarette prices was approximately equally split between a reduction in the smoking participation rate and a reduction in the quantity smoked by smokers.

Wasserman et al. (1991) found that, for adults, the reaction to a change in the price of cigarettes was explained mainly by a change in smoking participation, and to a smaller extent by a change in the quantity demanded by smokers. However, later studies (e.g. Chaloupka and Grossman, 1996 and Chaloupka and Wechsler, 1997), which focused primarily on youth smoking, found that the smoking participation rate and conditional demand elasticities were approximately equal.

Studies that estimated smoking participation and conditional demand elasticities form a subset of a larger empirical literature that investigated the price elasticity of demand for various demographic subgroups (e.g. gender, race and age). According to Chaloupka (1990b and 1999), Chaloupka and Pacula (1998) and Cawley et al. (2003) the US evidence suggests that men are generally more price sensitive than women. In considering the impact of race and ethnicity on the price elasticity of demand for tobacco, Chaloupka and Pacula (1998) found that black youths were generally more price sensitive than white youths. Chaloupka (1999) pointed out that to the extent that socio-economic status is correlated with race and ethnicity, these findings may reflect differences in price sensitivity related to socio-economic status. Generally speaking, poorer people are more sensitive to cigarette price changes than more affluent people (see Townsend, 1987 and Townsend et al., 1994 for the UK experience).

A sizeable literature has investigated the determinants of youth smoking. There is overwhelming empirical evidence that teenagers' and young adults' reaction to a change in cigarette prices is much more pronounced than that of older people (e.g. Lewit and Coate, 1981, Lewit et al., 1981, Chaloupka and Grossman, 1996, Chaloupka and Wechsler, 1997, Tauras and Chaloupka, 1999, Harris and Chan, 1999, Gruber, 2000,[58] Gruber and Zinman, 2000 and Ross and Chaloupka, 2000).[59] The price elasticity estimates varied from study to study, but the current general consensus is that the overall price elasticity of teenage cigarette demand is in the interval from –0.9 to –1.5 (Ross and Chaloupka, 2000: 4). This is between two and three times higher than the price elasticity of demand for the population as a whole.

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[58]. Interestingly, Gruber found that the price elasticity of younger teenagers (aged 13-16) is much smaller and even statistically insignificant, than that of older teenagers (aged 17-18).

[59]. An important exception is Wasserman et al. (1991), who found that the absolute value of the price elasticity of demand for the population as a whole is low, ranging from +0.06 in 1970 to –0.23 in 1985. In addition, they found that the teenage price elasticity does not differ significantly from the estimates for adults. Chaloupka and Warner (1999: 7-8) suggest that this unexpected result can be explained by the manner in which Wasserman and colleagues specified their model. By including an index of smoking restrictions in the model (which are positively correlated with the price of cigarettes), they "diluted" the price effect and biased the coefficients towards zero. Most other studies did not incorporate measures of smoking restrictions in the specification of their models.

Why should this be so? As was pointed out in the previous chapter, Lewit et al. (1981: 6) argued that youths are less addicted than adult smokers, and are thus more able to quit in the face of a cigarette price increase. Secondly, they pointed out that teenagers are generally more subject to bandwagon or peer effects than adults. An increase in the price of cigarettes not only reduces a teenager's tobacco consumption directly, but also indirectly because his/her friends are smoking less and thus the peer pressure to smoke is reduced. Thirdly, Grossman and Chaloupka (1997: 294) argued that young smokers generally spend a much higher proportion of their disposable income on cigarettes than adult smokers, which also tends to increase their price elasticity of demand, vis-à-vis adults.[60] Lastly, as was pointed out in Section 3.2.1, in the context of Becker and Murphy's (1988) model of rationally addictive behaviour, teenagers tend to be more responsive to changes in the price of cigarettes because they generally discount the future more heavily than adults.

In studies that employ individual level data it is generally accepted that the smoking participation elasticity of demand of teenagers is determined by different factors than that of adults. For teenagers, an increase in the price of cigarettes tends to reduce smoking participation because it is assumed that the more expensive cigarettes will cause them not to initiate smoking. For adults, on the other hand, an increase in the price of cigarettes will generally reduce the smoking participation rate because some smokers decide to quit smoking (Chaloupka and Warner, 1999: 8-9). The rationale for this thinking is that smoking is generally initiated in the teenage and early adult years. Less than 10 per cent of smokers initiate their habit after the age of 25 years (Douglas and Hariharan, 1994: 214).

Recently a number of studies have attempted explicitly to study the determinants of smoking *initiation*, rather than the determinants of smoking prevalence and quantity of cigarettes consumed, as most other studies that employ individual level data have done. To date the results have been inconclusive. Using a split population duration model,[61] Douglas and Hariharan (1994) found that non-economic variables such as lifetime educational attainment, marital stress, race and gender appear to have a much larger impact than price or income on the probability and timing of initiating the smoking habit. A similar conclusion was reached by Douglas (1998) in a later study, although he conceded that there could be many errors-in-variables problems that could have had a detrimental impact on his results.

Studies by DeCicca and colleagues (cited in Chaloupka and Warner, 1999: 9) and Foster and Jones (cited in Tauras et al., 2001) also did not find that smoking initiation was significantly affected by the price of cigarettes. However, Dee and Evans (cited in Chaloupka and Warner, 1999) using a somewhat

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60. The same argument can be applied to poor individuals and households. Poor smokers generally spend a higher percentage of their disposable income on tobacco products vis-à-vis rich smokers. As has been pointed out in numerous studies (e.g. Sayginsoy et al., 2000, and Sarntisart, 2003), and as this study found for South Africa as well (see chapter 6), poor people are generally more price sensitive than rich people.

61. The model is based on a duration/hazard model, where a "failure" is defined as the decision of a person who has never smoked to start smoking. In a standard duration model, everyone eventually "fails". However, because a large percentage of people never start smoking, a more general model is required that allows for this. In the split population model each observation is weighted with the estimated probability that the person will ever start to smoke. Using a likelihood function, the split population model allows one to estimate the probability that a person will ever start smoking, and the age at which the person will start.

extended version of DeCicca's data set, but essentially the same approach, found that the price elasticity of smoking onset was significant and had a value of –0.63. Similarly, Tauras et al. (2001) also found that smoking initiation was inversely related to the price of cigarettes. They found that individuals who initiated smoking based on greater cigarette consumption were generally more price responsive than those who consumed smaller quantities. In a recent study that focused primarily on the impact of actual and perceived body weight on the decision to initiate smoking, Cawley et al. (2004) found that higher cigarette prices decreased the probability of smoking among males, but had no impact on female smoking initiation. The authors argued that gender-specific differences may help explain why the literature on the impact of price on smoking initiation has been so mixed and inconclusive.

3.3 Other developed countries

A survey of non-US tobacco demand studies reveals that the focus of attention has changed a number of times in the past 60 years. In fact, a number of "waves" of empirical studies into the demand for tobacco can be identified.

In what could possibly be termed the "first wave", a small number of studies investigated the demand for tobacco in the 1940s to 1960s (Stone, 1945, Prest, 1949 and Koutsoyiannis, 1963). These studies were part of a growing literature that aimed to investigate the demand for household goods. Price and income elasticities were estimated, but the public health implications of these estimates were not discussed, presumably because the health impact of smoking was not well publicised at that time.

The focus of tobacco-related empirical research changed significantly in the early 1970s. During the 1970s-1990s period, which could be called a "second wave", researchers began to draw policy conclusions from their results. The focus in this period shifted away from the estimation of price and income elasticities, to the impact of advertising and health awareness on the demand for tobacco products. In estimating the impact of advertising and health awareness on cigarette demand, price and income were included as control variables in the regression equation, but these were often not the focus of the investigation. During this period the lines between "pro-industry" research and "pro-tobacco control" research were drawn, and the debate between these two camps was vigorous and often acrimonious (see section 3.3.2).

The first two "waves" focused exclusively on developed countries and the empirical results were based on time series data. The "third wave" had its origins in 1990, when price elasticity estimates were published for Papua New Guinea, the first developing country studied (Chapman and Richardson, 1990). During the 1990s the focus gradually shifted towards developing countries. This shift in research focus was in reaction to the large increase in smoking in the developing world, and the likely impact that this would have on mortality patterns in the twenty-first century (see World Bank, 1999). The focus in most of the developing country studies was on the price elasticity of demand. The primary aim of these studies was to urge governments to increase the price of cigarettes by increasing the excise tax on cigarettes. The literature on developing countries is discussed in section 3.4.

3.3.1 Price elasticity of demand

Table 3.1 is a fairly comprehensive chronological summary of published cigarette demand studies in developed countries other than the US. The list is dominated by studies based on the UK (twelve), followed by that of New Zealand (five). As it turns out, these two countries, together with Australia, Canada and the US, have been at the forefront of tobacco control policy.

All studies are based on time series data, and thus tend to focus on aggregate demand only. None of these studies used individual or household surveys, which precludes the possibility of investigating smoking patterns by demographic group, or the differential impact that cigarette price changes have on smoking prevalence and smokers' demand for cigarettes. The only possible exceptions are Townsend (1987) and Townsend et al. (1994), who considered the impact of price changes and health publicity on different socio-economic groups, but which were nevertheless based on aggregate data.[62]

From Table 3.1 it can be seen that the price elasticity estimates range between zero (i.e. not significant) and -1.0, with an average of about -0.4. Whereas there is some evidence that the absolute value of the price elasticity of demand is decreasing in the US, there is no such evidence for other developed countries. It is part of the "received wisdom" that the average price elasticity of demand for tobacco is around -0.4 in developed countries (see World Bank, 1999: 41, Chaloupka et al., 2000a: 244 and USDHHS, 2000: 323).

Table 3.1: Chronological summary of studies on tobacco demand in developed countries, excluding the US

Study	*Country*	*Estimated price elasticity*	*Control variables*	*Comments*
Stone (1945)	UK and US	UK: between –0.49 and –0.53 US: - 0.24	Income (positive in some specifications), Time trend (positive), UK dummy for coupon trading (1928-33) (positive)	The study used annual time series data (1920-1938) to estimate the demand for a number of household goods, including tobacco, in the UK and the US. No policy implications were drawn from the results.
Prest (1949)	UK	Between –0.12 and –0.31, depending on specification	Income (positive), Time trend (positive), Post-World War I dummy variable (positive)	The study used annual time series data (1870-1938, with 1915-1919 excluded) to estimate demand equations for a number of household goods, e.g. beer, spirits, tea, tobacco, potatoes and soap.
Koutsoyiannis (1963)	14 developed	US: -0.94 UK: -0.04 (insig.)	Income (positive), Population size	The study used annual data (1950-1959) to investigate the demand for

62. Their data was derived from the Tobacco Research Council and the British General Household Surveys, but in the analyses themselves, they made use of aggregated data. Townsend and her colleagues found that cigarette consumption among higher social classes was influenced significantly by health awareness and not much by price changes, while lower social classes' cigarette consumption was more sensitive to price changes and less sensitive to health publicity.

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
	countries	France: -0.54 Italy: -0.82 The Netherlands: -0.08 (insig.) Belgium: -0.68 Sweden: -0.41 Norway: Not shown (insig.) Finland: -0.41 Austria: -0.95 Greece: Not shown (insig.) Ireland: -0.14 (insig.) Canada: -0.21 (insig.) Australia: -0.36	(positive), Prices of all other goods and services (negative for Greece, not included for other countries), Time trend (generally positive)	tobacco in 14 different countries. Other than estimating price and income elasticities, and the impact of population size on tobacco demand, no policy recommendations were derived from the results.
Sumner (1971)	UK	For annual data: between –0.13 and –0.57, depending on specification For quarterly data: between –0.60 and –0.83, depending on specification	Income (positive), Health publicity dummy and trend variables (negative)	The paper used annual and quarterly data (1951-1967) to investigate the impact of the 1962 Royal College of Physicians report on cigarette consumption. There is evidence that the effect of the health publicity had been increasing over time (i.e. a significant trend variable), rather than a one-off effect (i.e. a 0-1 dummy variable).
Atkinson and Skegg (1973)	UK	All adults: between –0.1 and –0.4 depending on specification Males: statistically insignificant Females: -0.35	Income (positive), Health publicity dummy and trend variables (generally negative)	Used annual time series data (1951-1970) to investigate the effect of health publicity on the number of cigarettes smoked, and found that the impact was small and transitory. No explicit focus on price elasticity.
Russell (1973)	UK	-0.50 to –0.66	Royal College of Physicians Reports (1962 and 1971) (negative)	Used annual time series data (1946-1971) to estimate the price elasticity of demand (for males only), and argued that, on the basis of the results, increasing the tax on cigarettes would reduce cigarette consumption. Rather than using regression analysis, the results are based on correlations and graphical representations of the data.
Peto (1974)	UK	For males: -0.37 to –0.64 Females not investigated	Income (positive), Health publicity dummy and trend variables (generally negative)	Used annual time series data (1951-1970) to try to address the conflicting results regarding price elasticity between Atkinson and Skegg (1973) and Russell (1973). The study concludes that "it thus seems likely that systematic tax increases would have an immediate and progressive effect on consumption and recruitment, particularly among young people, who are less wealthy and less educated".

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
				However, the study did not explicitly investigate smoking behaviour among subpopulations.
McGuinness and Cowling (1975)	UK	Short-run: -0.99 Long-run: -1.05	Income (positive), "Stock" of advertising expenditure (positive)	The paper used quarterly data (1957q2-1968q4) to investigate the impact of advertising on the demand for cigarettes, using a "stock" of advertising expenditure. A positive relationship was found. After the publication of the Royal College of Physicians report the impact of advertising on consumption was partly offset.
Metra Consulting Group Ltd (1979)	UK	Short-term: -0.34 to –0.54 Long-term: -0.42 to –0.54	Unknown	The study was based on quarterly time series data (1958-1978), and aimed to refute McGuinness and Cowling's (1975) finding of a positive relationship between advertising and cigarette consumption. Using data supplied by the tobacco industry, the study found no significant relationship between advertising and cigarette consumption. Quoted in High (1999).
Salter (1981)	New Zealand	Between –0.15 and –0.21	Unknown	Quoted in Chetwynd et al. (1988).
Witt and Pass (1981)	UK	-0.32	Income (positive), Advertising expenditure (positive), "Health scare" dummy variables (negative)	The paper used annual data (1955-1975) to investigate whether the reports by the Royal College of Physicians (1962 and 1971) and the US Surgeon-general (1964) had an impact on cigarette consumption. A significant but transitory effect was found. Advertising was found to have a significant impact on cigarette consumption.
Leeflang and Reuijl (1985)	West Germany	Excluded from analysis because "coefficient of variation is extremely low"	Household consumption (proxy for income) (positive), Sales quantities of substitutes to cigarettes (generally negative), Advertising expenditure (positive)	The paper uses annual, quarterly and monthly data (1961-1975) to investigate the relationship between cigarette advertising and sales, and finds a strong positive relationship. The impact of advertising is smaller for high-frequency (i.e. monthly) data than for low-frequency (i.e. annual) data, suggesting that "the influence diminished over time".
Radfar (1985)	UK	-0.23	Income (positive), "Stock" of advertising expenditure (positive), Health publicity (interaction	This paper replicates McGuinness and Cowling's (1975) study, using quarterly data (1965q3-1980q4). They come to similar conclusions about the impact of advertising on cigarette consumption, i.e. a positive effect.

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
			dummy variables with advertising variables)	
Johnson (1986)	Australia	-0.10 at the means of the sample data	Income (positive), Advertising expenditure (insignificant), Ban on electronic media advertising dummy variables (insignificant)	The paper used annual data (1961/62-1982/83) to determine the relationship between cigarette advertising expenditure and cigarette demand, and none was found. In the chosen specification the absolute price, rather than the relative (i.e. real) price was included, because this gave a better fit. This implies a degree of "money illusion" among smokers.
Worgotter and Kunze (1986)	Austria	-0.54	Total private consumption (proxy for income) (positive), "Stop smoking" dummy variable for 1974 (negative)	The paper used annual data (1961-1983) to investigate the determinants of demand for cigarettes. No further analysis was made.
Townsend (1987)	UK	Between +0.15 (not statistically different from zero, for male professionals) and –1.26 (for unskilled male workers)	Income (positive), Trend (generally negative, but insignificant), Health publicity dummy variables (varying, but generally negative)	Used annual time series data (1961-1977) to investigate the responses of five social classes to price changes and health publicity. Because of limited sample size most relationships were not statistically significant. Despite this, the study concluded that more educated and well-off people have lower price elasticity of demand, but respond faster to health information than less educated and poorer people.
Stavrinos (1987)	Greece	Short-run: -0.08 Long-run: -0.15	Income (positive), Health promotion programme dummy variable (negative)	The paper used annual data (1961-1982) to investigate the impact of a strong anti-smoking campaign (1979-1982) on cigarette consumption, and they found that this decreased consumption by 7.3 per cent. The variables were specified in nominal terms ($R^2 = 0.997$), which could suggest a spurious relationship.
Chetwynd et al. (1988)	New Zealand	Between –0.11 and –0.73 (but generally insignificant), depending on specification and data frequency	Income (positive), Advertising expenditure (positive), Consumption in previous period (positive)	The aim of the paper is to determine whether print advertising has had an impact on cigarette consumption, and a significant positive relationship is found for quarterly, but not annual, data. No explicit focus on price elasticity.
Harrison et al. (1989)	New Zealand	Short-run: -0.08 Long run: -0.14 (but both	Income (positive), Lagged consumption,	This paper is an extension of Chetwynd et al. (1988) and addresses Jackson and Ekelund's (1989)

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
		elasticity estimates are statistically insignificant)	Seasonal dummy variables	criticism that the original paper suffers from a number of econometric modelling drawbacks. Using some standard econometric tests, Harrison et al. show that "the original model and conclusions appear to be very robust".
Harrison and Chetwynd (1990)	New Zealand	-0.32	Income (positive), Advertising expenditure (positive), Anti-smoking advertising (negative)	The paper used quarterly data (1973q1-1989q2) to determine the impact of pro-tobacco advertising expenditure and anti-smoking advertising on cigarette consumption. Used numerous econometric tests to investigate the adequacy of the model, and found the model econometrically acceptable.
Duffy (1991)	UK	-0.32	Income (positive); Advertising expenditure (not significant)	The study used quarterly data (1963q1-1987q3) to investigate the impact of advertising on the demand for alcoholic drinks and cigarettes, using a system-wide model. The focus is on alcohol, with cigarettes entering as a control variable. No advertising effects were found.
Andrews and Franke (1991)	Meta analysis of studies performed in the UK, US, and six other countries	Weighted mean elasticity for all 198 regression equations: -0.36 Weighted mean elasticity for all 41 studies: -0.47	Other relationships: Income (positive), Advertising expenditure (positive)	The aim of the study was to investigate the magnitude of three determinants (price, income and advertising) on the demand for tobacco using a meta-analysis of 48 studies. The income and advertising expenditure elasticities of demand are positive, but have been decreasing over time. Similarly, the demand for tobacco has become less price elastic over time (from –0.82 in 1950s to –0.36 in the 1970s and 1980s).
Laugesen and Meads (1991)	22 OECD countries	-0.19	Income (positive), Advertising restrictions (negative), Female labour participation rate (negative), Manufactured cigarettes as fraction of total tobacco consumption (positive)	The study is based on pooled cross-section annual time-series data (1960-1986 for 22 OECD countries). The focus is on whether *restrictions* on advertising have a significant impact on the demand for cigarettes, and a significant negative relationship was found.
Stewart (1993a)	22 OECD countries	All countries: -0.31 for middle year, but was decreasing (in absolute terms) over time	Income (ignored in specification), Advertising ban (insignificant), Quadratic trend (varied for	Stewart (1992 and 1993a) attacked Laugesen and Meads's (1991) study. Using similar data (pooled cross-section (22 OECD countries) annual time-series (1964-1990) data), he found that the advertising ban has had

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
		Individual countries: Austria (-0.34) Australia (insig.) Belgium (-0.61) Canada (-0.37) Denmark (-0.29) Finland (-0.45) France (-0.23) Greece (-0.35) Iceland (-0.32) Ireland (-0.30) Italy (-0.39) Japan (-0.18) Netherlands (-0.69) New Zealand (-0.25) Norway (-0.49) Portugal (insig.) Spain (-0.16) Sweden (-0.45) Switzerland (-0.83) UK (-0.55) US (-0.29) West Germany (-0.54)	different countries)	an insignificant impact on cigarette consumption. This result is contrary to that obtained by Laugesen and Meads (1991). Stewart tabulated all data used in the analysis, except for the advertising ban (which he presumably defines as a 0-1 dummy variable). The inclusion of quadratic and linear trend variables to account for "a host of 'cultural' variables which go to make up the attitude that a society has towards smoking in general" may have been included to hide the advertising effect. The results of a number of regressions, where individual independent variables are removed, are discussed and generally the results are robust. However, Stewart does not discuss the regression results when the quadratic and linear trend variables are removed, suggesting that the removal of these variables would result in an unwanted result.
Valdés (1993)	Spain	Short-run: -0.60 Long-run: -0.69	Income (positive), Advertising expenditure (positive), Dummy variables for legislative interventions (generally negative)	The study investigated the demand for cigarettes in Spain and is based on annual data (1964-1988). All specified demand determinants are statistically significant, but the derivation of the advertising variable is open to criticism.
Simester and Brodie (1994)	Meta-analysis of studies performed in UK, US, New Zealand and West Germany	Average price elasticity: -0.54 Median price elasticity: -0.48	Other relationships: Income (positive), Advertising (positive)	The primary aim of the study was to investigate the impact of advertising on brand and industry demand for tobacco using a meta-analysis of 29 published studies. Based on the sample selected, advertising expenditure was found, on average, to have a significant positive impact on tobacco consumption.
Townsend et al. (1994)	UK	For males (overall): -0.47 For females (overall): -0.61 Elasticity was inversely related to social class Young adult males are not	Income (positive), Health publicity (negative)	Using annual data (1972-1990) "this analysis was a first attempt to investigate the effects of price and health publicity on smoking behaviour by specific socio-economic and age groups in Britain using aggregate data".

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
		price responsive, but young adult females are		
Cameron (1997)	Greece	Insignificant price elasticity	Income (insignificant)	This paper attempts to test whether smokers in Greece are "rationally addicted", and finds empirical support for this hypothesis. Lack of explanation in paper precludes any further evaluation.
Bardsley and Olekalns (1999)	Australia	Short-run elasticities: Between -0.2 and –0.3 for period 1963 to early 1980s, but increases rapidly to –1.2 between 1982 and 1996 Long-run elasticities: Between -0.5 and –0.6 for period 1963 to early 1980s, but increases rapidly to –3.0 between 1982 and 1996	Income (positive), Age structure of population (older population ⇒ more cigarette consumption), Advertising (positive, but small), Health warnings (negative, but small), Ban on smoking in public places (negative, but small)	Based on annual time series data (1963-1996) and Becker and Murphy's (1988) concept of rational addiction. Found strong empirical support for rational addiction. Regression equation is specified in linear terms, so that elasticities are not forced to be constant, but can change over time. "Virtually all of the reduction in tobacco consumption can be attributed to tobacco taxes. Income growth and demographic effects have tended to increase consumption, and direct regulatory intervention has had a very small effect".

3.3.2 The advertising-consumption debate

Of all the debates in the tobacco control literature, none is as acrimonious as the debate on whether tobacco advertising increases cigarette consumption or not. As was pointed out in chapter 1, the industry position is that they advertise to maintain and/or expand their market share (e.g. Hamilton, 1972: 401 and High, 1999: 18-22). The industry argues that tobacco products compete in mature markets and therefore face established consumer product attitudes, which are not influenced by advertising. Tobacco control advocates reject the industry's position, and claim that the industry uses advertising to increase the size of the market. They argue that tobacco advertising is inherently misleading and is aimed at enhancing the social acceptability of smoking.

This relationship has significant policy implications. If there is indeed a positive relationship between cigarette advertising and aggregate cigarette consumption, it provides the rationale for banning, or at least restricting, tobacco advertising. Of the various control measures, restrictions on tobacco advertising feature very prominently among anti-tobacco lobby groups. Thus, from a tobacco control perspective, it is important to show that this relationship is supported by the empirical evidence.

The advertising-consumption relationship, based on time series data, has received a fair amount of attention in the US (see section 3.2.1), but generally these studies have been subject to less controversy

than non-US studies. The main controversies have been about cross-section studies and literature reviews. Also, the advertising-consumption literature in the US seems to have been largely eclipsed by an analysis of the price-consumption relationship.

The first non-US study to investigate the advertising-consumption relationship was by McGuinness and Cowling (1975). They found a positive relationship between the "stock" of advertising and cigarette consumption in the UK.[63] Using data supplied by the tobacco industry, the Metra Consulting Group (1979), not unexpectedly, found no significant relationship between tobacco advertising and consumption. Subsequently, Witt and Pass (1981, for the UK), Radfar (1985, for the UK), Leeflang and Reuijl (1985, for West Germany), Chetwynd at al. (1988, for New Zealand)[64] and Harrison and Chetwynd (1990, for New Zealand) found a significant positive relationship between advertising expenditure and the demand for cigarettes. In contrast, Johnson (1986) found that advertising expenditure did not have a significant impact on cigarette demand in Australia.

A meta-analysis by Andrews and Franke (1991), based on 22 published studies (of which 15 were US-based), found that the advertising elasticity of demand is positive, but has been decreasing over time. The mean advertising elasticity was calculated at between 0.06 and 0.07, which implies that a 10 per cent increase in cigarette advertising would increase cigarette demand by between 0.6 and 0.7 per cent. In another meta-analysis, Simester and Brodie (1994) came to essentially the same conclusion, i.e. that industry sales are responsive to advertising expenditure. In addition, Simester and Brodie found that brand advertising has a sizeable impact on selective demand (i.e. the demand for specific brands), a result consistent with the industry position that they advertise to maintain or expand market shares of specific brands. However, the tobacco control position that advertising increases industry sales is also supported by these two meta-analyses.

In comprehensive reviews, Duffy (1996) and High (1999) analysed the published literature and concluded that studies that found a significant advertising-consumption relationship were generally theoretically and empirically inferior to studies that found a non-significant relationship.[65] Using well-selected quotes from studies that found a positive advertising-consumption relationship, they created

63. McGuinness and Cowling (1975) obtained long-run advertising elasticity estimates of between 0.2 and 0.3, which, compared to subsequent studies are comparatively large. Johnston (1980) points out that McGuinness and Cowling erred in their calculation of these elasticities, and that the correct estimate is substantially lower at between 0.08 and 0.09.

64. Chetwynd et al's results were challenged by Jackson and Ekelund (1989), who suggested that the model did not allow for simultaneity in the regression equation, and that this would lead to biased results. In reply, Harrison, Chetwynd and Brodie (1989) re-estimated the model, subjected it to a number of econometric tests, and confirmed their original result.

65. Duffy's main points of criticism were the following: (1) when estimating the impact of cigarette advertising on cigarette demand, one should not look at the absolute level of advertising, but rather the ratio of cigarette advertising to all advertising, a point originally raised by Hamilton (1972); (2) because most studies did not account for the possibility of simultaneity in the relationships, the advertising elasticities are biased upwards; (3) most studies used annual data, whereas they should ideally use higher frequency data; and (4) even when significant positive advertising elasticities were found, these were dismissed as very small and inelastic. Also, he inferred from Andrews and Franke's (1991) meta-analysis that the mean advertising elasticities in the US and UK decreased from a small positive value in the period prior to 1970 to a *negative* value after 1970.

the impression that these researchers did not attach much value to the policy implications of these results and that advertising did not have a significant impact total cigarette demand. High, specifically, heaped scorn on studies that found a positive relationship, while being very complimentary towards studies that did not find a significant relationship.[66] However, at a tobacco control conference in 1998 in Cape Town he presented this review and was accused by delegates (a number of whom were authors of the studies that he reviewed) of misrepresenting their results.

A similar spat took place in the early 1990s when Laugesen and Meads (1991) investigated the impact of advertising restrictions on cigarette consumption in 22 OECD countries.[67] If advertising increases consumption, presumably advertising *restrictions* would decrease consumption. Laugesen and Meads created an advertising restriction score between 0 and 10 for each country and year, based on a range of advertising restrictions.[68] Controlling for the real price of cigarettes, real income, and some other factors, they found that adverting restrictions significantly reduced tobacco consumption, and that the impact of these restrictions became more pronounced after 1970. They calculated that if these OECD countries were to implement a complete ban on advertising and force cigarette manufacturers to place health warnings on the packaging, tobacco consumption would decrease by between 6 and 7 per cent.

In a 22-page response, Stewart (1992) attacked Laugesen and Meads's results. He tried to cast doubt on their price and consumption data, argued that the advertising restriction score was conceptually flawed, and suggested that they should have used OLS rather than generalised least squares. On the basis of his critique, he claimed to have demonstrated that "the data used are so flawed that no form of analysis could yield valid conclusions" (Stewart, 1992: 97). In response, Laugesen and Meads (1993) argued that the points of criticism were essentially frivolous and do not change the results and conclusions in any significant way. One potentially valid point by Stewart (1992) is that Laugesen and Meads's results

66. For example, the McGuiness and Cowling (1975) study is dismissed on the grounds that "given the qualitative, quantitative and methodological problems surrounding and underlying the M&C study, little credence can be placed on their results" (p. 45). Radfar's (1985) "attempted rehabilitation of M&C was a dismal failure" (p.48). After pointing out some (arguably minor) problems with Chetwynd et al's (1988) econometric techniques, the study was dismissed on the grounds that "given these problems, little confidence can be placed in any of the authors' conclusions". On the other hand, High hails Schmalensee (1972) as "exceptionally sophisticated in its econometric treatment of the advertising consumption relationship", despite the fact that it only uses twelve annual observations (p. 53). Leeflang and Reuijl's (1985) study is described as "one of the best designed and executed studies we have encountered, but is not without flaws, as the authors recognize". One of the "flaws" is that the demand equation does not include the price of tobacco, or a measure of income. These and other "good" studies, not surprisingly, did not find a significant relationship between tobacco advertising and consumption.

67. This study was a shortened version of the Toxic Substances Board's report on tobacco advertising and promotion, conducted by New Zealand's Department of Health in 1989. The Tobacco Institute of New Zealand were offended by the report and highlighted certain data deficiencies. The Department of Health subsequently obtained the services of an expert statistical consultant, who reached a similar conclusion as the original report (see Stewart, 1992: 98).

68. For example, restrictions on cigarette advertising by television, radio, cinema, outdoor posters, shops, press, magazines and sponsorship were allocated one point if the ban was complete and half a point if a warning was required. Cigarette packet disease warnings were allocated one point if they were the same on every packet, and two if the warnings were strong and varied between packets (Laugesen and Meads, 1991: 1345).

are simply a reflection of the fact that countries with lower tobacco consumptions tend to be those with more advertising restrictions, and that advertising restrictions do not cause a reduction in tobacco consumption. Laugesen and Meads (1993) responded by showing that inter-country differences in consumption in the starting year of the study (1960) bore no resemblance to the advertising restrictions in place in that year. This implied that Stewart's criticism was invalid. In a further response, Stewart (1993b: 84) finally tried to cast doubt on Laugesen and Meads's integrity by claiming that their research had produced a result "to support a preconceived belief, using slipshod data and an undefined regression technique".

Subsequently, Stewart (1993a) performed a similar study to that of Laugesen and Meads (1991) and found that advertising bans (which he defined as a 0-1 variable, rather than a score out of 10) did not have a significant impact on cigarette consumption. An interesting feature of his model is that, other than the standard control variables, he included a two-parameter quadratic trend variable to account for "a host of 'cultural' variables which go to make up the attitude that society has towards smoking in general" (Stewart, 1993a: 163). This trend variable seems to be quite important for the explanatory power of the regression. Unfortunately he does not report regression results in which the trend variables are not included, but to an outside observer it seems possible that the trend variables are correlated with the advertising ban variable.[69] This would help explain the insignificant coefficient on the advertising ban variable, which was the result that he wanted.[70] Despite apparent flaws, his study was not challenged.

The review studies by Duffy (1996) and High (1999), and Stewart's analyses (1992, 1993a and 1993b) indicate that the advertising-consumption controversy was no longer in the realm of honest academic debate. Whereas the meta-analyses by Andrews and Franke (1991) and Simester and Brodie (1994) found a significant positive effect between advertising expenditure and cigarette consumption, analyses such as those by Duffy, High and Stewart were aimed at casting doubt on the veracity of practically any study that finds a positive advertising-consumption relationship.[71] The main aim of these studies, it seems, was to discredit research results that were perceived to be against the tobacco industry's interests.

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69. After being so vitriolic about Laugesen and Meads's use of generalised least squares on the basis that this is a "computationally burdensome and risky procedure" and "to say that one has used GLS, without stating what transformations have been performed, is to prevent anyone from checking that the data do indeed yield the claimed results" (Stewart, 1992: 107), it is strange that he also decided to use GLS to counteract autocorrelation.

70. Stewart (1993a) reported the results of a number of variations from the original regression results (e.g. if the price elasticity were forced to be the same for all countries, if the price effect was removed completely, if the data were weighted according to population size, etc.), and found that the regression results were generally robust to these changes in the regression specification. He did not report the results if he removed the impact of the trend variables, suggesting that this might have given him an undesired result.

71. A similar debate exists on the issue of environmental tobacco smoke (ETS). Whereas the medical and epidemiological evidence clearly indicates that ETS has detrimental health consequences (although the relative risk ratios are modest in comparison to direct smoking), the tobacco industry flatly denies that ETS is bad for one's health (see, for instance, http://www.bat.com). What they do admit is that it can be a nuisance and unpleasant to some people, but that there is no conclusive evidence to indicate that it materially affects health.

However, even if one ignores this biased criticism, the fact that the empirical evidence on the advertising-consumption relationship does not present a consistent picture, and that the estimated advertising elasticities are generally quite small, should be worrying to tobacco control advocates. In order to address this, tobacco control economists have recently argued that standard econometric techniques (where the variables are specified in level terms) might be inappropriate to investigate the relationship between cigarette advertising and consumption (Saffer and Chaloupka, 2000). The argument, first mooted by Johnston (1980: 120), is based on the principle that advertising, like all economic inputs in a production process, is subject to diminishing returns. Given a certain "base level" of advertising, the marginal impact of additional advertising on the quantity sold is likely to be small. However, the demand equation is typically specified in linear or log-linear terms, which implies a constant relationship between the dependent and independent variables. If advertising expenditure is indeed subject to diminishing returns, small differences in advertising expenditure from one period to the next would not have a sizeable impact on cigarette consumption. This would then explain why the standard econometric evidence on the relationship between cigarette advertising and consumption is so ambiguous.

An important implication of this result concerns the use of partial versus comprehensive advertising bans. Tobacco control economists have noted that partial advertising bans are relatively ineffective in reducing tobacco consumption, while comprehensive bans seem to be much more effective (World Bank, 1999: 50). This result can be explained using Saffer and Chaloupka's framework. A partial advertising ban tends to decrease advertising expenditures which yield a relatively small marginal return, but the bulk of the advertising impact is likely to be maintained. However, a comprehensive advertising ban will remove all advertising. Using OECD data, Saffer and Chaloupka (2000) found that the imposition of comprehensive advertising bans would reduce cigarette consumption by between 5 and 10 per cent, a result quantitatively similar to that obtained by Laugesen and Meads (1991). On the other hand, Saffer and Chaloupka (2000) found that partial advertising bans did not have a significant impact on cigarette consumption in the OECD countries.

3.3.3 Tobacco control implications

There is consensus in the empirical literature that the price of cigarettes is an important determinant of cigarette consumption, and that the average price elasticity of demand is around -0.4 for developed countries. Changes in the price of cigarettes have had a larger impact on cigarette consumption than any other tobacco control intervention, and as such form the mainstay of tobacco control policy (see, for example, Bardley and Olekalns, 1999).

Similarly, consumers' income is a highly significant determinant of cigarette demand. As per capita income increases, the demand for tobacco increases, even in developed countries. Thus, for a typical

growing economy, the real price of cigarettes would have to increase to keep the affordability of cigarettes, and thus cigarette consumption, at the same level.[72]

Other tobacco control interventions are relevant, but have a smaller impact on tobacco consumption. Non-US studies by Sumner (1971), Atkinson and Skegg (1973), Witt and Pass (1981), Townsend (1987), Stavrinos (1987) Townsend et al. (1994) and Bardsley and Olekalns (1999) found that health publicity has helped to reduce cigarette consumption, but the impact was generally small and in some cases temporary.

An aspect that has received little attention in the empirical literature to date is the impact of smoking restrictions in public places on cigarette demand. Bardsley and Olekalns (1999) investigated this for Australia and found that it reduced cigarette consumption by about 5 per cent.

As discussed above, studies on the effectiveness of advertising restrictions and advertising bans have caused much heated debate among tobacco control researchers and "pro-industry" researchers. Irrespective of one's persuasion, the overall conclusion is that the potential impact of this intervention is small in comparison to large tax increases.

Despite the fact that the direct impact of the non-price tobacco control interventions on cigarette consumption is modest, they are actively pursued by tobacco control advocates. A possible reason for this is to create a social environment in which smoking is no longer perceived as a normal activity. Stewart (1993a: 163) summarised this changing culture as follows:

> "Each step towards the anti-smoking society, from prohibition of smoking on buses to anti-smoking teaching in schools, from requiring a health warning in tobacco advertisements to politicians avoiding smoking on television, may individually have little effect on a particular year's tobacco consumption, but they contribute to a gradually increasing social pressure on people not to smoke, and thus ultimately consumption is reduced".

3.4 Developing countries

As pointed out in the introduction to this chapter, tobacco use is shifting from the developed to the developing world. Of the four million annual tobacco-related deaths in the early 2000s, about half were in developed countries while the other half were in developing countries (World Bank, 1999). Based on current trends, seven million of the ten million tobacco-related deaths in 2030 are expected to be in developing countries (Gajalakshmi et al., 2000).

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72. See Scollo (1996), Lal and Scollo (2002) and Guindon et al. (2002). Using a panel data approach, Blecher and Van Walbeek (2004) found that cigarette affordability is inversely related to cigarette consumption, and that the affordability elasticity of demand is about -0.5. This elasticity estimate is not significantly different from the consensus price elasticity estimate of about -0.4.

Before 1990 the economics of tobacco control in developing countries received practically no attention from either policy makers or academic researchers. The fall of communism and rapid globalisation created opportunities for multinational cigarette companies to diversify their markets into a rapidly growing developing world, particularly in Eastern Europe and Asia. The US used the threat of trade sanctions to prise open the markets in Thailand, Japan, South Korea and Taiwan to foreign cigarettes (Chaloupka and Laixuthai, 1996). Developing countries did not have effective tobacco control policies in place, and presumably many developing countries did not see the need for such "First World interferences".[73] Against this background an empirical literature on the demand for tobacco in developing countries developed.

A chronological summary of studies that investigated the demand for tobacco is provided in Table 3.2. The first attempt was by Chapman and Richardson (1990), who used annual time series data to estimate the response in tobacco demand to a change in tobacco excise taxes.[74] They found that the "excise tax elasticity" was about -0.7 for cigarettes and -0.5 for other forms of tobacco. Subsequent studies, also based on time series data, estimated price elasticity estimates for Turkey (Tansel, 1993), Egypt (Kazem, 1993), South Korea (Wilcox et al., 1994), South Africa (Reekie, 1994, Van Walbeek, 1996 and ETCSA, 1998), Zimbabwe (ETCSA, 1998), Taiwan (Hsieh and Hu, 1997), Brazil (Da Costa e Silva, 1998) and Morocco (Aloui, 2003). With minor exceptions, the short-run price elasticity estimates were in the range -0.5 to -1.0. This suggests that the demand for cigarettes in these developing countries is relatively price inelastic but, on average, more elastic than in the typical developed country.[75]

The fact that cigarette demand in developing countries is more elastic than in developed countries was predicted by Warner (1990), on the grounds that cigarettes are generally less affordable in developing countries, given their much lower per capita income levels. The reason is that, like the lower social classes in the UK and teenagers in the US, tobacco users in developing countries have relatively lower incomes, and consequently price increases for goods in their budgets impinge more significantly on their ability to purchase other goods and services (Warner, 1990: 529).

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73. Consider the example of South Africa. When the Tobacco Products Control Amendment Bill was debated in 1998, a number of presentations to the Portfolio Committee on Health commented on the fact that the proposed legislation would be inappropriate for a developing country like South Africa, that it was a "cut and paste" exercise based on the legislation of several developed countries and documents produced by the WHO and was thus unsuitable for local needs, that it did not fit in with South Africa's legal practice and institutions, and that the economic cost of such legislation would be prohibitive (see Van Walbeek, 2001).

74. They used cigarette excise taxes as a proxy for cigarette prices, because the latter were unavailable.

75. The long-run elasticities were estimated for some countries and the absolute values were generally significantly greater than the short-run elasticities.

Table 3.2: Chronological summary of studies on tobacco demand in developing countries

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
Chapman and Richardson (1990)	Papua New Guinea	-0.50 for non-cigarette tobacco -0.71 for cigarettes (Important: these are "excise elasticities": see Comments)	Income (positive), Price of substitutes (positive), Trend (negative)	Based on 1973-1986 annual time series; excise tax data, rather than price data, were used because of data unavailability; as a result the price elasticities are larger than the "excise elasticities" estimated in the study.
Tansel (1993)	Turkey	Short-run: -0.21 Long-run:-0.37	Income (positive), Lagged consumption (positive), Anti-smoking campaign dummy variable (negative), Health warning dummy variable (negative)	The study used annual time series data (1960-1988) to estimate the demand for tobacco. Because of the low price elasticity of demand, and the relatively large coefficient on the health warning dummy variable, the author suggests that "public education about the health effects of smoking may be more effective in reducing consumption than raising the price of cigarettes."
Reekie (1994)	South Africa	-0.88	Income (positive)	The study used annual time series data (1970-1989) to estimate a demand equation for cigarettes. The demand equation was used to estimate the size of the consumer surplus.
Wilcox et al. (1994)	South Korea	Significantly negative (but elasticity estimate not shown)	Income (positive), Advertising expenditure (generally insignificant), Population (insignificant), Health warnings (insignificant)	The study used monthly data (7/1988-4/1992) to investigate the relationship between cigarette consumption and advertising, in aggregate format and by brand. Advertising had no impact on aggregate consumption, but did have an effect on the consumption of some cigarette brands. The model is specified in linear terms, thus the coefficients are not elasticity estimates.
Kazem (1993)	Egypt	-0.30	Unknown	Quoted in Nassar (2003).
Van Walbeek (1996)	South Africa	Short-run: Between –0.32 and –0.99, depending on data source and	Income (positive)	The study used annual data (1970-1990) to analyse the determinants of demand for tobacco.

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
		specification Long-run: Between –0.53 and –1.52		The demand equation was used to estimate the revenue-maximising excise tax rate.
Hsieh and Hu (1997)	Taiwan	Between –0.5 and –0.7, depending on specification	Income (positive), Market share of low tar cigarettes, Female labour force participation rate, Market share of imported cigarettes	Study based on annual time series data (1966-1995). Quoted in Chaloupka et al. (2000a).
ETCSA (1998)	South Africa	Short-run: between –0.57 and –0.59 Long-run: -0.69	Income (positive), Advertising expenditure (positive)	The study used annual time series data (1970-1994) to estimate the demand for cigarettes. The aim of the study was to determine how government revenue would be affected should the excise tax increase, and to show that advertising expenditure has a positive impact on cigarette consumption.
ETCSA (1998)	Zimbabwe	Short-run: -0.52 Long run: -0.85	Income (positive)	The study used annual time-series data (1970-1996) to estimate the demand for cigarettes. The demand equation was used to determine whether excise tax increases would raise government revenue. The results indicated that this was unlikely.
Da Costa e Silva (1998)	Brazil	Short-run: between –0.11 and –0.35 Long-run: between –0.48 and –0.80	Income (positive)	The study was based on annual time series data (1983-1994) and employs a "rational addiction" framework. A lack of explanation in the paper precludes any further evaluation.
Mao et al. (1999)	China (Sichuan and Fujian provinces)	Overall price elasticity: -0.52 Price elasticity of smoking participation: -0.49 Conditional price elasticity for quantity smoked: -0.28	Income (positive), Age (inverse U-shape), Education (negative), Drinking habits (positive), Gender (males smoke more)	Based on a 1995 survey of 3907 individuals. Regression analysis is done in two steps: logit model to determine smoking participation and OLS model for the conditional demand equations.

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
Sayginsoy et al. (2000)	Bulgaria	Overall: -0.80 Low and lower-middle income earners: -1.33 Upper-middle income earners: -1.02 High income earners: -0.52	Income (positive), Average age of household members (negative), Highest education of a household member (negative), Alcohol consumption (positive), Ratio of adult males in household (positive)	The study is based on a 1995 household survey and encompasses 2259 households. The aim of the study was to determine the price elasticity of demand for cigarettes for various income groups.
Onder (2002)	Turkey	Elasticities based on time series data: Between –0.09 and –0.41, depending on specification Elasticities based on household survey data: Price elasticity of smoking participation: -0.03 average, but varies from –0.32 for second poorest quintile to 0.15 for richest quintile Conditional price elasticity of demand: -0.39 average, but varies from –0.58 for second poorest quintile to –0.30 for richest quintile	Income (positive), Regulation index (not significant), Trend (not significant), Price of substitute cigarettes (varying) Income (negative for smoking prevalence, positive for quantity consumed by smoking households), Education (generally negative), Age (generally negative), Geographic region (varying).	The time series analysis was based on annual time series data (1961-2000). Using the concept of rational and myopic addiction, the price elasticity of demand was estimated, and used to show how an increase in the tax rate will affect consumption and government tax revenue. This part of the study considered the 26 166 households covered in the 1994 Household Expenditure Survey. Using a two-step model, the determinants of smoking participation were estimated first, using a logit model. In the second step of the process, the conditional price elasticity of demand was estimated for those households that decide to smoke. The results were used to determine the impact of a change in the tax rate on cigarette consumption, government tax revenue and the regressivity of the tax.
Arunatilate	Sri Lanka	Overall price	Income (positive	The study was based on

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
and Opatha (2003)		elasticity: -0.53 By expenditure quintile: Q1 (poorest): -0.64 Q2: -0.55 Q3: -0.60 Q4: -0.68 Q5: -0.29	and negative, depending on income quintile, no pattern), Occupation (no pattern), Education (negative), Male ratio (males smoke more)	survey data of about 7500 households. The aim of the study was to determine the impact of price increases on smoking prevalence and smoking intensity of different expenditure quintiles. The price elasticity of smoking participation was generally small and insignificant (and sometimes even positive!), but the conditional elasticities are as expected.
Aloui (2003)	Morocco	Short-run: between –0.51 and –0.73 Long-run: between –1.36 and –1.54	Income (positive), Past consumption (positive), Dummy variable to indicate tobacco control legislation (insignificant)	The study was based on annual data (1955-2000). The aim was to investigate the determinants of cigarette demand, and to use these results to determine the impact of tax increases on cigarette consumption and government revenue.
Nassar (2003)	Egypt	National average price elasticity for "tobacco", not only cigarettes: -0.40 Urban households: -0.41 Rural households: -0.39	Income quartile (poorer households have higher price elasticity), Education (negative),	The study considered the 1995/6 and 1999/2000 household expenditure surveys. Expenditure elasticities were calculated by expenditure groups, educational level, work status and urban/rural area. Average prices of different tobacco products were used to estimate price elasticities of demand. The methodology is not explained well, precluding any further analysis.
Guindon et al. (2003)	Bangladesh, Indonesia, Nepal, Sri La	Elasticities based on conventional demand specification: between –0.60 and –0.90 Elasticities based on myopic addictive model: Short-run: between –0.10 and	Income (generally positive), Appropriate dummy variables to account for political crises	The results were based on a panel study of seven East Asian countries, using annual data (1970s-2000 for most countries, but a much shorter period for the Maldives and Myanmar). The elasticity estimates were used to indicate the impact of excise tax increases on the demand for tobacco and government

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
	nka, Thailand, Maldives and Myanmar	–0.65 Long-run: between –0.80 and –1.40		revenue.
Ali et al. (2003)	Bangladesh	-0.27 (but not statistically significant)	Income (positive)	The estimation of the price elasticity of demand for cigarettes was based on time series data, but this part of the analysis comprises only a small section of a wide-ranging analysis of tobacco in Bangladesh. Since very little information on the methodology and data is provided, this equation cannot be evaluated further and, given the insignificance of the relevant coefficient, should not be taken too seriously.
Kyaing (2003)	Myanmar	Price elasticity of smoking participation: -1.28 average, but varies from –1.09 for poorest quintile to –1.41 for middle quintile Conditional price elasticity of demand: -0.34 average, but varies from –0.42 for poorest quintile to –0.24 for richest quintile	Income, price, age, education and literacy, gender, marital status and urban/rural residence (coefficients not shown in paper)	The study considered the household expenditure on cigarettes, cheroots and *phet kyan* (tobacco covered with *thenatphet* leaves). The survey was performed in 2001 and includes 9847 households. In Myanmar tobacco is consumed primarily in the form of cheroots. The price elasticity of demand was estimated using the two-step procedure described in Onder (2002).
Sarntisart (2003)	Thailand	Average price elasticity: -0.39; price elasticity varies between –1.00 for poorest urban households	Income (positive, average income elasticity = 0.70)	The study used a sub-sample of 11 968 households that bought cigarettes from 24 747 households surveyed in the 2000 household socio-economic survey. Using a

Study	***Country***	***Estimated price elasticity***	***Control variables***	***Comments***
		and –0.04 for richest urban households; demand for cigarettes among rural households is generally less elastic than among urban households.		linear expenditure system (LES) approach, the study estimated price, cross-price and income elasticities of 12 different categories of household goods and services.
Karki et al. (2003)	Nepal	Price elasticity of smoking participation: -0.46 Conditional price elasticity of demand: -0.42 Total price elasticity (average): -0.88 Total price elasticity among youth (aged 15-24) is much higher than the average (-1.88)	Income, Age, Gender, Literacy, Education level, Occupation, Urban/rural, Number of years that the person has smoked (signs and magnitudes of the relationships were not reported)	For this study 1400 households (about 4000 people) were interviewed. Based on the cross-sectional study a two-step procedure, similar to that of Onder (2003) was applied to determine the price elasticity of smoking participation and the conditional price elasticity of demand. In this comprehensive study price elasticities were estimated to determine the likely impact of price and tax increases on consumption and government revenue.

Since the mid-1990s tobacco control research in developing countries has received substantial financial and institutional support from Research for International Tobacco Control, the Tobacco-Free Initiative of the World Health Organisation and the World Bank. These organisations realised that there was a need for country-specific analytic work with a strong policy focus (De Beyer in Aloui, 2003). As is to be expected, policy makers in developing countries were unwilling to impose tobacco control policies in their countries on the grounds that they were successful in developed countries. They wanted research that took cognisance of the uniqueness of their countries. The research performed under the auspices of these organisations was an attempt to address such policy makers' concerns. Countries that were investigated in this research drive included Bulgaria, Turkey, Morocco, Egypt, the Maldives, Sri Lanka, Nepal, China, Thailand, Myanmar, and Bangladesh.[76]

The primary aim of most of these studies was to estimate the price elasticity of demand. The elasticity estimates varied significantly from one country to another, but as was the case with the earlier studies on the demand for tobacco in developing countries, they practically all found a relatively inelastic demand for cigarettes.[77] On the basis of these findings, these studies concluded that increases in the

[76]. These studies were, respectively, by Sayginsoy et al. (2000), Onder (2002), Aloui (2003), Nassar (2003), Afaal and Shareef (2003), Arunatilake and Opatha (2003), Karki et al. (2003), Hu and Mao (2002), Sarntisart (2003), Kyaing (2003) and Ali et al. (2003).

[77]. For example, the price elasticities of demand for Egypt, Turkey and Sri Lanka are estimated at –0.40, -0.42 and –0.53, respectively, which is in the same range as the estimates in the developed countries (Nassar, 2003, Onder, 2002 and Arunatilate and Opatha, 2002). On the

excise tax on cigarettes would have good public health and fiscal consequences. Firstly, a tax-induced increase in the price of cigarettes would reduce tobacco consumption, and secondly, given the relative inelasticity of the demand for tobacco products, an increase in the level of the excise tax would result in an increase in government revenue. Other policy implications included the following:

1. The excise tax should be increased annually, so that cigarettes become less affordable. Most studies recommended that taxes be used to increase the real price of tobacco products by at least 5 per cent each year. To prevent smokers from switching from one tobacco product to another, excise tax increases should be uniformly levied on all tobacco products, not only cigarettes (Afaal and Shareef, 2003, Ali et al., 2003, Guindon et al., 2003, Karki et al., 2003, Kyaing, 2003, and Sarntisart, 2003).

2. Other than increasing the excise tax on tobacco, governments should use tobacco control legislation to reduce tobacco consumption. This would include comprehensive advertising and sponsorship bans, clean indoor air laws in public places, information dissemination through pictorial health warning labels and counter-advertising, and treatment for tobacco dependence (e.g. Guindon et al., 2003, Kyaing, 2003, and Sarntisart, 2003).

3. While smuggling is not a big problem in some isolated countries like the Maldives, it could significantly undermine the excise tax effects in countries like Nepal and Thailand. Governments were strongly urged to curb smuggling activities, through initiatives such as enhanced tobacco control coordination between neighbouring countries and more effective surveillance at all ports of entry (Afaal and Shareef, 2003, Karki et al., 2003, and Sarntisart, 2003).

4. Governments were urged to earmark a small portion of the total national tax revenue on tobacco products to fund health promotion initiatives (e.g. Guindon et al., 2003)

5. Some studies commented that more tobacco control research was required. Specifically the need for better data on smoking prevalence was highlighted. Also, in a situation where the tobacco demand decreases, alternative agricultural commodities would have to be found, and this would require thorough research (Afaal and Shareef, 2003)

6. Tobacco control should be placed within the broader context of poverty reduction efforts. Generally, poor and uneducated people are more likely to suffer the consequences of tobacco use, and, because tobacco often accounts for a sizeable

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other hand, the overall price elasticity of demand is estimated at –0.80 in Bulgaria and –1.62 in Myanmar (Sayginsoy et al., 2000 and Kyaing, 2003).

percentage of household expenditure, may contribute to malnutrition (e.g. Guindon et al., 2003 and Karki et al., 2003).

Closely related to the relationship between poverty and tobacco use is the issue of the regressivity of tobacco excise taxes. In most countries the smoking prevalence percentage is higher among the poor than the rich, and they tend to spend a higher proportion of their income on tobacco products, which would imply that the tax is regressive (Bobak et al., 2000). From a social equity perspective a regressive tax is undesirable, and for this reason some development economists were against the principle of using excise tax increases as a tobacco control instrument (see Peck, c.2002). The tobacco control response has been to point out that demand for cigarettes by the poor is much more elastic than that of the rich. Thus a tax-induced increase in the price of cigarettes would cause the poor to cut back on their cigarette consumption by far more than the rich, and this would in fact reduce the regressivity of the excise tax. Based on research performed in developed countries, there is support for this assertion (e.g. Townsend, 1987, Townsend et al. 1994 and studies quoted by Chaloupka, 1999). The aim of many of these recent studies was to investigate whether this was true for developing countries as well.

Many of the recent studies that investigated the demand for tobacco in developing countries were based on large surveys of individual or household level data. These data sets are particularly useful in estimating differences in tobacco consumption and excise tax burdens between different income groups. If the data is rich enough, it is possible to estimate the price elasticity of demand for different income groups. Using a two-step methodology described in section 3.2.2, most studies subdivided the price elasticity of demand into two components: (1) the price elasticity of smoking participation and (2) the conditional price elasticity of demand.[78] The underlying assumption of the model is that households first decide whether or not to smoke, and then they decide how much to smoke (Onder, 2002: 40).

Most studies found that the absolute value of the price elasticity of demand is inversely related to household income which implies that the poor tend to be more responsive to price changes than the rich (e.g. Sayginsoy et al., 2000, Onder, 2002, Arunatilake and Opatha, 2003 and Sarntisart, 2003). This result suggests that as the excise tax on tobacco products increases, the relative regressivity of the tax tends to decrease, because the poor reduce their tobacco consumption by a greater percentage than the rich. In chapter 6 the issue of the regressivity of the tobacco excise tax is investigated for South Africa.

Whereas evidence from the US indicates that the elasticity of smoking participation and the conditional price elasticity of demand are of approximately similar magnitude (see section 3.2.2), the evidence from developing countries is mixed. For Turkey, Onder (2002) found that the price elasticity of smoking participation is very small,

78. See footnote 57 for a brief description of the two-step estimation procedure. To implement this procedure, one would have to have some indication of the prices paid by (potential) consumers and the quantities bought by them. In some cases respondents were requested to indicate the average price they paid for their cigarettes (e.g. Sayginsoy et al., 2000, Onder, 2002). In other cases the price elasticity was estimated, despite the fact that only expenditure data were available, and that individual households did not indicate the quantity and price components of this expenditure (e.g. Nassar, 2003 and Kyaing, 2003).

while the conditional elasticity of demand dominates. Thus, a price increase does not have a major impact on smoking prevalence, but encourages smokers to cut down their average consumption. On the other hand, Kyaing (2003) found that, in Myanmar, the absolute value of the price elasticity of smoking participation is high, implying that an increase in the price of cigarettes has a large impact on smoking prevalence. Smokers who do not quit in reaction to a price increase, apparently do not significantly cut down their cigarette consumption, even though smoking has become more expensive.

Other than estimating different price elasticities for different income groups, the survey data sets allow one to estimate different *income* elasticities for the various income groups. As is evident from Tables 3.1 and 3.2, practically all studies based on time series data find that income has a positive impact on the demand for cigarettes. The income elasticity of demand is nearly always between zero and one, implying that cigarettes are normal products. However, in studies based on household survey data, the relationship between income and cigarette consumption is less clear. Often the income elasticities are smaller than the income elasticities derived in time series data analyses (e.g. Sayginsoy et al., 2000, Arunatilate and Opatha, 2003). Furthermore, the income elasticity of demand for high-income earners is negative in some cases, implying that cigarettes for such people are inferior products (e.g. Arunatilate and Opatha, 2003). This is generally explained by the fact that more affluent people are generally more educated, and are thus more likely to heed health warnings.

3.5 Conclusion

The answer to the question "How effective are taxes in reducing tobacco consumption?" is "very effective" (Chaloupka, 1999). As has been indicated in this review chapter, a large and growing empirical literature has found that tobacco consumption decreases significantly when the price of tobacco increases. The consensus view is that the price elasticity of demand is around -0.4 for developed countries and between -0.4 and -0.8 for developing countries.

While non-tax tobacco control instruments like advertising bans, increased health awareness and clean indoor air policies certainly have a place in a comprehensive tobacco control strategy, the empirical evidence indicates that the impact of these interventions on the demand for tobacco is modest in comparison with the impact of a substantial tax-induced price increase. However, it is possible that the non-price interventions contribute to changing societal norms regarding smoking behaviour, but these are difficult to measure with standard econometric techniques. On the other hand, excise taxes have a direct and immediate impact on the demand for cigarettes. Also, whereas non-price tobacco control interventions are discrete (e.g. when advertising is banned, it cannot be banned any further), there is no such limitation on excise taxes. Tobacco excise taxes can be increased to very high levels. For example, in some Scandinavian countries taxes comprise more than 80 per cent of the retail price.

According to tobacco control advocates the rationale for increasing the excise tax on cigarettes is to enhance public health. A number of studies have hypothesised the public health consequences of a tobacco-free society and the analyses suggest that the impact on life expectancy and overall health is very pronounced (e.g. Warner 1987). However, increased excise taxes on tobacco also have very positive fiscal effects. Given the relative inelasticity of the demand for tobacco an increase in the excise tax will increase total excise revenue, despite the decrease in tobacco consumption. However, a limitation of excise taxes as a tobacco control and government revenue instrument is the possibility that an increase in excise taxes will increase cigarette

smuggling. While this point has been raised repeatedly by the tobacco industry, tobacco control economists argue that this threat is generally exaggerated (Joossens and Raw, 1995).

The question arises: will the government kill the goose that lays the golden eggs by increasing the excise tax too much? To date, no credible study has found that an increase in the level of the excise tax has decreased total tax revenue. However, in principle there will come a point where further increases in the excise tax might result in a decrease in the total excise revenue. This issue, together with the issue of the estimation of overall cigarette price and income elasticities in South Africa, is the topic of chapters 4 and 5.

CHAPTER 4

CIGARETTE TAXES, PRICES AND CONSUMPTION

4.1 Introduction

This chapter has two aims: firstly, to analyse the mainstay of South Africa's tobacco control policy, namely increased excise taxes, and secondly, to investigate econometrically the demand for cigarettes.

As was pointed out in the previous chapter, control measures such as restrictions on smoking in public places and advertising restrictions have played an important role in de-glamorising smoking, but their direct impact on reducing tobacco consumption is less clear. According to the international literature (see chapter 3), the potentially most potent deterrent to smoking is a large rise in the price of cigarettes. With the excise tax comprising a substantial proportion of the retail price of cigarettes in South Africa, as in most countries, the government can have a significant impact on the price of cigarettes, by changing the level of the excise tax.[79]

Of course, the effectiveness of excise tax increases is determined largely by cigarette manufacturers' reactions thereto. Conventional microeconomic theory suggests that the proportion of the increase in the excise tax passed on to consumers varies inversely with the price elasticity of supply of the product concerned. Unless the tobacco industry is faced with a perfectly elastic supply curve, the industry is hypothesised to carry a portion of the excise tax increase (i.e. by increasing retail cigarette prices by less than the increase in the cigarette excise tax). Average-cost pricing theory, in contrast, suggests that producers will pass on the full amount of the increase in the excise tax to consumers.

The effectiveness of the excise tax increase, as a tobacco control measure, would be undermined by the extent to which cigarette manufacturers do not pass on the increase in the cigarette excise tax. On the other hand, should the industry decide to increase the retail price of cigarettes by more than the increase in the excise tax, the impact of the tax increase on cigarette consumption would be amplified. From a tobacco control perspective the latter development would be advantageous. The tobacco industry's pricing strategy in reaction to excise tax increases in South Africa is investigated more fully in chapter 5.

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79. In most high-income countries more than 70 per cent of the retail price of cigarettes consists of taxes (Chaloupka, et al., 2000a). For middle and low-income countries the percentage is generally lower, but in nearly all countries taxes comprise more than 30 per cent of the retail price of cigarettes.

The structure of the chapter is as follows: in Section 4.2 a brief overview of South Africa's cigarette excise tax policy is provided. This is followed in Section 4.3 by a review of the main trends in some of the most important tobacco control variables: excise tax, retail price, and consumption. In Section 4.4 the demand for cigarettes in South Africa is specified and estimated using cointegration techniques. Some of the results obtained in this chapter are used as inputs to the analysis on the industry's reaction to the excise tax increases, which is presented in chapter 5.

4.2 Overview of South Africa's cigarette excise tax policy

South Africa's tobacco control strategy rests on two main pillars: (1) increases in the excise tax on tobacco products, and (2) tobacco control legislation. As was shown in chapter 1, the passing of South Africa's tobacco control legislation generated much public and media debate. In contrast, the annual increases in the excise tax on cigarettes in the second half of the 1990s did not spark nearly as much media attention, other than the expression of shock by the tobacco industry. This is somewhat ironic, because the international evidence (discussed in chapter 3), and the South African experience, presented in this chapter, clearly indicate that consistent and large tax increases have had a more pronounced impact on cigarette consumption than legislative interventions.

Throughout the twentieth century tobacco excise taxes have been an important source of government revenue. As a percentage of total government revenue, tobacco excise taxes increased from 1.0 per cent in 1911/12, to 3.8 per cent in 1930/31, and to 6.9 per cent in 1950/51 (Van Walbeek, 1996: 22). It peaked at 7.6 per cent of total government revenue in 1960/61, decreasing to 4.4 per cent in 1970/71, 2.4 per cent in 1980 and 1.1 per cent in 1990.

Between 1961 and 1990 the nominal excise tax on cigarettes, which is levied as a specific tax, increased from 9.1 cents per pack to 36.1 cents per pack (Tobacco Board, various years). However, given South Africa's rapid inflation during the 1970s and 1980s, this meant that the *real* excise tax per pack decreased by more than 70 per cent over the 1961-1990 period. The fact that the real excise tax decreased so sharply during the 1970s and 1980s can in all likelihood be attributed to the unhealthily close relationship that existed between the tobacco industry and the National Party government during this period. Two published quotes should illustrate this. In the 1983 Budget Speech, the then Minister of Finance, Owen Horwood, said: "The Tobacco Board has presented justified arguments for the maintenance of the status quo regarding the excise taxes on tobacco, and I do not intend to wake sleeping dogs" (Republic of South Africa, 1983). In the 1986 Budget Speech the level of excise tax on cigarettes was not increased on the grounds that "any increases in excise duties at present could be counter-productive, since it could in fact – on account of the potentially adverse effect on consumption – lead to a reduction of revenue from this source" (Republic of South Africa, 1986: 12). Considering that in 1986 excise taxes comprised less than 30 per cent of the retail price of cigarettes, that the real level of excise tax on tobacco had been decreasing steadily for the previous 15 years, and that numerous econometric studies from around the world indicated that the demand for cigarettes is relatively price inelastic, the industry must have marshalled very strong arguments to persuade the Minister to believe this.

Things changed significantly after South Africa's first democratic elections in April 1994, when the African National Congress became the senior partner in the Government of National Unity. In the 1994 Budget Speech the then Minister of Finance, Derek Keys, announced that the government intended to increase the level of excise tax to 50 per cent of the retail price, a rate similar to that in many other countries (Republic of South Africa, 1994: 5.7). Importantly, the Minister pointed out that the primary aim of the increase was the promotion of public health, rather than extra revenue. In the 1994, 1995 and 1996 Budget Speeches, the tax increases of between 18 and 25 per cent were comparatively modest, but in 1997 and 1998 increases of 52 per cent and 29 per cent, respectively, were announced. Since 1997 the Department of Finance has claimed that the target excise tax rate of 50 per cent of retail price has been achieved. As will be pointed out in Section 4.3.2, this is more illusory than real. However, this does not detract from the fact that the government has made much progress in raising cigarette excise taxes to levels where they serve as an effective deterrent to smoking.

Not surprisingly, the tobacco industry berated the increases as unfair, arguing that cigarettes were already the most heavily taxed consumer product, and that it would increase the incidence of smuggling. In their corporate video and presentation on tax and smuggling issues, BAT South Africa draws a very clear link between the two (Simon Millson, Director, Corporate and Regulatory Affairs, BAT South Africa, personal communication: 2004). Illegal (i.e. counterfeit and smuggled) cigarettes are presented as the bane of legitimate cigarette manufacturers, which undermine their brands, and cause consumer resistance and confusion. The fact that excise taxes in South Africa are generally higher than in the neighbouring countries, and have increased seven-fold in nominal terms between 1993 and 2003, is held to be the main cause of the alleged increase in cigarette smuggling.

The link between cigarette taxes and cigarette smuggling seems to be held as an article of faith among multinational tobacco companies.[80] In October 1996 Johann Rupert, the chairman of Rembrandt, wrote a full-page open letter to the Minister of Health in which he argued that "cheap smuggled cigarettes" had entered South Africa illegally as a result of the high tobacco taxes (Rembrandt Group, 1996). In his letter he warned the Minister that this trend would continue if she increased taxes further. The rationale for highlighting the tax-smuggling relationship is obvious: if tax increases result in more smuggling, the government would curb smuggling by not increasing the excise tax on cigarettes. The fact of the matter is that since 1996 the real excise tax on cigarettes has nearly tripled. Other than some well-publicised apprehensions of cigarette smuggling syndicates, there is no strong evidence that cigarette

[80]. The following quotes are taken from BAT's website (www.bat.com): "Smuggling is caused by tax differentials, weak border controls, and import restrictions and bans…In the UK, where tobacco duties are far higher than in many neighbouring European countries, Her Majesty's Customs & Excise estimates for the year 2001-2002 put smuggled tobacco goods at some 21 per cent of the market, causing losses of tax revenue to the UK Government of more than £3.5 billion a year." The best way to reduce smuggling is to reduce, or at least not increase, the tax rate. According to BAT "when the Hong Kong Government used dramatic increases in cigarette tax to try to deter smoking, smoking did not reduce, but smuggling soared. The tobacco industry worked with Government to try to solve the problem, and one outcome was a freeze on further tax increases".
These sentiments are echoed in the websites of Philip Morris (www.philipmorrisinternational.com) and Japan Tobacco (www.jti.com) and the report of the International Tax and Investment Centre (2003).

smuggling in South Africa is out of control.[81] From this experience it seems that the industry's comments on the threat of smuggling in reaction to tax increases seem exaggerated.

In 2004 the Minister of Finance, Trevor Manuel, announced that the excise tax on cigarettes would be adjusted so that the sum of excise tax and VAT would equal 52 per cent of the retail price of cigarettes (Republic of South Africa, 2004). In order to allow proper planning in the tobacco industry, the tax incidence would remain at this level for the following three years. In the 2005 Budget speech the Minister of Finance increased the level of the excise tax by 52 cents per pack in order to maintain the 52 per cent tax incidence.

4.3 Trends in cigarette consumption, prices, excise tax and excise revenue

The ultimate aim of a tobacco control policy is to decrease mortality and morbidity associated with tobacco consumption. In the short term the aim is to reduce tobacco consumption. If one accepts this as justification for intervention, the success of a tobacco control policy would be measured by the extent to which it has reduced consumption. Other issues, such as increases in retail prices or government revenue, while not unimportant, would be secondary. Nevertheless, given the fiscal demands on the South African government, an increase in excise revenues would certainly relieve the pressure on other revenue sources. Trends in some tobacco-related variables, namely cigarette consumption, prices, excise tax and excise revenue, are shown in Table 4.1.

[81]. Such evidence would presumably consist of at least the following: (1) regular reports of the existence of smuggling syndicates and the arrest of smugglers, (2) a strong awareness among the public of the existence of cigarette smuggling; (3) a rapid decrease in legal cigarette sales, not explained by an increase in cigarette prices and/or other tobacco control interventions. In South Africa these three conditions apparently do not hold. In contrast, Cunningham (1996) investigated cigarette smuggling into Canada in the early 1990s, and it was quite obvious that, despite the fact that smuggling is difficult to monitor and quantify, the evidence clearly pointed to large-scale cigarette smuggling.

Table 4.1: Trends in cigarette consumption, prices and excise taxes

Year	Con-sumption Millions of packs	Price (Nominal) Cents per pack	Price (Real, 2000 base) Cents per pack	Excise tax (Nominal) Cents per pack	Excise tax (Real, 2000 base) Cents per pack	Excise tax as perc. of price	Industry price (Real, 2000 base) Cents per pack	Excise revenue (Real, 2000 base) R mill.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1961	517	19.1	616	9.1	294	47.6%	323	1517
1965	608	19.4	571	9.1	268	46.9%	303	1626
1970	783	22.1	553	11.1	278	50.2%	275	2173
1975	1048	31.8	521	14.6	239	45.9%	282	2508
1980	1283	49	454	20.1	186	41.0%	250	2388
1981	1443	53	424	20.1	161	37.9%	247	2320
1982	1632	62	434	21.1	148	34.0%	264	2408
1983	1551	66	413	24.1	151	36.5%	239	2336
1984	1570	74	413	24.6	137	33.2%	244	2158
1985	1571	84	404	26.1	125	31.1%	237	1972
1986	1591	94	381	26.1	106	27.8%	234	1681
1987	1671	109	380	26.1	91	23.9%	248	1520
1988	1795	122	377	27.1	84	22.2%	253	1502
1989	1809	138	372	30.6	82	22.2%	247	1492
1990	1868	165	389	33.1	78	20.1%	266	1459
1991	1927	171	350	37.6	77	22.0%	235	1482
1992	1900	222	399	44.6	80	20.1%	282	1520
1993	1802	255	417	53.2	87	20.9%	282	1567
1994	1769	284	426	60.5	91	21.3%	283	1605
1995	1708	348	481	75.3	104	21.6%	318	1777
1996	1690	387	498	92.0	118	23.8%	318	2001
1997	1577	497	589	117.5	139	23.6%	377	2195
1998	1495	608	674	169.5	188	27.9%	403	2810
1999	1422	730	769	214.3	226	29.3%	449	3210
2000	1334	803	803	254.5	255	31.7%	450	3396
2001	1276	889	841	291.5	276	32.8%	462	3518
2002	1234	987	855	325.3	282	33.0%	468	3480
2003	1210	1098	899	360.2	295	32.8%	494	3571
2004*	1208	1213	970	404.6	324	33.4%	528	3909

Note: * Preliminary figures (consumption, excise taxes and government revenue based on budgeted figures, prices based on an extrapolation of the first seven months of 2004).

All data were converted to calendar years using a weighted average of the financial year, if the source data were in financial year format.

Source: Auditor-General (selected years), Statistics South Africa (1998), Republic of South Africa (selected years), Tobacco Board (selected years).

4.3.1 Consumption

Between 1961 and 1991 recorded consumption of cigarettes grew at an average annual rate of 4.1 per cent. During this period annual per capita consumption increased from 50 packs to more than 80 packs.[82]

Aggregate cigarette consumption peaked in 1991 at nearly two billion packs, after which it decreased steadily. Between 1991 and 2003 aggregate consumption decreased by 37 per cent. This was the result of decreases in both smoking prevalence and smoking intensity, as was pointed out in chapter 2. During the mid- and late-1990s the rate of decrease in cigarette consumption was very sharp, with annual decreases of around 5 per cent per year. However, in the period 2001-2004 the average rate of decrease moderated to about 2-3 per cent per year.

Given that tough anti-smoking legislation was introduced in 2001, the rather modest decrease in tobacco consumption since then may come as a disappointment to champions of such legislation. However, one cannot judge the success, or otherwise, of the legislation without considering other factors that determine the demand for cigarettes. Specifically, the growth in the country's GDP and average real personal disposable incomes in the period since 2000 could have stimulated the demand for cigarettes, ceteris paribus. For this reason a multiple regression framework is crucial to disentangle the impact of the various demand determinants.

4.3.2 Excise duties

As in many countries (Sunley et al., 2000), cigarette excise taxes in South Africa are levied as a specific tax. While a specific tax is relatively easy to administer, it can be rapidly eroded in times of inflation. This is exactly what happened in South Africa during the 1970s and 1980s. Buckling under the pressure exercised by the cigarette manufacturing industry and the Tobacco Board (representing the tobacco-growing subsector), the government allowed inflation to reduce the excise tax rate from 50 per cent of the retail price of cigarettes in 1970 to only 20 per cent in 1990. Between 1970 and 1990 the real level of excise tax fell by 72 per cent, from 278 cents per pack to 78 cents per pack (in 2000 prices).

However, as mentioned earlier, the Minister of Finance announced in June 1994 that the government would increase the excise tax on cigarettes to 50 per cent of the retail price, to be phased in over a number of years (Republic of South Africa, 1994). The result was that the nominal excise tax increased by 660 per cent between 1993 and 2004. In real terms, the excise tax increased by 272 per cent between 1993 and 2004.

Subsequently, the target of an effective 50 per cent *excise* tax on cigarettes was changed to a 50 per cent *total* tax (i.e. the sum of excise tax and VAT) on cigarettes. With a VAT rate of 14 per cent, a 50

82. Unless otherwise stated, per capita figures are calculated using a population aged 15 and older.

per cent total tax burden would imply that the excise tax would equal 37.7 per cent of the VAT-inclusive retail price.[83] Despite large increases in the level of excise tax, especially since 1997, the target tax rate of 50 per cent of the retail price has not yet been achieved. In 2004, excise taxes comprised only 33.4 per cent of the retail price, yielding a VAT-inclusive tax percentage of 45.7 per cent.

In each of the years between 1997 and 2003 the Ministry of Finance has claimed that the recommended increase in the level of excise tax would allow it to achieve the target excise tax rate of 50 per cent of the retail price. However, this is more illusory than real. The data suggest that the Ministry of Finance increases the level of excise tax to achieve a 50 per cent excise tax component, based on retail prices that do not take account of the tax increase. Thus, when the Minister of Finance announces the excise tax increase, total taxes as percentage of the retail price prevailing at the time of the announcement do indeed equal 50 per cent. However, the tax increase causes the retail price to increase, with the result that the denominator increases. So, *ex post*, the total tax percentage is lower than the claimed 50 per cent.

To solve this situation is quite simple. The Ministry of Finance should increase the excise tax to a level where total taxes equal 50 per cent of the retail price, taking the impact of the tax increase on the retail price into account. Of course this presupposes knowledge of the impact of tax increases on the retail price. The most plausible assumption is that the increased tax is fully passed on to consumers, and that the Ministry of Finance would calculate the required tax increase based on this assumption. Obviously, increasing the targeted tax percentage from 50 to 52 per cent of the retail price will increase the effective tax percentage, but unless the nominal cigarette price increases are very small, the ex post tax percentage is unlikely to ever exceed 50 per cent under the current formula.

As mentioned in the introduction to this chapter, the industry's pricing strategy and how they pass the excise tax increase to consumers has an important bearing on the effectiveness of the tax as (1) a tobacco control tool, and (2) a revenue generating mechanism. From Table 4.1 it is evident that the industry price of cigarettes (defined as the retail price less excise taxes and VAT) has more than doubled in real terms since the early 1990s. The impact of this is to decrease the ex post effective tax rate on cigarettes. As will be pointed out in chapter 5, the industry's pricing strategy in reaction to the excise increases has increased their profitability at the expense of the consumer, but has certainly had good tobacco control consequences.

4.3.3 Excise revenue

Before the rapid increases in the cigarette excise tax after 1994, total real excise revenue decreased rapidly, despite the fact that cigarette consumption was increasing. Due to the decrease in the real excise tax, real (in constant 2000 prices) cigarette

[83]. At a nominal rate of 14 per cent, VAT comprises 12.3 per cent (=0.14/1.14) of the VAT-inclusive retail price.

excise revenue decreased from a high of around R2.5 billion in the mid-1970s to less than R1.5 billion in 1990.

The large increases in the real excise tax since 1994 have resulted in large increases in real excise revenue; in fact, real cigarette excise revenues have more than doubled since 1993, despite the fact that consumption has decreased by a third. Cigarette excise revenues currently comprise about 1.5 per cent of total government revenue (Republic of South Africa, 2004), compared to about 1 per cent in the early 1990s.

4.3.4 Cigarette prices

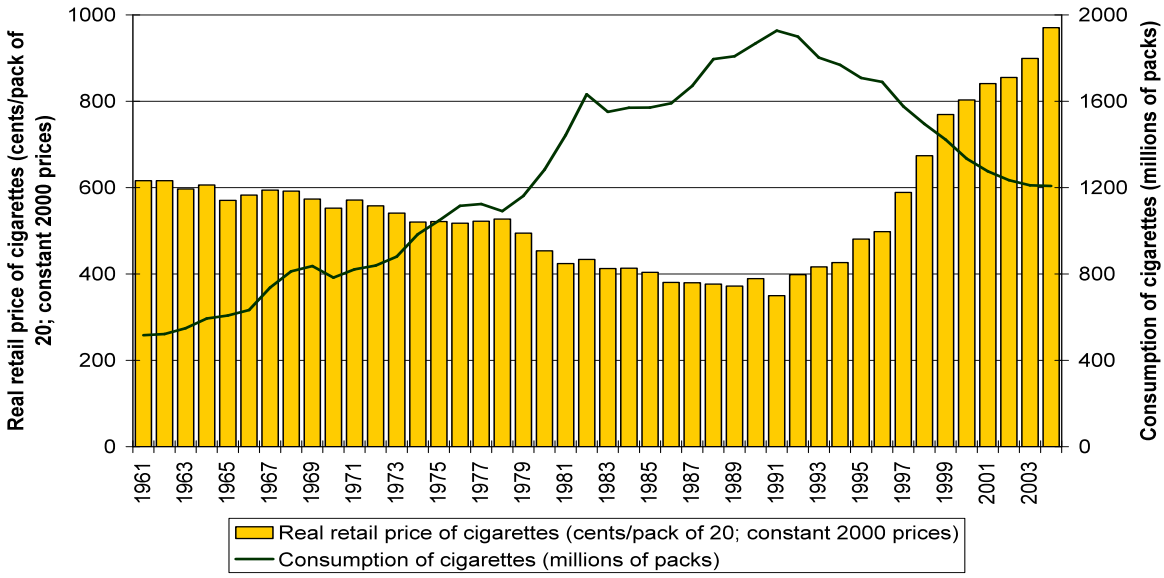
As could be expected, the real retail price of cigarettes closely follows the real excise level given that excise taxes comprise a sizeable share of the retail price. The real retail price decreased by 43 per cent between 1961 and 1991, as a result of a 74 per cent decrease in the real excise tax, and a 27 per cent decrease in the real industry price of cigarettes.

The real price of cigarettes started to increase very rapidly from 1992. In nominal terms the price of cigarettes increased at an average annual rate of 15.2 per cent between 1992 and 2004. During the same period, the real price of cigarettes rose by 143 per cent, an average annual increase of nearly 8 per cent.

The relationship between cigarette consumption and real cigarette prices is shown in Figure 4.1. This simple diagram clearly illustrates the strongly negative relationship between these two variables, although the growth in consumption up to 1983 is much faster than the fall in the real price.[84] A more rigorous treatment of the determinants of the demand for cigarettes is provided in the following section.

[84]. Yussuf Saloojee (Director, National Council Against Smoking, personal communication, 2004) explains that an earlier version of this graph was used by the National Council Against Smoking to persuade the then Deputy President, FW de Klerk, that an increase in excise taxes was an effective tool to curb cigarette consumption. According to Saloojee, the chain-smoking Deputy President was impressed by the strong negative relationship between cigarette prices and consumption, and subsequently supported the notion that tax increases could act as an effective tobacco control mechanism. What this anecdote suggests is that simple, yet well-presented, data can have much policy impact.

Figure 4.1: Cigarette real retail price and cigarette consumption, 1961-2004



Source: Auditor-General (selected years), Statistics South Africa (1998), Republic of South Africa (selected years).

4.4 Estimating the demand for cigarettes in South Africa[85]

Chapter 3 clearly illustrated that the single most important determinant of cigarette consumption is the price of cigarettes. From a tobacco control perspective, the recommended policy would be to increase the level of the excise tax, since this would result in a reduction in cigarette consumption. However, the effectiveness of a policy of raising the excise tax depends crucially on the magnitude of the price elasticity of demand. The greater the absolute value of the price elasticity of demand, the larger the impact of a given tax increase is likely to be on the cigarette consumption, and vice versa.[86]

Previous South African studies have found that the demand for cigarettes in South Africa is relatively price inelastic, with most price elasticity estimates clustered between -0.5 and -0.9 (Reekie, 1994, Van Walbeek, 1996 and ETCSA, 1998). Reekie (1994) and Van Walbeek (1996) used single equation techniques to estimate the demand equations, while ETCSA (1998) used a system of equations.

In the past two decades there have been major advances in econometric theory and practice, particularly in time-series analysis,

85. This section has benefited much from the input of Johannes Fedderke and Stan du Plessis. Their practical insights are gratefully acknowledged.

86. In chapter 5 this aspect, together with the impact that excise tax increases are likely to have on government revenue, is investigated in substantial detail.

as will be indicated below. Whereas previously applied econometricians largely ignored the dangers of performing analyses with non-stationary data, this issue is central to current econometric practice. Also, there is increased awareness of the fact that single equation models place unrealistic restrictions on the data, and that a more general and encompassing approach to econometric modelling is required (Enders, 2004: 262-264).

In the following sections a multi-equation system is specified and estimated using the Johansen technique. While this technique is generally regarded as state of the art in time-series analysis, its major drawback is that it is very data intensive. As will be pointed out, results of the present study are sensitive to small changes in the specification of the model, which can be attributed primarily to the fact that the model employs fewer than 40 annual observations. Unfortunately it was impossible to find longer time-series and/or higher frequency data. One could argue that it does not make sense to use such an advanced and data-intensive estimation technique given the relative paucity (and in some instances the poor quality) of the data. According to this view, the data simply cannot bear the demands that the technique places on the data. Despite all the practical drawbacks associated with this technique, it is presented here, on the grounds that it may help to understand the intricacies of the cigarette market.

Rather than presenting a systems model in which both supply and demand equations are estimated, one could make certain assumptions about industry behaviour and focus exclusively on the demand for cigarettes. This alternative approach would entail the estimation of a single equation, which places fewer demands on the data. The drawback is that such an approach is theoretically less sound than a systems approach, and thus the accusation of model misspecification could be levelled against it. As will be pointed out, the results obtained by employing this approach are less sensitive to small specification changes than the results obtained from the systems approach.

While it is unfortunate that one is caught between two imperfect approaches, the practical reality is that there is no "golden key" that employs the best possible techniques and provides robust econometric results. In the ensuing discussion, the results of the systems approach are presented first, followed by the single equation approach.

4.4.1 The modern econometric approach

The main focus of the modern approach to econometrics is on the stationarity, or otherwise, of the data. If two or more time-series are non-stationary, it is quite possible that a statistically significant, but entirely meaningless relationship exists between them. This is the problem of spurious regression. A number of tests have been developed to determine whether time-series are stationary or not, of which the augmented Dickey-Fuller and the Phillips-Perron tests are the most widely used (see Harris, 1995 and Patterson, 2000). In a stationary time-series the mean, variances, and autocovariances are independent of time. Such time-series are said to be integrated of order zero, denoted as I(0). Non-stationary time-series can always be made stationary by differencing. A time-series which needs to be differenced *b* times in order to yield it stationary is said to be integrated of order *b*, denoted as I(*b*). As a general principle, a linear combination of I(*b*) variables will also be I(*b*). However, where a linear combination of I(*b*) variables is I(*b*-*d*), *d*>0, these variables are said to be cointegrated, denoted as CI(*b*,*d*). If there is a long-run equilibrium relationship between a set of variables, then this would be represented as a cointegrating relationship, also known as a cointegrating vector (CV). A cointegrating relationship implies that, even though the individual time-series are non-stationary, the relationship is not spurious. Also, any deviations from the equilibrium will tend to be (partially) corrected for in the following period. In fact, according to the Granger Representation Theorem one can derive an error-correction model, also known as an equilibrium-correction model (ECM), if there is a cointegrating long-run relationship (Engle and Granger, 1987).

Given the complexity of the real world, a single-equation approach is unlikely to capture adequately all the intricacies. By employing a single-equation approach, a researcher would impose zero restrictions on many relationships without actually having tested whether such restrictions are statistically justified. A more prudent and less prescriptive approach would be to place fewer restrictions on the data and the nature of the relationships. By setting up the data in the form of a vector autoregressive relationship (VAR), all variables are endogenous, and each variable is specified to be determined by its own lagged values and the lagged values of all other variables in the system. Within such a VAR system, one can then determine one or more cointegrating relationships.

The Johansen technique, first developed by Johansen and his colleagues (see Patterson, 2000: 616) has become the standard way of establishing cointegration in a multivariate system. It is well described in numerous textbooks (e.g. Patterson, 2000, Harris, 1995 and Enders, 2004) and is a standard feature of most econometric software packages.

Two major advantages of the Johansen approach are that it does not impose *a priori* restrictions on the exogeneity of the variables in the system (although it does allow for them if desired) and allows for the possibility of more than one cointegrating relationship between the variables. Rather than estimating the long-run cointegrating equation and ECM sequentially, they are estimated simultaneously.[87] While

[87]. An alternative, but limited approach to cointegration is the Engle-Granger two-step approach. It requires the researcher to first estimate the long-run equation using OLS. Cointegration is deemed to exist if the residuals are stationary. Once cointegration is established, the second

the estimation techniques are driven by the *statistical* features of the data, the important aspect of the Johansen approach is the *economic* interpretation of the results.

The Johansen approach consists of the following steps:

1. Test for the order of integration of each variable entering the multivariate model. Most economic time-series (with the possible exception of nominal variables such as money supply, the CPI and nominal national accounting magnitudes) are I(1). Fedderke (2003: 211) points out that the standard Johansen technique applies only to systems of variables that are strictly I(1), although an estimation method for variables that are I(2) has been developed by Johansen (Patterson, 2000: 767).

2. Select the appropriate lag length for each of the endogenous variables included in the vector autoregressive (VAR) model. As a general rule it is better to include more, rather than fewer lags in the VAR, since an underparameterised model will give biased results (Fedderke, 2003: 198). On the other hand, an overparameterised model is very data intensive and less efficient, particularly when the sample size is small.

3. Determine the number of CVs in the VAR.

4. Based on the number of CVs found and economic theory, identify the system by imposing just-identifying restrictions on the long-run regression equations. The just-identifying restrictions are necessary to ensure that multiple CVs are empirically distinguishable from each other (Patterson, 2000: 637).

5. Using over-identifying restrictions, test whether the individual coefficients in the long-run equations are statistically significant. Some coefficients in the CVs are expected to be insignificant, if they are presumed to be irrelevant to the relationship under scrutiny. A test of over-identifying restrictions is a joint test to determine whether a set of restrictions are statistically justified or not. Furthermore, if over-identifying restrictions indicate that superfluous variables can be safely removed from the CVs, the statistical significance of the remaining variables can be tested, again using over-identifying restrictions.

6. Estimate the ECM to determine the short-run dynamics of the system. The ECM includes the lagged residuals from the long-run equation. If there are deviations

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step is to estimate an ECM, which includes the lagged errors from the long-run equation. While this sequential approach is easy to apply, the Engle-Granger approach suffers from a number of drawbacks. These drawbacks include the imposition of zero restrictions on potentially important relationships, and the assumption that there is only one CV, when there might be more than one (Fedderke, 2003: 198-199). Given these drawbacks, the Engle-Granger approach is not recommended.

from equilibrium in the long-run equations, the residuals in the long-run equation will (partially) compensate for these deviations in the following period.

4.4.2 Specifying the supply and demand system

Because the price of cigarettes and cigarette consumption are simultaneously determined, a systems approach is required to ensure unbiased parameter estimates. Provided the system is adequately identified, one can then distil the supply and demand equations from this system.

Standard demand theory indicates that the quantity demanded of a product depends on a number of factors, such as its own price, the income of consumers, the extent of the market (population size), the price of related products, tastes and product-specific factors. In the case of cigarettes, the product-specific factors would presumably include legislative and social aspects related to smoking.

Formally, the demand equation for cigarettes can be expressed as

$$Q_{DEMAND} = f(P_{2000}, PDI_{2000}, P_s, P_c, ADV_{2000}, TC), \quad (4.1)$$

where the explanations of these variables are provided in Table 4.2 and are shown graphically in Figure 4.2.[88]

Similarly, the quantity supplied can be derived as a function of price (i.e. the industry's income) and cost factors. The following specification was used as the basis for identifying and estimating the cigarette supply equation:

$$Q_{SUPPLY} = f(P_{2000}, TOBPP_{2000}, PAPER_{2000}, EXCISE_{2000}, CR4), \quad (4.2)$$

where the explanations are also given in Table 4.2 and shown graphically in Figure 4.2.

Raw tobacco leaf ($TOBPP_{2000}$) and paper products ($PAPER_{2000}$), together with the excise tax ($EXCISE_{2000}$) represent the major cost factors for the cigarette manufacturing industry, and should be negatively related to the quantity of cigarettes supplied. Given the high degree of concentration in the cigarette manufacturing industry, one would expect producers to be able to influence prices by limiting the quantity supplied. The four-firm concentration ratio (CR4) aims to capture the degree of market power in the tobacco industry. However, readers should note that the quality of these data is poor.[89] In

88. One could argue that, other than PDI_{2000}, population size should be included in the regression equation as a proxy for market size. In the empirical application this strategy was followed, but was abandoned because of the high degree of correlation (r = 0.993) between population and PDI_{2000}.

89. The following data were derived from the censuses of manufacturing, with the tobacco industry being defined as the cigarette, cigar, snuff and tobacco industries:

Year	CR4	Year	CR4	Year	CR4
1967	0.927	1979	0.972	1988	0.858
1972	0.954	1982	0.862	1991	0.910
1976	0.982	1985	0.879	1993	0.890

Sources: Censuses of manufacturing, various years

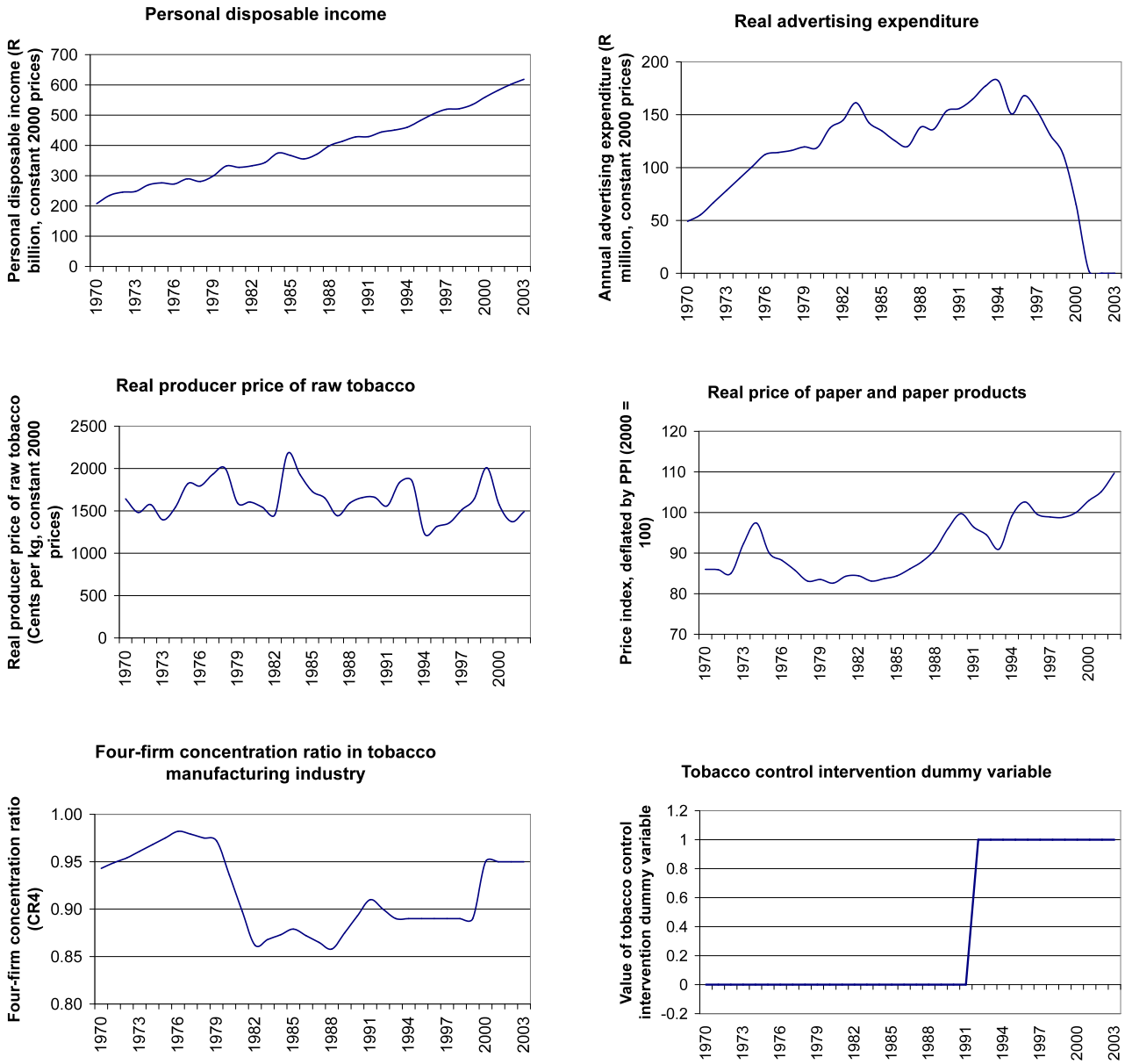
principle, one would expect a negative relationship between CR4 and Q_{SUPPLY}, given that more concentrated industries would be tempted to use their monopoly power to raise prices by reducing the quantity supplied.

For non-census years before 1993 the data were interpolated. For manufacturing censuses after 1993, the tobacco industry was included in the category of miscellaneous industries, and could thus not be identified separately. Thus for the period 1993 to 1999 the CR4 was held constant at 0.890. In light of the Rothmans-BAT merger in 1999, the CR4 ratio was increased to 0.950 in 2000.

Table 4.2: Definition and units of measurement of relevant variables

Variable	***Description***	***Comments***	***Unit of measurement***
Q_{DEMAND}	Cigarettes demanded		Millions of packs per annum
PDI_{2000}	Real personal disposable income	Deflated by CPI (2000 = 100)	R millions, constant 2000 prices
P_{2000}	Real price of cigarettes	Deflated by CPI (2000 = 100)	Cents per pack of 20, constant 2000 prices
P_s	Price of substitutes	This would include price of roll-your-own and pipe tobacco. Reason for non-inclusion is because time-series data for these products do not exist and are highly correlated with P_{2000}. Also, the demand for these substitutes is small.	Not applicable
P_c	Price of complements	Possibly alcoholic beverages (see Jimenez and Labeaga, 1994) and marijuana (see Chaloupka et al., 1999). Reason for non-inclusion is because of data unavailability.	Not applicable
ADV_{2000}	Impact of advertising	Advertising expenditure, deflated by the PPI (2000 = 100).	R millions, constant 2000 prices
TC	Tobacco control interventions	The impact of the anti-smoking legislation (first passed in 1993) and changing societal norms was captured by means of dummy variable (1970-1992 = 0; 1993-2003 = 1). Alternative specification: 1970-1992 = 0; 1993-2003 = t-1992. Unfortunately, slowly changing, but difficult to measure factors like society's attitude towards smoking can not be measured directly.	0-1 dummy variable and trend variable, starting in 1993
Q_{SUPPLY}	Cigarettes supplied		Millions of packs per annum
$TOBPP_{2000}$	Real producer price of raw tobacco	Gross value of tobacco leaf produced, divided by total tobacco production, and deflated by the PPI (2000 = 100). Source: Department of Labour.	Cents per kg; constant 2000 prices
$PAPER_{2000}$	Real price of paper and paper products	Price index of paper and paper products (as published in the PPI statistics), deflated by the PPI (2000 = 100).	Index value; 2000 = 100
$EXCISE_{2000}$	Real excise tax on cigarettes	Deflated by CPI (2000 = 100).	Cents per pack of 20, constant 2000 prices
CR4	Four-firm concentration ratio	Percentage of gross output produced by the four largest establishments in the cigarette, cigar, snuff and tobacco industries. Derived from the manufacturing censuses of various years. Given interpolation, extrapolation and the generally poor quality of data, this variable must be treated with great caution.	Ratio, between zero and one

Figure 4.2: Graphical representations of variables included in the VAR[90]



4.4.3 Testing for stationarity

As was mentioned in Section 4.4.1, time-series data are characterised in terms of the stationarity of their underlying data-generation processes. While the theoretical literature distinguishes between trend and difference stationarity (Patterson, 2000: 225-227, Harris, 1995 and Enders, 2004: 164-170), in practice trend stationary time-series are rare. However, for small samples, stationarity tests often cannot distinguish between these two types of stationarity. A visual inspection of the data did not suggest trend stationarity, and it was thus not investigated further in this study.

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90. Graphical representations of Q and P_{2000} were given in Figure 4.1, while $EXCISE_{2000}$ is presented in Figure 5.1.

The standard way to test for stationarity is by means of the augmented Dickey-Fuller (ADF) test. The null hypothesis is that the time-series is non-stationary. Rejection of the null implies that the series is stationary. To ensure that the error terms in the Dickey-Fuller test equation are white noise, a number of lags of the dependent variable are included in the test equation. In this study the lag length was determined by the Schwartz Information Criterion (SIC) (Patterson, 2000: 238-241). Where a time-series was found to be non-stationary, the first difference of that series was tested for stationarity, to establish whether the original series was I(1). As mentioned previously one expects most time-series to be I(1). Unfortunately, the ADF test has the drawback that it has low power, in that it may reject the hypothesis that the time-series is non-stationary, when in fact it is non-stationary (Patterson, 2000: 258, Enders, 2004: 156 and Fedderke, 2003: 109).

In practice, especially where the ADF test gives inconclusive or counterintuitive results, it is more prudent to base the decision on a number of tests, such as the Phillips-Perron test,[91] the correlogram and the spectrum (Fedderke, 2003: 112). In addition, there may be structural breaks in the data, which could "mislead" the other tests to conclude non-stationarity (or integration of a higher order), where in fact the data are stationary (or integrated of a lower order than indicated by the standard tests), but subject to a structural break. Perron's innovational outlier model specifically aims at testing for structural breaks in the data.[92] As was pointed out above, there have been significant changes in cigarette taxes, prices and consumption in the past 30 years, and one would want to test whether these constitute a structural break. In Table 4.3 the ADF tests are shown for all relevant variables, and Perron's structural break tests are shown for P_{2000} and $EXCISE_{2000}$.

Both the ADF and Perron tests are sensitive to the number of augmented terms included in the test equation. For the ADF test a trend was not included in the test equation. For the Perron test a trend variable (i.e. coefficient β in footnote 14) was initially included in the specification, but was removed if it did not add significantly to the model. The "best" test equation was chosen on the basis of the SIC.

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91. The Phillips-Perron test is similar to the augmented Dickey-Fuller test, with the exception that, rather than augmenting the test equation with lagged values of the dependent variable, a Newey-West transformation is applied to correct for autocorrelation in the residuals in the test equation.

92. The Perron test for structural breaks has the following structure:

$y_t = \mu + \beta t + \theta DU_t + \gamma DT_t + \delta DTB_t + \alpha y_{t-1} + \Sigma \alpha_i \Delta y_{t-i} + e_t$,

with $DU_t = 1$ if $t > T_b$, zero otherwise; $DT_t = t - T_b$ if $t > T_b$, zero otherwise; $DTB_t = 1$ if $t = T_b + 1$, where T_b is the time point where the structural break is held to have occurred (Fedderke, 2003: 127). The Phillips-Perron test involves testing whether α is significantly different from one. The associated t-value has a non-standard distribution, but the critical values have been recorded by Perron (see Fedderke, 2003: 127).

Table 4.3: Augmented Dickey-Fuller and Perron tests for relevant variables, 1970-2003

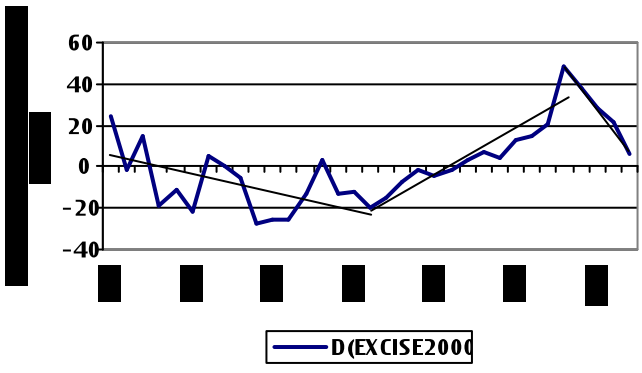
	ADF test with no trend in test equation (No. of lags in parentheses)		Perron tests on first differences for break in (No. of lags in parentheses)					Conclusion
Variable	Levels	1st diff.	1991	1992	1993	1986 & 1998	1986 & 1999	
Q	-1.60 (1)	-3.06* (0)						I(1)
PDI_{2000}	1.50 (2)	-5.95* (1)						I(1)
P_{2000}	-0.88 (2)	-1.65 (2)	-3.66 (0)§	-5.63* (0)§	3.37 (2)§			I(1), with one structural break
$EXCISE_{2000}$	-1.46 (1)	-2.19 (0)				6.93* (2)§§	4.78 (2)§§	I(1), with two structural breaks
AD_{2000}	-1.17 (1)	-3.48* (0)						I(1)
$TOBPP_{2000}$	-3.71* (0)							I(0)
$PAPER_{2000}$	-0.49 (0)	-4.36* (0)						I(1)
CR4	-1.77 (1)	-3.79* (0)						I(1)

* Significant at 5 per cent level of significance.
§ No trends included in test equation.
§§ Trends included in test equation.

The ADF statistics suggest that Q, PDI_{2000}, AD_{2000}, $PAPER_{2000}$ and CR4 are I(1), while $TOBPP_{2000}$ is I(0). A graphical analysis of P_{2000} (see Fig. 4.1) indicates that the structural break occurred in the early 1990s, and the Perron test suggests that 1992 was the point of the break. A graphical analysis of $D(EXCISE_{2000})$ indicates that there were two structural breaks in this variable: one in 1986, followed by one in 1998.[93] These structural breaks should be accounted for by including appropriate deterministic components in estimation.

Given that the time-series under scrutiny are generally non-stationary, the implication of these results is that an approach that does not test for cointegration might yield spurious results. Thus, in order for these results to be economically meaningful, at

[93]. See diagram below:



least one cointegrating relationship must be found. This is the focus of the following section.

4.4.4 Testing for cointegration

In establishing the number of CVs in the VAR, one can specify whether intercepts and/or trends are included in the cointegrating space or not. As the default in this study, the intercepts were unrestricted, but no trends were included, on the grounds that the inclusion of trends in the long-run and short-run relationships imply quadratic trends in the data, which, given a graphical representation of the data, seems inappropriate in this context (Patterson, 2000: 627).[94]

The VAR was estimated for the period 1971 to 2002, and is based on thirty-two annual observations. The first step was to determine the lag length of the VAR. Patterson (2000: 649) indicates that the SIC performs well in the context of simultaneously estimating the lag length and the cointegrating rank of the VAR, and based on this information criterion the optimal lag length was found to be equal to one. Given that the data is annual, this result is not implausible. The results presented here are based on a VAR with a lag length of one.[95]

In establishing the number of CVs, one can use either the maximal eigenvalue or the trace statistic approach. These two approaches often give the same result, but exceptions are possible. Since the trace statistic has better power properties for small samples and is more robust to skewness and excess kurtosis in residuals, the trace statistic, rather than the maximal eigenvalue, was employed in this study (Fedderke, 2003: 215).

As was pointed out above, it is well known that the Johansen technique is very data intensive, and ideally one would want to work with more than thirty-two observations. The unfortunate result of using so few observations is that the econometric results are very sensitive to small changes in the specification. The results of the analysis are shown in Section 4.4.5 below. In the process of getting to these results a large number of different specifications were investigated, tested and discarded. The following paragraphs aim to reflect on some of these attempts. Hopefully this discussion will address some of the questions that the reader might have about why certain approaches were followed.

Number of CVs: The number of CVs was generally found to be positively related to the number of endogenous variables specified in the model and the number of lags included in the VAR. Depending on the specification of the system, the number of CVs varied between one and four. Since it is intuitively apparent that the system should include a supply and demand equation, the preferred outcome was to establish the existence of two CVs. In the chosen specification, five variables (Q, P_{2000},

94. Johann Fedderke (personal communication: 2004) argues against the inclusion of a trend term in the VAR because it is "an admission of ignorance".

95. A substantial amount of experimentation with different lag lengths, and the inclusion or exclusion of trends and/or intercepts in the VAR suggested that higher order lags in some cases also gave "good" results. However, since extra lags in the VAR use up many degrees of freedom, it was decided to use a modest lag length, at the risk of underparameterising the model.

$EXCISE_{2000}$, AD_{2000} and PDI_{2000}) were regarded as endogenous, and it was clear that there were two CVs. However, if a longer lag structure were chosen, a specification that endogenised most variables often yielded more than two CVs. In cases like these, one could then assume that the variables of interest (usually the price and the quantity) are endogenously determined, while other variables are regarded as exogenous. According to Sims's general-to-specific methodology such an ad hoc approach is unsatisfactory, because the researcher would force his/her will on the data, and not allow the data to lead the researcher (Enders, 2004: 263). Fortunately, in the model presented here, such restrictions have not been placed on the data.

Solving the model: In estimating the long-run coefficients, the model is solved iteratively using either the backward substitution or modified Newton-Raphson algorithm (Pesaran and Pesaran, 1997). Given the paucity of data, the model often did not converge, and an alternative specification was then required. As a result, a number of specifications could not be investigated. In particular, the deterministic components[96] that were required to account for the structural breaks in P_{2000} and $EXCISE_{2000}$ could not be included in the model presented below, because their inclusion resulted in non-converging parameters.

Input costs: The two single most important variable inputs in the production of cigarettes are raw tobacco and paper products (Anton du Plessis, manager of Paarl factory, personal communication: 2004). One would expect a negative relationship between the real costs of each of these inputs and the quantity of cigarettes produced. The real price of raw tobacco ($TOBPP_{2000}$) was found to be I(0) and thus entered the system only through the ECM.[97] The cost of paper used in the cigarette manufacturing process ($PAPER_{2000}$) was proxied by the producer price index of "paper and paper products", and deflated by the overall PPI. Of course, price movements in the various paper requirements of the cigarette manufacturing industry may differ from an aggregated index, but unfortunately no better data were available. Given its importance in the manufacturing process, $PAPER_{2000}$ should be included in the supply equation, but the estimated coefficient consistently had the wrong (i.e. positive) sign. Attempts to use the prices of other paper-based products, like newsprint and kraft paper, and corrugated cardboard boxes, did not yield any meaningful results either. Regretfully and reluctantly, this input cost variable was excluded from the VAR.

Industry concentration: As pointed out before, the cigarette manufacturing industry is highly concentrated and, viewed from a very long term perspective, has become more concentrated over time.

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96. D86plus (1970-1985 = 0, 1986-2003 = 1), D92plus (1970-1991 = 0, 1992-2003 = 1), D98plus (1970-1997 = 0, 1998-2003 = 1)

97. The implication is that the real price of raw tobacco has not been subject to long-term trends. The real price of flue-cured and air-cured tobacco is presented in Table 5.4, and clearly does not display long-term upward or downward trends. This result should not be surprising. The real price is defined as the price of a commodity, divided by an appropriate price index. The price index, in turn, is comprised of a large basket of commodities. It thus follows that the weighted average real price of all the commodities included in the price index remains constant from one period to the next. Thus, while some commodities may experience an increase in the real price, other commodities may experience decreases, and some may not experience any change over time. Using other price indices to deflate the nominal price of raw tobacco did not change the basic conclusion that this variable was stationary.

Four-firm concentration (CR4) indices for the tobacco industry were presented in footnote 11. In principle, one would expect a positive relationship between the degree of concentration and the retail price of cigarettes. Irrespective of the chosen specification, the relationship was found to be statistically insignificant. While at first sight this result seems strange, an analysis of the data suggests that there has been very little variation in CR4 since the early 1970s. Although the Dickey-Fuller test suggests that CR4 is I(1), a visual inspection of the data indicates that the data is stationary (see footnote 11). Also, the CR4 data indicates some counterintuitive decreases in concentration in 1982, 1988 and 1993, which are presumably the result of changes in the definition of "tobacco industry" and/or changes in the coverage of the manufacturing censuses.[98] Given these data problems, and the insignificance of the variable, CR4 was discarded from the analysis.

Advertising expenditure: Product promotion consists of a number of activities, of which advertising is probably the most visible and well-known. Other promotional activities include price discounts, special offers, personalised marketing activities and smokers' parties. While the US requires tobacco companies to declare all their promotional activities, there is no such obligation on South African tobacco companies. Thus the advertising data used here is a subset of all promotional activities. This would not be a major problem if advertising expenditures remained a constant proportion of all promotional activities. In the US, advertising expenditure as a proportion of all tobacco promotional activities has decreased over time. This seems to be the case in South Africa as well, particularly after health warnings on packaging and advertising materials were introduced in 1995 and even more so after all advertising and sponsorship activities were banned in 2001.

Rather than using advertising expenditures as the appropriate explanatory variable, a small number of cigarette demand studies have used a stock concept (e.g. McGuinness and Cowling, 1975 and Radfar, 1985). This approach assumes that advertising has a cumulative, rather than just a transitory effect. Since the advertising impact dissipates over time, an appropriate depreciation rate needs to be applied. Presumably the depreciation rate is likely to be substantially higher than the capital depreciation rates used in growth studies, but the tobacco demand literature is too thin to provide credible guidance on this issue.

A further complicating issue are the health warnings on cigarette packaging and advertising material which were introduced in August 1995. This legislative intervention devalued the impact of advertising, to the extent that in the months after August 1995 the tobacco industry severely reduced its adverting expenditure (see chapter 7). One way of accounting for the impact of health warnings is reduce the actual advertising expenditure numbers after 1995 by some percentage. The problem with this approach is that it is arbitrary. As an alternative, the advertising expenditure series was divided into two periods (before 1995 and after 1995), which allows the advertising effect to be measured before

98. The CR4 figures might seem somewhat low, given that Rembrandt had an 85 per cent market share throughout the 1980s, and the next three largest cigarette manufacturing firms would have resulted in a CR4 percentage of at least 98 per cent. The explanation lies in the fact that the published CR4 figures refer to the "tobacco industry" and not only the cigarette manufacturing industry.

and after the introduction of health warnings. While this approach is presumably better than an arbitrary devaluation approach, the empirical results were weak. They were very sensitive to small changes in the specification of the model, and generally statistically insignificant.

Lastly, Schmalenzee (cited in High, 1999) argued that one should not only consider the absolute value of advertising expenditures on cigarettes, but the share of cigarette advertising, relative to the advertising expenditure on all goods and services. The argument is that if the advertising expenditure on a commodity (or group of commodities) increases, sales of that commodity would be expected to increase at the expense of all other commodities. However, if all commodities experience similar increases in their advertising expenditures, the impact would be self-cancelling.

The upshot of this discussion is that it is difficult to accurately capture the impact of cigarette promotion on consumption, because the variable is so difficult to measure. There are a number of permutations on how to incorporate its effects, none of which are completely satisfactory. While it may be possible, in principle, to run the model with a different specification of the advertising variable, such an approach could be criticised as data mining. The advertising data are simply not good enough to subject it to such pressure, and to do so would create an impression of sophistication that does not really exist.

4.4.5 Results

Given the discussion in the previous sections, the chosen VAR has a lag length of one year and consists of five endogenous variables (Q, P_{2000}, $EXCISE_{2000}$, AD_{2000} and PDI_{2000}) and three exogenous I(0) variables ($TOBPP_{2000}$, D82 and D92plus). D82 was included to neutralise the impact of an outlier, and D92plus was included to indicate a trend break in P_{2000}.[99] P92plus also proxies the change in the legislative and social environment since the early 1990s.

Both the trace and maximal eigenvalue statistics clearly established the presence of two CVs. The results are shown in Table 4.4.

[99]. Recorded cigarette consumption in 1982 was much higher than can realistically be explained by the exogenous variables. The only plausible explanation is that the Auditor-General's Report for 1982 included cigarette excise tax revenues accumulated over previous years, but that had not been reflected in those years. Since cigarette consumption is derived from tax revenue receipts, the consumption figures for 1982 might thus be overstated.

Table 4.4: Establishing the number of CVs in the VAR (unrestricted intercepts and no trends), 1970-2003

Eigenvalues in descending order:				
0.745 0.599 0.443 0.021 0.006				
Cointegration LR test based on maximal eigenvalue				
Null hypothesis	Alt. hypothesis	Test statistic	95% critical value	90% critical value
r = 0	r = 1	43.76	33.64	31.02
r ≤ 1	r = 2	29.26	27.42	24.99
r ≤ 2	r = 3	18.75	21.12	19.02
r ≤ 3	r = 4	0.71	14.88	12.98
r ≤ 4	r = 5	0.18	8.07	6.50
Cointegration LR test based on trace statistic				
Null hypothesis	Alt. hypothesis	Test statistic	95% critical value	90% critical value
r = 0	r ≥ 1	92.66	70.49	66.23
r ≤ 1	r ≥ 2	48.90	48.88	45.70
r ≤ 2	r ≥ 3	19.64	31.54	28.78
r ≤ 3	r ≥ 4	0.89	17.86	15.75
r ≤ 4	r ≥ 5	0.18	8.07	6.50

With two CVs, the just-identified cointegrating VAR can thus be represented as follows:

$$\begin{bmatrix} 1 & \beta_{12} & 0 & \beta_{14} & \beta_{15} \\ \beta_{21} & 1 & \beta_{23} & \beta_{24} & 0 \end{bmatrix} \begin{bmatrix} Q \\ P_{2000} \\ EXCISE_{2000} \\ AD_{2000} \\ PDI_{2000} \end{bmatrix} = \begin{bmatrix} e_1 \\ e_2 \end{bmatrix} \tag{4.3}$$

On the assumption that the demand for cigarettes is influenced by the retail price of cigarettes, and not by the level of the excise tax, it follows that CV_1 is specified as the demand equation. Similarly, on the assumption that the supply of cigarettes is not influenced by PDI_{2000}, it follows that CV_2 is specified as the supply equation. For CV_1 the long-run equation is normalised on quantity (Q), and for CV_2 the long-run equation is normalised on price (P_{2000}).

One over-identifying restriction ($\beta_{24} = 0$) was imposed on the system of CVs, on the grounds that advertising expenditure affects the quantity demanded, but not the quantity supplied. According to the Lagrange test of restrictions, the restriction is valid ($\chi^2(1) = 0.012$, p = 0.915). The rescaled CVs, with the associated standard errors, are shown in Table 4.5. Using a test of over-identifying restrictions on

each of the individual coefficients, all coefficients, other than those on AD_{2000}, were found to be statistically significant at the 1 per cent level, as indicated in Table 4.5.

Table 4.5: Maximum likelihood estimates of CVs in the VAR (with unrestricted intercepts and no trends, annual data, 1971-2002)

	CV_1: Demand (normalised on Q_{DEMAND})		CV_2: Supply (normalised on P_{2000})	
	Coefficient (standard error)	χ^2 test (1 df) for over-identifying restriction on coefficient	Coefficient (standard error)	χ^2 test (1 df) for over-identifying restriction on coefficient
Q	1.000		-0.660 (0.125)	17.52*
P_{2000}	2.801 (0.254)	21.50*	1.000	
$EXCISE_{2000}$			-4.045 (0.538)	**
AD_{2000}	1.272 (0.608)	6.29		
PDI_{2000}	3.001 (0.160)	12.45*		

* Significant at the 1 per cent level.

** Model was unable to solve for these restrictions, but relatively small standard errors suggest that these coefficients are statistically significant.

In Table 4.6 a number of relevant elasticities are shown. The standard way of estimating elasticities when the equations are specified in linear terms is at the means. This approach was also adopted in this chapter.

Table 4.6: Elasticity estimates at the respective means, based on the CVs of the VAR, 1971-2002

	CV_1: Demand equation	CV_2: Supply equation
P_{2000}	-0.99*	0.54*
$EXCISE_{2000}$		-0.74*
AD_{2000}	-0.10	
PDI_{2000}	0.82*	

* Significant at the 1 per cent level.

The average price elasticity of demand for cigarettes is estimated at -0.99 for the period 1971 to 2002. This is somewhat higher in absolute terms than previous estimates (Reekie, 1994, Van Walbeek, 1996 and Van der Merwe and Annett, 1998) and is also at the high end of price elasticity estimates obtained in other developing countries (see chapter 3). This finding supports the assertion by ETCSA (2003: 59) that the absolute value of the price elasticity of demand is increasing over time.[100] If this is true, real

[100]. There are at least two possible explanations for the increase in the absolute value of the price elasticity of demand. First, it could imply a linear, rather than a loglinear (constant elasticity) demand curve. As the real price of cigarettes increase, so the demand becomes more price elastic. Second, it could imply more illegal cigarette sales than was previously thought. If actual cigarette consumption is more than the consumption figures on which the demand

excise tax and price increases are becoming increasingly effective as a tobacco control tool. The flipside is that government revenue from cigarette excise tax increases is unlikely to increase as much as in the past. The issue of the impact of excise tax increases on government revenue is considered in more detail in chapter 5.

This result is not an artefact of the chosen specification. Based on a variety of specifications of the demand and supply systems (not shown here), there is little doubt that there is a strong negative relationship between the real cigarette price and the quantity consumed. However, many of the alternative specifications indicated a somewhat less price elastic demand (with ε_P ranging between -0.7 and -0.9) than the results shown here.

The average income elasticity of demand is estimated at 0.82, which suggests that cigarettes are normal goods. This elasticity estimate is significantly higher than previous estimates by Van Walbeek (1996), who obtained income elasticity estimates between 0.48 and 0.58. The current income elasticity estimates are substantially lower than Van der Merwe and Annett's (1998) estimates of around 1.60. As was pointed out in chapter 2, a relatively high income elasticity of demand for cigarettes is not surprising because, given the high degree of poverty in South Africa, a modest increase in income is likely to cause a substantial increase in cigarette smoking among the poor, since cigarettes are one of the few "luxury" goods that they can afford.

The advertising elasticity of demand is estimated at -0.10, suggestive of a counterintuitive negative relationship between advertising expenditure and cigarette consumption. However, it is not statistically significant. In fact, in practically all alternative formulations of the model (not shown here), the coefficient on AD_{2000} was statistically insignificant. The conclusion is that, with the available data, there is no evidence to support the thesis that there is a direct relationship between cigarette advertising expenditure and cigarettes consumption. However, this does not necessarily mean that there is no relationship between these two variables whatsoever. The direct relationship between advertising expenditure and cigarette consumption could have been disturbed by variations in the effectiveness of cigarette advertising, the introduction of health warnings on advertising material and packaging in 1995, and the possibility that cigarette advertising has a long-term indirect impact on cigarette demand (for example, by enhancing the social acceptability of smoking).

On the supply side, the evidence suggests that the supply of cigarettes is relatively price inelastic (ε_S = 0.54). In this specification of the model the coefficient is statistically significant, but in many other specifications (not shown) a non-significant price elasticity of supply was found. The reported results thus indicate a relatively slow supply response to changes in the price of cigarettes.

The model indicates a strong negative relationship between the excise tax and quantity supplied, as one would expect. *Ceteris paribus*, a one per cent increase in the level of the real excise tax decreases quantity supplied by an average of 0.74 per cent. This negative relationship between quantity supplied

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analysis is based, a given increase in the retail price will cause an exaggerated decrease in consumption, which is reflected in a more price elastic response.

and the excise tax was found to be relatively robust, irrespective of the specification of the cointegrating VAR. As was noted in the introduction to this chapter, an important aspect is how the excise tax impacts on the retail price, and whether the industry bears some of the tax changes, or whether the tax changes are fully passed onto consumers. This aspect cannot be adequately investigated within the VAR context, but is explored more fully in chapter 5.

4.4.6 The error-correction model

Whereas the long-run cointegrating relationships are based on non-stationary data, the error-correction model (ECM) is based on stationary data. The ECM focuses on the short-run dynamics between the variables, and aims to describe how the system moves from one point of equilibrium to another. Crucially in an ECM is the inclusion of the lagged errors from the long-run CVs. These errors can be regarded as disequilibria in the long-run equation. Should there be a long-run equilibrium relationship between the relevant variables, as cointegration assumes, a short-run disequilibrium (i.e. an error in the CV) would dissipate over time. In terms of the Johansen procedure, this would imply that the coefficient on the lagged error from the cointegrating relationship be negative. The magnitude of this coefficient (which theoretically lies between zero and -2) would indicate how fast equilibrium would be restored.[101]

As was pointed out in section 4.4.1, the Granger Representation Theorem indicates that an ECM exists where there is a cointegrating relationship. Where there are two cointegrating relationships, two lagged error terms should be included in the ECMs.

Since five variables (Q, P_{2000}, $EXCISE_{2000}$, AD_{2000} and PDI_{2000}) were specified as endogenous, one can estimate five different ECMs. However, it would not make sense to estimate ECMs for all five variables. For example, even though PDI_{2000} is regarded as endogenous in the model, it would be odd to present a theory of income determination based on developments in the tobacco industry. Given that the normalisations were performed on Q and P_{2000}, these two are the more interesting ones, and their ECMs are reported here.

Generally speaking theory tells very little about the short-run dynamics and the movement from one position of equilibrium to another and thus the coefficients in the ECM, other than the lagged error terms, are generally not analysed in detail. As a practical matter, it proved particularly difficult to find two negative coefficients on the error-correction terms in the error-correction model. In most specifications of the cointegrating VAR, the ECMs had one positive and one negative coefficient on the lagged error term.[102] The results presented in Table 4.7 are far from perfect, but sounder than practically all other specifications.

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[101]. If, for instance, the coefficient is -0.5, half of the disequilibrium error is bridged in one period. If the coefficient is -1, equilibrium is restored in one period, while if the coefficient is less than -1, this is indicative of overshooting (e.g. Dornbusch's model of exchange rate determination).

[102]. This was, in fact, a fairly robust finding. For any particular cointegrating VAR, a very general ECM was specified. The least significant variables were removed from the ECM in a stepwise

Table 4.7: Short-run dynamics in the regression model

Dependent variable:	ΔQ	ΔP_{2000}
Explanatory variables	Demand equation (t-values in parentheses)	Supply equation (t-values in parentheses)
Constant	1005.0***	306.2***
	(3.41)	(3.34)
ΔP_{2000}	-1.01**	
	(2.29)	
ΔPDI_{2000}	1.34**	0.33
	(2.22)	(1.38)
ΔAD_{2000}	-0.18	-0.66***
	(0.32)	(-3.67)
$\Delta EXCISE_{2000}$		1.01***
		(3.24)
TOBPP	0.04	0.07***
	(0.61)	(3.93)
D82	190.0	48.4***
	(4.11)	(3.21)
D92plus	-43.0	42.7***
	(-1.34)	(4.62)
$ECM1_{-1}$	-0.381**	-0.237***
	(-2.67)	(5.19)
$ECM2_{-1}$	0.31	0.005
	(1.62)	(0.06)
R^2 statistic	0.840	0.894
Adjusted R^2 statistic	0.784	0.855
Durbin-Watson statistic	1.59	2.58
Ramsey RESET test	F(1,22) = 7.14**	F(1,21) = 3.27*
	[0.014]	[0.085]
Jarque-Bera normality test	$\chi^2(2) = 0.58$	$\chi^2(2) = 1.02$
	[0.749]	[0.602]
White heteroscedasticity test	F(1,30) = 0.008	F(1,29) = 0.476
	[0.977]	[0.496]

$ECM1 = Q + 2.801\ P_{2000} + 1.272\ AD_{2000} - 3.001\ PDI_{2000}$

$ECM2 = P_{2000} - 0.660\ Q - 4.0453\ EXCISE_{2000}$

Note: Probability values for rejecting the null hypothesis in the diagnostic tests are shown in square parentheses.

Although most applied time-series econometricians attach little value to the coefficients in the ECM, as pointed out above, some potentially interesting results follow from Table 4.7. For the dynamic demand equation the change in quantity is significantly negatively related to the change in the real price, significantly positively related to the change in personal disposable income, and insignificantly related to the change in advertising expenditure. The signs and significance of these coefficients are similar to those in the long-run equation. However, the absolute values of the coefficients on ΔP_{2000} and ΔPDI_{2000}

fashion, and the magnitudes on the lagged error terms were monitored after each step. While the removal of certain variables from the model often had a significant impact on the magnitudes of the coefficients on the remaining variables, they had surprisingly little impact on the sign and magnitude of the coefficient on the lagged error terms.

are smaller than in the long-run equation, suggesting a less elastic price and income elasticity of demand. In fact, at the means, the short-run price and income elasticities of demand are estimated as -0.36 and 0.37, respectively.[103] The coefficient on the lagged ECM1 term (-0.38) implies that only 38 per cent of a disequilibrium error is eliminated in the following period. The coefficient on the lagged ECM2 term is positive but not statistically different from zero.

For the supply equation, the normalisation was done on P_{2000}, and thus the discussion will focus on price as the dependent variable, rather than quantity supplied. An increase in $EXCISE_{2000}$ increases the retail price, as one would expect. The coefficient of 1.01 suggests that the full amount of the tax increase is passed onto consumers in the form of a higher price. The positive coefficient on TOBPP suggests that a short-run change in the real price of raw tobacco leaf has an impact on the retail price. The coefficient on D92plus is positive and highly significant. The interpretation is that the retail price of cigarettes has increased by approximately 43 cents per packet each year since 1992, and that this increase is not accounted for by any of the other determinants included in the ECM. This result is expected, given the trend in the real industry price, shown in column 7 of Table 4.1, and the analysis of the industry's pricing strategy in chapter 5. The coefficient on the lagged value of ECM1 is -0.24 and highly significant, suggesting that deviations from equilibrium are eliminated rather gradually. The lagged coefficient on ECM2 is insignificant. With ECM1 referring to the long-run demand equation and ECM2 to the long-run supply equation, this analysis suggests that disequilibria in the cigarette market are solved by adjustments on the demand side, rather than on the supply side.

While the results from the ECM are interesting and potentially instructive, the regression results with the most policy impact are the long-run relationships. Tobacco control is a structural and long-term issue, and the results on tobacco production and consumption, and in particular smoking-related morbidity and mortality, are visible only over a period of decades, rather than months or even years. Being able to explain the movement from one short-run equilibrium to another, interesting though it is, is less important than being able to describe the longer term trends in the relevant variables.

4.4.7 An alternative estimation approach

The Johansen approach has the distinct advantage in that it places fewer restrictions on the data than traditional econometric approaches, and allows one to investigate multi-equation systems in a structured way. Other than investigating the demand for cigarettes, the previous section also focused on the supply side. Unfortunately, because of a lack of data, the results were generally sensitive to specification changes, and thus have to be used with great care.

In this section an alternative approach to estimating the demand for cigarettes is presented. It is modest in that it does not use multi-equation estimation techniques, but takes a single-equation approach. This being the case, the estimates could suffer from simultaneity bias, although Hausman simultaneity tests

[103]. The finding that the absolute values of the short-run elasticities are less than the absolute values of the long-run elasticities is consistent with the elasticities typically obtained from a rational, as well as a myopic, addiction model.

suggest that the price could be regarded as exogenous (see below). The technique aims to estimate the ECM and the long-run equation simultaneously, but in a single equation context. It is based on the Engle-Granger two-step procedure (see footnote 9 and Harris and Sollis, 2003). However, where the Engle-Granger technique is sequential, the advantage of this approach is that the short-run and long-run coefficients are estimated jointly. The implication is that the short-run changes in the dependent variable are allowed to influence the long-run relation, while long-run disequilibrium effects are allowed to influence the short-term dynamics of the system. The ECM employs stationary data, which implies that the standard tests are applicable, and the relationship is not spurious (as could be the case with non-stationary data).

Instead of estimating the supply of cigarettes, this model assumes that the cigarette manufacturing industry sets the price of cigarettes exogenously, and that it will supply whatever quantity people demand at that price. It assumes that changes in the costs of the cigarette manufacturing industry do not have an impact on the retail price of cigarettes. Is there any empirical support for this assumption? Firstly, despite serious attempts to include cost factors other than $EXCISE_{2000}$ in the long-run supply equation in the previous analysis, none were found to be statistically significant. This "negative" finding might suggest that there is no consistent relationship between the retail price and the cost of manufacturing tobacco. Secondly, the real industry price (see column 7 of Table 4.1) has increased sharply since the early 1990s, but this increase in the industry price cannot be explained in terms of an increase in input costs (this aspect is discussed in detail in chapter 5). The industry price, and by implication the retail price, has apparently been set at a level that maintains (and even increases) the profitability of the cigarette industry, irrespective of changes in the cost structure of the industry. In fact, chapter 5 will show that, despite a sharp fall in cigarette consumption, real industry revenue has increased by about 20 per cent since the early 1990s. If this explanation holds, the supply curve can be presented as a horizontal line, where the industry sets the retail price, and supplies whatever is demanded at that price.

Given that the demand-related variables are all I(1), a stationary version of the quantity demanded can be represented in first difference form as follows:

$$\Delta Q_t = \alpha_0 + \alpha_1 \Delta P_t + \alpha_2 \Delta P_{t-1} + \alpha_3 \Delta P_{t-2} + \alpha_4 \Delta PDI_t + \alpha_5 \Delta PDI_{t-1} + \alpha_6 \Delta PDI_{t-2} + \alpha_7 \Delta AD_t + \alpha_8 \Delta AD_{t-1} + \alpha_9 \Delta AD_{t-2} + \alpha_{10} (Q_{t-1} - \beta_1 P_{t-1} - \beta_2 PDI_{t-1} - \beta_3 AD_{t-1}) + v_t, \quad (4.4)$$

where the variables are defined in Table 4.2. All relevant variables are in constant 2000 prices, but the subscripts denoting this have been suppressed for ease of reading.

The long-term relationship between consumption and its demand determinants is indicated in parentheses in equation (4.4). Deviations from long-run equilibrium are represented by the value of $(Q_{t-1} - \beta_1 P_{t-1} - \beta_2 PDI_{t-1} - \beta_3 AD_{t-1})$. The long-run price, income and advertising elasticities can be derived from the β coefficients. The α_{10} coefficient indicates the speed of adjustment to deviations from long-run equilibrium. The α_1 to α_9 coefficients indicate the dynamic responses of cigarette consumption to the demand determinants (Harris and Sollis, 2003: 93).

An issue of substantial importance is whether price is exogenously or endogenously determined. If price is endogenous, then the coefficients in equation (4.4) will be inconsistent when estimated using ordinary least squares. In contrast, in a VAR, all variables are assumed to be endogenous, and so the issue falls away. The Hausman test has been developed to test whether variables are endogenous or not (see Pindyck and Rubinfeld, 1998: 353-355).

From the demand and supply system presented in the previous sections, P_t can be represented in reduced form specification as a function of PDI_t, AD_t, $EXCISE_t$, $CR4_t$ and D82. Taking the residuals from this equation, one can then include them in the demand equation, specified in level terms:

$$Q_t = \gamma_0 + \gamma_1 P_t + \gamma_2 PDI_t + \gamma_3 AD_t + \gamma_4 \hat{e}_t + v_t, \quad (4.5)$$

where $\hat{e}_t = P_t - \beta_1 PDI_t - \beta_2 AD_t - \beta_3 EXCISE_t - \beta_4 CR4_t - \beta_5 D82.$ (4.6)

According to the Hausman test P_t is exogenously determined if γ_4 is not significantly different from zero, since this implies that that the correlation between $\hat{e}_t$ (which is the effect of P_t, "purified" of other factors that could affect it) and v_t is not statistically significant.

From the standard econometric texts it is unclear whether the Hausman test can be applied to non-stationary data, as well as stationary data (see Pindyck and Rubinfeld, 1998: 353-354). To ensure that the relationships are not spurious, the Hausman test was also applied to stationary data, i.e. where the relevant data in equations (4.5) and (4.6) are presented in first differences. The results are shown in Table 4.8

Table 4.8: Hausman tests to determine whether the price of cigarettes is endogenous or exogenous

Dependent variable	Q_t	Dependent variable	ΔQ_t
Independent variables	Coefficient (t-statistic)	Independent variables	Coefficient (t-statistic)
Constant	1324.2***	Constant	19.88
	(11.86)		(1.28)
P_t	-2.14***	ΔP_t	-1.56***
	(-12.15)		(-3.48)
PDI_t	2.96***	ΔPDI_t	0.82
	(19.83)		(0.88)
AD_t	0.34	ΔAD_t	0.69
	(0.70)		(0.98)
$\hat{e}_t = P_t - \beta_1 PDI_t - \beta_2 AD_t - \beta_3 EXCISE_t - \beta_4 CR4_t - \beta_5 D82_t$	1.27*	$\hat{e}_t = \Delta P_t - \beta_1 \Delta PDI_t - \beta_2 \Delta AD_t - \beta_3 \Delta EXCISE_t - \beta_4 \Delta CR4_t - \beta_5 D82_t$	0.97
	(1.82)		(1.38)
Adjusted R^2-value	0.963	Adjusted R^2-value	0.422
DW-statistic	0.99	DW-statistic	1.89

Notes: *** Significant at the 1 per cent level
* Significant at the 10 per cent level (all tests are two-sided).

In the Hausman test where the variables are specified in levels, the test is not conclusive. The null hypothesis that P_t is exogenous can be rejected at the 10 per cent level but not at the 5 per cent level.

For the Hausman test specified in first differences, one can conclude that P_t is exogenous. While the evidence is admittedly not overwhelming either way, the analysis proceeds on the premise that the price of cigarettes is indeed exogenously determined.

The implication of this finding is that one would not require a multiple equation approach to model the demand for cigarettes. The quantity of cigarettes demanded is the only endogenous variable, specified as a function of a number of exogenous variables.

Table 4.9 presents the regression results of three alternative specifications of model (4.4). Model 1 is a more parsimonious version of model (4.4), and includes only one lag on the differenced variables. In model 2 two variables are added, i.e. D82 (to account for an outlier, see footnote 21) and D92plus (a dummy variable taking the value of one from 1992 forward). D92plus aims to account for tobacco control measures other than the increases in the excise tax, which started taking effect in the early 1990s. Model 3 has a more generous specification than the previous two, with more lagged difference variables and D82 and D92plus included.

Other than the fact that model 2 seems to suffer from model misspecification, there are no compelling reasons why one model is significantly better than the others. All three models are presented to indicate the sensitivity of the results to changes in the specification.

Table 4.9: Single-equation demand estimation

Dependent variable: ΔQ_t	Coefficients (t-values in parentheses)		
Explanatory variables	Model 1	Model 2	Model 3
Constant	904.85**	678.02**	836.89**
	(2.67)	(2.59)	(2.83)
ΔQ_{t-1}	0.414**	0.102	0.105
	(2.12)	(0.63)	(0.59)
ΔP_t	-1.016**	-0.749**	-0.900**
	(-2.55)	(-2.30)	(-2.58)
ΔP_{t-1}	-0.069	-0.158	-0.073
	(-0.12)	(-0.37)	(-0.15)
ΔP_{t-2}			0.401
			(0.88)
ΔPDI_t	1.300	1.630**	1.310
	(1.51)	(2.54)	(1.65)
ΔPDI_{t-1}	-1.538	-0.835	1.162
	(-1.71)	(-1.19)	(-1.46)
ΔPDI_{t-2}			-0.847
			(-0.86)
ΔAD_t	-0.237	0.541	0.683
	(-0.29)	(0.80)	(0.95)
ΔAD_{t-1}	-0.337	-0.296	0.195
	(-0.36)	(-0.43)	(0.23)
ΔAD_{t-2}			1.10
			(1.43)
D82		141.77***	178.14***
		(3.20)	(3.21)
D92plus		-96.55**	-112.88**
		(-2.64)	(-2.85)
Q_{t-1}	-0.592***	-0.544***	-0.649***
	(-2.98)	(-3.71)	(-3.96)
P_{t-1}	-1.357**	-1.131***	-1.424***
	(-2.62)	(-2.91)	(-3.23)
PDI_{t-1}	1.738**	1.814***	2.385***
	(2.71)	(3.71)	(3.68)
AD_{t-1}	-0.198	0.111	-0.38
	(-0.31)	(0.22)	(-0.65)
R^2 statistic	0.732	0.869	0.888
Adjusted R^2 statistic	0.584	0.774	0.769
Durbin-Watson statistic	2.05	1.55	1.75
Ramsey RESET test	F(1,19) = 3.34*	F(1,17) = 8.75***	F(1,14) = 3.70*
	[0.083]	[0.009]	[0.075]
Jarque-Bera normality test	$\chi^2(2) = 0.73$	$\chi^2(2) = 0.06$	$\chi^2(2) = 1.55$
	[0.695]	[0.968]	[0.460]
White heteroscedasticity test	F(1,30) = 0.003	F(1,30) = 0.271	F(1,30) = 0.017
	[0.955]	[0.607]	[0.896]

Note: Probability values are shown in square parentheses

In the dynamic components of the three models presented, the evidence suggests that there is a statistically significant negative relationship between changes in the retail price and changes in cigarette consumption. This is to be expected. Regarding the relationship between changes in personal disposable income and changes in cigarette consumption, the statistical evidence is less conclusive, but the weight of evidence seems to support a positive relationship. There is no evidence of any meaningful relationship between changes in advertising expenditure and changes in cigarette consumption. This result is consistent with the findings in the previous VAR analysis. The coefficient on D92plus is consistently and significantly negative. The interpretation of this coefficient is that non-excise related tobacco control measures decreased cigarette consumption by approximately 100 million packs of cigarettes per year between 1992 and 2002.

While the dynamics of the model convey some information, the main focus of this analysis is on the long-run relationships, i.e. on the coefficients on the lagged variables in level terms. In order to obtain meaningful and interpretable coefficients on P, PDI and AD, the coefficients were normalised on Q.[104] These normalised coefficients, as well as the relevant elasticities at the means, are presented in Table 4.10.

In all three specifications of the model the coefficients on price and income were highly significant. The estimated price elasticity of demand (calculated at the means) varied between -0.74 and -0.81, depending on the specification of the model. The absolute value of these estimates are slightly lower than the price elasticity estimate of -0.99, obtained using the systems estimation approach. However, as was pointed out in Section 4.4.5, alternative specifications of the systems approach often yielded price elasticity estimates in the -0.70 to -0.90 range. The estimated income elasticity of demand using the single equation approach varied between 0.80 and 1.00, suggesting that cigarettes are a normal good. These estimates are of the same magnitude as those obtained with the multi-equation system approach ($\varepsilon_Y = 0.82$).

As was the case with the systems estimation approach, no significant relationship was found between advertising expenditure and cigarette consumption. The advertising elasticity estimates are presented in Table 4.10 for the sake of completeness only; the analysis did not find any evidence to suggest that aggregate advertising expenditure has a consistent impact on total cigarette consumption.

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[104]. For example, the long-run component in Model 1 is estimated as $-0.592\ Q_{t-1} - 1.357\ P_{t-1} + 1.738\ PDI_{t-1} - 0.198\ AD_{t-1}$. Normalising on Q_{t-1} means that this relationship can be presented as $-0.592\ (Q_{t-1} + 2.292\ P_{t-1} - 2.936\ PDI_{t-1} + 0.334\ AD_{t-1})$.

Table 4.10: Normalised long-run demand equations and relevant elasticities

	Model 1	Model 2	Model 3
Normalised coefficient on			
P_{t-1}	2.29	2.08	2.19
PDI_{t-1}	-2.94	-3.33	-3.67
AD_{t-1}	0.33	-0.20	0.58
Elasticity estimates			
Price	-0.81	-0.74	-0.78
Income	0.80	0.91	1.00
Advertising	-0.02	0.02	-0.05

4.5 Conclusion

The aim of this chapter was to investigate the demand for cigarettes in South Africa. In the descriptive section it was shown that the demand for cigarettes has been decreasing sharply since the early 1990s, reversing a trend of rapidly increasing cigarette consumption during the 1970s and 1980s. The sharp increase in the real retail price of cigarettes since the early 1990s was triggered by rapid increases in the excise tax, but the industry also aided the process by increasing the real retail price by far more than the increase in the excise tax.

Despite the fact that cigarette consumption decreased by about a third since the early 1990s, total real government revenue from cigarette excise taxes more than doubled as a result of the sharp increase in the real excise tax per pack.

In order to understand the magnitudes of the relationships between the tobacco-related variables and other determinants, a cointegration analysis was performed using the Johansen technique. This proved to be difficult and frustrating because with only thirty-two annual observations available, the results were very fragile. Relatively small changes to the specification of the system and/or the time period yielded significantly different results. As an alternative, a single equation estimation methodology was applied and gave surprisingly similar results on the demand side. Some results from the systems approach seem to be relatively robust: (1) the real price (negative) and real income (positive) have a strong impact on the demand for cigarettes; (2) the quantity supplied is negatively affected by an increase in the excise tax; (3) no readily available input cost factor was found to have a significant impact on the quantity supplied, and (4) no evidence was found to suggest that advertising expenditure is significantly related to cigarette consumption.

In previous studies (see Van Walbeek, 1996, and ETCSA, 2003) the analysis of demand was used to estimate the relationship between cigarette excise tax increases and likely tax revenues to be gained. In chapter 5 the impact of past excise tax changes on cigarette prices, consumption and government revenue is investigated, and some simulation analyses on possible future scenarios are presented. Furthermore, as has been alluded to before, the reaction of the cigarette manufacturing industry to the excise tax increases of the past decade has been very interesting and deserves further attention.

CHAPTER 5

INDUSTRY RESPONSES TO THE RECENT TOBACCO EXCISE TAX INCREASES IN SOUTH AFRICA

5.1 Introduction

As pointed out in previous chapters, the operating environment of South African tobacco producers and cigarette manufacturers has become increasingly hostile. The rapid decrease in cigarette consumption in the past decade was discussed in chapter 4. This decrease is generally attributed to a rapid increase in the real level of the cigarette excise tax. The tobacco industry reacted to the government's tobacco control policy by making significant adjustments to business operations. For example, whereas it previously sought to increase its profitability by increasing cigarette sales quantities, British American Tobacco (BAT) currently publicly acknowledges that it is operating in a continuously shrinking market and that it accepts this as a reality (Simon Millson, Director, Corporate and Regulatory Affairs, BAT South Africa, personal communication: 2004). It has had to retrench staff, and there has been talk of closing one of the two manufacturing plants (Anton du Plessis, manager of Paarl factory, personal communication: 2004). Also, the marketing strategy has changed dramatically. Since direct advertising is banned, the industry currently engages in personalised (one-on-one) marketing, exploiting a loophole in the 1999 legislation. Furthermore, in order to be seen as a socially responsible company, BAT published the first of its annual social reports in 2003. While changing corporate governance rules necessitated this, a secondary reason for publishing such a report is to counteract the bad publicity that has resulted from the publication of secret industry documents (see footnote 18 in chapter 1).

The focus of this chapter is on the industry's reactions to changes in the level of the cigarette excise tax, particularly in terms of their pricing strategy. This analysis enables policy-makers (1) to understand the industry's past pricing strategy, and (2) to evaluate the impact of future pricing strategies on cigarette consumption and the efficacy of the government's tobacco control policy.

In Section 5.2 the focus is on the composition of the retail price of cigarettes. Three components of the retail price are identified: the "industry price", excise tax and value-added tax. In this section it will be shown that cigarette excise tax increases were only partially responsible for the increases in the retail price of cigarettes since 1991. The real retail price increased by much more than could reasonably be attributed to tax and cost increases. Trends in some important input prices are also investigated. There is evidence to suggest that the industry increased the retail price of cigarettes to increase its revenue and profitability, using the excise tax increases as camouflage. A number of scenarios concerning future cigarette pricing strategies are presented in Section 5.3. Two factors have a crucial impact on the cigarette manufacturing industry's future pricing strategy: the government's excise tax policy, and the magnitude of the price elasticity of demand for cigarettes. The choice of the industry's pricing strategy

will, in turn, have significant implications for South Africa's tobacco control policy in the following decade.

5.2 Composition of the real retail price of cigarettes

The retail price of cigarettes can be divided into two components: (1) taxes and (2) the remainder received by the cigarette industry. Taxes consist primarily of excise taxes and value-added tax (VAT), the latter having replaced General Sales Tax in 1991. Import taxes are negligible. The retail price of cigarettes less excise tax and VAT, which was termed the *industry price* in section 4.3.2, is shared by a number of businesses along the value chain: tobacco farmers, suppliers of other inputs, cigarette manufacturers, suppliers of logistical services, wholesalers and retailers.

It is easy to distil the tax component of the retail price from official sources. Unfortunately it was not possible to obtain an accurate subdivision of the industry price between the manufacturers and the various service providers, specifically the wholesale and retail traders. However, informal interviews with some wholesalers and retailers in the Cape Peninsula showed that the wholesale and retail margins were generally low (significantly less than 10 per cent).[105] The low margins were the result of stiff competition between cigarette wholesalers and retailers, and the marketing arrangements with the cigarette manufacturers. The fact that the cigarette retail market, and to a lesser extent the wholesale market, is so fragmented, adds to the highly competitive environment.

In contrast to wholesalers and retailers, the cigarette manufacturing industry has significant economic power, because the industry is so concentrated. As was mentioned in chapter 1, BAT has a 93 per cent market share in South Africa, followed by Japan Tobacco with less than 5 per cent. This monopoly power allows BAT to exert much influence over the industry price. In a case before the Competition Tribunal in 2002, cigarette wholesalers accused BAT of anti-competitive behaviour, and argued that they were increasing their profitability at the expense of the wholesale trade.[106] BAT admitted that it "squeezed" the wholesalers, but argued that it did not abuse its market power. Even though the complaint was not upheld, it does suggest that the economic power, and thus the ability to influence prices, lies with the cigarette manufacturing industry, rather than with downstream industries.[107]

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105. This information was obtained from some wholesale and retail outlets by the researcher of this dissertation. A market tour was organised by sales representatives of BAT South Africa in December 2004.

106. See www.comptrib.co.za/decidedcases/html/49IRJUL02M.htm. The wholesalers argued that BAT intended to introduce new distribution agreements that would reduce the wholesalers' margins and raise their costs. Whereas previously wholesalers were classified into three distinct categories (specialists, general wholesalers and cash and carry operations), and BAT paid a different "service fee" to each of these categories, the new distribution agreement did away with this categorisation. Specialist cigarette wholesalers, in particular, argued that they were negatively influenced by the new distribution agreement.

107. To avoid confusion the following convention is used in this chapter: the "industry" or "cigarette industry" refers to all businesses along the cigarette value chain: tobacco farmers, suppliers of other inputs, cigarette manufacturers, suppliers of logistical services, wholesalers and retailers, while the "cigarette manufacturing industry" refers to the manufacturers of cigarettes, but excludes all logistical, distribution and related activities.

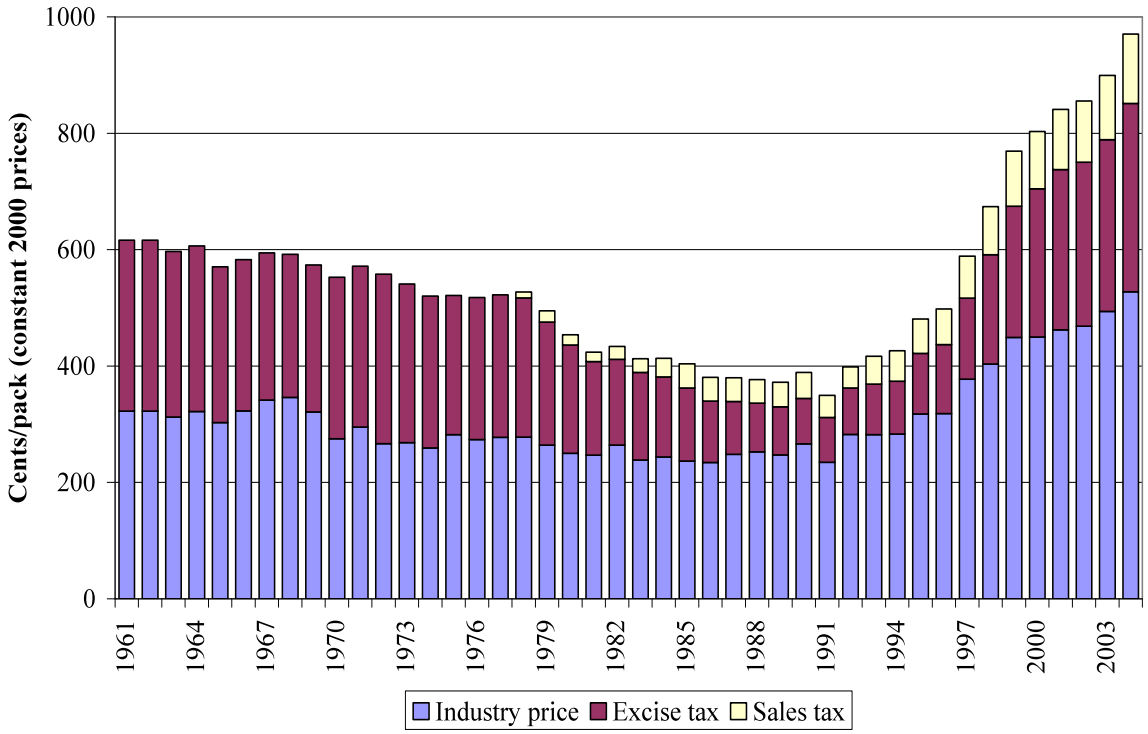
It is evident that the cigarette industry price represents the value-added activities of a large and heterogeneous group of firms. Because it was impossible to break the industry price into the various value-added activities, particularly over a long period, the industry price is considered in its entirety. However, the evidence and economic logic clearly suggest that the cigarette manufacturing industry controls the largest share of the industry price, and is largely responsible for changes in the industry price.

In Figures 5.1 and 5.2 the composition of the real retail price of cigarettes is shown for the period 1961-2004.[108] During the 1970s, and especially during the 1980s, the decrease in the real retail price was caused primarily by significant decreases in the level of the real excise tax. The total consumption tax burden on cigarettes decreased in both absolute and relative terms, despite the imposition of General Sales Tax in 1978. Moderate decreases in the real industry price between the early 1970s and the mid 1980s also reduced the real retail price of cigarettes.

Since the early 1990s the real retail price of cigarettes has increased very rapidly, as was highlighted in chapter 4. This is generally ascribed to the increase in the real level of cigarette excise tax, and to a large extent this is true. However, an aspect that has received virtually no attention in the media is the very rapid real increase in the industry price of cigarettes. In fact, between the early 1990s and 2004 the real industry price has doubled. More than 40 per cent of the increase in the retail price of cigarettes can be ascribed directly to an increase in the industry price. On average, for every 10 cent increase in the real level of excise tax, the cigarette industry increased the real retail price of cigarettes by approximately 18 cents. This suggests that the industry used the media publicity about the excise tax increases to divert attention from the rapid increases in the industry price. The result was that the retail price increased by a disproportionately large amount in comparison to the increase in the tax.

[108]. Interested people are referred to ETCSA (2003: 121-125) for a comprehensive exposition of the derivation of the data.

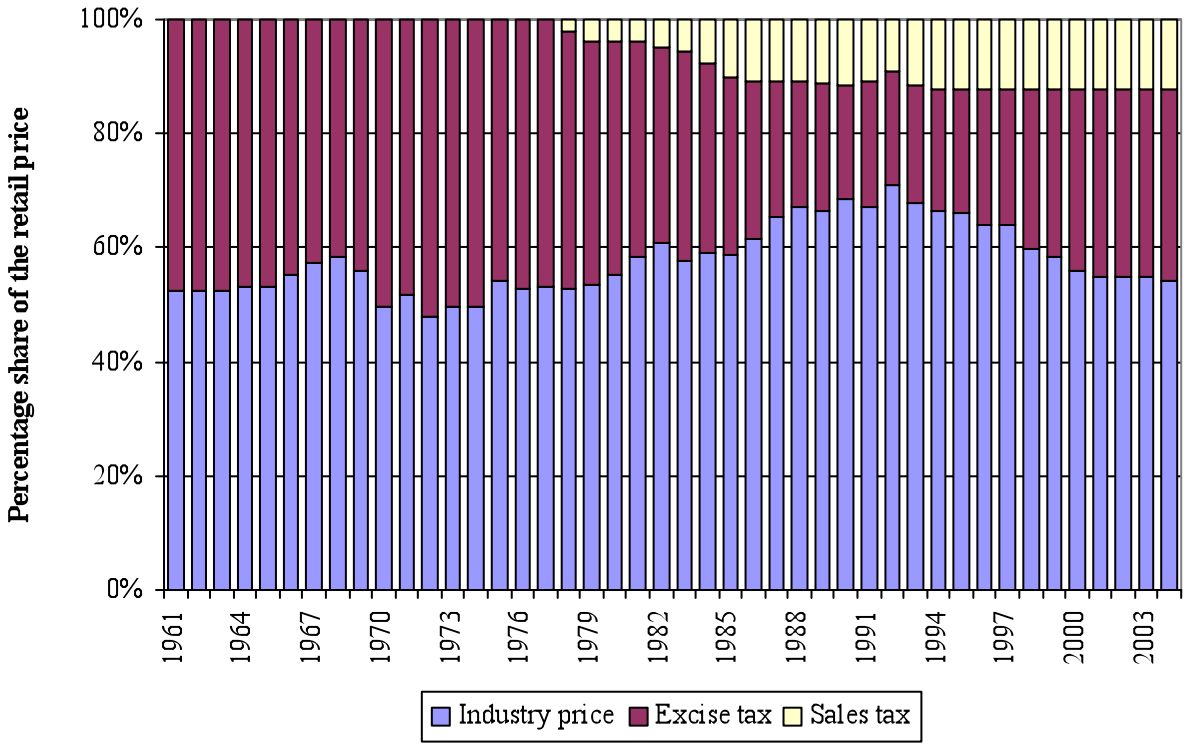
Figure 5.1: Composition of the real retail price of cigarettes in South Africa, in absolute terms



Sources: Department of Statistics, Central Statistical Service, Statistics South Africa, Auditor-General, Tobacco Board, Republic of South Africa

Figure 5.2 focuses on the relative shares of the industry price, excise tax and sales tax in the retail price of cigarettes. It is evident that despite the sharp increases in the level of excise tax during the 1990s and subsequently, the total consumption tax burden on cigarettes (i.e. including VAT) is no higher than during the 1960s and 1970s, i.e. between 45 and 50 per cent of the retail price. The government could quite legitimately argue that the rapid increases in the level of the excise tax after 1994 were to reverse the rapid decrease in the tax burden that had taken place during the 1980s. However, even though the current tax burden is not excessive in a historical context, the real retail price is higher than it has ever been, given the sharp increase in the industry price in the past decade.

Figure 5.2: Composition of the real retail price of cigarettes in South Africa, in relative terms



Sources: Department of Statistics, Central Statistical Service, Statistics South Africa, Auditor General, Tobacco Board, Republic of South Africa

This industry pricing strategy is not unique to South Africa. In fact, a number of researchers have noted that federal and state-specific excise tax increases in the US have led to magnified price increases (see Chaloupka et al., 2000a: 240-242). The tax increases in the US were relatively modest, and/or one-off. In contrast, the tax increases in South Africa have been pronounced and continuous since 1994. Throughout this period the cigarette industry has followed a consistent strategy of raising the real retail price by more than the increase in the real level of the excise tax.

Barnett et al. (1995) tried to explain and rationalise the pricing behaviour of the US cigarette manufacturing companies. Firstly, with the knowledge that cigarette smoking is on the decline, high prices represent a strategy of extracting the maximum possible consumer surplus in the long run. If the cow is dying, the best strategy would be to milk the cow as quickly as possible before it dies. Secondly, whereas previously US companies adopted a limit pricing strategy to keep competitors out of the market, the burgeoning number of product liability lawsuits in the US in the 1980s and 1990s acted as a successful deterrent to potential new competitors. With the effective demise of limit pricing, prices were free to increase. Thirdly, the tax increases were used as a signalling device to coordinate a series of price increases. Since the tax increases were publicly announced, people expected retail prices to increase and thus consumer resistance to the price increases was subdued. Fourthly, the US cigarette market had become increasingly concentrated throughout the 1970s and in subsequent decades. With increased monopoly power, the industry was able to charge higher prices, and presumably make greater

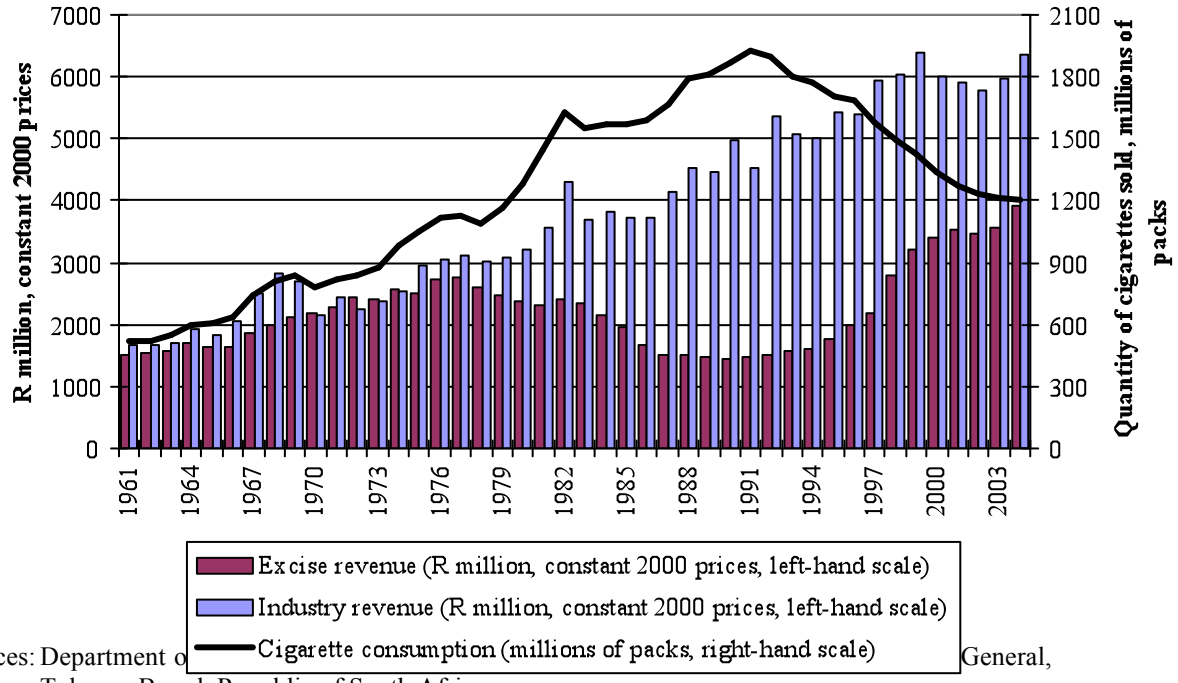
profits. With the possible exception of the second, these four explanations are also applicable to South Africa.

A more formal explanation of US pricing is provided by Becker et al. (1994: 412-413), and is couched in the rational addiction framework. According to this explanation, if cigarette companies had monopoly power they would "set a price where marginal revenue is below marginal cost, as long as consumption is addictive and future prices tend to exceed future marginal costs due to the monopoly power. The reason is that future profits are higher when current price is lower, because greater current consumption raises future consumption. As it were, a monopolist may lower the price to get more consumers 'hooked' on the addictive good" (Becker et al., 1994: 412-413). Once the future demand for cigarettes decreases (caused, for example, by an increase in the excise tax, or by the imposition of tobacco control legislation) the gains from maintaining a lower price to stimulate future consumption are reduced, and the rational monopolist would then raise the price.

This theory seems to fit the South African experience rather well. The tobacco industry's "golden age" of decreasing real excise taxes and minimal legislative interference lasted until 1991. As was mentioned in chapter 1, the tide started to turn in 1991 when the Minister of Health was challenged on the issue of tobacco control legislation. This challenge eventually led to the passing of the Tobacco Products Control Act of 1993. Furthermore, in 1991 the ruling National Party government initiated talks with ANC, which culminated in the democratic elections of 1994. Already in 1991 far-sighted people would have predicted that the ANC would become the ruling party in the not-too-distant future. From the outset the ANC was unambiguous in its tobacco control stance, and it would have been clear to the tobacco industry that the tide was turning against them. Not surprisingly, the real industry price of cigarettes started rising in 1991. After 1994 the trading environment became increasingly difficult, as excise taxes were raised and tobacco control legislation was implemented. With expected future demand decreasing rapidly, the rational response was to increase the industry price of cigarettes.

Trends in total real industry revenue (calculated as the product of cigarette consumption and the real industry price), cigarette excise tax revenue, and cigarette consumption are shown in Figure 5.3. The rapid increase in total real industry revenues during the 1970s and 1980s is unsurprising, given the sharp rise in cigarette consumption. However, despite a sharp decrease in cigarette consumption between 1991 and 1999, total real industry revenue continued to increase at a similar rate as in the two previous decades. Since 1999, industry revenues have stabilised at R6000 million (in 2000 prices), even though cigarette consumption fell by another 15 per cent. It seems that the following quote, made in the US context, is true of South Africa as well: "One of the great magic tricks of market economics…(is) how to force prices up and increase profits in an industry in which demand falls by tens of billions of cigarettes each year" (quoted in Becker et al., 1994: 413).

Figure 5.3: Real industry revenue, government excise tax revenue and cigarette consumption



Sources: Department o General, Tobacco Board, Republic of South Africa

Within the context of Becker et al.'s theory, this pricing strategy was obviously rational and shrewd from the industry's perspective. A more pejorative interpretation would be that the industry was opportunistic and exploitative, and that it abused its monopoly power. In response to such accusations, the industry could possibly argue that this pricing strategy was not an abuse of market power, but that the increase in the real industry price was caused mainly by rapid increases in the real cost of manufacturing and of doing business. This needs to be investigated.

Since detailed cost statements of the industry are generally confidential and were not available for this study, official data on some of the more important cost elements – raw tobacco, paper and paper products, and labour costs – were analysed. Trends in the cigarette excise tax were investigated in chapter 4. Given that the industry price is defined as the net-of-tax retail price, the excise tax is not a component of the industry price.

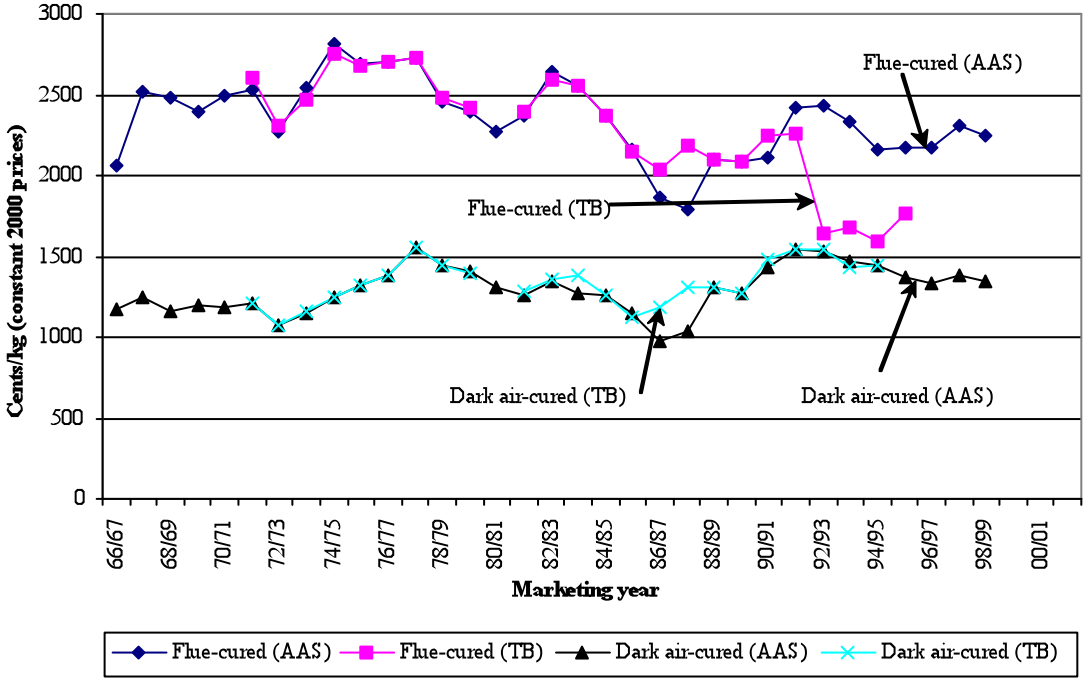
5.2.1 Price of raw tobacco

Raw tobacco is marketed in a number of types: flue-cured, air-cured (light or dark), burley and oriental (also known as Turkish tobacco). Currently raw tobacco production in South Africa consists nearly exclusively of flue-cured and dark air-cured tobacco. Until about 2001 oriental tobacco was grown on a limited scale in the Western Cape, but this has ceased subsequently. Since the early 1990s the production of burley tobacco has also practically ceased.

In Figure 5.4 the prices achieved by South African producers for flue-cured and dark air-cured tobacco leaf are shown. These are average prices realised at the various tobacco co-operatives, deflated by the

Production Price Index (PPI) of all goods produced for South African consumption. Given some discrepancies in the data, two sources, the Abstract of Agricultural Statistics (AAS), published by the Department of Agriculture, and Tobacco Board (TB) Annual Reports, have been used.[109] A rough calculation, based on Figure 5.4 and Table 4.1, suggests that the tobacco content of cigarettes currently comprises less than 4 per cent of the tax-inclusive retail price and less than 10 per cent of the industry price of cigarettes.

Figure 5.4: Trends in real tobacco leaf prices



Sources: Tobacco Board, Department of Agriculture, Statistics South Africa

Flue-cured tobacco leaf has experienced some variations in the real price, the cycle consisting of protracted periods of price decreases in the late-1970s and mid-1980s, and periods of price recovery in the early-1980s and late-1980s. Despite the cyclical movements, there is no noticeable long-term trend

[109]. In the AAS, the Department of Agriculture publishes the selling prices by co-operatives for the production year and the marketing year (May-April), sourced from the Tobacco Board. One would presumably place more confidence in data that is generated by the Tobacco Board, vis-à-vis the Department of Agriculture, since the Tobacco Board is the primary source of the data. The Tobacco Board ceased to exist in 1996, with the result that the Department of Agriculture had to source the data from the co-operatives. No data for flue-cured and air-cured tobacco are available beyond the 1998/99 marketing year.

Despite the fact that the Department of Agriculture does not publish the prices of flue-cured and air-cured tobacco separately after 1998/99, they do calculate an average producer price, based on the gross value divided by the total production of tobacco. However, as was pointed out in ETCSA (2003: 123-124) this measure has some obvious drawbacks and should be treated with caution, and it is thus not presented in Figure 5.3. For what it is worth, the Department of Agriculture (2003) indicates that the real average producer price of raw tobacco has decreased by 9 per cent between the 1997/98 and the 2002/03 marketing years.

in the real price series. During the 1990s the real price of flue-cured tobacco has remained practically constant (based on Department of Agriculture data).

The real price of dark air-cured tobacco is between 40 and 50 per cent lower than that of flue-cured tobacco (based on Department of Agriculture data). For the past 30 years real prices have been relatively stable and again there is little evidence of a long-term trend.

Unfortunately comparable recent data are not available, but the (admittedly incomplete) picture presented here does not support the hypothesis that the large increases in the industry price of cigarettes since the early 1990s can be attributed to large increases in the price of raw tobacco leaf. Even if there had been an increase in the real price of tobacco leaf, this effect would have been diluted because the tobacco content of a typical cigarette has been decreasing by about 1 per cent per year, on average, over the past three decades or more (Tobacco Board, various years). Currently each cigarette requires about 700 milligrams of raw tobacco (Anton du Plessis, personal communication: 2004).

5.2.2 Price of paper

The demand for paper products by the industry, and cigarette manufacturers in particular, is mainly in the form of wrappers and filters for individual cigarettes, as well as cigarette packs and cardboard cartons. According to BAT's Paarl factory manager, paper products comprise nearly half the variable input costs of producing a pack of cigarettes (Anton du Plessis, personal communication: 2004).

Production price indices for paper and paper products are published by Statistics South Africa. Before 1990, this index also included printing. The real PPI of paper and paper products, together with the real industry price of cigarettes, is shown in Figure 5.5.[110]

Since the price index for paper and paper products is based on a basket of products, rather than the exact paper requirements of the cigarette industry, some distortion is likely to occur. However, given these caveats, it is apparent from Figure 5.5 that the real price of paper and paper products has not been subject to any significant trend change during the 1990s. In contrast, the real industry price of cigarettes increased by approximately 80 per cent. Between 2000 and 2003 the real price of paper and paper products increased by nearly 10 per cent, a similar magnitude to the increase in the real industry price. The conclusion is that the large increase in the real industry price between 1990 and 2000 cannot be explained in terms of an increase in the real price of paper and paper products, but that there is some evidence that the (more modest) industry price increases since 2000 could be attributed, at least partially, to an increase in the cost of paper and paper products.

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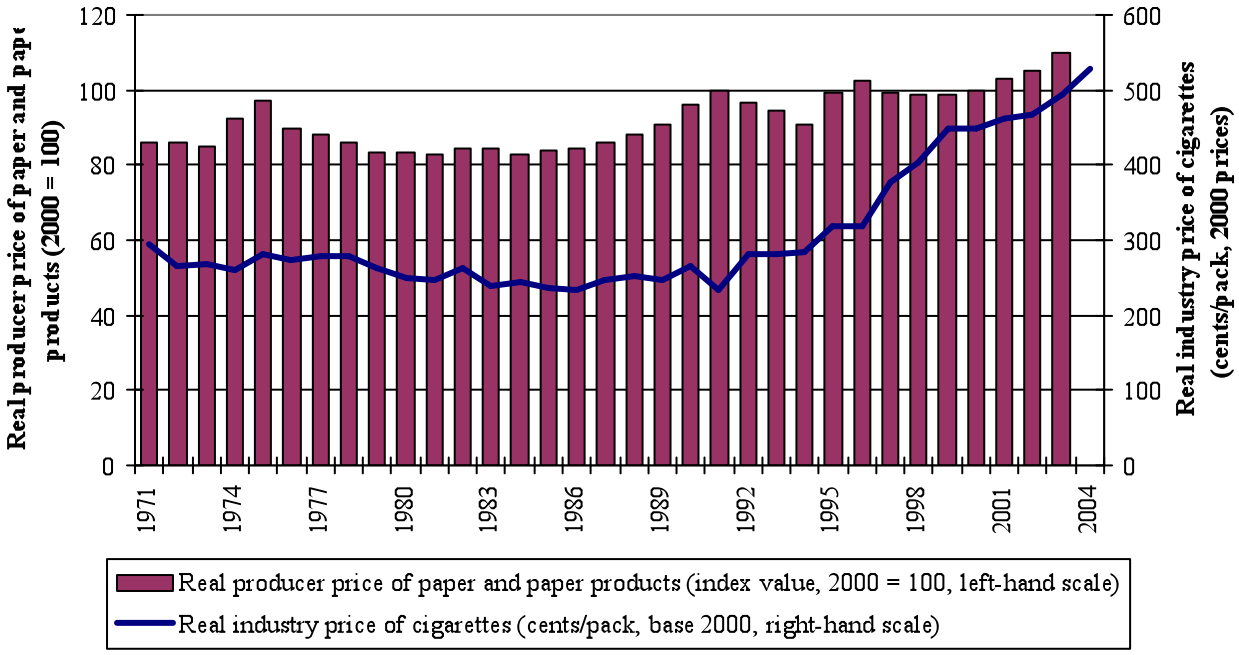
[110]. The source of PPI data between January 1971 and June 1995 is the Central Statistical Service's *Statistical Release P0142.4*. For subsequent periods *Statistical Release P0142.1* was used. The real figures were obtained by deflating the nominal PPI figures by the PPI of all goods produced for South African consumption.

Figure 5.5: Real industry price of cigarettes and the real PPI of paper and paper products



Sources: Central Statistical Service, Statistics South Africa

5.2.3 Labour costs

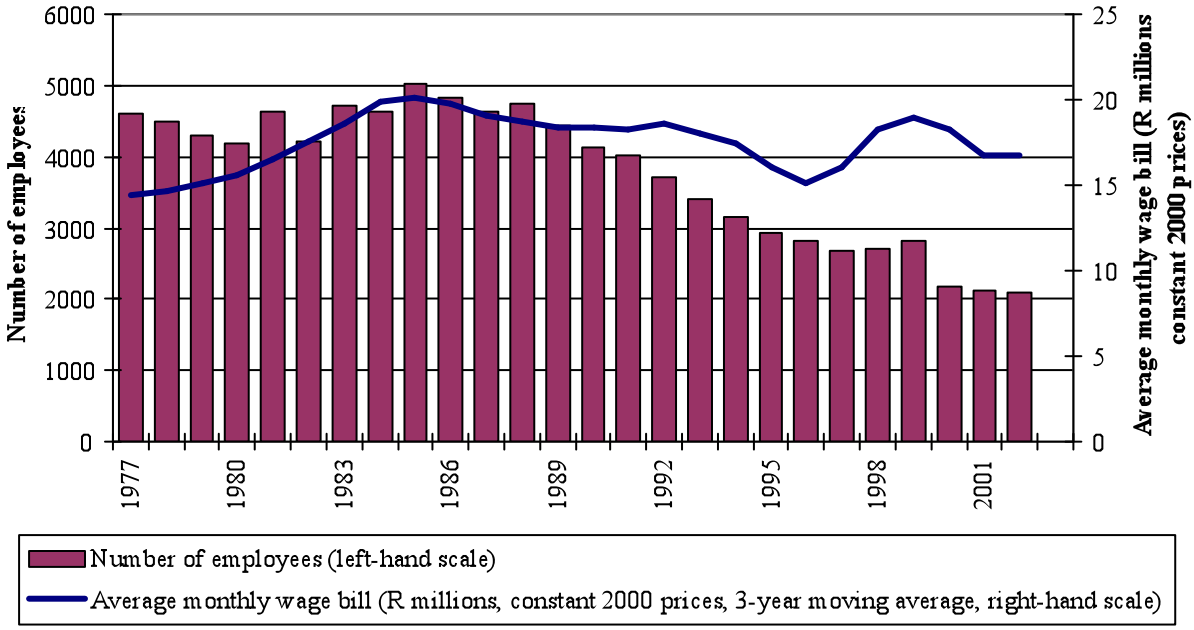
Even though large numbers of farm labourers are employed in the production of raw tobacco, the focus in this section falls on employment in the cigarette manufacturing sector.[111] The main source of employment data is Statistics South Africa and its predecessor, the Central Statistical Service. At the outset it must be mentioned that, as a general rule, labour statistics are subject to more than the average degree of measurement and sampling error, and that results must therefore be interpreted with caution.[112] The aim of this subsection is to highlight trends rather than absolute values.

111. Agricultural labour statistics are notoriously imprecise. Tobacco farming is no exception. According to the last Annual Report (1996) before the Tobacco Board was disbanded, 34 584 people were directly employed by the industry. According to BAT South Africa's website (www.batsa.co.za) the tobacco industry provides employment to more than 46 000 agricultural workers (which BAT claims represents 24 per cent of the total agricultural workforce), 2 400 workers in tobacco co-operatives and some 5 000 people in manufacturing, totalling 53 400 directly employed in the tobacco industry. If the BAT figures are to be believed, it implies a 55 per cent growth in tobacco industry employment, despite a drop of more than 25 per cent in tobacco consumption between 1996 and 2004. The industry has often emphasised its role as a provider of employment, and for this it has a clear incentive. In contrast, the industry does not appear to have an incentive for understating its level of employment. It is likely, therefore, that the employment figure is optimistic and should be treated as an upper limit. Even so, employment in the tobacco growing and manufacturing industries is less than 1 per cent of total formal employment in South Africa.

112. See ETCSA (2003: 124-125) for a discussion on the various labour data sources that are available, and some of the problems associated with this data. An apparently consistent labour and remuneration series was derived from the following sources: for the period 1977 to 1994, the Central Statistical Service's *South African Labour Statistics 1995* (published on 2 October 1996); for the period 1995 to 1997, *Statistical Release P0242.1*; for the period 1998 to 2000,

In Figure 5.6 total employment in the cigarette manufacturing sector, as well as the average monthly wage bill, deflated by the PPI, is shown for the period 1977 to 2002. Evidently cigarette manufacturing employment has decreased by nearly 65 per cent since 1985, leaving the current level of employment in the cigarette manufacturing sector at slightly more than 2000.

Figure 5.6: Cigarette manufacturing labour statistics



Sources: Central Statistical Service, Statistics South Africa

It is important to note that the decline in employment in the cigarette manufacturing sector started long before cigarette consumption started to decline. Cigarette consumption increased during the late 1980s, peaking in 1991. However, by 1991 employment had already declined by nearly 20 per cent from its 1985 level. Between 1991 and 1994 - during which period the government was debating, but not yet actively enforcing a tobacco control policy – employment decreased by another 20 per cent. Between 1995 and 1997 employment continued to decrease at approximately the same rate, but the rate of decrease levelled out in the late 1990s. Employment in the cigarette manufacturing industry dropped sharply from 2800 in 1999 to about 2200 in 2000, presumably as a result of the rationalisation that followed the merger of Rembrandt and United Tobacco Company to form BAT South Africa.

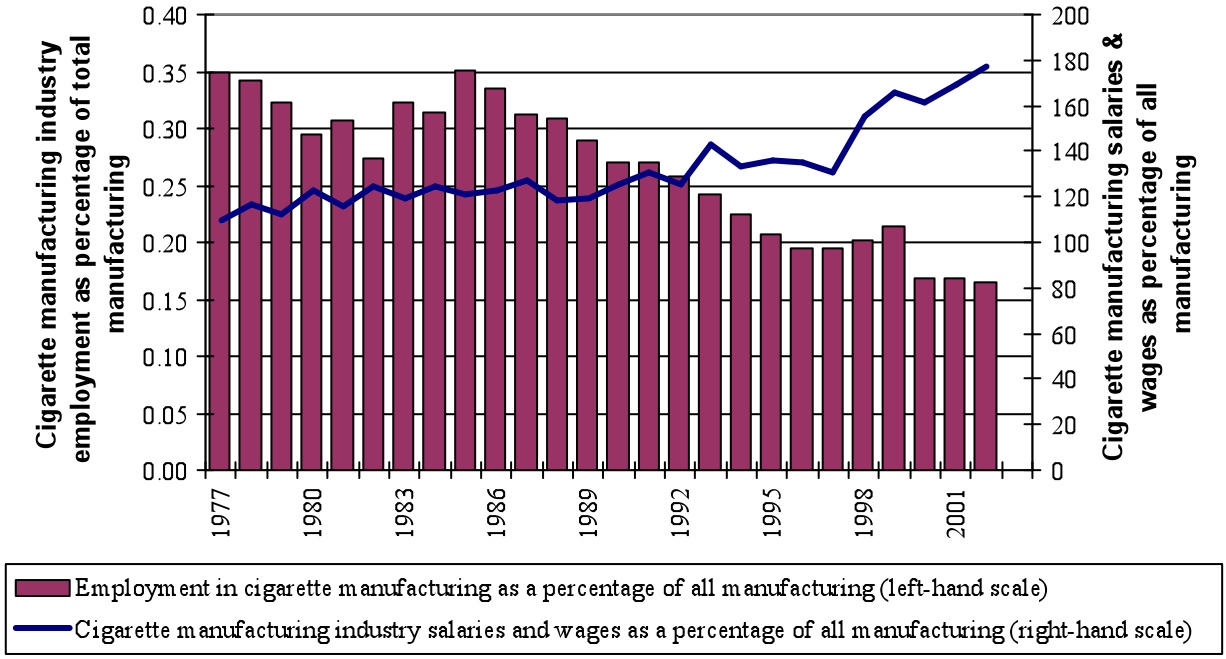
After increasing consistently between 1977 and 1985, the average monthly wage bill (measured in constant 2000 prices) has remained largely constant, varying between R15 million and R20 million. Given the high degree of capital intensity in the cigarette manufacturing industry, it is not surprising

Statistical Release P0271; and for the period 2001 to 2002, Statistics South Africa's *Comparative labour statistics, Survey of employment and earnings in selected industries*. The reason for using such a variety of data sources is that the statistical authorities changed the publication codes every few years. No employment and remuneration data are available for manufacturing subsectors after 2002, since they are no longer published in the new *Statistical Release P0275*.

that the labour cost of manufacturing cigarettes comprises a comparatively small proportion of total value added in the cigarette industry. In fact, in 2002, labour costs associated with the manufacture of cigarettes comprised less than 4 per cent of all revenue accruing to the cigarette industry.

The average wage per employee in cigarette manufacturing is compared to the average of all manufacturing industries in Figure 5.7. Workers in cigarette manufacturing earned a premium of about 20 per cent during the 1980s, which increased somewhat in the late-1980s and early-1990s. During the first years of the government's tobacco control policy, the premium stabilised at about 30 per cent. Subsequently, however, the premium rapidly increased to the current level of nearly 80 per cent. This increase corresponds to the large increase in the industry price of cigarettes since 1997.

Figure 5.7: Cigarette manufacturing compared to all manufacturing industry



Sources: Central Statistical Service, Statistics South Africa

The increasing average wage rate and wage premium of workers in cigarette manufacturing during the 1990s can possibly be explained as follows:

- Despite the salary increases, labour costs comprise a comparatively small proportion of the cigarette industry's total costs and revenues.
- It is possible that, as a result of increased mechanisation and greater labour productivity, caused by a higher capital/labour ratio, a higher proportion of the lower-paid employees were retrenched during this period, which means that the average wage of the remaining employees would have increased.

It is well known that during the past two decades, but especially in the 1990s, the South African manufacturing industry as a whole has been subject to repeated cycles of decreased employment, increased capital/labour ratios and increased real wages. What Figure 5.7 indicates is that the cigarette

manufacturing industry has also been subject to the same trends, but more amplified: employment has decreased more rapidly, and real wages have increased more rapidly than the manufacturing sector as a whole.

The trends presented in this subsection do not suggest that increases in labour costs have contributed significantly to an increase in the production costs of cigarettes during the past number of years. Even if they had, the fact that labour comprises a modest percentage of the total costs of the cigarette industry would limit the impact on the total cost structure of the industry.

5.2.4 Profit margins

In the previous three subsections trends in some of the cigarette industry's cost components were investigated to determine whether the rapid increase in the industry price of cigarettes could be ascribed to a change in the cost structure of the cigarette manufacturing industry. There is no evidence that significant real increases in any of the three cost factors investigated were responsible for the rapid increase in the industry price in the second half of the 1990s.[113]

A more plausible explanation is that cigarette manufacturers (and possibly downstream distributors and service providers as well) have been increasing their profitability by increasing the margins on cigarettes. In a scenario of decreasing sales quantities, and a comparatively price-inelastic demand for the product, cigarette manufacturers with significant market power would be in a position to raise the profit margin per cigarette by increasing the real retail price in excess of cost increases, and thus maintain, or even increase, the overall profitability of the cigarette industry.

A perusal of the Rembrandt Group's Annual Reports confirms an increased focus on increased prices between 1997 and 2000.[114] In Rembrandt's Annual Reports before 1997, increases in net sales revenue were either not explained or were ascribed to increases in sales quantities.[115] Other than a price war in Australia in 1995/96, price changes were not offered as explanations for changes in net sales revenue or

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113. In this analysis other costs, especially those that apply to downstream industries, are not investigated. These costs include capital costs, maintenance, advertising costs (although these are discussed in chapter 7), distribution, merchandising and other marketing costs, pilferage costs, wholesale and retail margins, etc. If these downstream industries experienced significant real cost increases over the past decade, the conclusions reached in the previous three sections may have to be qualified.

114. As was mentioned in chapter 1, the Rembrandt Group, through its interests in Rothmans International, was a truly global company, marketing cigarettes and other tobacco products in more than 160 countries. Similarly, BAT is also a truly international company. The two companies' Annual Reports focus not only on South Africa, but on all markets, and detractors of this thesis could argue that some of the quotes from the Annual Reports are taken out of context. While this is a possibility, one also has to consider that these companies were operating in a global environment which became increasingly hostile to the tobacco industry and in which there was pressure on sales volumes. In a global environment of reduced sales quantities, as in South Africa, a pricing strategy aimed at maintaining turnover despite falling sales quantities seems to have been appropriate. Also, in some instances the Annual Reports focus explicitly on trading circumstances in South Africa, and the relevant comments are reported below.

115. As an example, "The Asia region increased its operating profits by 13% to £ 138 million which resulted from volume growth of 6%, higher net sales revenues and lower product costs…" (Rembrandt Controlling Investments Ltd., 1996: 9).

profits. Throughout the world, the focus was firstly on increasing sales quantities and secondly on reducing costs. However, in the 1998 and 1999 Annual Reports the Group repeatedly state that they increased the price of cigarettes to increase or maintain net sales revenue.[116]

A perusal of BAT's Annual Reports after the merger in 1999 suggests that price increases were no longer seen as the primary drivers of increased profitability in most geographic markets. According to the Annual Reports of 2001 to 2003 the profitability of many regions was improved by volume increases and improved market shares of BAT's brands. However, "improved margins", despite volume declines, maintained the company's profitability in many other markets. In South Africa, in 2001 "profits increased due to higher prices, good progress with the merger and a cost reduction programme…. This improvement was achieved despite the domestic market decline of 3 per cent" (BAT, 2001). In 2003 "the contribution from South Africa showed strong growth, with price and mix driven margin gains partly offset by cost increases and lower volumes as the total market shrank. Peter Stuyvesant, Rothmans and Dunhill increased market share, contributing to the higher margins" (BAT, 2003). These comments suggest that, as was the case in the late 1990s, the profitability of the South African cigarette market was still driven primarily by increases in the real industry price.

As was alluded to before, the change in the pricing strategy of the cigarette industry in South Africa after 1991, and especially after the mid-1990s, could best be explained in the context of its long-term profit maximisation. In the absence of any tobacco control policy in the 1970s and 1980s, and with a rapidly decreasing real level of excise tax, the industry increased the size of the market by allowing the real retail price of cigarettes to fall. As a result, cigarette consumption increased rapidly.

As the external environment in South Africa from the early 1990s became increasingly hostile, the industry's strategy to increase consumption by reducing real prices was counteracted by sizeable increases in the real level of cigarette excise tax. Cigarette consumption in South Africa was declining. The cigarette industry faced a choice: either it could keep the real industry price at previous levels and allow its profits to decline, or it could increase the real industry price and allow the industry to make larger profits, despite the decline in consumption. The second approach required that the real retail price of cigarettes had to increase by more than the increase in the real level of cigarette excise tax. Even though this approach yielded short-term profits, the industry would damage its own market in the medium to longer term, since the increased industry (and hence retail) price of cigarettes would reduce consumption.

Statistical trends and Rembrandt's and BAT's Annual Reports indicate that the South African cigarette industry increased industry prices in order to increase its (short-term) profits. Under a tight tobacco

116. For example, in Africa and the Middle East, "In the year under review, net sales revenue for the region increased…., principally due to price increases" (1998:8). In Jamaica in particular and the Americas in general "…profitability improved substantially through price increases" (1998:8). In its 1999 general overview, Rembrandt states: "The underlying growth in net sales revenue was achieved as price increases more than offset the effect of lower sales volume…." (1999:5). In Africa and the Middle East "price increases in the region more than offset volume declines" (1999:6) and in Canada "…profitability was maintained through price increases" (1999:6).

control policy the market would shrink in any case. This being so, the industry presumably took the decision to enjoy the higher profits, even at the expense of reduced consumption in the long term.

This section concludes with a brief consideration of the performance of Rembrandt's and BAT's share prices. Between January 1994 and December 2003 London-listed BAT's total shareholder return averaged 13.3 per cent per year, which compares well with the 6.0 per cent return achieved by the FTSE 100 (BAT, 2003). Unfortunately, it is practically impossible to calculate the shareholder return on Rembrandt's tobacco-related business, since the company has diversified into many other industries, and has split into a number of different holding companies, namely Richemont, Venfin and Remgro. As was pointed out in chapter 1, the mainstay of Richemont and Remgro is still tobacco, despite the diversification. According to Simon Marais, the chairman of highly respected Allan Gray portfolio managing company, the listed company with the best return over the past 25 to 30 years has been Rembrandt (Moneyweb radio talk show: 24 June 2004).[117] According to Marais "it has done better for its shareholders than any other company in Africa". For a company that has been experiencing major headwinds in many of its markets, including South Africa, this is an impressive commendation. Despite large decreases in sales quantities, the company was able to maintain and extend its profitability by raising the margins on its product.

5.3 Future pricing scenarios

At this point it is clear that the interaction of the industry's pricing decisions and the government's excise tax policies have had an important bearing on cigarette consumption, government excise tax revenue, and total industry revenue in the past. The aim of this section is to investigate how the industry's and government's future strategies could impact on future cigarette consumption, government revenue and industry revenue, taking into account some of the econometric findings of chapter 4. However, since these findings were found to be sensitive to small changes in the specification of the system, a number of alternative scenarios, based on different sets of assumptions, are also presented.

In order to determine the sensitivities of various taxation policies and pricing strategies on the future tobacco landscape, a comparatively simple spreadsheet-based model is developed. The following outputs are required: (1) predicted future cigarette consumption, (2) the predicted real excise tax, real industry price and real retail price of a pack of cigarettes, (3) predicted future government cigarette excise tax revenue, and (4) predicted future industry revenue. In order to obtain these outputs, the researcher set the magnitudes of following variables: (1) the average growth in personal disposable income, (2) the average growth in the real industry price, (3) the income elasticity of demand, (4) the VAT rate, (5) the tax burden (i.e. the total tax as a percentage of the retail price), and (6) the price elasticity of demand. The base year is chosen as 2003, and all magnitudes are calculated in real terms (constant 2000 prices).

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[117]. The transcript can be accessed at http://m1.mny.co.za/__42256878002E23DA.nsf/0/C2256A2A005298FA42256EBD00544E09?Open&Highlight=2,rembrandt.

The following formulae are used to calculate the retail price (RP):

$$RP_t = (IP_t + EXCISE_t) \times (1 + VAT_t) \quad (5.1)$$

$$EXCISE_t = RP_{t-1} \times [TARGET_t - \{VAT_t/(1 - VAT_t)\}] \quad (5.2)$$

where

IP_t = industry price in year t (cents per pack),

$EXCISE_t$ = level of excise tax in year t (cents per pack),

VAT_t = VAT rate in year t, and

$TARGET_t$ = target total tax percentage in year t, i.e. sum of the excise tax and the VAT, expressed as a percentage of the retail price.

Importantly, the excise tax (which in practice is expressed in cents per pack) is set as a percentage of the retail price of cigarettes of the *previous* year, which is the approach taken by the South African Treasury (previously the Department of Finance) (see section 4.3.2). The predicted future values for cigarette consumption are calculated taking into account the hypothesised growth rates of these two variables and the income and price elasticities (which, because the changes in income and price can be quite large, are defined in terms of the midpoint formula, rather than the point formula).[118] Once the predicted quantity consumed was calculated for the final period of the analysis, total expected excise tax revenue is calculated as the product of predicted future consumption and the predicted future excise tax per pack. Total industry revenue is calculated similarly.

The scenarios cover a period of five years, from 2003 to 2008. To ensure that a particular strategy is not time dependent (in the sense that it might give a certain outcome for a short period of time, but that the long-term outcome is significantly different), the analysis is extended to cover a range of ten years as well. While the 10-year scenarios are presented below, they are not discussed in detail, except where the short-run effects are qualitatively different from the long-run effects.

The default values of the elasticities are based on the econometric analysis of chapter 4. The sensitivity of the results is investigated by comparing the base results using both a lower and a higher limit for the two elasticities, as shown in Table 5.1. The upper limits are set 100 per cent higher than the base elasticities, while the lower limits are set 50 per cent lower than the base elasticities. The average

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118. From the standard midpoint formula for price elasticity of demand $\varepsilon_P = \frac{Q_2 - Q_1}{P_2 - P_1} \cdot \frac{P_1 + P_2}{Q_1 + Q_2}$, solve for Q_2. The impact of a change in personal disposable income is incorporated also using the principle of the midpoint formula. Q_2 is then calculated as $Q_2 = Q_1 \times \left\{\left(1 - \varepsilon_P \frac{(P_2 - P_1)}{(P_1 + P_2)}\right) / \left(\varepsilon_P \frac{(P_2 - P_1)}{(P_1 + P_2)} + 1\right)\right\} \times \left\{1 + \varepsilon_Y \frac{(Y_2 - Y_1)}{\frac{1}{2}(Y_1 + Y_2)}\right\}$, where the subscripts 1 and 2 refer to the initial and final periods, respectively.

annual growth in personal disposable income is assumed to be 3 per cent in the base scenario, with low growth and high growth scenarios of zero and 6 per cent respectively.

Table 5.1: Assumptions regarding exogenous variables for different scenarios

Variable	Base scenario	"Upper limit"	"Lower limit"
Income elasticity of demand ε_Y	1.00	2.00	0.50
Price elasticity of demand ε_P	-0.80	-1.60	-0.40
Growth in PDI	3 %	6 %	zero

In the analysis below it is assumed that the government, because it can control the tax rate on cigarettes, enjoys a first-mover advantage over the tobacco industry. The industry is assumed to react to the government's moves by changing the industry price. It is assumed that the government has two (sometimes contradictory) objectives: (1) reducing cigarette consumption and/or (2) increasing government revenue. The primary objective of the tobacco industry is assumed to be increasing industry revenue.

Given the limited number of parameters in the model, it has some obvious shortcomings. Firstly, the analysis only considers changes in price and income on the demand for cigarettes. Other aspects, like legislative interventions, are not considered. Secondly, the analysis excludes the possibility of an increase in cigarette smuggling. To the extent that a sharp increase in the real retail price of cigarettes might lead to an increase in smuggling, this will undermine the efficacy of the tax increases, and will result in less government revenue and greater cigarette consumption than the figures show. Thirdly, it is assumed that the monopoly power of the tobacco industry and BAT in particular, will continue to allow the industry to set the industry price, as was discussed in section 5.2. By implication, it is assumed that non-BAT brands, like Marlboro and Camel, will follow the pricing strategy of the BAT brands. Fourthly, a "normal" macroeconomic environment is assumed, with PDI growing over time. Should the real economy shrink over time, for example, some of the results would not hold, but such scenarios are not considered.

The South African government currently sets the total tax burden on cigarettes at 52 per cent of the retail price. As was pointed out before, the government has indicated that this tax burden will stay in place for three years. However, in a hypothetical situation the government could raise or lower the tax burden to any other percentage. In Table 5.2 the predicted values for relevant variables are shown for a range of cigarette tax burdens, on the assumption that the industry does not change the industry price in real terms, and given the default elasticities. From the perspective of reducing cigarette consumption and raising government revenue, the government's best strategy is to increase the tax burden to much higher levels than the current 52 per cent. In fact, should the government set the excise tax at 67 per cent (to be introduced into the model in a one off act in 2004), cigarette consumption would fall from its 2003 level of 1210 million packs to 955 million packs in 2008. The real retail price would increase

by more than 50 per cent from R8.99 to R14.40 per pack. Real government excise tax revenue would be expected to increase by more than 100 per cent over the period.

A scenario of a sharp increase in the tax burden on cigarettes would be disastrous for the tobacco industry. Real industry revenue would decrease by more than a fifth between 2003 and 2008. Should this somewhat unlikely scenario come to pass, the questions facing the tobacco industry would be (1) whether the impact of the tax increases can be alleviated, (2) what the best strategy will be, and (3) whether such a strategy is sustainable over time? These issues are discussed below.

Not surprisingly, the best case scenario for the tobacco industry is a tax rate as low as possible.

Comparing the outcomes after five years against those after ten years suggests that the impact of a sharp increase in the tax rate on cigarette consumption is very pronounced initially, but tends to fade away after about five years. In fact, ten years after the tax shock cigarette consumption is hypothesised to be slightly higher than after five years. The reason is that the decrease in consumption due to the higher real price is more than compensated for by the increase in consumption due to the hypothesised increase in real PDI. In turn, the increase in consumption increases real government revenue and real industry revenue in the longer turn.[119]

Table 5.2: Sensitivity of cigarette consumption, tax, retail price, and industry revenue to changes in the tax burden on cigarettes

Assumptions			
Growth in PDI	3 %	Price elasticity	-0.80
Growth in industry price	Zero	Income elasticity	1.00

Secondary outputs	PDI (R billions, 2000 prices)	Industry price (cents/pack, 2000 prices)
Initial values	620	494
Values after 5 years	719	494
Values after 10 years	833	494

Implications of different tax burdens										
Total tax burden (as percentage of retail price)	Excise tax per pack	Retail price	Quant.	Total excise tax revenue	Total industry revenue	Excise tax per pack	Retail price	Quant.	Total excise tax revenue	Total industry revenue
Base 2003	295	899	1210	3570	5975	295	899	1210	3570	5975
	After 5 years					After 10 years				
45%	294	898	1390	4084	6865	294	898	1567	4603	7738
46%	308	914	1370	4223	6766	308	914	1544	4761	7625
47%	323	931	1350	4363	6666	323	932	1521	4921	7512
48%	339	949	1330	4504	6567	339	950	1498	5082	7399
49%	355	967	1310	4646	6467	356	968	1475	5245	7285
50%	371	986	1290	4789	6368	372	988	1452	5409	7170

[119]. This result is based solely on the assumption that the real industry price remains constant. As will be shown later a constant decrease or increase in the industry price has a pronounced effect on the long-run effects of certain interventions or strategies.

51%	389	1006	1269	4933	6268	390	1008	1429	5575	7055
52%	406	1026	1249	5078	6169	409	1029	1405	5742	6940
53%	425	1047	1229	5223	6069	428	1051	1382	5912	6825
54%	444	1069	1209	5370	5970	448	1073	1359	6083	6709
55%	464	1092	1189	5517	5871	469	1097	1335	6257	6592
56%	485	1115	1169	5665	5772	490	1122	1311	6432	6476
57%	506	1140	1149	5814	5674	513	1148	1288	6609	6359
58%	528	1165	1129	5964	5576	537	1175	1264	6789	6241
59%	551	1191	1109	6115	5478	562	1204	1240	6971	6123
60%	575	1219	1090	6266	5380	588	1234	1216	7156	6005
61%	600	1247	1070	6418	5284	616	1265	1192	7343	5887
62%	626	1276	1050	6571	5187	645	1298	1168	7533	5768
63%	652	1306	1031	6725	5092	675	1333	1144	7726	5650
64%	680	1338	1012	6880	4997	707	1369	1120	7922	5531
65%	709	1371	993	7035	4902	741	1408	1096	8121	5411
66%	738	1405	974	7191	4809	777	1448	1072	8323	5292
67%	769	1440	955	7348	4716	814	1491	1048	8529	5173

Considering the sensitivity of the results, the conclusion that an increase in the tax rate will decrease cigarette consumption and increase government revenue is generally robust to changes in the exogenously determined variables. Of course, changes in the magnitudes of the exogenously determined variables changes the numerical values, but not the qualitative nature of the results. Specifically, more rapid PDI growth and/or a greater income elasticity of demand for cigarettes will result in a smaller reduction in cigarette consumption and a greater increase in government revenue than the figures provided in Table 5.2, and vice versa (results not shown). The tobacco industry would also gain from an increase in PDI and/or the income elasticity of demand. For example, should PDI grow at 6 per cent, rather than at 3 per cent, and the income elasticity of demand stay at 1.00, a 67 per cent tax rate would yield expected industry revenues of R5299 million in 2008, compared to industry revenues of R4716 million in 2008 if PDI were to grow at 3 per cent.

Considering the sensitivity of the results to the magnitude of the price elasticity of demand, it was shown (but not presented here) that, should the demand be less price elastic than the default value (-0.80), an increase in the tax rate would result in a smaller decline in consumption and a greater increase in government revenue, than the figures shown in Table 5.2. Also, a lower absolute value of the price elasticity of demand would make an increase in the tax rate less ruinous for the tobacco industry.

On the other hand, if the demand for tobacco is highly price elastic, the revenue maximising tax rate is much lower than if the demand is less price elastic. This is demonstrated in Table 5.3. The only difference in the assumptions between Table 5.3 and Table 5.2 is the magnitude of the price elasticity of demand (-1.60 in Table 5.3 vs. -0.80 in Table 5.2). With a very price elastic demand, the revenue maximising tax rate on cigarettes is now achieved at a 64 per cent tax rate, which is lower than in the previous scenario. While real excise tax revenue would increase from R3570 million in 2003 to R4931 million in 2008, the increase in tax revenue is smaller than if the price elasticity of demand is lower in absolute terms. At a 64 per cent tax rate and a price elasticity of -1.60, cigarette consumption would

drop from 1210 million packs in 2003 to 725 million packs in 2008, which is much sharper than if the demand was less price elastic. If the tax rate was set at 64 per cent, the tobacco industry's revenue would be reduced by about 40 per cent from its 2003 levels, compared to a reduction of 16 per cent, had the price elasticity been -0.80.

It is evident from Table 5.3 that an increase in the excise tax is particularly effective in reducing cigarette consumption if the demand for cigarettes is relatively price elastic. However, the converse is that a relatively elastic demand for cigarettes undermines the tax revenue potential of further increases in the excise tax. Also, the tobacco industry tends to be hurt more by excise tax increases if the demand for cigarettes is relatively price elastic.

From the perspective of the government, the analysis suggests that an increase in the tax rate will, under all realistic assumptions of the price and income elasticity of demand, lead to an increase in government revenue and a decrease in tobacco consumption. From a practical tobacco control policy perspective, the analysis indicates that the government can still increase the tax rate from its current level of 52 per cent, without having to sacrifice government revenue. However, the scope for large increases in government revenue is currently less than it was in the early and mid-1990s (see Van Walbeek, 1996). It is also clear that, should the real industry price be kept constant, an increase in the tax rate is detrimental to the industry. The negative relationship between the tax rate and industry revenue explains the industry's vehement opposition to increases in the excise tax.

Table 5.3: Sensitivity of cigarette consumption, tax, retail price, and industry revenue to changes in the tax burden on cigarettes, with a highly elastic demand

Assumptions			
Growth in PDI	3 %	Price elasticity	-1.60
Growth in industry price	Zero	Income elasticity	1.00

Secondary outputs	PDI (R billions, 2000 prices)	Industry price (cents/pack, 2000 prices)
Initial values	620	494
Values after 5 years	719	494
Values after 10 years	833	494

Implications of different tax burdens										
Total tax burden (as percentage of retail price)	Excise tax per pack	Retail price	Quant.	Total excise tax revenue	Total industry revenue	Excise tax per pack	Retail price	Quant.	Total excise tax revenue	Total industry revenue
Base 2003	295	899	1210	3570	5975	295	899	1210	3570	5975
	After 5 years					After 10 years				
45%	294	898	1392	4089	6874	294	898	1569	4609	7748
46%	308	914	1352	4167	6676	308	914	1524	4698	7524
47%	323	931	1313	4242	6482	323	932	1479	4783	7302
48%	339	949	1274	4314	6289	339	950	1434	4865	7083
49%	355	967	1235	4382	6100	356	968	1390	4943	6866
50%	371	986	1197	4447	5913	372	988	1347	5017	6651
51%	389	1006	1160	4508	5729	390	1008	1304	5087	6439
52%	406	1026	1123	4566	5547	409	1029	1261	5154	6229
53%	425	1047	1087	4619	5368	428	1051	1219	5216	6021
54%	444	1069	1051	4669	5192	448	1073	1178	5273	5815
55%	464	1092	1016	4715	5018	469	1097	1136	5326	5612
56%	485	1115	982	4757	4847	490	1122	1096	5374	5411
57%	506	1140	948	4795	4679	513	1148	1055	5417	5212
58%	528	1165	914	4828	4514	537	1175	1016	5455	5015
59%	551	1191	881	4857	4351	562	1204	976	5488	4820
60%	575	1219	849	4881	4191	588	1234	937	5515	4628
61%	600	1247	817	4901	4034	616	1265	899	5535	4438
62%	626	1276	786	4916	3880	645	1298	861	5550	4250
63%	652	1306	755	4926	3729	675	1333	823	5557	4064
64%	680	1338	725	4931	3581	707	1369	786	5558	3880
65%	709	1371	696	4930	3436	741	1408	749	5550	3699
66%	738	1405	667	4925	3293	777	1448	713	5535	3519
67%	769	1440	639	4914	3154	814	1491	677	5511	3343

The next important issue to understand is how the industry should respond to the tax increases, should it wish to mitigate the tax effect on its income. On the assumption that it has monopoly power, it can change the industry price, as it has done in the past decade. In Table 5.4 the industry is hypothesised to increase the real industry price by 6 per cent each year. Other than this change, the assumptions that underpin the results of Table 5.4 are exactly the same as Table 5.2, and the comparative figures presented in the analysis below thus refer to these two tables.

Table 5.4: Sensitivity of cigarette consumption, tax, retail price, and industry revenue to changes in the tax burden on cigarettes, with a rapidly increasing industry price

Assumptions			
Growth in PDI	3 %	Price elasticity	-0.80
Growth in industry price	6 %	Income elasticity	1.00

Secondary outputs	PDI (R billions, 2000 prices)	Industry price (cents/pack, 2000 prices)
Initial values	620	494
Values after 5 years	719	664
Values after 10 years	833	881

Implications of different tax burdens										
Total tax burden (as percentage of retail price)	Excise tax per pack	Retail price	Quant.	Total excise tax revenue	Total industry revenue	Excise tax per pack	Retail price	Quant.	Total excise tax revenue	Total industry revenue
Base 2003	295	899	1210	3570	5975	295	899	1210	3570	5975
	After 5 years					After 10 years				
45%	359	1163	1131	4060	7474	480	1555	1014	4867	8963
46%	376	1182	1116	4198	7376	503	1582	1000	5034	8847
47%	394	1202	1101	4337	7278	527	1609	987	5203	8731
48%	412	1223	1086	4477	7179	552	1637	974	5374	8615
49%	431	1245	1071	4617	7081	577	1666	961	5546	8498
50%	450	1267	1057	4759	6982	604	1696	948	5721	8381
51%	471	1290	1042	4902	6883	631	1727	935	5897	8264
52%	491	1314	1027	5045	6785	659	1760	921	6075	8147
53%	513	1338	1012	5190	6687	689	1794	908	6256	8030
54%	535	1363	997	5336	6588	720	1828	895	6438	7912
55%	558	1390	982	5482	6490	752	1865	881	6623	7794
56%	582	1417	967	5630	6392	785	1903	868	6811	7676
57%	607	1445	953	5779	6294	819	1942	855	7001	7558
58%	632	1474	938	5929	6197	855	1983	841	7194	7439
59%	659	1504	923	6079	6100	893	2026	828	7390	7320
60%	686	1535	908	6231	6003	932	2070	814	7588	7202
61%	714	1568	894	6384	5907	973	2117	801	7790	7083
62%	743	1601	879	6538	5811	1015	2166	787	7995	6963
63%	774	1635	865	6693	5715	1060	2217	774	8204	6844
64%	805	1671	851	6848	5620	1107	2270	760	8416	6725
65%	838	1708	836	7005	5526	1156	2326	747	8633	6605
66%	871	1747	822	7163	5433	1207	2384	733	8853	6486
67%	906	1786	808	7322	5340	1261	2446	720	9078	6367

The industry's strategy of raising the industry price by 6 per cent each year has some predictable consequences. Firstly, at any tax rate, an increasing real industry price raises both the level of the real excise tax (because the excise tax is a function of the retail price, which in turn is a function of the industry price) and the real retail price of cigarettes. Secondly, through its impact on the real retail price, an increasing real industry price causes a sharper decrease in cigarette consumption than a constant real industry price. For example, should the government maintain the total tax burden at 52

per cent of the retail price, an industry strategy of keeping the real industry price constant would increase cigarette consumption by 3.2 per cent between 2003 and 2008 (because of the increase in personal disposable income), whereas an annual increase of 6 per cent in the real industry price would reduce consumption by 15 per cent over the same period.

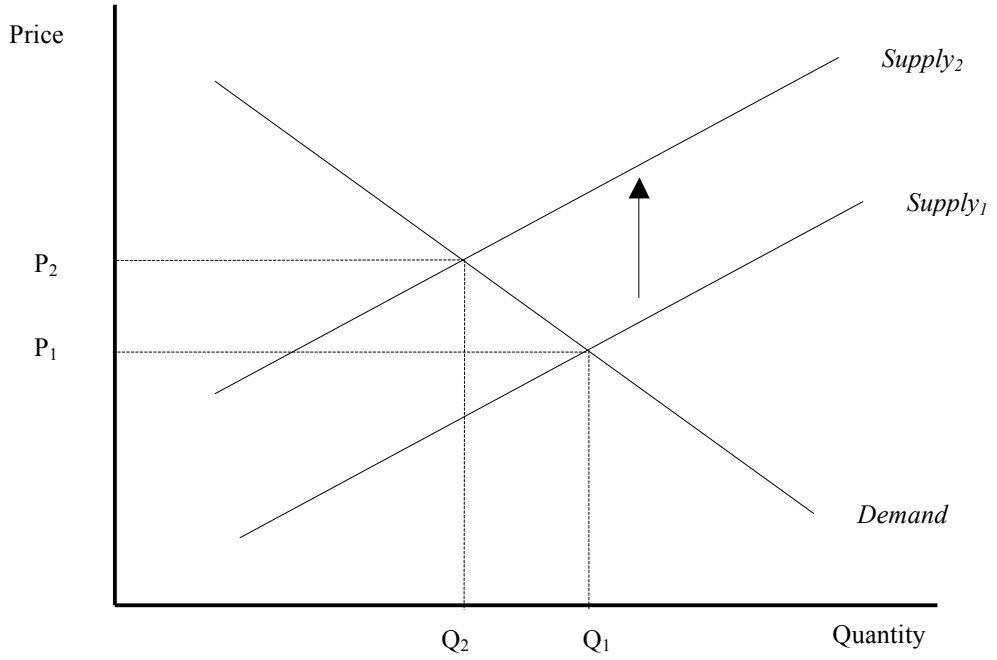
Focusing on industry revenue, rather than cigarette consumption, an increasing real industry price is beneficial to the industry. Assuming that the tax rate remains constant at 52 per cent, a 6 per cent annual increase in the real industry price is expected to increase real industry revenues by 13.6 per cent between 2003 and 2008. This compares well to a 3.2 per cent increase in real industry revenues, should the industry decide to keep the real industry price constant. Even with a 10-year forecast horizon, an annual increase of 6 per cent in the real industry price will result in greater industry revenues than will a strategy of keeping the industry price constant.

Within the parameters of this model, and assuming that the price elasticity of demand remains constant at -0.80, even at very high prices, an increase in the real industry price will be to the industry's advantage, *irrespective of the tax rate*. Of course, a high tax rate will reduce industry revenues compared to a lower tax scenario, but the industry can mitigate the effect of the high taxes by raising the real industry price. The industry's pricing strategy since the early 1990s clearly suggests that they understand this principle, and were prepared to suffer a sharp reduction in the quantity of cigarettes sold, in order to maintain and increase their revenues.

A sensitivity analysis (not shown here) indicates that a larger increase in the industry price will result in greater industry revenue, vis-à-vis a smaller increase (or a decrease) in the industry price, assuming that the price elasticity of demand remains constant at -0.80. As will be shown below, the effectiveness of increasing the industry price depends crucially on the price elasticity of demand. However, given that most empirical studies indicate that the demand for cigarettes is relatively price inelastic, it would be fair to conclude that the best short and medium term strategy for the industry would be to raise the real industry price by modest quantities.

While an increasing industry price seems to be beneficial from a tobacco control perspective and from the perspective of the tobacco industry, the impact on the government's revenue account is more nuanced and depends on the price elasticity of demand. One needs to distinguish between immediate and long-term effects of increases in the real industry price of cigarettes. If the industry raises the real industry price immediately after the government has set the level of the excise tax, the industry's actions will result in lower than expected government revenue. This principle can be easily explained using Figure 5.8. $Supply_1$ represents the supply curve after the excise tax has been levied on the producer. The quantity sold is Q_1, and the tax-inclusive retail price is P_1. Total tax revenues accruing to the government would be equal to the specific tax (not explicitly shown in Figure 5.8), multiplied by quantity Q_1. An increase in the industry price is indicated by an upward shift of the supply curve to $Supply_2$. As a result, the equilibrium quantity decreases to Q_2, and since the excise tax is levied as specific tax, the tax revenue reduced by $(Q_1 – Q_2)$ multiplied by the level of the excise tax per pack.

Figure 5.8: Explaining why an increase in the industry price reduces government excise tax revenue



However, in the longer term it is possible that government revenue may increase as a result of the industry's pricing strategy. Because the specific excise tax rate is set as a percentage of the previous year's retail price, an increase in the industry price raises the subsequent year's level of excise tax. Whether the increase in the level of the excise tax increases real government revenue or not crucially depends on the price elasticity of demand. Generally speaking, an excise tax increase will result in a greater increase in tax revenue if the demand is less price elastic, and vice versa. Consider the following scenarios. If (1) the real industry price increases by 6 per cent per year, (2) the tax rate is kept at 52 per cent, and (3) the price elasticity of demand is -0.80, real government revenue is expected to grow from R3570 million in 2003 to R5045 million in 2008 (see Table 5.4). Had the real industry price not changed over that period, and holding the other factors the same, real government revenue would have been expected to grow from R3570 million in 2003 to R5078 million in 2008 (see Table 5.2), an increase of 0.6 per cent. Thus, if the price elasticity of demand is equal to -0.8, the industry's strategy of increasing the industry price is expected to reduce government revenue. If, on the other hand, the price elasticity of demand was -0.4, a 6 per cent annual increase in real industry price, and keeping the tax rate constant at 52 per cent, would have increased real government revenue from R3570 million in 2003 to an expected R5872 million in 2008. Had the real industry price remained constant, and given a price elasticity of -0.4, real government revenue would have been expected to increase to R5353 million in 2008, about 9 per cent less.

What does this mean? If the demand for cigarettes is relatively inelastic, and the excise tax is set as a percentage of the retail price, both industry revenues and government revenues are expected to increase

in the long term should the industry decide to raise the real industry price of cigarettes. If the demand for cigarettes is relatively more elastic, the industry will benefit from an increase in the real industry price, but at the expense of government revenue.

Returning the discussion to the future scenarios, how sensitive are the industry's pricing strategy and their revenue projections to changes in the underlying assumption of the elasticities and growth rates? A change in the growth rate of PDI and/or the income elasticity of demand does not have a material impact on the major finding that, given a price elasticity of -0.80, it is to the industry's advantage to raise the real industry price (results not shown). Similarly, given the assumption of a price elasticity of demand of -0.80, a smaller or larger increase in the industry price does not have a qualitatively different impact on the results either (results not shown). Should the demand for cigarettes be less price elastic than the assumed price elasticity of -0.80, this would be highly beneficial for the tobacco industry, since the industry would be able to sell greater quantities at the higher industry price, compared to the situation where the demand is more price elastic. As an example, if (1) the price elasticity were -0.40, (2) the industry price increases by 6 per cent per year, and (3) the tax rate is held at 52 per cent of retail price, total industry revenue in 2008 would be R7897 million, compared to R6785 million had the price elasticity been -0.80.

However, if the demand for cigarettes is more price elastic than the assumed elasticity value of -0.80, the picture changes dramatically, as is shown in Table 5.5. The assumptions underpinning Table 5.5 are exactly the same as those for Table 5.4, with the only exception that the price elasticity of demand is assumed to be -1.60, not -0.80.

Table 5.5: Sensitivity of cigarette consumption, tax, retail price, and industry revenue to changes in the tax burden on cigarettes, with a rapidly increasing industry price, and a highly elastic demand

Assumptions			
Growth in PDI	3 %	Price elasticity	-1.60
Growth in industry price	6 %	Income elasticity	1.00

Secondary outputs	PDI (R billions, 2000 prices)	Industry price (cents/pack, 2000 prices)
Initial values	620	494
Values after 5 years	719	664
Values after 10 years	833	881

Implications of different tax burdens										
Total tax burden (as percentage of retail price)	Excise tax per pack	Retail price	Quant.	Total excise tax revenue	Total industry revenue	Excise tax per pack	Retail price	Quant.	Total excise tax revenue	Total industry revenue
Base 2003	295	899	1210	3570	5975	295	899	1210	3570	5975
	After 5 years					After 10 years				
45%	359	1163	917	3293	6062	480	1555	627	3012	5547
46%	376	1182	893	3357	5898	503	1582	608	3061	5380
47%	394	1202	868	3418	5735	527	1609	590	3107	5214
48%	412	1223	844	3476	5574	552	1637	571	3149	5049

49%	431	1245	819	3531	5415	577	1666	552	3188	4885
50%	450	1267	796	3583	5257	604	1696	534	3222	4721
51%	471	1290	772	3632	5100	631	1727	515	3252	4558
52%	491	1314	748	3677	4945	659	1760	497	3278	4396
53%	513	1338	725	3720	4792	689	1794	479	3300	4235
54%	535	1363	702	3758	4640	720	1828	461	3316	4075
55%	558	1390	679	3793	4490	752	1865	443	3328	3916
56%	582	1417	657	3824	4342	785	1903	425	3334	3757
57%	607	1445	635	3852	4195	819	1942	407	3334	3599
58%	632	1474	613	3875	4050	855	1983	389	3329	3442
59%	659	1504	591	3894	3907	893	2026	372	3317	3286
60%	686	1535	570	3909	3766	932	2070	354	3299	3131
61%	714	1568	549	3919	3626	973	2117	337	3274	2977
62%	743	1601	528	3925	3489	1015	2166	319	3242	2824
63%	774	1635	507	3926	3353	1060	2217	302	3202	2671
64%	805	1671	487	3923	3219	1107	2270	285	3153	2519
65%	838	1708	467	3914	3088	1156	2326	268	3096	2369
66%	871	1747	448	3900	2958	1207	2384	251	3029	2219
67%	906	1786	428	3881	2830	1261	2446	234	2953	2071

A scenario of a highly elastic demand for cigarettes, coupled with a rapid growth in the industry price, would be disastrous for the tobacco industry. If the government keeps the tax rate constant at its current level of 52 per cent, industry revenue is expected to fall by 17.2 per cent between 2003 and 2008 and by another 11 per cent between 2008 and 2013. For higher tax rates, the impact on the industry would be even more catastrophic. Comparing the industry revenue columns of Table 5.3 (where real industry prices were assumed not to increase) and Table 5.5 (where real industry prices are assumed to increase by 6 per cent per year), it is clear that the industry's best strategy would be to keep the real industry price unchanged when faced with a highly elastic demand for cigarettes. In fact, a decreasing real industry price would yield the least disastrous outcome for the industry, faced with a highly elastic demand for cigarettes.

Combining the results of Tables 5.4 and 5.5 yields the following advice for the tobacco industry wanting to increase its revenue: if the demand for cigarettes is relatively price elastic (less than 0.80, in absolute terms), increase the real industry price; if the demand is very price elastic (greater than 1.60 in absolute terms), do not increase (and even decrease) the real industry price. What should the industry do if the price elasticity of demand lies between -0.8 and -1.6? One would want to find the value of the price elasticity of demand where the industry would be indifferent about increasing or decreasing its industry price, given different tax rates and time horizons. For lack of a better word, these are termed "turning point elasticities".

To find the values of these "turning point elasticities" at a particular tax rate, an iterative approach was employed. Based on the base scenario assumptions for PDI growth and the income elasticity of demand, as presented in Table 5.1, and assuming that the real industry price grows by 6 per cent per year, one calculates (through iteration) what value of the price elasticity of demand would keep total

industry revenue at its 2003 level, given different tax rates and the two different time horizons, viz. 5 years and 10 years. The results are shown in Table 5.6.

By way of explanation, consider a tax rate of 52 per cent. If the absolute value of the price elasticity of demand is less than 1.03, the tobacco industry is able increase its revenues by increasing the real industry price of cigarettes by moderate quantities. However, if the demand for cigarettes is more elastic than a price elasticity of -1.03, the industry should not increase (but rather decrease) the real industry price. Should the government decide to substantially raise the tax rate, the demand for cigarettes would have to be quite price inelastic for the industry to increase its revenues by raising the real industry price. In fact, if the tax rate is increased to 67 per cent of the retail price, the price elasticity of demand would have to be -0.58 or less (in absolute terms) if the industry decides on a price raising strategy. Since the demand for cigarettes is likely to be more elastic than a price elasticity of -0.58, the industry would probably be forced to reduce the real industry price, or at the minimum keep it constant.

Over a 10-year time horizon the industry has somewhat more leeway to increase the real industry price, because the "turning point elasticities" are larger (in absolute terms) than they are over a 5-year horizon. The explanation is that, in the longer term (i.e. after 5 years), the impact of an increase in PDI on cigarette demand tends to be larger than the dissipating effect of the tax adjustments, and as a result the industry has more scope to raise their revenues by raising the industry price.

Table 5.6: "Turning point elasticities" for an industry aiming to increase its revenues by changing the real industry price

Total tax burden (as percentage of retail price)	"Turning point elasticity"		Total tax burden (as percentage of retail price)	"Turning point elasticity"	
	5-year horizon	10-year horizon		5-year horizon	10-year horizon
0.45	-1.51	-1.37	0.57	-0.83	-1.00
0.46	-1.42	-1.33	0.58	-0.79	-0.98
0.47	-1.34	-1.30	0.59	-0.76	-0.95
0.48	-1.26	-1.26	0.60	-0.74	-0.93
0.49	-1.19	-1.23	0.61	-0.71	-0.91
0.50	-1.13	-1.20	0.62	-0.69	-0.89
0.51	-1.08	-1.16	0.63	-0.66	-0.87
0.52	-1.03	-1.13	0.64	-0.64	-0.85
0.53	-0.98	-1.11	0.65	-0.62	-0.83
0.54	-0.94	-1.08	0.66	-0.60	-0.81
0.55	-0.90	-1.05	0.67	-0.58	-0.79
0.56	-0.86	-1.02			

Note: These elasticities are based on the following assumptions: (1) income elasticity of demand = 0.70, (2) annual PDI growth = 3 per cent, (3) annual real industry price growth = 6 per cent

The magnitudes of these elasticities depend on the underlying assumptions, as indicated in the note to Table 5.6. Changes in any of these assumptions will change the "turning point elasticities" (not shown) but the general trends indicated in Table 5.6 hold. The important principle, as was evident in the

preceding analysis, is that the government's excise tax policy constrains the industry's ability to raise the price of their product.

A number of final observations can be made from this section. Firstly, despite the fact that the tobacco industry has substantial monopoly power, and is assumed to be able to exploit that power, the industry's future revenue growth potential seems to be modest. As was indicated in Figure 5.2, since the late 1990s total industry revenue has not deviated much from R6000 million (in constant 2000 prices). This analysis suggests that, in future, the industry is unlikely to substantially increase its revenue from the R6000 million level, and there is a possibility that it could decrease, particularly if the demand for cigarettes is more elastic than previously thought. The increase in the tax rate from 50 per cent to 52 per cent of the retail price will place pressure on the industry's revenue growth, especially in the next few years. However, unless the tax rate is increased further, the effect will wear off after about three to five years. Other than through the overall growth of the economy (and particularly personal disposable income), the only way that the industry will be able to substantially increase its revenue is if the demand is significantly less price elastic than has been assumed in this chapter.

Secondly, the future looks far more promising from a tobacco control perspective and from the perspective of the Treasury, than from that of the industry. Unless something completely unforeseen happens, real government revenue from cigarette excise taxes is likely to grow significantly, irrespective of the industry's pricing strategy. The decision to raise the tax rate from 50 per cent to 52 per cent of the retail price takes a number of years to be fully reflected in the real level of the excise tax (i.e. the excise tax per pack of cigarettes). This adjustment process is likely to result in a rapid annual increase in real government revenue. It seems probable that real government revenue from tobacco excise taxes will increase by at least 30 per cent between 2003 and 2008, despite the fact that cigarette consumption is expected to decrease. Of course, should the government decide to increase the tax rate further, it would increase government revenue even more.

Given the many unknowns, particularly regarding the industry's pricing strategy, it is difficult to predict the magnitude of the decrease in cigarette consumption. The evidence presented in this chapter suggests a further decrease in cigarette consumption in the near future, particularly if the industry continues to raise the real industry price as it has done in the past decade, and/or if the government decides to raise the tax rate further from the 52 per cent level. In fact, if this happens, it is quite likely that cigarette consumption in South Africa will drop from its 2003 level of 1210 million packs to less than 1000 million packs by 2008.

The principles that have been analysed in this section are summarised in Table 5.7. This table indicates the "ideal world" for the three main role players in the tobacco industry, where it is assumed that the tobacco industry aims to increase industry revenues, the tobacco control lobby aims to reduce cigarette consumption, and the Ministry of Finance aims to increase excise tax revenue. This table does not assume that all of these variables are under the control of any of the role players; it is simply a wish list. In fact, the first three factors are, for all practical purposes, exogenously determined, but as has been indicated, have a profound impact on the objective functions of these three role players.

The government controls the tax rate. A high tax rate has positive tobacco control consequences and increases government revenue, but is very detrimental to the industry. On the other hand, the rate of increase in the real industry price is largely controlled by the industry. In the past ten years the rapid increases in the real industry price has benefited the industry immensely, as was highlighted in section 5.2. It has also had very positive tobacco control consequences, and was responsible for about half the decrease in tobacco consumption since 1994. The future strategy for the industry is less clear. Current estimates of the price elasticity of demand indicate that the industry has some leeway for increasing the real industry price. However, if the demand becomes more price elastic (or is more price elastic than the analysis shows), this would cause the industry to seriously reconsider its position.

Table 5.7: The ideal world for three important role players in the tobacco industry, given an environment of non-decreasing real excise taxes

	Tobacco industry	Tobacco control lobby	Ministry of Finance
Price elasticity of demand (in absolute terms)	Low	High	Low
Income elasticity of demand (assuming a normal good)	High	Low	High
Income growth	High	Low	High
Tax rate (tax as percentage of retail price)	Low	High	High
Industry price increases	High (if actual elasticity is less than "turning point elasticity")	High	Low if demand is relatively elastic; High if demand is inelastic

5.4 Conclusion

In previous analyses of the economics of tobacco control in South Africa (Reekie, 1994, Van Walbeek, 1996 and ETCSA, 1998) the industry's pricing strategies were not considered. This chapter points out that the industry's pricing strategy has played a pivotal role in the effectiveness of the excise tax increases that the government has implemented since the early 1990s.

By increasing the real retail rate by more than the increase in the real excise tax, the industry amplified the consumption-reducing effect that the excise tax increases were intended to have. While it was obviously not in the industry's interests to reduce cigarette consumption, this analysis has shown that the industry's pricing strategy of the 1990s and early 2000s has given them substantial short- and medium-term benefits.

The industry's pricing strategy has had very positive tobacco control consequences. It is ironic that the tobacco industry became an unlikely "ally" of the tobacco control lobby in the fight against tobacco. Smokers who became addicted to cigarettes at the time when it was relatively cheap will, however, feel resentment against an industry that is taking advantage of their addiction via disproportionate increases in the real price of cigarettes, but only to the extent that they are aware that this is the case. As long as

they remain ignorant of the cigarette industry's true pricing strategy and actions, smokers will blame government for the steeply rising real price of cigarettes. A perusal of the articles in the popular press throughout the 1990s indicates that many people were aware that excise tax increases have increased the retail price of cigarettes, but very few people were aware of the industry's role in raising the retail price.[120]

Whereas the past has been very profitable for the cigarette industry, the future seems more uncertain. Further increases in the tax rate (i.e. the tax as a percentage of the retail price) and/or a more price elastic demand for cigarettes could potentially result in a reduction in industry revenues. The increase in the tax rate from 50 per cent to 52 per cent is likely to increase real government revenue significantly in the following five years, and reduce cigarette consumption further.

[120]. In total about 4000 newspaper articles, opinion pieces and letters to the editor, covering the 1990-2001 period, were reviewed in preparing chapter 1. Many newspaper articles and statements by the tobacco industry emphasised the impact of tax increases on the retail price of cigarettes. However, other than a number of letters to the editor by Yussuf Saloojee (director of the National Council Against Smoking) in which he points out that the price of cigarettes were raised by substantially more than the tax increase, the industry's pricing strategy was not analysed at all.

CHAPTER 6

DO TAX INCREASES ON TOBACCO HURT THE POOR?[121]

6.1 Introduction

It is clear from chapters 3 and 4 that large annual increases in tobacco excise taxes are an appropriate strategy to reduce tobacco consumption. However, some economists have expressed concern that tax increases may have a disproportionately detrimental impact on poor smokers (see studies cited in Jha and Chaloupka, 2000). The argument runs as follows: (1) in most countries, smoking prevalence is higher among lower socio-economic groups,[122] and (2) poorer smokers tend to spend a greater proportion of their income on tobacco than richer smokers. If this is true, cigarette taxes are regressive. Given that regressive taxes are undesirable from a social equity perspective, such a finding might be used as a socio-economic argument against further increases in the level of real cigarette excise tax.

Until recently few studies have empirically investigated the regressivity of the cigarette excise taxes, and specifically the impact of changes in cigarette taxes and prices on the distribution of the burden of the tax (some earlier studies include Townsend, 1987, Townsend et al., 1994, and Sayginsoy et al., 2000). However, as was pointed out in chapter 3, in 2002 and 2003 a large number of studies on the determinants of the demand for cigarettes in developing countries, particularly in South East Asia, have been published under the auspices of the World Bank. A number of these studies have investigated the demand for cigarettes for various income groups, and generally concluded that smoking prevalence is higher among the poor, and that poorer households spend a larger proportion of their disposable income on cigarettes, relative to more affluent households. This supports the hypothesis that the excise tax is regressive.

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[121]. An earlier version of this paper, based on the Income and Expenditure Surveys (IES) of 1990 and 1995, was published in the South African Journal of Economics (Van Walbeek, 2002b). The original paper was financially supported by Research for International Tobacco Control (RITC), based at the International Development Research Centre in Ottawa, and the World Bank. Subsequently the analysis was updated with the IES of 2000 with financial assistance of the International Tobacco Evidence Network (ITEN). The comments and insights of the following people are gratefully acknowledged: Murray Leibbrandt, Joy de Beyer, Frank Chaloupka, Hana Ross and two anonymous referees from ITEN.

[122]. There is much empirical support for this comment. Bobak et al. (2000) concluded that 65 out of 74 studies they reviewed found that smoking prevalence was higher among the poor than among the rich. Furthermore, they found that "in total, the studies reveal that differences in smoking prevalence between poor and rich groups are greater in low-income countries than those in high-income countries" (Bobak et al., 2000: 44-45)

While agreeing that tobacco taxes are regressive, tobacco control economists are of the opinion that the government should not reduce the excise tax in order to lessen the burden of the tax (World Bank, 1999: 74 and Chaloupka et al., 2000a: 259). In fact, they argue that *increases* in the excise tax are likely to reduce the excise tax's regressivity. This is based on the premise that the poor are likely to be more sensitive to price changes, and would thus reduce their cigarette consumption by a greater percentage than the rich in response to an excise tax-induced increase in cigarette prices. It is argued that the *relative* tax burden on the poor, vis-à-vis the rich, is likely to decrease as the excise tax is increased. Recent empirical studies confirm this hypothesis: it is found that the absolute value of the price elasticity of demand varies inversely with income (see, for instance, Onder, 2002, Arunatilate and Opatha, 2003, Kyaing, 2003, and Sarntisart, 2003).

In chapter 2, changes in smoking prevalence in South Africa were considered. However, because of limitations in the data set, it was impossible to investigate the potential regressivity of tobacco excise taxes. This chapter aims to address some of the shortcomings of chapter 2, particularly regarding changes in the regressivity of the tobacco excise tax. It is an extension of Van Walbeek (2002b), in which changes in the regressivity of cigarette excise taxes in South Africa between 1990 and 1995 were considered. This chapter builds on the methodology by Pechman and Okner (1974) and Pechman (1985). Two interrelated aspects will be explored: (1) the relative importance of tobacco in South African households' expenditure patterns; and (2) changes in the regressivity of cigarette taxes between 1990 and 2000.

6.2 Data issues

6.2.1 Finding appropriate surveys

An analysis aimed at investigating household consumption patterns of different income groups requires a cross-sectional approach. In South Africa, a number of cross-sectional household survey data sets exist.[123] In many countries cigarette prices differ across space[124] and because of quality differences, market segmentation, different mark-up percentages, variable tax rates on imported cigarettes, etc. (see Guindon et al., 2002). In South Africa, however, prices do not differ significantly across space and the price variation among different brands is much lower than in most other countries.[125] Thus, while an

123. Some of the major cross-section data sets include the following: the University of Cape Town's 1993 SALDRU survey; the University of Natal's 1998 KwaZulu-Natal Income Dynamics Survey; Statistics South Africa's 1990, 1995 and 2000 Income and Expenditure Surveys; and the annual All Media and Product Survey (AMPS) performed by AC Nielsen.

124. This is particularly true of cigarette prices in the US, where the individual states have the power to impose excise taxes on cigarettes. According to the Surgeon-General, other than a federal excise tax of 34 cents/packet, state excise taxes in 2000 varied between 2.5 cents/packet in tobacco-growing Virginia to $1.11/packet in anti-smoking New York State (USDHHS, 2000:340). Since 2000 the range of state excise taxes have increased even further (Joy de Beyer, personal communication, 2005).

125. According to British American Tobacco's recommended retail price lists, super premium brands (e.g. Cartier and Courtleigh) were selling at R13.50 per packet in August 2004, premium brands, (e.g. Dunhill, Gauloises and Camel) were selling at R13.00 per packet, popular brands (e.g. Peter Stuyvesant, Rothmans and Chesterfield) at R12.30 per packet, while mid- and low price cigarettes (e.g. Royals and Embassy) were selling at R10.40 per packet

individual survey is useful to determine certain relationships at that point in time, it cannot be used to investigate a household's reaction to price *changes*, because the price is essentially the same for everyone. Furthermore, since respondents were asked the total amount that they spent on cigarettes – not the price they paid per pack, nor the number of cigarettes smoked - it is impossible to determine the impact of differences in cigarette prices on people's consumption patterns from only one survey.

At least two comparable survey data sets taken at different periods are required, so that one can track the impact of changes in cigarette prices over time. Two data sets fulfil these criteria: the Income and Expenditure surveys (IES) of 1990, 1995 and 2000, and the 1993 Southern African Labour and Development Research Unit (SALDRU) survey, in conjunction with the 1998 KwaZulu-Natal Income Dynamics Survey (KIDS). The SALDRU and KIDS data form a panel, in that the same households are tracked over time. However, it is limited to only one of the nine provinces (KwaZulu-Natal) and, within this province, it only covers African and Indian households. Given its limited scope, the SALDRU/KIDS data set was not used in this study. This chapter is based on results derived from the three Income and Expenditure surveys.[126] The Income and Expenditure surveys are performed by Statistics South Africa, primarily to determine the base weights for the Consumer Price Index.

6.2.2 How good are the data?

The data are obtained using a two-stage stratified sampling methodology. For example, for both the 1995 and 2000 IES, approximately 3 000 of the 30 000 enumerator areas (EAs) in the country are chosen in the first stage of the process, where the probability of an EA being chosen is proportional to the number of households in that EA. In the second stage ten households are randomly selected from the chosen EAs. The resulting observations are weighted, with weights proportional to the number of households in the EA from which the sample was drawn. The sample was stratified by race, province, and urban and non-urban areas (Hirschowitz, 1997). The 1990 IES focused only on metropolitan households, while the 1995 and 2000 surveys included rural and other urban households as well.

Given the differences in coverage, the surveys are not comparable in their current format. For comparative purposes it was decided to perform the main analysis on *urban* households for 1990, 1995 and 2000.[127,128]

(Simon Millson, Director, Corporate and Regulatory Affairs, BAT South Africa, personal communication: 2004). More than 70 per cent of BAT's sales were in the popular price category. While some cigarettes are sold for less than R10 per packet, BAT believes that these are likely to be illicit sales. When the Altria Group introduced Marlboro into South Africa in April 2004, the brand was, rather surprisingly, positioned in the popular rather than the premium price category. In most countries Marlboro is marketed as a premium brand.

126. Unfortunately the AMPS database could not be used, since it simply investigates whether people smoke or not; it does not investigate how much they spend on cigarettes. However, as was pointed out in chapter 2, AMPS did investigate the quantities that people smoked in 2002 in an ad hoc survey, but as has been pointed out above, one survey is not sufficient to investigate the impact of price changes on people's smoking behaviour.

127. An analysis of all (i.e. urban and rural) households for the years 1995 and 2000 indicated that the conclusions were qualitatively the same as those of the urban households only. To prevent

In Table 6.1 some salient features of *all* households, covered in the three surveys, are shown. As discussed, the 1995 and 2000 data sets are comparable, but the 1990 data set is not, given that the latter does not consider rural households. Unfortunately, a number of data inconsistencies, particularly regarding the 2000 IES data, are evident.

- According to the 2000 IES data, nominal per capita income has increased by only 1.8 per cent per year between 1995 and 2000. Given moderate inflation (of between 5 and 8 per cent per year) during this period and a steady, albeit unspectacular economic performance, nominal per capita income should have increased by much more than 1.8 per cent per year.

- A comparison of the IES's weighted aggregated household income with current income, as measured on a macroeconomic level by the South African Reserve Bank (SARB), reveals that the IES tends to underestimate the SARB's estimate of household income. The underestimation varies significantly between 1995 and 2000: the 1995 IES accounted for 96.1 per cent of the SARB's estimate of current income for 1995, while the 2000 IES accounted for only 66.4 per cent of the SARB's estimate of current income in 2000. Clearly, household income is badly underreported in the 2000 IES.

- A similar picture emerges for households' expenditure on cigarettes. In principle, South Africa's aggregate cigarette expenditure is equal to the product of average cigarette expenditure for each smoking household, and the weighted number of smoking households included in the survey. From Table 6.1 it is clear that the implied aggregate cigarette expenditure, based on the IES data, is much smaller than the Treasury's estimate of cigarette consumption (which is based on cigarette excise tax revenue). While some underreporting is to be expected (since people might be embarrassed about their smoking behaviour, or about the amount of money they spend on cigarettes, or simply because they get the calculations wrong), the degree of underreporting is significant. In 1995, for example, 48.8 per cent of "true" cigarette consumption is reported, while in 2000 only 36.1 per cent

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an unnecessary proliferation of tables in the text, the paper's focus is solely on urban households.

128. The 1990 survey was based on 14 332 households located in South Africa's twelve metropolitan areas. These were the (1) Cape Peninsula, (2) Port Elizabeth-Uitenhage, (3) East London, (4) Kimberley, (5) Bloemfontein, (6) Free State Goldfields (Welkom-Virginia-Odendaalsrus), (7) Durban-Pinetown, (8) Pietermaritzburg, (9) Pretoria-Centurion-Akasia, (10) Witwatersrand, (11) Vaal Triangle (Vereeniging-Van der Bijl Park-Sasolburg) and (12) Klerksdorp-Stilfontein-Orkney. The 1995 survey was based on 29 595 households, of which 16 903 households (57.1 per cent) were from metropolitan areas. To obtain the metropolitan households, all observations with a "Description of settlement" field number of 30 or more were excluded because they represented rural areas. A closer matching of areas was not possible. In the 2000 IES, 26 263 households were interviewed, of which 15 972 (60.8 per cent) were defined as "urban households".

is reported.[129] For the 1990 IES, only 22 per cent of "true" national cigarette expenditure is reported, but given the limited scope of the 1990 survey, it is impossible to say precisely what the degree of underreporting was.

Table 6.1: Characteristics of the three Income and Expenditure Survey data sets

	IES 1990 (only urban households were surveyed)	IES 1995 (urban and rural households)	IES 2000 (urban and rural households)
Number of observations on which the survey is based	14 332	29 595	26 263
Number of households that the survey purports to represent (weighted data)	2 063 400	9 477 040	11 027 777
Average declared household income per household (Rand per year)	41 414	40 784	39 596
Average household size (number)	3.69	3.92	3.48
Average declared per capita income (Rand per year)	11 223	10 404	11 378
Total declared household income (weighted data) (R millions)	85 500	386 512	436 656
Current income of households (SARB data) (R millions)	206 016	402 311	657 687
Total income as obtained in IES, as percentage of SARB current income	41.5	96.1	66.4
Number of households that spend money on cigarettes (weighted data)	1 004 403	3 618 315	3 779 138
Average expenditure on cigarettes per smoking household (Rand per year)	676	801	1023
Total expenditure per year on cigarettes based on IES data (R million)	679	2 898	3 867
Aggregate "official" expenditure on cigarettes based on the Treasury data (R million)	3 082	5 944	10 704
Total expenditure on cigarettes as percentage of "official" aggregate expenditure	22.0	48.8	36.1

Sources: IES data (1990, 1995 and 2000); SARB Quarterly Bulletins.

Underreporting of income and cigarette consumption is a significant problem, and casts doubt about the quality and usefulness of the data set as a whole.[130] Within any one survey, it could easily bias the

[129]. A sizeable literature exists on how to conduct household surveys aimed at measuring living standards (see, for instance, Grosh and Glewwe, 2000 and Deaton, 1997). This literature points out that the time period for which respondents are requested to estimate their expenditure (the recall period), has a major impact on the results. For items that are frequently bought, like tobacco, reported expenditures fell sharply as the recall period was extended, say from one week to one month (Deaton and Grosh, 2000: 110). Given that the Income and Expenditure surveys used a one month recall period for tobacco, these findings would suggest that the reported expenditure on tobacco would be significantly underreported, compared to, for instance, a recall period of one week or less.

[130]. The problems in the 2000 IES are regarded as so serious that the survey has been referred to the South African Statistical Council for comment. According to Van der Berg and Louw (2003) "those working on the 2000 IES have found it to be an exceedingly poor data set, with evidence of sloppy work both in the gathering and in the management of data. For instance, grain expenditure is double counted in total food expenditure and in total expenditure. About 25 per cent of records are useless for many purposes, for instance because recorded food

results if the degree of underreporting is not the same among all households, or cohorts of households. However, more problematic is the fact that the degree of underreporting differs so significantly from one survey to another, resulting in incomparable surveys over time. This is unfortunate, but this is currently the best data available.

One option, if one wishes still to use the survey sets, is to assume that individual surveys are meaningful and consistent in themselves, but that the surveys are not comparable over time. An alternative option is to re-scale the three surveys to make them comparable. The principle is to balance the aggregate income and cigarette expenditure amounts in the three surveys with corresponding macroeconomic data, obtained from sources that use consistent data collecting methods. This was the chosen option. The procedure for upscaling household income and cigarette expenditure was as follows:

1. For the 1995 and 2000 surveys, aggregate household income, based on the respective IESs, was calculated by multiplying the number of weighted households by the average household income, for the respective years.

2. Current household income, as published in the SARB's Quarterly Bulletin, was assumed to be the correct measure of income. For 1995 and 2000 the scaling factor was calculated as the SARB's estimate of current income divided by the IES's estimate of aggregate household income. The scaling factor for 1995 was 1.0406 (= 1/0.961) and for 2000 it was 1.5060 (= 1/0.664).

3. The relevant scaling factor was applied to each household's income in the respective years. Using this transformation, aggregate household income derived from the Income and Expenditure surveys balances with the current income published in the SARB's Quarterly Bulletin.

4. Using the same principle, scaling factors were calculated for cigarette expenditure for 1995 and 2000. The "true" expenditure on cigarettes was derived from excise tax revenue data obtained from the National Treasury (see ETCSA, 2003: 121-125). The scaling factors were calculated as 2.0492 for 1995 and 2.7701 for 2000. The scaling factors were subsequently applied to each household's cigarette expenditure in the respective years.

5. For the 1990 IES a different process had to be followed, because the coverage of the survey was limited to twelve metropolitan areas. Towns and rural areas were excluded from the survey. Between 1990 and 1995 the number of metropolitan households increased dramatically, mainly as a result of rapid urbanisation. During this period the demographic and socio-economic structure of these

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expenditure is zero, or because total expenditure and total income differ (after allowing for savings and dissaving) by more than 30 per cent."

metropolitan areas underwent major changes. Determining an appropriate scaling factor for these households' income proved very problematic, and it was decided to keep the 1990 IES income data unchanged. The assumption is that the published data most accurately reflects the true situation in 1990; it is believed that no transformation of the data will result in "better" or more comparable data.[131]

6. Cigarette expenditure in the 1990 IES is clearly underreported. According to the SARB's estimate of current income and the Treasury's estimate of cigarette expenditure, cigarettes comprised 1.477 per cent of aggregate household current income in 1990. If one applies this percentage to the 1990 IES's aggregate household income, total expenditure on cigarettes in the chosen sample of households should be equal to R1 263 million (= R85 500 x 0.01477), which is much higher than the published total of R679.3 million. Thus the scaling factor for cigarette expenditure is calculated as 1.8590 (= 1 263/679.3).

For the 1995 and 2000 IES it is assumed that the income and cigarette expenditure of each household is underreported equally (i.e. that there is no systematic income bias in under-reporting), and that a blanket transformation, as applied, would solve the problem. This is a strong assumption, but not materially different from the (incorrect) assumption that income and cigarette consumption are correctly measured in the first place. The transformation does not and cannot correct measurement errors for individual households, but it does ensure that the aggregate of the IES's income and cigarette expenditure data balances with data from reputable sources. As a result of this transformation the absolute differences in income (and cigarette expenditure) between households are increased, but the relative differences remain unaffected. The transformation impacts quite significantly on some results, while others remain unaffected. Where appropriate, the impact of the transformation on the results is indicated in a footnote. Importantly, the transformation has made the three surveys comparable, something that was not possible before.

Unless explicitly stated otherwise, the analysis is based on the transformed data. Also, all the data are weighted by the weights determined by the statistical authorities, as discussed earlier in this section.

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131. Using the 1990 income data in unadjusted form, and applying a scaling factor to the 1995 income data implies that average household income in constant prices in urban areas has decreased by 17 per cent between 1990 and 1995. According to the national accounts, real per capita household income increased by 5 per cent in the same period. This sounds like a contradiction. The explanation lies in the rapid urbanisation of this period, with large numbers of poor people migrating to the cities, thus reducing the average household income in metropolitan areas. It is quite possible that, as a result of this migration, the average income of urban households would have been reduced by *more* than 17 per cent. However, on the assumption that people generally do not overstate their income (Deaton and Grosh, 2000), and also because no other estimate of household income was available, it was decided not to downscale the 1990 figures. Nevertheless, given the dramatic socio-economic impact of the rapid urbanisation of that period, it must be pointed out that the 1990 income figures might be biased upwards.

6.2.3 Defining appropriate income quartiles

After the income adjustments were made, the data were divided into four income quartiles, for each year under consideration. Each income quartile includes 25 per cent of households.[132] The quartiles were defined in terms of *per capita* income. In a previous study (Van Walbeek, 2002b) the quartiles were defined in terms of overall household income, but, in retrospect, this was incorrect because it does not take the size of the household into account.[133]

The results for urban households, the subject of this study, are shown in Table 6.2.[134] The table highlights well-known facts about income distribution in South Africa, i.e., that it is highly unequal and largely split along racial lines. The poorest two income quartiles (Q1 and Q2) are comprised primarily of Africans. On the other hand, whites are more than proportionally represented in the highest income quartile (Q4), but other population groups have been rapidly increasing their presence in this income quartile in recent years. In all years, for urban areas and for the country as a whole, the median income of the highest income quartile is more than eight times larger than the median income of the lowest income quartile. The widespread poverty and large income inequalities are (and should be) a source of concern. However, while poverty and inequality issues are important, this chapter will not focus on income differences among the different races *per se*, but rather on the tobacco consumption patterns of households in the various racial and income groups.

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132. In practice small deviations can occur, because households with the same reported income are categorised into one income quartile. It does not make sense to randomly allocate households with the same income into two income quartiles, simply because the twenty-fifth, fiftieth or seventy-fifth percentile goes through that income level. However, as is clear from Table 2, the differences in the number of households included in the four income quartiles are negligible.

133. As an example, a household earning R90 000 in 2000 would be classified in the richest quartile (Q4) if it consisted of one or two people, in quartile Q3 if it consisted of between three and six people, in quartile Q2 if it consisted of between seven and fifteen people, and in the poorest quartile (Q1) if it consisted of sixteen or more people. Per capita income, rather than household income, is a better indicator of the standard of living in a heterogeneous mix of households that display large variations in the number of household members

134. The quartile splits were done on the per capita income of *weighted* households, not on the number of observations in the sample. It is clear that in all three years poorer households (quartiles Q1 and Q2) are more than proportionally represented in the sample. This implies that the weights for poorer households are relatively lower than those of the richer households. Also note that the data transformation, discussed in section 6.2.2, does not affect the compilation of the income quartiles in any way.

Table 6.2: Number of weighted households (in thousands) and observations (in parentheses), by income quartile, urban households only

	Q1	Q2	Q3	Q4	Total
1990					
Africans	399.5	272.5	136.8	15.7	824.5
	(4568)	(2145)	(547)	(70)	(7330)
Coloureds	77.4	88.3	27.2	6.4	199.3
	(442)	(495)	(157)	(31)	(1125)
Indians	33.2	52.9	16.9	2.1	105.1
	(244)	(511)	(243)	(31)	(1029)
Whites	6.5	101.8	334.6	491.6	934.5
	(49)	(743)	(1975)	(2081)	(4848)
Total	516.5	515.5	515.6	515.8	2063.4
	(5303)	(3894)	(2922)	(2213)	(14332)
Percentage of total households (observations)	25.03	24.98	24.99	25.00	100.0
	(37.00)	(27.17)	(20.39)	(15.44)	(100.0)
Median annual household income*	8400	16032	36000	81612	21816
Mean annual household income*	9411	18558	38341	99374	41414
Median household size	5	3	3	2	3
Mean household size	5.75	3.52	2.89	2.58	3.69
1995					
Africans	1068.8	860.1	579.3	241.5	2749.6
	(3657)	(2496)	(1541)	(639)	(8333)
Coloureds	218.4	236.2	128.7	48.1	631.5
	(1119)	(1022)	(575)	(212)	(2928)
Indians	19.8	74.8	91.7	53.1	239.4
	(74)	(280)	(368)	(243)	(965)
Whites	17.4	156.9	521.3	980.5	1676.1
	(54)	(521)	(1608)	(2494)	(4677)
Total	1324.4	1328.0	1321.0	1323.2	5296.5
	(4904)	(4319)	(4092)	(3588)	(16903)
Percentage of total households (observations)	25.01	25.07	24.94	24.98	100.0
	(29.01)	(25.55)	(24.21)	(21.23)	(100.0)
Median annual household income**	11363	26062	49948	108013	33190
Mean annual household income**	12893	28450	53206	134783	57298
Median household size	5	4	3	2	4
Mean household size	5.49	4.17	3.32	2.71	3.92
2000					
Africans	1618.8	1482.8	1256.2	716.2	5074.0
	(4000)	(3266)	(2571)	(1625)	(11462)
Coloureds	163.7	235.5	228.7	138.8	766.8
	(558)	(662)	(572)	(318)	(2110)
Indians	15.8	61.3	108.4	74.0	259.5
	(28)	(112)	(210)	(157)	(507)
Whites	25.1	45.0	225.8	883.7	1179.6
	(33)	(78)	(400)	(1342)	(1853)
Total	1826.4	1827.6	1825.4	1826.1	7305.5
	(4625)	(4122)	(3765)	(3460)	(15972)
Percentage of total households (observations)	25.00	25.02	24.99	24.99	100.0
	(28.96)	(25.81)	(23.57)	(21.66)	(100.0)
Median annual household income***	12289	27108	50843	151807	36145
Mean annual household income***	15084	31299	61953	197833	76533
Median household size	5	3	2	2	3
Mean household size	5.02	3.64	2.87	2.41	3.48

Sources: IES (1990, 1995 and 2000)

Note: The following transformations were applied to balance aggregate weighted income in the survey with SARB's estimate of current income in the relevant year.

* 1990 income data: Original data was left unchanged.

** 1995 income data: Original data was upscaled by 1.0406

*** 2000 income data: Original data was upscaled by 1.5060

6.3 Investigating possible product substitution

In the Income and Expenditure surveys four tobacco products are identified: (1) cigarettes; (2) cigars and cigarillos; (3) pipe and other tobacco (used for roll-your-own cigarettes)[135]; and (4) smoking requisites. Cigarettes are by far the most important category. Of the other three categories, only roll-your-own (RYO) tobacco is a realistic substitute to cigarettes. Smoking requisites (e.g. lighters and ashtrays) are complements to cigarettes. Cigars may be a substitute to cigarettes in a biochemical sense, but not in an economic sense. Thus, if people find that cigarettes become too expensive, they generally would not switch to even more expensive cigars.

As was highlighted in chapters 3 and 4, the empirical literature clearly indicates that an increase in the price of cigarettes decreases the quantity demanded. However, a predictable consequence of cigarette price increases is that some people will switch to cheaper substitutes, like RYO tobacco. From a public health perspective, this substitution effect is problematic. While a reduction in cigarette smoking has positive health benefits, the benefit would be partially eroded by the large increase in the consumption of hand-rolled cigarettes.

According to a representative of the tobacco industry (Andre van Pletzen, Manager: Corporate and Regulatory Affairs, BAT South Africa, personal communication, 2003), the market for RYO tobacco has been growing rapidly in South Africa in recent years. Even though the focus of this chapter is primarily on the regressivity of *cigarette* excise taxation, one cannot ignore the potential substitution effect, since this could bias the conclusions quite significantly. This is particularly true if the substitution effect is not the same for all income quartiles. Households that have switched from cigarettes to RYO tobacco would thus pay less *cigarette* excise tax, but more tax on RYO tobacco than households that did not switch. If a significant substitution effect were found, one would have to account for this in the analysis.

In Table 6.3 the total expenditure on tobacco products is divided into three categories for the various income quartiles: (1) cigarettes, (2) RYO tobacco, and (3) other tobacco products (consisting of cigars, cigarillos, smoking requisites and unspecified smoked products). To prevent any systematic bias in the relative shares of these categories, the same scaling factors that were applied to cigarettes were applied to the two non-cigarette tobacco categories. As is to be expected, cigarettes are by far the most important tobacco category, comprising more than 90 per cent of all tobacco expenditure for most income groups. However, between 1990 and 2000 the share of RYO tobacco in total tobacco consumption increased from 2.5 per cent to 4.1 per cent. The increase among the poorest income quartile is pronounced, increasing from

[135]. In this section "roll-your-own tobacco", "pipe and other tobacco" and "hand-rolled cigarettes" are used as synonyms.

5.1 per cent of total tobacco expenditure in 1990 to 18.7 per cent in 2000. This clearly indicates that a sizeable proportion of poor people have substituted relatively cheaper RYO tobacco for more expensive cigarettes. Even among the second poorest income quartile (Q2) there is evidence that some substitution has taken place, albeit at a more modest scale.[136] For richer households (Q3 and Q4) the share of RYO tobacco has not changed significantly in the past decade, suggesting no major substitution effect between cigarettes and RYO tobacco.

In order to calculate the relative regressivity of the tobacco tax, the results of Table 6.3 clearly indicate that one cannot focus only on cigarettes, because this will understate the tax burden of the poor vis-à-vis the rich, especially in 2000. Thus, in the following analysis the results are generally shown for two tobacco categories: firstly, for cigarettes separately and, secondly, for all tobacco products combined (including cigars and smoking requisites).

Table 6.3: Decomposition of tobacco expenditure, by income quartile

	Cigarettes	Pipe and other tobacco	Other tobacco products
Income quartile Q1			
1990	92.5	5.1	2.4
1995	88.4	9.3	2.3
2000	77.9	18.7	3.4
Income quartile Q2			
1990	94.5	2.4	3.1
1995	95.0	3.4	1.6
2000	91.1	7.1	1.8
Income quartile Q3			
1990	95.5	1.6	2.9
1995	96.4	1.1	2.5
2000	96.4	2.1	1.5
Income quartile Q4			
1990	94.8	1.9	3.3
1995	95.8	1.1	3.1
2000	95.0	0.9	4.1
Total			
1990	94.5	2.5	3.0
1995	94.8	2.7	2.5
2000	93.0	4.1	2.9

Sources: IES (1990, 1995 and 2000)

6.4 Smoking households and tobacco expenditure patterns

[136]. Can the substitution effect be effectively countered? Between 1994 and 2002 the nominal excise tax on RYO cigarette tobacco increased by a compounded rate of 38 per cent per year, compared to a compounded annual rate for cigarettes of 25 per cent (Van Walbeek, 2003). Unfortunately data on the retail price of RYO tobacco are not available, but the tax data suggests that the retail price of RYO tobacco is probably increasing more rapidly than the retail price of cigarettes. However, despite this gradual convergence in prices (in relative, but not necessarily in absolute terms), hand-rolled cigarettes are still much cheaper than manufactured cigarettes. As the price of manufactured cigarettes increase, people (and especially poor people) will have an incentive to switch to cheaper alternatives. If the government wishes to discourage this switching behaviour it should continue with its policy of increasing the tax on RYO tobacco by a greater percentage than that of manufactured cigarettes, since this would cause further convergence in the prices of these two products.

The data in the Income and Expenditure surveys refer to household expenditure, rather than individual expenditure. A smoking household is defined as a household that buys tobacco products. Since it would not usually be the case that all household members smoke, the percentage of smoking households should not be equated to the smoking prevalence percentage. Smoking prevalence is defined in terms of individuals, while smoking households are defined in terms of households. Nevertheless, one would expect a fairly close correlation between the percentage of smoking households and the smoking prevalence percentage over time.

While cigarette smoking may be more prevalent among lower socio-economic groups in many countries (Bobak et al., 2000), this does not appear to be the case in South Africa. It is evident from Table 6.4 that the poorest urban households (quartile Q1) have the lowest percentage of *cigarette* smoking households and, together with quartile Q2, have also experienced the largest decreases in the percentage of smoking households in the past decade. Cigarette smoking among the poorest urban households (income quartile Q1) has decreased from 46 per cent to 22 per cent of households. Cigarette smoking in the second poorest income quartile (Q2) has decreased by 23 percentage points (from 54 to 31 per cent), and in the third quartile by 17 percentage points (from 51 to 34 per cent). The percentage of urban cigarette smoking households among the richest income quartile (Q4) decreased by only 9 percentage points (from 43 to 34 per cent) in the same period. As was shown in chapter 4, the decrease in aggregate cigarette consumption in South Africa during the 1990s was driven primarily by an increase in the real price of cigarettes. Table 6.4 suggests that poorer households are more likely to give up cigarette smoking than richer households when faced with higher cigarette prices. Qualitatively, the results of Table 6.4 are consistent with the conclusions of chapter 2, i.e. (1) that overall smoking prevalence has decreased rapidly during the 1990s, (2) that smoking prevalence among the poor has decreased more sharply than among the rich and (3) that, between 1995 and 2000, smoking prevalence has decreased most sharply among Africans, followed by coloureds, Indians and whites, in that order.[137]

[137]. While smoking household and smoking prevalence percentages are not directly comparable, there does appear to be a *quantitative* discrepancy between the results presented here and those of chapter 2. Even if one accounts for the fact that the time periods do not overlap completely, the decrease in the percentage of smoking households in the 1995-2000 period seems too pronounced, compared to the more modest decreases in smoking prevalence indicated in chapter 2. The implication is that the absolute value of the decreases in the percentage of smoking households should thus be seen as upper limits.

Table 6.4: Percentage of urban households spending money on tobacco products, 1990, 1995 and 2000[138]

	Percentage of households			Change in percentage	
	1990	1995	2000	1990-1995	1995-2000
Cigarettes					
Q1	**46**	**42**	**22**	**-4**	**-20**
Q2	**54**	**46**	**31**	**-8**	**-15**
Q3	**51**	**45**	**34**	**-6**	**-11**
Q4	**43**	**44**	**34**	**+1**	**-10**
African	**48**	**41**	**25**	**-7**	**-16**
Coloured	**66**	**58**	**47**	**-8**	**-11**
Indian	**61**	**50**	**40**	**-11**	**-10**
White	**44**	**44**	**38**	**0**	**-6**
Total	**49**	**44**	**30**	**-5**	**-14**
All tobacco					
Q1	**48**	**52**	**34**	**+4**	**-18**
Q2	**56**	**49**	**37**	**-7**	**-12**
Q3	**52**	**47**	**36**	**-5**	**-11**
Q4	**44**	**45**	**36**	**+1**	**-9**
African	**50**	**46**	**32**	**-4**	**-14**
Coloured	**67**	**67**	**56**	**0**	**-11**
Indian	**62**	**50**	**40**	**-12**	**-10**
White	**45**	**46**	**39**	**+1**	**-7**
Total	**50**	**48**	**36**	**-2**	**-12**

Sources: IES (1990, 1995 and 2000)

However, if one considers *all tobacco* (i.e. not only cigarettes), the decrease in the percentage of smoking households is less pronounced. Nevertheless, between 1990 and 2000 the percentage of households that consume tobacco has decreased significantly, by 14, 19, 16 and 8 percentage points for income quartiles Q1 to Q4, respectively.

Among Africans (with 18 percentage points) and Indians (with 22 percentage points) the decrease in the percentage of tobacco-consuming households was much greater than among coloureds (11 percentage points) and whites (6 percentage points). Among coloureds, more than any other population group, hand rolling is far more prevalent, and Table 6.4 indicates that many coloureds switched from cigarettes to RYO tobacco during the 1990s. Among whites the decrease in the proportion of tobacco consuming households has been modest, primarily because the average income level of this group is so much higher than other groups, and the tobacco tax and price increases have not affected them as strongly.

[138]. This table is *not* affected by the upscaling of the data. Of course, should a significant proportion of households falsely declare that they do not buy tobacco, while in fact they do, then these percentages would be too low. However, this cannot be resolved by applying a blanket transformation to the data.

The results from Table 6.4 support the hypothesis that the demand for cigarettes is generally more price elastic for poor households and less price elastic for richer households. As indicated in chapter 4, between 1990 and 2000 the real retail price of cigarettes increased by more than 100 per cent, and at the same time total consumption of cigarettes decreased by nearly 30 per cent. The analysis presented here clearly suggests that the decrease in aggregate cigarette consumption was driven largely by poorer households quitting (or not starting) cigarette smoking. While some households' switch from cigarettes to RYO tobacco has diminished this effect to some degree, the net effect is that, in the period 1990 to 2000, there has been a pronounced decrease in smoking among the poor.

Even though the percentage of cigarette smoking households is lowest in the poorest income quartile, it is frequently argued that the poor generally spend a greater proportion of their income on cigarettes than the rich. In the top half of Table 6.5 the percentage of households that spend more than a certain (arbitrarily chosen) threshold percentage of their total income on cigarettes is shown.[139] Thus, in 1990, 29 per cent of urban households in the poorest income quartile spent more than 5 per cent of their total income on cigarettes, and 14 per cent spent more than 10 per cent of their income on cigarettes. At the other extreme, only 5 per cent of the richest households (quartile Q4) spent more than 5 per cent of their income on cigarettes in 1990, and only 1 per cent spent more than 10 per cent of their income on cigarettes. For 1990 and 1995 there is clear evidence that as income levels increase, the proportion of households spending above the threshold percentage decreases quite significantly. Between 1990 and 1995 the proportion of households spending more than the threshold percentage on cigarettes decreased slightly for all income quartiles, other than Q4.

Between 1995 and 2000 the overall picture, and especially the relative position of the rich versus the poor, changed dramatically. The proportion of very poor urban households (quartile Q1) spending more than 5 per cent of their income on cigarettes decreased from 26 per cent in 1995 to 15 per cent in 2000. Similarly, the proportion of very poor urban households (quartile Q1) spending more than 10 per cent of their income on cigarettes decreased from 12 to 9 per cent. On the other hand, the proportion of more affluent households (quartiles 3 and 4) spending more than 5 per cent of their income on cigarettes increased substantially, from 16 per cent to 19 per cent for quartile Q3 and from 7 per cent to 12 per cent for quartile Q4. The evidence suggests a major structural shift in the cigarette market in the 1995-2000 period. Household expenditure on cigarettes has decreased sharply among the poor, while it has increased among the rich.

The fact that the proportion of households spending in excess of some threshold percentage has decreased is consistent with the fact that poor people have a relatively high price elasticity of demand, and, given their limited income, a stronger incentive to quit smoking cigarettes in the face of cigarette price increases. At the same time, the evidence in Table 6.5 is consistent with the hypothesis that rich

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[139]. These percentages are much higher than those published in Van Walbeek (2002b). The reason is that the data in the present analysis has been weighted and upscaled to balance with aggregate income and cigarette expenditure figures, whereas the data used in the 2002 study were not upscaled, nor weighted. A change in the scaling parameters has a pronounced effect on the results presented in Table 6.5.

people are less likely to change their consumption volumes and are less inclined to quit smoking in reaction to price changes. Thus, an increase in the real price of cigarettes will increase their real expenditure on cigarettes, and will thus cause their cigarette expenditure, as a proportion of income, to increase.

If one considers all tobacco – not only cigarettes – the conclusions are qualitatively similar, but not quite as pronounced as for cigarettes separately. The proportion of poorer households (quartiles Q1 and Q2) that spend more than the threshold percentage on tobacco products has remained more or less constant between 1995 and 2000.[140] For richer households (quartiles Q3 and Q4) the proportion has increased quite sharply between 1995 and 2000. Thus, even though the position of the poor has not changed significantly in absolute terms, the proportion of poorer households spending more than the threshold percentages on tobacco products, *relative to more affluent households*, has decreased.

[140]. While a sizeable percentage of poorer households have quitted tobacco altogether (see Table 6.4), many poor households have switched to RYO tobacco. This substitution effect explains why the percentage of poor households that spend more than the threshold percentage on cigarettes has decreased, while the equivalent percentage for all tobacco products has remained approximately constant between 1995 and 2000.

Table 6.5: Percentage of moderate and heavy smoking households, by income quartile[141]

	Percentage of households spending more than X per cent of total household income on cigarettes						Absolute change in the percentage			
	5 %	10 %	5 %	10 %	5 %	10 %	5 %	10 %	5 %	10 %
	1990		1995		2000		1990-1995		1995-2000	
Cigarettes										
Q1	29	14	26	12	15	9	-3	-2	-11	-3
Q2	28	14	20	7	20	10	-8	-7	0	+3
Q3	17	5	16	5	19	10	-1	0	+3	+5
Q4	5	1	7	2	12	4	+2	+1	+5	+2
African	27	13	17	7	15	8	-10	-6	-2	+1
Coloured	32	13	26	11	27	15	-6	-2	+1	+4
Indian	24	8	14	4	19	7	-10	-4	+5	+3
White	10	3	14	5	14	6	+4	+2	0	+1
Total	20	8	17	6	16	8	-3	-2	-1	+2
All tobacco										
Q1	31	15	30	13	22	13	-1	-2	-8	0
Q2	30	15	21	8	23	12	-9	-7	+2	+4
Q3	18	5	17	5	21	11	-1	0	+4	+6
Q4	6	1	8	2	12	4	+2	+1	+4	+2
African	29	15	19	8	18	10	-10	-7	-1	+2
Coloured	33	14	29	12	34	18	-4	-2	+5	+6
Indian	25	9	15	4	19	7	-10	-5	+4	+3
White	11	3	15	5	15	6	+4	+2	0	+1
Total	21	9	19	7	19	10	-2	-2	0	+3

Sources: IES (1990, 1995 and 2000)

6.5 The regressivity of the cigarette excise tax

It is generally accepted that an equitable tax (or set of taxes) must be progressive, i.e. that the tax, as a percentage of income, increases as people's level of income increases. A regressive tax, on the other hand, is one that falls disproportionately heavily on the poor. The tobacco industry has argued that cigarette excise tax increases are misdirected as a tool for reducing cigarette consumption, because, amongst other things, they are regressive (Viscusi, 2003).[142] As pointed out in section 6.1, tobacco control economists accept that cigarette excise taxes are often regressive but that increases in the excise tax are likely to reduce the regressivity of the tax, because the poor's demand for cigarettes is generally more price sensitive than that of the rich.

[141]. The numbers in this table are influenced to a large extent by the data transformation discussed in section 6.2.2. Should it be found that the upscaling of the data was excessive, these figures would be too high. However, even if that were the case, it would not change the basic message that, in any year, as household income increases, the proportion of households spending more than a threshold percentage on tobacco would decrease.

[142]. Viscusi (2003: 22) claims that in the US people earning $50 000 or more per year pay 0.08 per cent of their income in cigarette taxes, while people earning less than $10 000 pay 1.62 per cent of their income in cigarette taxes.

The aim of this section is to investigate empirically these competing claims, based on South Africa's experience during the 1990s. Given that (1) cigarette prices in South Africa do not vary greatly for different brands, and (2) the quantity of cigarettes consumed by any household is not known, but total expenditure is known, we assumed that the excise tax amount paid by a smoking household is proportional to the cigarette expenditure of that household.[143,144] Also, it is explicitly assumed that consumers pay the full burden of the excise tax. It was shown in chapter 5 that, given the high degree of concentration in South Africa's cigarette manufacturing industry, this is a realistic assumption to make. Following the methodology of Pechman (1985), the total excise tax amount is then expressed as a percentage of total household income. Averages of the relative excise tax burden were calculated (1) for urban smoking households in the respective years and (2) for all urban households that bought tobacco in 1990, but that subsequently quit smoking. The results of this analysis are presented in Tables 6.6 through 6.9.[145]

Table 6.6: Average percentage of household income spent on cigarette excise taxes, for urban smoking households only[146]

	Cigarettes			All tobacco products		
	1990	**1995**	**2000**	**1990**	**1995**	**2000**
Q1	**1.71**	**1.79**	**3.17**	**1.74**	**1.68**	**2.87**
Q2	**1.54**	**1.29**	**2.84**	**1.57**	**1.29**	**2.71**
Q3	**0.96**	**1.06**	**2.61**	**0.99**	**1.06**	**2.57**
Q4	**0.49**	**0.66**	**1.53**	**0.51**	**0.66**	**1.55**
African	**1.62**	**1.28**	**2.77**	**1.65**	**1.27**	**2.57**
Coloured	**1.33**	**1.36**	**2.56**	**1.37**	**1.36**	**2.57**
Indian	**1.10**	**0.91**	**2.03**	**1.11**	**0.93**	**2.03**
White	**0.76**	**1.02**	**1.67**	**0.79**	**1.02**	**1.70**
Total	**1.19**	**1.19**	**2.52**	**1.22**	**1.19**	**2.44**

Sources: IES (1990, 1995 and 2000)

143. As indicated in chapter 4, the excise tax component of total cigarette expenditure was 20.1 per cent in 1990, 21.6 per cent in 1995 and 31.7 per cent in 2000. These percentages were obtained by dividing the excise tax by the average retail price of cigarettes in the appropriate month. The impact of sales tax is excluded, since this indirect tax is applied equally on most non-essential products and services. For other tobacco products the same percentages were applied as those applied to cigarettes.

144. Given that the excise tax is levied as a specific tax, rather than as a percentage of value, the tax burden on cheaper cigarettes is higher than more expensive cigarettes. Also, given that the poor are more likely to buy cheaper cigarettes, it is possible that the tax burden could be slightly higher than the figures shown below. However, without more precise data on the prices of cigarettes bought by the various income groups, one cannot investigate this effect further.

145. In order not to distort the results by obvious outliers and data capturing errors, households that indicated that they spend 40 per cent or more of their income on cigarettes were excluded from the analysis. The number of observations excluded from the 1990, 1995 and 2000 data sets were 70, 3 and 27 respectively. In the rest of the chapter all these outliers are excluded from the analysis.

146. Even though the *relative* tax burdens for the various income and population groups within any particular year are unaffected by the upscaling procedure that was described in section 6.2.2, the comparability of the results between the various years is crucially affected by the upscaling procedure. The same comment applies to Table 6.8.

From Table 6.6 it is evident that, during the 1990s, the burden of excise tax has increased significantly for smoking households. For those households average cigarette excise tax, as a percentage of average household income, increased from 1.2 per cent in 1990 and 1995 to 2.5 per cent in 2000. This rapid increase in the burden of the tax on smoking households is unsurprising, given the very sharp increases in the excise tax in the latter half of the 1990s. As the industry points out, the poor (quartile Q1) carry a disproportionately heavy burden of excise tax, and for those households that have been unable to quit smoking cigarettes, the burden has increased from 1.7 per cent of household income in 1990 to 3.2 per cent of household income in 2000. For households that consume any form of tobacco – not only cigarettes – the average tax burden among the poorest smoking households has increased from 1.7 per cent to 2.9 per cent of household income. For each of the three survey years, the burden of the tax (on cigarettes and all tobacco) decreases as the households' income level increases.

Regressivity can be measured as follows: for any specific year, the average cigarette excise tax burden for the average smoking household is set at 100, and the tax burden of any income and/or racial group is expressed as a percentage of the "average smoking household". The higher the "regressivity index", the greater the relative burden of the tax and vice versa. In Table 6.7 the *relative* regressivity of the cigarette excise tax is shown for all smoking households. For example, in 1990 the regressivity index of cigarette smoking households in the poorest income quartile was 144, implying that the tax burden was 44 per cent higher than that of the "average smoking household". In the same year, the regressivity index of the richest income quartile was only 41, implying a much lower than average excise tax burden.

What this table shows is that the excise tax on cigarettes, and tobacco products in general, is regressive, but has become less regressive over time. As noted before, the fact that cigarette excise taxes are regressive is frequently pointed out by the tobacco industry as a reason for the government not to increase the excise tax. Tobacco control economists acknowledge this, but they focus much more on the impact of tax and price *changes* on the regressivity of the excise tax (see Jha and Chaloupka, 2000). In Table 6.7 there is clear evidence that the relative burden of excise taxes on the poorest smoking households (quartile Q1) has decreased, while the burden has increased significantly for more affluent smoking households.

In 1990 the cigarette excise tax burden was 3.5 (= 144/41) times heavier on smoking households in the poorest income quartile, compared to the richest income quartile. By 2000 this ratio had decreased to 2.1. For tobacco as a whole the excise tax burden of the poorest smoking households compared to the richest smoking households had decreased from a ratio of 3.4 in 1990 to 1.9 in 2000. What this means is that the tobacco excise tax is still regressive, but the degree of regressivity has been substantially reduced.

Table 6.7: Relative burden of the excise tax, for urban smoking households only[147]

	Cigarettes			All tobacco products		
	1990	**1995**	**2000**	**1990**	**1995**	**2000**
Q1	**144**	**150**	**126**	**142**	**141**	**118**
Q2	**129**	**108**	**113**	**128**	**108**	**111**
Q3	**80**	**89**	**104**	**81**	**89**	**106**
Q4	**41**	**55**	**61**	**42**	**55**	**63**
African	**136**	**108**	**110**	**135**	**106**	**105**
Coloured	**112**	**114**	**102**	**112**	**114**	**105**
Indian	**93**	**77**	**81**	**91**	**78**	**83**
White	**64**	**85**	**66**	**64**	**86**	**70**
Total	**100**	**100**	**100**	**100**	**100**	**100**

Sources: IES (1990, 1995 and 2000)

The conclusion from Tables 6.6 and 6.7 is that although the *absolute* burden of excise tax on smoking households has increased for all income quartiles, the regressivity of the tax has been reduced. However, Tables 6.6 and 6.7 do not present the full picture, since they focus only on smoking households. As was pointed out in Table 6.4 and also in chapter 2, there is ample evidence that between 1990 and 2000 many people have quit smoking. A major contributing factor to people's decision to quit smoking is the increasing price of tobacco. In order to determine the relative regressivity of the excise tax, one should not only focus on smoking households, but also take cognisance of those households that have quit smoking tobacco over the relevant period.

The proportion of households that smoked in 1990 (see Table 6.4) was taken as the benchmark, and it was assumed that this benchmark proportion would have remained constant had it not been for the price increases of the 1990s.[148] Thus, to account for the changes in the proportion of smoking households, the tax burdens presented in Table 6.6 were adjusted by incorporating the effect of the change in the percentage of smoking households after 1990. In Table 6.8 the average excise tax burden on cigarettes and all tobacco (expressed as a percentage of household income) is calculated for the proportion of households that were consuming tobacco in 1990. In Table 6.9 the results are presented in index form.

147. Because of the "normalisation" of the tax burdens, the results of this table are not affected at all by the upscaling procedure derived in section 6.2.2. The same comment applies to Table 6.9.

148. As was explained in chapter 1, South Africa has imposed strong legislative restrictions against cigarette advertising and indoor smoking. However, this legislation only became effective in 2001 and would not have had a material impact on people's smoking patterns before then.

Table 6.8: Average percentage of household income spent on cigarette excise taxes, for the proportion of urban households that smoked in 1990

	Cigarettes			All tobacco products		
	1990	**1995**	**2000**	**1990**	**1995**	**2000**
Q1	**1.71**	**1.63**	**1.52**	**1.74**	**1.82**	**2.03**
Q2	**1.54**	**1.10**	**1.63**	**1.57**	**1.13**	**1.79**
Q3	**0.96**	**0.94**	**1.74**	**0.99**	**0.96**	**1.78**
Q4	**0.49**	**0.68**	**1.21**	**0.51**	**0.68**	**1.27**
African	**1.62**	**1.09**	**1.44**	**1.65**	**1.17**	**1.64**
Coloured	**1.33**	**1.20**	**1.82**	**1.37**	**1.36**	**2.15**
Indian	**1.10**	**0.75**	**1.33**	**1.11**	**0.75**	**1.31**
White	**0.76**	**1.02**	**1.44**	**0.79**	**1.04**	**1.47**
Total	**1.19**	**1.07**	**1.54**	**1.22**	**1.14**	**1.76**

Sources: IES (1990, 1995 and 2000)

Table 6.8 indicates that the average burden of the cigarette excise tax on the proportion of households that smoked cigarettes in 1990 increased from 1.19 per cent of aggregate household income in 1990 to 1.54 per cent in 2000. For all tobacco the average excise tax burden increased from 1.22 per cent to 1.76 per cent of household income. What this means is that, although the tax burden has increased substantially for *smoking* households (as indicated in Table 6.6), the increase in the overall tax burden has been tempered by the fact that the proportion of smoking households has decreased sharply.

Interestingly, there has been a decrease in the *absolute* burden of the cigarette excise tax on the lowest income quartile (Q1). This is the result of a decrease in the average number of cigarettes smoked by smoking households and a sharp reduction in the percentage of very poor households that smoke. However, the absolute burden of *all tobacco* tax on the lowest income quartile has increased slightly, because a large proportion of poor households have switched to cigarette substitutes. The decrease in the cigarette excise tax burden of the poorest households (Q1) has been so sharp that their excise tax burden (1.52 per cent of household income) in 2000 was somewhat smaller than the "average household" (1.54 per cent of household income). For all tobacco, the tax burden on the poorest households (2.03 per cent of household income) was, however, slightly higher than the tobacco tax burden on the "average household" (1.76 per cent) in 2000.

The absolute cigarette tax burden has increased sharply for the other three income quartiles, especially between 1995 and 2000. The implication, also borne out in Table 6.9, is that the cigarette excise tax has changed from being obviously regressive in 1990 and 1995, to something closer to a proportional tax in 2000. The middle two income quartiles carry a heavier than average cigarette tax burden, while the poorest and richest income quartiles carry a below average cigarette tax burden. For all tobacco, the tax is still regressive, but much less than used to be the case in 1990 or 1995. Between 1990 and 2000 the relative tax tobacco burden of the richest income quartile (Q4) has increased by more than 70 per cent, primarily because the sharp increases in the excise tax did not result in a significant reduction in tobacco consumption, nor in a significant increase in quitting rates. Among households in income

quartile Q3, the relative tobacco excise tax burden has increased by 25 per cent, while for income quartiles Q2 and Q1 it has decreased by approximately 20 per cent between 1990 and 2000.[149]

Table 6.9: Relative burden of the excise tax, for the proportion of urban households that were smoking in 1990

	Cigarettes			All tobacco products		
	1990	**1995**	**2000**	**1990**	**1995**	**2000**
Q1	**144**	**153**	**98**	**143**	**159**	**116**
Q2	**129**	**103**	**106**	**129**	**99**	**102**
Q3	**81**	**88**	**113**	**81**	**84**	**101**
Q4	**41**	**63**	**78**	**42**	**59**	**72**
African	**136**	**102**	**94**	**135**	**102**	**94**
Coloured	**112**	**112**	**118**	**112**	**119**	**122**
Indian	**92**	**70**	**86**	**91**	**66**	**75**
White	**64**	**95**	**93**	**65**	**91**	**84**
Total	**100**	**100**	**100**	**100**	**100**	**100**

Sources: IES (1990, 1995 and 2000)

6.6 Conclusion

The aim of this chapter was to investigate how changes in the excise tax on, and price of, cigarettes affect South African households' expenditure on tobacco products. The results are based on three household surveys, performed over a period in which there were large changes in the real price of cigarettes.

Analyses of household survey data are fraught with potential biases, errors, omissions and trade-offs in the data collection process, as is pointed out in detail by Deaton (1997) and Grosh and Glewwe (2000). Unfortunately the household survey data, on which this analysis is based, was also subject to errors that limited the comparability of the various surveys. In order to make the data more comparable, some transformations were applied across all households. These transformations have, in some instances, had a significant quantitative impact, but have not substantially changed the basic findings.[150]

Despite these caveats, a number of conclusions can be drawn from this study. There is strong evidence that the proportion of cigarette smoking households has decreased sharply between 1990 and 2000. This is especially true for poorer households. This conclusion is qualitatively similar to those of chapter 2, where it was found that cigarette smoking prevalence has decreased sharply since 1993. However, there has been a significant increase in the use of RYO tobacco among poor households. The decrease

[149]. Other than reducing their expenditures on tobacco and reducing their effective tax burden, there are clear health benefits from not smoking. Households that stop smoking (or do not start) reduce their risk of contracting potentially debilitating and fatal diseases, which carry a large, albeit difficult to quantify, cost.

[150]. For example, because of the transformation the average tax burden has increased numerically for all households, i.e. the tax burden is higher for all households as a result of the data transformation. However, the transformation has not affected the central conclusion that the regressivity of the tax has decreased over time.

in the proportion of poor households that smoke cigarettes has thus been tempered by the substitution effect. Overall, despite this substitution towards RYO tobacco, there has been a significant decrease in tobacco use among poor households.

The proportion of rich households that smoke has also decreased, but at a less pronounced rate than among poorer households.

Econometric evidence, presented in chapter 4, clearly indicates that the decrease in cigarette consumption in South Africa is primarily the result of the large increases in the real price of cigarettes, especially since 1994. Since poor and rich households react so differently to the tax-induced increases in the price of cigarettes, the excise tax has become less regressive. Relative to the rich, the cigarette excise tax burden on the poor has decreased. Even if one takes the cigarette/RYO substitution effect into account, the empirical evidence clearly indicates that the regressivity of the tobacco excise tax has decreased.

From a tobacco control perspective, this is a very positive finding. It confirms the view that although excise taxes on tobacco are regressive, increases in the excise tax reduce the regressivity of the tax (World Bank, 1999: 74). Despite the industry's rhetoric, this study shows that an increase in the tobacco excise tax does not place an unjustified economic burden on the poor.

CHAPTER 7

ADVERTISING EXPENDITURE AND THE TOBACCO INDUSTRY: A VIEW FROM THE OUTSIDE

7.1 Introduction

In many countries cigarettes are among the most heavily advertised and promoted consumer products (Saffer, 2000: 217).[151] The aim of advertising is to use the mass media to create positive product imagery or positive product association. Cigarette advertising is usually designed to associate the product with people's desire for sophistication, pleasure and success. In order to segment the market and to appeal to a wide variety of current and potential consumers, different desires are created by different brands.[152]

Tobacco control advocates argue that all tobacco advertising and promotion should be banned (World Bank, 1999 and Saffer, 2000). They maintain that advertising presents cigarette smoking as glamorous, sophisticated and sexy, and that the associated health risks are downplayed. Advertising creates an environment where smoking is seen as a natural, normal and pleasurable activity. Through the advertising imagery, it appeals to the personal and developmental concerns of teenagers. Furthermore, rather than providing information to the public, it is argued that cigarette advertising stifles the dissemination of knowledge about the product (Seidel Marks, 1998). By threatening to divert their advertising expenditure away from particular publications or broadcasters, cigarette manufacturers could bias the media's analysis of tobacco-related news.

In contrast, the tobacco industry argues that cigarette advertising is not primarily aimed at glamorising the product or at recruiting new smokers. Because the product is in the mature stage of the product life cycle, advertising merely encourages confirmed smokers to stay with, or switch to, a particular brand. Cigarette advertising is meant to inform consumers (for example, about new product developments); it does not coerce them to smoke. The tobacco industry further argues that their advertising is not aimed at children, but at existing smokers.

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151. In the US, for example, cigarette advertising expenditures as a percentage of total retail sales (approximately 6 per cent) is more than double the industry average. A similar pattern was found in South Africa before cigarette advertising was banned in 2000. Throughout the 1980s and the first half of the 1990s, cigarette advertising comprised between 4 and 6 per cent of total advertising expenditure. Cigarette expenditures were consistently less than 2 per cent of total consumer expenditures during this period.

152. Some of the well-known cigarette advertising themes in South Africa included the following: international travel (Peter Stuyvesant, "The international passport to smoking pleasure"), self-confidence and rebelliousness (Winston, "Do I look shy?"), and adventure (Camel).

The international empirical literature on the relationship between advertising expenditure and cigarette consumption does not provide conclusive answers (Chaloupka and Warner, 1999). In fact, as was pointed out in chapter 3, the debate between proponents of a consumption-advertising relationship and its critics is particularly acrimonious. The standard econometric way of measuring the impact of advertising on cigarette consumption is to include advertising expenditure as an independent variable in a demand regression equation, and to consider the significance of the coefficient on the advertising expenditure variable. A study on the impact of advertising expenditure on cigarette consumption in South Africa, in which a marginally significant positive relationship was found (ETCSA, 1998), was heavily criticised by detractors (High, 1999 and Leach, 1998).

Saffer (2000) argued that traditional econometric techniques are unlikely to produce any significant results, because advertising is likely to be subject to decreasing marginal returns. A moderate increase or decrease in advertising expenditure is unlikely to have a significant impact on total cigarette expenditure. However, should advertising be banned completely, it would probably have a significant impact on aggregate cigarette consumption. Saffer investigated a number of countries that have imposed partial or complete advertising bans. He concluded that partial bans had little or no impact on cigarette consumption, but total (or very strong) advertising bans resulted in significant falls in cigarette consumption over time.

Based on the rationale that complete bans are more effective than partial bans, South Africa has implemented legislation (the Tobacco Products Control Amendment Act, Act 12 of 1999) which banned all tobacco advertising and sponsorship from January 2001, subject to a 'sunset clause'.[153] The legislation was vehemently opposed by both the tobacco and advertising industries, the latter arguing that the legislation would lead to major revenue and job losses in the advertising industry. However, despite its opposition to the legislation, the advertising industry complied with the regulations after these were enacted.

The aim of this chapter is to examine the main trends in South Africa's advertising expenditure and the role that cigarette advertising played. In previous research on the demand determinants of cigarette consumption, cigarette advertising expenditure was included in the demand equation, but the data were highly aggregated and not complete for the full sample. It is believed that this is the first South African tobacco-related study to analyse cigarette advertising data at this level of comprehensiveness and detail.

The structure of the chapter is as follows. In Section 7.2 the derivation of the data is discussed. This is followed in Section 7.3 with a discussion of the main trends in cigarette advertising in South Africa, specifically in comparison to total advertising expenditure. In Section 7.4 the focus shifts to an analysis of advertising trends among the major cigarette brands.

153. According to the regulations, tobacco product advertising had to be phased out by April 2001. The three-month grace period would have allowed the industry to honour contracts with advertising agencies for that period. However, the tobacco industry announced in December 2000 that it would cease all advertising by the end of that year.

7.2 Data used

All advertising expenditure ('adspend') data were obtained from AC Nielsen, which has been collecting adspend data since 1967. At first only advertising data for the print media and the state radio and television broadcast network, the South African Broadcasting Corporation (SABC), were collected, but since 1976 outdoor and cinema advertising has been monitored as well. All television advertising has been observed since this advertising medium was introduced in 1978.[154] Advertising on independent radio stations has been monitored since 1981. 'Knock 'n drop' advertising[155] and Internet advertising has been monitored since 1998 and 2000, respectively.

AC Nielsen collects the data in one of two ways. For print, television and radio advertising, they monitor the relevant medium and record the value of the advertising for all products and services advertised. This means they subscribe to all newspapers, magazines and journals, and their personnel listen to all radio stations and watch all television channels. To calculate the print media's adspend, each publication is scrutinised, the size of the advertisement is measured, its location (e.g. back page, cover page, etc.) is noted, and the details are entered into the computer system. The value of the advertisement is calculated by applying the relevant publication's published rates. For radio and television advertising AC Nielsen employees listen to and watch all stations and record the details of the advertisement (station, time of day, length of advert, product, etc.). For outdoor, cinema, 'knock 'n drop' and Internet advertising, AC Nielsen obtains copies of invoices from the main service providers.

Given that the data are collected in great detail, the resulting reports are also very detailed. In the main report, monthly and year-to-date data about the adspend on a particular product or range of products are provided by medium, or component thereof (e.g. English weekend newspapers, trade magazines, Radio 702, TV1, etc.). So, for example, one can trace the monthly adspend on Dunhill Superior Mild cigarettes in English weekly newspapers, or a particular radio station, or a television channel, etc.

One must bear in mind that although the data are comprehensive and detailed, this only covers a proportion of the total costs of advertising.[156] For example, the production costs of the advertisements are not included in these figures. These data only refer to publication and broadcasting costs.

Monthly data after January 1994 were made available in electronic format. However, before 1994, the data were only available in published (hard copy) form. To obtain the data, the researcher searched through AC Nielsen's archives. A complete set of monthly data was available for the period after 1981,

154. Advertising on the TV1 channel was introduced in 1978, on TV2 and TV3 in January 1982, on Bop TV in July 1984, on TV4 in May 1985 and on M-Net in October 1986.
155. 'Knock 'n drop' advertising includes unsolicited distribution of samples, and delivery of flyers at people's homes, street corners, etc.
156. Furthermore, advertising costs comprise only a part of overall marketing or promotion costs. Marketing is defined as all activities designed to increase sales. Other than advertising, marketing includes promotional allowances, free sampling, sponsorship, public entertainment, and retail coupons. In the US the relative share of advertising in total promotional costs dropped from 32 per cent in 1986 to 16 per cent in 1996 (Saffer, 2000: 216). Since then it has dropped even further (De Beyer, personal communication, 2005).

but because of missing data sources, the data set is incomplete for the period before 1981. The focus of this paper will therefore be primarily on the period after 1981.

Given the relative insignificance and newness of knock 'n drop and Internet advertising,[157] this was excluded from the analysis altogether. The following media were included in the current analysis: (1) print, (2) radio, (3) television, (4) cinema, and (5) outdoor advertising. AC Nielsen also publishes a "total adspend" figure for a particular month or year.[158]

Naturally the quality of the data depends very much on the data collecting process. This is something that cannot be readily verified, especially not retrospectively. However, one can take comfort from the fact that, given AC Nielsen's reputation in the collection of management information, it is unlikely that systematic and serious errors will be made.

However, an area where there have been some significant problems is in radio adspend. During some months during the 1980s and early 1990s some radio stations were not monitored, with the result that these data would understate true radio adspend.[159] Rather than publishing obviously wrong and distorted data, new data were generated based on the average year-on-year growth rate of adspend in the previous and following months for which accurate data were available.

7.3 The relative importance of cigarette advertising to the advertising industry

At the 1998 public hearings by the South African Parliamentary Portfolio Committee for Health on the Tobacco Products Control Amendment Bill, the advertising industry argued strongly against the tobacco advertising ban proposed in the Bill, on the grounds that tobacco advertising business was an important component of their total revenue. According to some submissions (see Van Walbeek, 2001), the tobacco business was more profitable than other business, and the loss of this adspend would lead to cash flow problems. While the present data do not allow one to investigate these claims, the aim of this section is to determine the relative importance of cigarette advertising in the advertising industry.

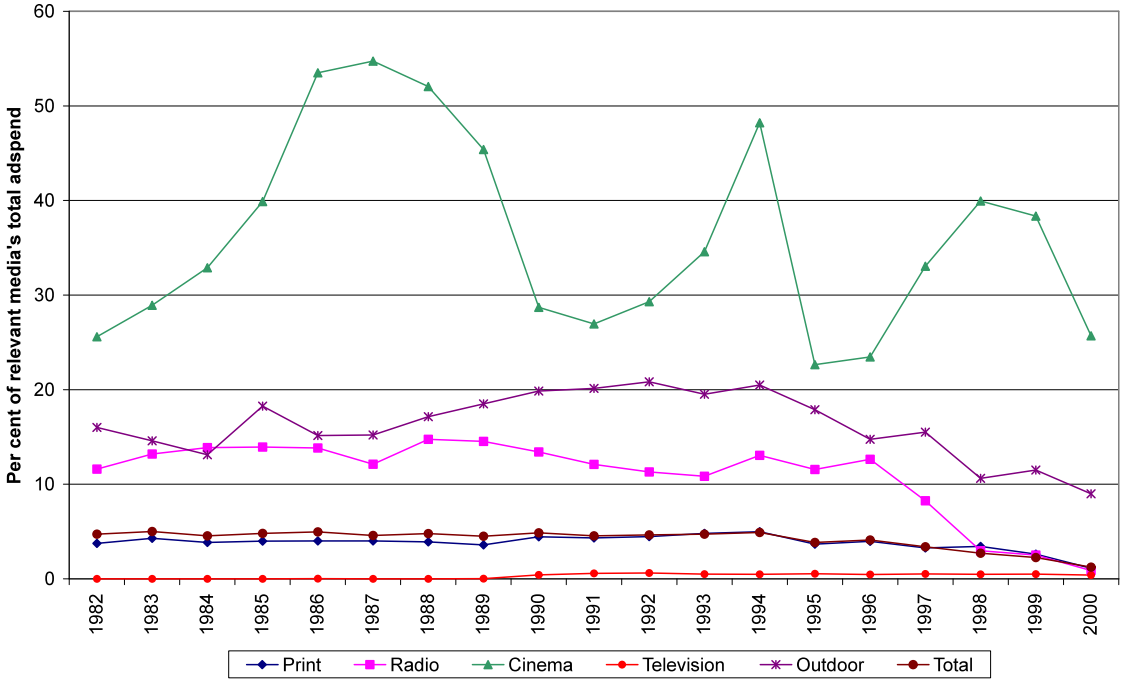
157. In 2000 these two media, combined, comprised less than 1 per cent of total adspend.

158. Ignoring knock 'n drop and Internet advertising, this figure should equal the sum of the five listed media. However, for unknown reasons this does not always happen. The following convention was thus followed: If the sum of the adspend by medium exceeds the published total, the published total is discarded and replaced by the sum of the adspend by medium. However, if the sum of the adspend by medium is less than the published total, the published total is presumed to be correct.

159. Months where the radio adspend data are incomplete are the following:
Nov 1983: 702, Paralelo and Bop stations excluded;
Mar 1986: most stations excluded;
Feb 1988 – Nov 1988: most stations excluded;
April 1992: No explanation;
June 1992 – Nov 1992: most stations excluded;
Dec 1997: There seems to be a problem on the AC Nielsen side. The value is apparently far too high. This seems wrong, given that December generally marks a seasonal downturn.

The relative importance of cigarette advertising, defined as the percentage of cigarette advertising in total adspend, per medium, for the period 1982 to July 2001 is shown in Figure 7.1.

Figure 7.1: Relative importance of cigarette advertising on various advertising media



Source: AC Nielsen (2001)

There are clearly wide variations in "cigarette dependency" between the various media. Cinema advertising was by far the most dependent, with about a third of total advertising revenue derived from cigarette advertising over the past 20 years. This was subject to significant fluctuations. Similarly, outdoor advertising was heavily dependent on cigarette advertising, the latter contributing 20 per cent of total revenues during the early 1990s. However, between 1994 and 2000, the share of cigarette advertising decreased from 20 per cent to 10 per cent.

Cigarette advertising was responsible for between 10 and 15 per cent of all radio adspend between 1982 and 1996. Subsequently, there was a dramatic decline in radio cigarette advertising. After 1998 less than 3 per cent of radio adspend was obtained from cigarette advertising.

Cigarettes comprised a stable 5 per cent of total print advertising for most of the period. During the second half of the 1990s it tailed off, and generated less than 2 per cent of the print media's adspend during 1999 and 2000.

As a result of an agreement with the South African Broadcasting Corporation not to advertise cigarettes on television, the "cigarette dependence" of television advertising was very small. However, throughout the 1990s the tobacco industry advertised some of its promotional and sponsorship activities on television.

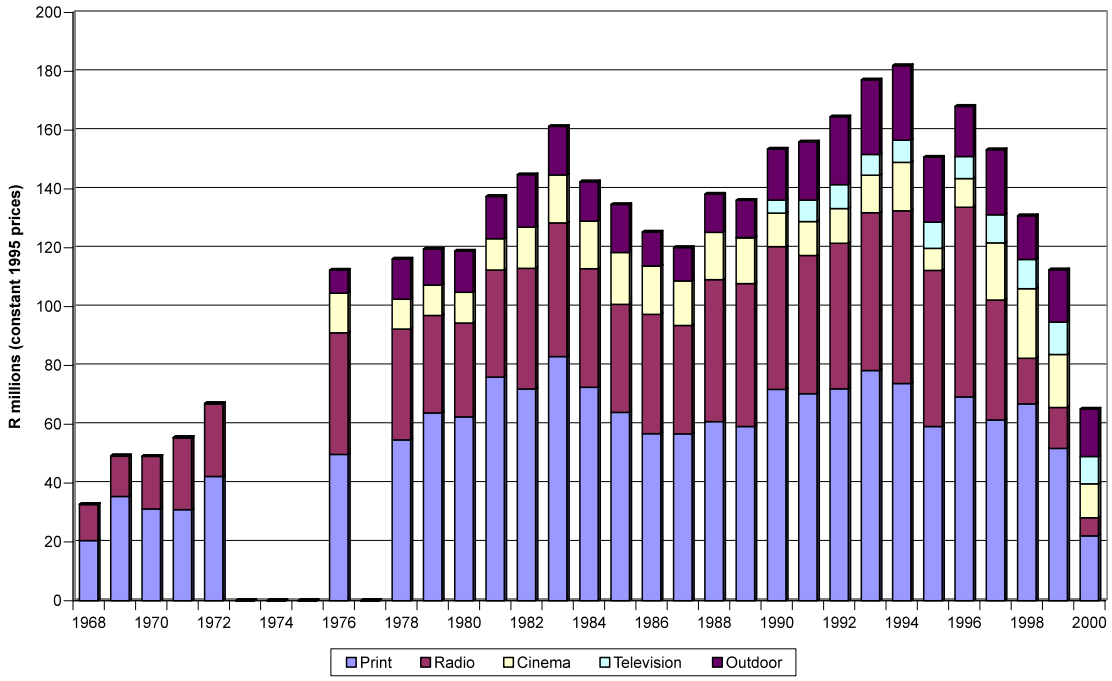
The overall conclusion is that cigarette advertising has been decreasing in all media, other than cinema, since the early 1990s. This decrease in adspend is correlated with the sharp decrease in cigarette consumption since the early 1990s. The implication for

advertising agencies is that their dependence on cigarette advertising has been slowly decreasing, not because of government-imposed advertising restrictions, but because of reduced advertising budgets by the cigarette manufacturing industry itself.

In Figure 7.2 real annual cigarette adspend (deflated by the CPI) is shown for the period 1968 through 2000. Unfortunately, data for four years during the 1970s could not be located in the AC Nielsen archives. Furthermore, some media were not monitored before 1976 (cinema and outdoor), or did not yet exist (television).

Despite these limitations, some interesting trends can be recognised: (1) a rapid increase in cigarette advertising throughout the 1970s and early 1980s, (2) a decrease in the mid-1980s, (3) a recovery between 1987 and 1994, and (4) a very rapid decrease after 1994. The sudden, but temporary, decrease in adspend in 1995 was caused by the introduction of health warnings on cigarette packs, to which the industry reacted by greatly reducing adspend in most media.

Figure 7.2: Media composition of cigarette advertising, 1968-2000



Source: AC Nielsen (2001)

Long before the South African Minister of Health introduced the Tobacco Products Control Amendment Bill in Parliament in 1998, the tobacco industry was reducing its real advertising expenditure. One could speculate on possible reasons for this: (1) the industry pre-empted the legislation and wanted to phase out its advertising slowly; (2) advertising expenditures were reduced in accordance with the decrease in sales; and (3) the industry was shifting its resources from direct advertising to other promotional activities. It is also possible that the threat of legislation reduced advertising agencies' interest in tobacco advertising, because they may have expected the tobacco revenue to be transitory.

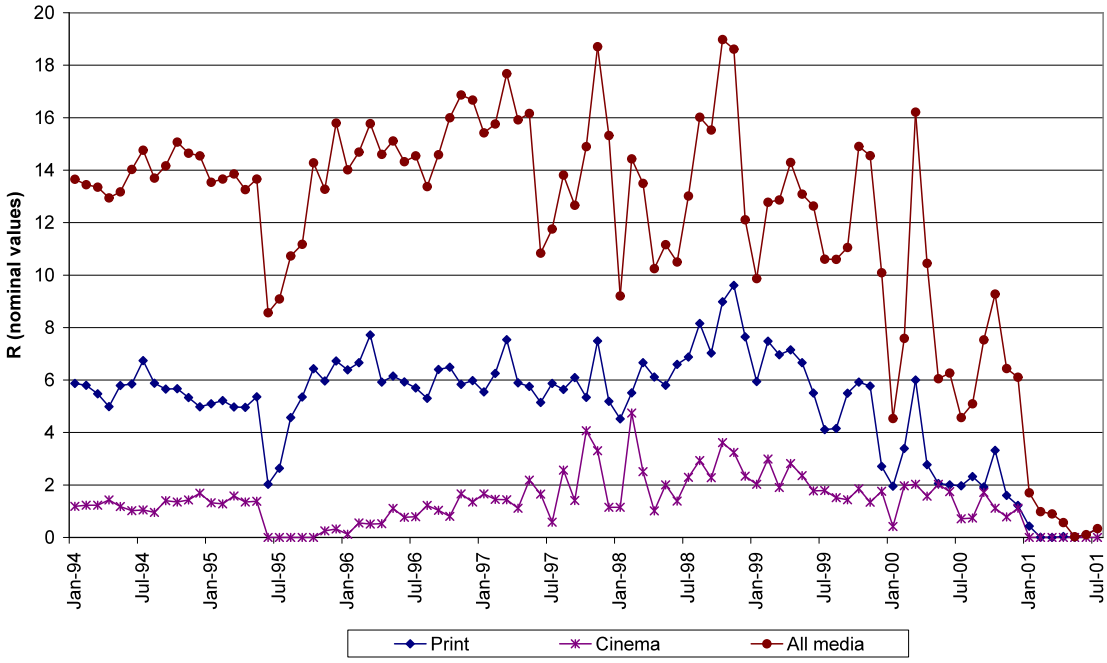
Whatever the reason for the real decrease in cigarette advertising, it is clear that the impact of the advertising ban on the advertising industry was significantly diminished. The advertising industry was being "weaned off" cigarette advertising for a period of at least five years before the advertising ban became effective in January 2001.

Using monthly data, short-term movements in cigarette advertising are analysed. In Figure 7.3 nominal adspend amounts are shown for cigarette advertising in some selected media (print and cinema, as well as the total) for the past seven years.

After 1997, nominal total cigarette adspend decreased rapidly and was subject to much volatility. The cause of this volatility is not investigated, but could serve as a potentially fruitful area for future research. However, one could speculate that legislative developments and the threat of such developments could have increased the volatility of cigarette adspend. For example, the sharp decrease

in cigarette adspend at the end of 1999 could be explained by the fact that the industry may have expected the advertising ban to become effective in 2000 and that they reduced their advertising expenditure as a precautionary measure. An alternative explanation is that the industry made more use of 'pulsing' techniques after 1997. A 'pulse' is a burst of advertising that lasts for a limited period, and then stops (Saffer, 2000: 218). Depending on the product, pulsing may be more effective than consistent, but less intense, advertising.

Figure 7.3: Monthly cigarette adspend in nominal values



Source: AC Nielsen (2001)

The sharp decrease in adspend in June 1995 is explained by the introduction of health warnings on cigarette packs and visual advertising material. Cigarette advertising in cinemas disappeared completely for five months, and made only a slow recovery afterwards. Print advertising was halved for two months, but recovered rapidly. Interestingly, radio and outdoor cigarette advertising did not experience any significant reductions during this period.[160] In the case of outdoor advertising, this is explained mainly by the way in which the data are collected (i.e., invoices, based on long-term contracts, not on actual observation of billboards). In the case of radio, it is presumably due to the fact that the legislation did not prescribe health warnings for radio advertising.

7.4 Advertising of specific cigarette brands

Until recently some of the large international cigarette brands, Marlboro in particular, were regarded as the world's most valuable brands. Public opinion, lawsuits and legislative restrictions in many

160. To prevent Figure 7.3 from becoming excessively cluttered, these two media are not included in the graph.

developed countries, and the US in particular, have placed large cigarette companies under pressure, and this has resulted in a debasement of the brands' value over the past number of years.

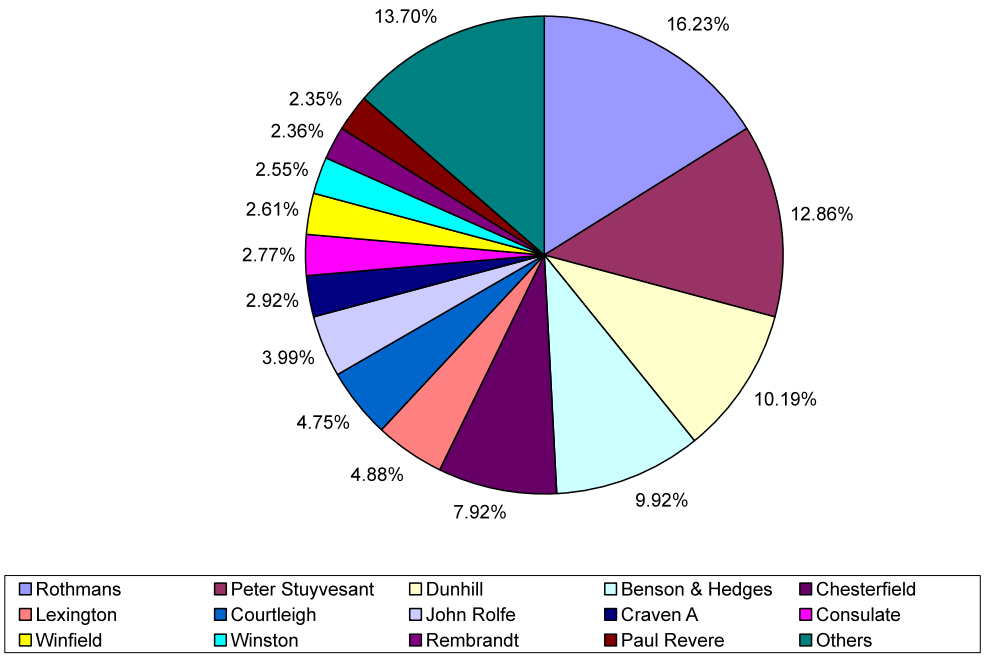
In South Africa, the most advertised and promoted cigarette brands have been Peter Stuyvesant, Rothmans, Benson & Hedges, and Dunhill. These four brands were heavily associated with sport and cultural sponsorships, specifically:

- Peter Stuyvesant: music extravaganzas;
- Rothmans: the Rothmans July Handicap (horse racing) and the Rothmans Cup (soccer);
- Benson & Hedges: the Benson & Hedges Night Cricket series; and
- Dunhill: the Dunhill Cup (golf).

Sales data on the various cigarette brands are not in the public domain, which makes it impossible to ascertain the market shares of the various brands. However, the relative shares of these brands in total cigarette *advertising* are available from AC Nielsen. In Figures 7.4 and 7.5 the percentage shares of total cigarette adspend (all media) are shown for two years, 1994 and 1999. Data were available for 2000 as well, but because this was a 'sunset' year for cigarette advertising, 2000's data are not shown.

Please note that this discussion focuses only on the main brand names (also known as brand families), not the descriptors (e.g., 'light', 'mild', 'super', 'king size', etc.).

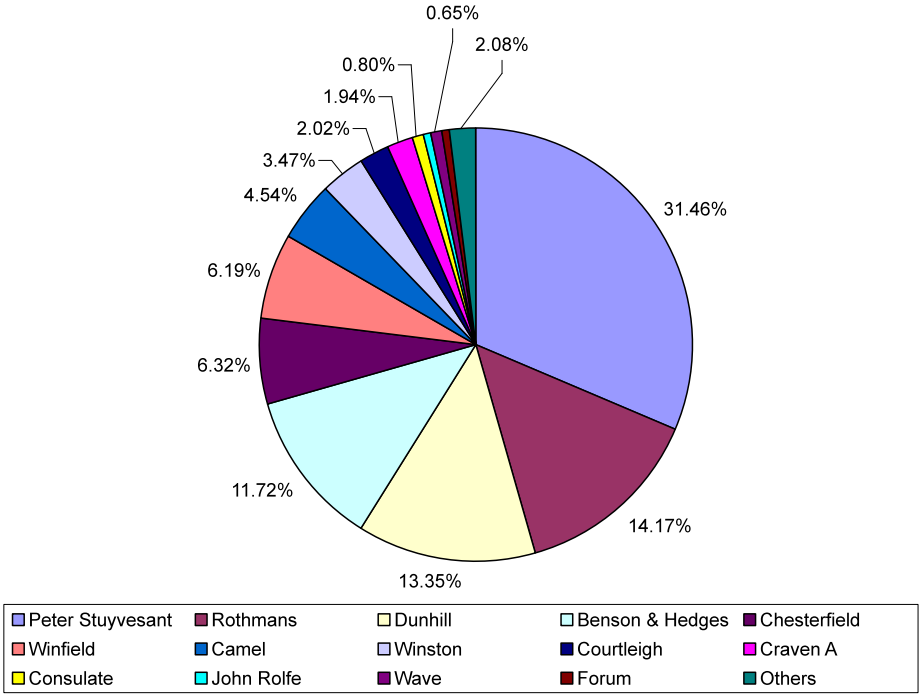
Figure 7.4: Relative adspend shares, 1994



Source: AC Nielsen (2001)

In 1994, about 50 per cent of all cigarette advertising expenditure was spent on the four main brands. However, by 1999 and 2000 this percentage had increased to 70 per cent. One possible explanation could be that the industry, in a shrinking market, wanted to protect its core brands and was therefore prepared to jettison its less valuable brands. Another explanation could be that the industry anticipated the advertising ban and decided to discontinue advertising the smaller brands because it knew that it was impossible to sustain its advertising legally.

Figure 7.5: Relative adspend shares, 1999

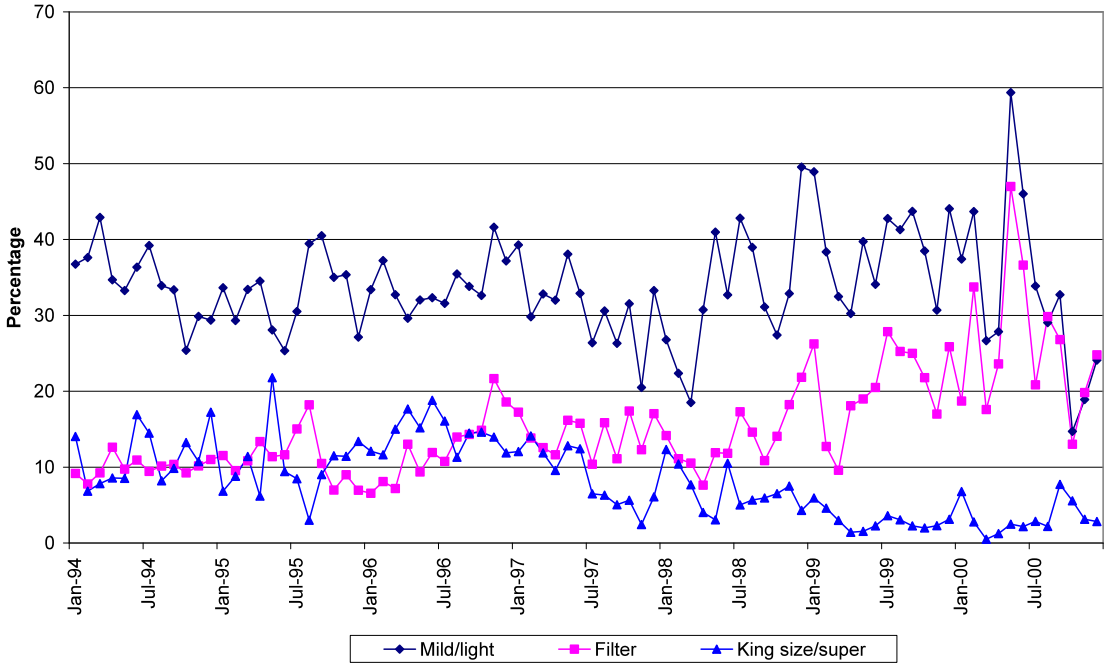


Source: AC Nielsen (2001)

An issue of considerable concern to tobacco control advocates is the use of descriptors such as "mild", "light", "ultralight", etc. It is argued that these descriptors create a false impression that such cigarettes are less harmful than other cigarettes. According to the US Surgeon-General (USDHHS, 2000) people who smoke low-tar and low-nicotine cigarettes "compensate" by smoking more cigarettes per day, and by inhaling deeper into the lungs. It is also argued that this false impression encourages smokers who want to quit, to switch to "mild" cigarettes, rather than quitting completely.

Given the fact that government policy and public perception has turned against smoking (primarily because of health concerns), it seems likely that the tobacco industry would be advertising its "mild" and "light" cigarettes more vigorously than before. The total adspend on cigarettes that have these and similar descriptors, expressed as a percentage of the total, is shown in Figure 7.6. Included in the graph is the share of cigarettes that have the descriptors "super" or "king size", as well as the share of cigarettes that have specific reference to filters.

Figure 7.6: Adspend on specially designated cigarettes as percentage of total adspend on cigarettes



Source: AC Nielsen (2001)

Figure 7.6 does not reveal a significant change in the relative share of adspend on "mild" and "light" cigarettes. However, there has been a significant increase in the adspend share on filtered cigarettes and a decrease in that of "super" and "king size" cigarettes.[161] The growth in adspend on designated filtered cigarettes is to be expected, given the increased focus on less harmful cigarettes. However, the fact that adspend on "light" and "mild" cigarettes has not increased is rather surprising.

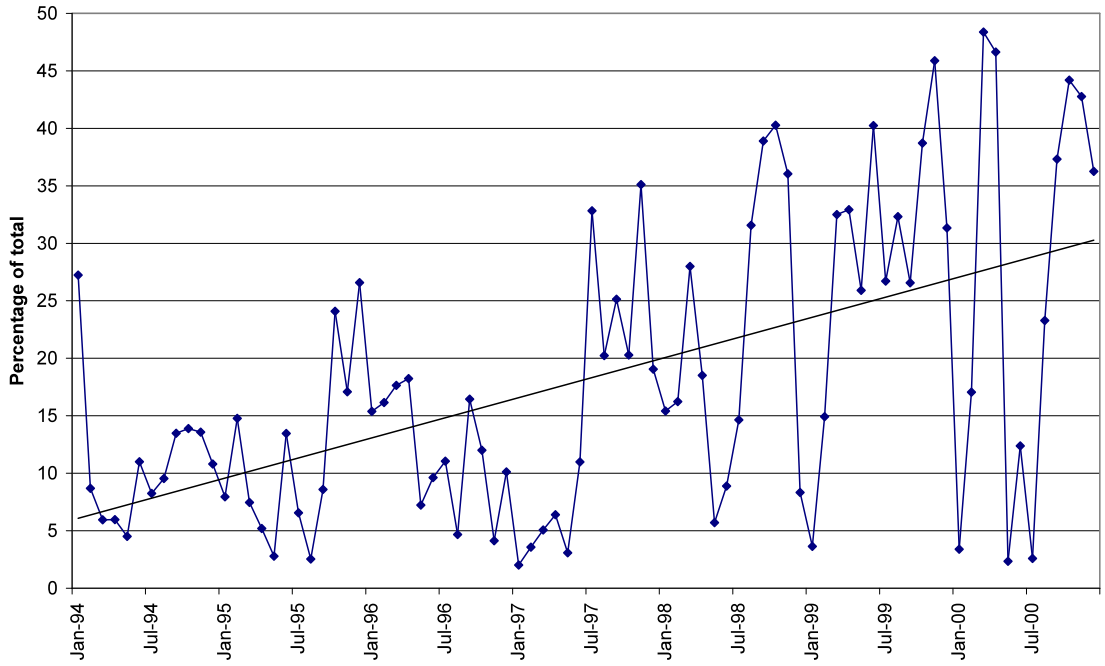
Another interesting feature is the increasing share of sponsorship advertising over the past seven years, shown in Figure 7.7.[162] Despite the extreme volatility of this type of advertising, there had been a strong upward trend since 1994. The explanation probably lies in the fact that sponsorship advertising was not subject to the health warnings. The volatility is probably the result of pulsing.

Tobacco control advocates have argued that non-comprehensive legislation against the tobacco industry is ineffective because the industry will simply exploit the gaps in the legislation. For example, a non-comprehensive ban on advertising would simply divert spending from banned activities to activities that are not banned. The rapid growth in sponsorship advertising suggests that the industry used this channel to circumvent the health warnings.

161. Please note that these descriptors are not mutually exclusive. For example, Rothmans King Size Light cigarettes would appear under both the "mild/light" and "king size/super" categories. However, examples of such "dual descriptors" are relatively rare.

162. Please note that these data do not include the value of the sponsorship itself, but only the advertisements related to the sponsorship.

Figure 7.7: Expenditure on corporate and sponsorship cigarette advertising as percentage of total cigarette advertising



Source: AC Nielsen (2001)

7.5 Conclusion

The aim of this chapter was to provide a broad historical overview of cigarette advertising expenditure in South Africa. The Tobacco Products Control Amendment Act, Act 12 of 1999 banned cigarette advertising as from January 2001. The evidence indicates that the tobacco industry has complied with the regulations. The sizeable fines and associated negative publicity for not keeping to the regulations would certainly have encouraged compliance.

Before the imposition of the advertising ban, the advertising industry argued that the ban would hurt them badly. Whether this has actually occurred cannot be verified, mainly because the period after the imposition of the ban is too short to identify any trend break in overall adspend. However, in fighting the proposed legislation the advertising industry did not mention that cigarette advertising had been decreasing rapidly since 1994. While it is true that the process may have been accelerated after the Ministry of Health mentioned the possibility of an advertising ban in the mid-1990s, the fact of the matter is that the advertising industry was being weaned off cigarette advertising for at least five years. Cigarette advertising was, so to speak, phased out with a whimper rather than with a bang.

The manner in which cigarette advertising was phased out would certainly have had an effect on the advertising industry. Had the termination been sudden and unexpected, the advertising industry would have experienced a major shock in adjusting to the new environment. However, given that the process was relatively slow and the ban was anticipated for at least two years, the advertising industry presumably has had time to adjust.

CHAPTER 8

CONCLUSION

The aim of this thesis was to investigate some economic aspects related to South Africa's tobacco control strategy, which has seen dramatic changes in the past decade. The policy was comprehensive and included both legislated restrictions on smoking and advertising, and significant tobacco excise tax increases. As a result of this, as well as changing societal values and perceptions, smoking in South Africa has been de-glamorised and large sections of the population no longer perceive it as socially acceptable.

While the health impact of the change in smoking patterns will only be felt in years to come, the short-term measurable outcomes suggest that, to date, the South African government's tobacco control policy has achieved what it aimed to achieve. Total cigarette consumption has decreased by more than a third since its peak in 1991; per capita cigarette consumption has decreased by about 50 per cent; smoking prevalence has been reduced; and the number of young people who smoke has decreased significantly.

Effective tobacco control measures in South Africa were realised despite significant opposition, primarily from the tobacco industry itself, but also from other industries which stood to lose from these measures. Surveys revealed that the public was generally supportive of the tobacco control initiatives (Reddy, et al., 1996). The press seems to have been split on the issue: while some segments of the press were against tobacco consumption (specifically for medical reasons) and supported measures to curb smoking, other segments of the press were vehemently opposed to the new measures, mainly because the interventions were seen as unnecessary, authoritarian and paternalistic. However, despite the opposition, the relevant legislation was passed. The degree of compliance with the new tobacco control legislation seems to be high.

In 1999 South Africa passed comprehensive tobacco control legislation that many tobacco control advocates perceived as among the most progressive in the developing (and even the developed) world. From a policy perspective, the challenge for the country is not to pass more tobacco control laws, but rather to implement and enforce the existing legislation. The current study aimed to evaluate the existing policy. In South Africa's case significant results have been achieved within a short period.

8.1 Policy implications

From the perspective of a developing country interested in implementing a tobacco control strategy, this study has a number of important policy implications. The most important are the following:

8.1.1 The importance of strong and consistent lobbying

South Africa's strong tobacco control policy can be attributed largely to strong and consistent lobbying. Over a period of more than 25 years medical societies, such as the South African Medical Research Council, the Cancer Association of South Africa, the Heart Foundation South Africa, the South African Medical Association and the National Council Against Smoking have lobbied the government to impose an effective tobacco control policy. Even though the tobacco control lobbyists were few in number, they were highly effective and generated substantial media attention. They used public fora and the media to warn the public about the dangers of tobacco, to call on the government to introduce effective counter-measures, and to discredit the tobacco industry's claims about the economic importance of their industry. During the 1980s the press was generally sympathetic to the tobacco control cause, but tobacco control lobbyists had little success in bringing about change through the parliamentary system. The lack of success was primarily due to the unhealthily close relationship between the tobacco industry and the then governing political party. However, during the early 1990s tobacco control lobbyists eventually prised the politicians' doors open, and persuaded the Minister of Health to implement legislation restricting tobacco use.

Once the "political door" was opened and the Ministry of Health placed tobacco control on the political and legislative agenda, the lobbyists' role changed somewhat. Rather than lobbying the policy-makers, tobacco control advocates worked with them in publicising the positive aspects of the proposed tobacco control measures (Yussuf Saloojee, personal communication, 2004).

8.1.2 Lobbyists should derive their information from a variety of disciplines

While medical evidence is vital in the fight against tobacco, economic, marketing and legal expertise should be used to counter claims of a non-medical nature. In South Africa's case, as in most countries, relevant medical associations led the fight against tobacco. They campaigned for effective tobacco control measures, based primarily on medical and epidemiological grounds, and the results of prevalence surveys. They argued the well-known facts that tobacco increases the risk of getting certain diseases, and that it often leads to premature death and disability.

In South Africa's case, medical associations were also the first to perform an economic cost-benefit study on tobacco (Yach, 1982 and SAMRC, 1988 and 1992). Using mortality and morbidity data in a fairly unsophisticated cost-benefit model, they showed that the costs associated with tobacco outweigh the benefits. While these analyses were crude and imperfect, they certainly grabbed the attention of the public and the government. In the mid-1990s the ranks of the tobacco control lobby were swelled when a number of professional economists entered the debate, specifically in the form of the Economics of Tobacco Control Project. The research performed by the Project was well publicised in the popular press and amongst policy-makers. Specifically, the project aimed to dispel the tobacco industry's claims that it played an important role in the economy. Amongst others, it used input-output tables to show that a reduction in cigarette consumption would not lead to a net loss of jobs because people would switch their consumption to industries that were more labour intensive than the cigarette

industry (Van der Merwe and Abedian, 1999). Also, it demonstrated that an increase in the level of the excise tax would not only result in a decrease in cigarette consumption, but also an increase in government revenue.

Legal and marketing expertise was required when the legality of a ban on tobacco product advertising was debated in the late 1990s. Opponents to the advertising ban argued that this would be an infringement on the right of free speech, a right entrenched in the South African Constitution. Marketing and legal experts were required to persuade policy-makers and the public that a restriction on the right of free speech in the interests of public health was legal, and would be effective in reducing tobacco consumption.

8.1.3 Political changes could be used to good effect in accelerating tobacco control measures

In South Africa's case the tobacco control cause was helped immensely by the first democratic elections in 1994, when the African National Congress became the dominant party in the Government of National Unity. The new party had no allegiance to the tobacco industry and had a much stronger primary health care focus than the previous government. While a change in government is not a prerequisite for the successful implementation of a comprehensive tobacco control strategy, in South Africa's case it certainly played an important part. The first Minister of Health of the new government made it clear from the outset that she would do all in her power to reduce tobacco consumption. She has been described as headstrong, autocratic and arrogant by some; she certainly did not bend under the pressure exerted on her by the tobacco industry.

8.1.4 Tax increases are an extremely effective tobacco control measure

Despite the fact that tobacco is addictive, studies in South Africa and a large number of developed and developing countries have shown that price changes have a significant effect on tobacco consumption. This finding is uncontroversial, and is acknowledged by the tobacco industry as well. In this study, the price elasticity of demand of cigarettes sold in South Africa was estimated at around -0.99 (at the mean price and quantity) using a systems approach and around -0.8 using a single-equation approach. These estimates are similar to those of many developing countries.

It comes as no surprise that tobacco control lobbyists used information about the magnitude of the price elasticity of demand to campaign for large increases in the excise tax on cigarettes in South Africa. They furthermore argued that an increase in the cigarette excise tax would increase government revenue. They showed that the government had lost substantial amounts of revenue by allowing the real level of excise tax on cigarettes to decrease by 70 per cent between 1970 and 1990.

As a result of this consistent lobbying, and also because of the change in the ruling party earlier that year, the South African government announced in 1994 that it would raise the level of excise tax on cigarettes from 20 per cent to 50 per cent of the retail price, to be phased-in over a number of years. The result was a dramatic increase in the real price of cigarettes, and a rapid decrease in cigarette

consumption since 1994. Despite the lower levels of cigarette consumption, real government revenue has more than doubled over this period.

It is the firm conclusion of this thesis that large excise tax increases are the single most effective, and definitely the most cost-effective, tobacco control measure. Given that cigarettes are subject to excise duties in most countries already, it is a simple matter to implement a tax increase, and the results in the form of reduced consumption and increased government revenue are easy to monitor. However, this conclusion is subject to the precaution that the excise tax increases do not result in a major increase in cigarette smuggling.

8.1.5 The industry has an interest in exaggerating the threat of cigarette smuggling

The possibility of cigarette smuggling is often used by the tobacco industry as a rationale not to increase cigarette excise taxes. The industry's argument is that cigarette smuggling is a rational reaction to price and tax differentials, and that cigarettes will be smuggled from low-tax countries to high-tax countries (International Tax and Investment Centre, 2003). The large-scale smuggling between the US and Canada in the early 1990s was initially ascribed to informal and spontaneous bootlegging between the "low-price" US and "high-price" Canada. Eventually the Canadian government decided to reduce the tax in order to curb the smuggling. Some people argue that the current wave of cigarette smuggling into the UK is a spontaneous response to the large tax differentials between the UK and continental Europe.

Tobacco control lobbyists argue that the main culprits in cigarette smuggling are sophisticated criminal syndicates, who smuggle cigarettes in 20-foot and 40-foot shipping containers, rather than members of the public who bootleg small quantities (Joossens and Raw, 1998). Rather than smuggling cigarettes from low-tax to high-tax jurisdictions, it is argued that these syndicates avoid the excise tax completely by legally exporting the product (tax-free), but illegally smuggling it into the target country through a complex and obscure logistical chain. In some cases the cigarettes are re-imported into, and sold tax-free in, the country of origin. They further argue that the smuggling takes place with the overt or covert knowledge of the tobacco industry itself. These claims seem credible after evidence has emerged that Brown & Williamson, British American Tobacco's US subsidiary, was actively involved in the US-Canadian smuggling of the early 1990s. Furthermore, the European Union is currently investigating some tobacco companies in connection with alleged cigarette smuggling into the EU. The London-based Action on Smoking and Health presents a comprehensive review of smuggling and racketeering cases that have been brought against the tobacco industry in the past ten years.[163]

In South Africa the cigarette manufacturing industry has repeatedly warned the government that increased cigarette excise taxes would result in increased cigarette smuggling into the country, and that the government would lose excise tax revenue as a result. While it is impossible to say whether cigarette smuggling has increased or not, smuggling is certainly not out of control, as the industry claims. Given the large increases in the real price of cigarettes, one would expect cigarette consumption

[163]. See http://www.ash.org.uk/.

to decrease by a substantial percentage. The official consumption figures do not suggest that illegal consumption has increased to the extent that it undermines the excise tax revenues collected from legal cigarettes.

While it would be naïve to suggest that no cigarette smuggling takes place at all, or that the customs authorities intercept all smuggled cigarettes, there have been very few press reports over the past decade involving smuggled cigarettes.[164] Despite the apparent lack of evidence, however, the industry has been arguing consistently and forcefully that cigarette smuggling is increasing (e.g. Simon Millson, Director: Corporate and Regulatory Affairs, BAT South Africa, personal communication, 2004). The industry's motive is clear: if they can persuade the government that cigarette smuggling is increasing as a result of the high taxes, the solution would be to reduce the tax.

This is not meant to imply that the problem or threat of cigarette smuggling in other countries is necessarily exaggerated. For other countries, the threat may be more real, but this would have to be determined in an objective way, not simply on the basis of the tobacco industry's assertions.

8.1.6 The industry's pricing strategy has aided the tobacco control cause

The increases in the level of excise tax on cigarettes were aimed at increasing the real retail price of cigarettes. As a general rule, one would not expect the real retail price of cigarettes to increase by more than the increase in the real level of cigarette excise tax. In fact, while average-cost pricing theory suggests that the entire increase in the level of excise tax will be passed on to consumers, conventional microeconomic theory suggests that producers would carry a proportion of the tax themselves, which would imply that the retail price increase would be less than the excise tax increase.

However, in South Africa's case the real retail price of cigarettes increased by much more than the real increase in the level of cigarette excise tax. In fact, the increases in the excise tax accounted for less than 60 per cent of the increase in the real retail price between 1990 and 2004. The other 40 per cent of the increase in the real retail price is ascribed to increases in the producer price. The real costs of production did not change significantly over this period, which means that the profit per cigarette increased substantially. Cigarette manufacturers were apparently using the tax increases as a convenient justification for increasing their profitability.

The fact that the South African cigarette industry is virtually a monopoly – British American Tobacco has a 93 per cent market share – makes this pricing behaviour possible. While smokers may perceive this pricing strategy as exploitative, the fact of the matter is that the industry's pricing behaviour has

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[164]. In contrast, there have been regular reports on the arrests of people involved in the smuggling of drugs. Presumably the South African Police Services have the resources to deal with smuggling issues. Whereas the apprehension of drug syndicates does not have an impact on government revenue since these products are illegal and thus not subject to tax, the government (and the Treasury in particular) has an interest in apprehending cigarette smugglers, because they are reducing government revenue. The fact that so few cigarette smuggling arrests have been made, suggests that it has not been worthwhile to target this crime.

had positive consequences for tobacco control. Had the tobacco industry not followed this pricing strategy, cigarette consumption would currently have been much higher than what it is. In fact, were it not for the industry's pricing strategy, the government would have had to increase the level of cigarette excise tax by nearly double the amount than it actually did to achieve the same decrease in consumption.

These results are not unique. Studies in the US indicate that cigarette excise tax increases have also led to a more than proportionate increase in the retail price of cigarettes (Chaloupka and Warner, 1999), but the effect is not as pronounced as in South Africa. The lesson is that cigarette companies, in looking after their short-term self-interest and profitability, can further the goals of the tobacco control community.

8.1.7 Industry involvement in the formulation of tobacco control policy?

In South Africa, the typical industry response to proposed tobacco control legislation is that they support "reasonable" restrictions, but that the proposed restrictions are "draconian" and "excessive". In most countries interested and affected parties often play an important role in the formulation of policy. How much influence the tobacco industry should have in the formulation of tobacco control legislation would have to be decided by individual countries. As was indicated in chapter 1, the tobacco industry successfully lobbied the Minister of Health and was able to water down the 1993 tobacco control legislation. In contrast, during the mid- to late-1990s the new Minister of Health largely ignored the industry's pleas for "reasonable" legislation when far-reaching amendments to the 1993 law were being considered. Although the Minister was criticised as being "undemocratic" and "authoritarian", the Amendment Act of 1999 was more comprehensive and much more effective than the 1993 legislation.

The 1999 legislation envisaged a complete ban on tobacco advertising and promotion. The tobacco industry and the advertising agencies decried this measure as excessive and an infringement of the right to free commercial speech. They would have preferred a compromise situation, such as restrictions on certain types of advertising, restrictions on certain media, etc. However, international evidence has shown that partial advertising bans generally do not decrease cigarette consumption, while comprehensive bans do (Saffer, 2000). Rather than succumbing to the tobacco industry's pressure for "reasonable" restrictions, the Ministry of Health decided to get rid of tobacco advertising completely.

In contrast to restrictions on indoor smoking, an advertising ban is relatively easy to enforce. Traditional advertising in the media has disappeared. However, in what most tobacco control lobbyists regard as an exploitation of a loophole in the 1999 legislation, the industry has continued to promote its products through one-on-one marketing events, such as "private parties" and industry-organised events. The government is currently considering legislation that will outlaw such marketing strategies.

As in most countries, the tobacco industry formerly sponsored some major sports events in South Africa. The advertising ban also prohibited sponsorships by tobacco companies. While the anticipated demise of some sporting events was lamented, nearly all events found new sponsors. The South African experience suggests that the

disruption associated with the banning of tobacco sponsorship is short-lived, and that alternative sponsors can be found relatively easily.

8.1.8 Tobacco control legislation changes property rights, and is usually self-enforcing

When the 1999 tobacco control legislation aimed at clean indoor air was debated, opponents to the legislation argued that it would be impossible to enforce, given that the South African Police Services were already overstretched. The Ministry of Health made it clear from the outset that the legislation would be largely self-enforcing. The legislation gives the right to smoke-free air to non-smokers. Whereas previously the right to clean air was disputed, and smokers exercised their right by polluting the air with their smoke, non-smokers now have the right to clean air. This is a significant transfer of property rights, and these are now more clearly defined.

While it is true that the clean indoor air policy is difficult to enforce in some settings (especially bars and nightclubs) the degree of compliance seems to be quite high in most workplaces and restaurants. This has been achieved without police crackdowns, but rather through public pressure. Furthermore, it seems plausible that the change in property rights will accelerate the change in societal values against public tobacco use.

8.1.9 Cigarette excise taxes are regressive, but increases in the tax level reduce the regressivity of the excise tax

In South Africa, as in most countries, it was found that the poor generally spend a greater percentage of their income on cigarettes than richer people. The burden of tobacco excise taxes falls more heavily on the poor, and thus the tax is regressive. This is regarded as socially undesirable, and could be used as an argument against further increases in the excise tax on cigarettes.

However, it was pointed out in this study that the poor are generally more sensitive to price changes, and an increase in the cigarette excise tax will reduce cigarette consumption among the poor by a greater percentage than among the rich. Thus, even though cigarette excise taxes are regressive, increases in the level of tax (and hence the retail price of cigarettes) reduce the degree of regressivity.

8.2 Avenues for future research

Compared to many other developing countries, a significant amount of research has been conducted into the economics of tobacco control in South Africa. Since the passing of the Tobacco Products Control Amendment Act in 1999 the research focus has shifted. Previous research was aimed at creating a change in policy; subsequent research has focused on monitoring the results of the policy and noting the lessons that have been learnt. There are a number of research issues not addressed in this study that could be investigated in future, including:

1. The degree of compliance with the clean indoor air policies. For example, what proportion of restaurants, taverns and bars have separate sections for smokers and non-smokers? Do those restaurants that do not have separate sections impose a non-smoking policy throughout the establishment or do they simply flout the legislation?

2. Are the "smoking sections" of restaurants frequented more regularly than the "non-smoking sections"; i.e. was it in restaurants' interests to incur the cost of putting up partitions, or should they have rather gone smoke-free completely?

3. What has been the financial impact of the clean indoor air policies on the hospitality industry? Has the possible reduction in smoking customers been offset by an increase in the number of non-smoking customers, or have the clean indoor air policies not had a material impact on the hospitality industry's custom?

4. By how much did the advertising ban decrease cigarette consumption? Was the complete advertising ban more effective than a partial ban, as was the case in other countries, or is the effect quite small? Can one disentangle the impact of the advertising ban on consumption from the impact of other tobacco control interventions?

5. Although traditional advertising has disappeared, there has been a sharp increase in personalised marketing. How effective and cost-effective is this marketing strategy? How should the legislation be worded to prevent such personalised marketing?

6. Has employment in the tobacco and cigarette manufacturing sectors changed significantly in recent years? What proportion of these changes can be attributed to legislative and tax changes, and what proportion is attributable to changes in production processes?

7. What is the impact of the tobacco industry on South Africa's balance of payments? Given the facts that the industry uses much imported capital in the manufacturing process, and a sizeable proportion of the tobacco for domestically produced cigarettes is imported (while local tobacco producers export a substantial proportion of their crop), is the industry a net contributor to or a net user of South Africa's foreign exchange reserves?

8. If the government were to set cigarette prices at "socially optimum" levels, what would this level be? This would entail estimating the social cost associated with smoking.

9. Should the South African Government subsidise nicotine replacement therapies (NRT), as is the case in several developed countries? Would the expected benefits of such subsidies justify the costs? In a country faced with many other public health challenges, would such a scheme be justified?

The negative health and socio-economic impact of smoking have persuaded many countries, especially in the developed world, to implement some form of tobacco control policy. The increased awareness

about tobacco has led a number of countries to consider more stringent tobacco control measures. This awareness has been raised in recent years during the negotiations on the Framework Convention on Tobacco Control in Geneva.

South Africa was able to implement an effective tobacco control policy over a short period of time. In retrospect the costs were comparatively small; the benefits, mainly in the form of reduced cigarette consumption and reduced tobacco-related mortality and morbidity, were substantial. The main ingredient in South Africa's strategy was political will. South Africa's success can be replicated in other countries, as long as the political will and conviction is present.

BIBLIOGRAPHY

Abedian, I and Dorrington, RE, 1994. "An evaluation of a recent attempt to assess the social benefits of cigarette smoking". *Journal for Studies in Economics and Econometrics*, 18(1): 59-72.

Abedian, I, Van der Merwe, R, Wilkins, N and Jha, P (eds.), 1998. *The economics of tobacco control: Towards an optimal policy mix*. Cape Town: AFReC, University of Cape Town.

Abernethy, AM and Teel, JE, 1986. "Advertising regulation's effect upon demand for cigarettes". *Journal of Advertising*, 15(4): 51-55.

Afaal, A and Shareef, IR, 2003. "Economics of tobacco control - the Maldives". *Economics of tobacco control paper no. 17*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Ali, Z, Rahman, A and Rahman, T, 2003. "Appetite for nicotine: an economic analysis of tobacco control in Bangladesh". *Economics of tobacco control paper no. 16*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Aloui, O, 2003. "Analysis of the economics of tobacco in Morocco". *Economics of tobacco control paper no. 7*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Andrews, RL and Franke, GR, 1991. "The determinants of cigarette consumption: a meta-analysis", *Journal of Public Policy Marketing*, 10(1): 81-100.

Arunatilake, N and Opatha, M, 2003. "The economics of tobacco in Sri Lanka". *Economics of tobacco control paper no. 12*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Atkinson, AB and Skegg, JL, 1973. "Anti-smoking publicity and the demand for tobacco in the UK". *The Manchester School of Economic and Social Studies*, 41: 265-282.

Auditor-General, various years. *Report of the Auditor-General on the appropriation and miscellaneous accounts in respect of general affairs*. Government Printer, Pretoria.

Auld, MC and Grootendorst, 2002. *An empirical analysis of milk addiction*. University of Calgary Department of Economics Working Paper 2001-17.

Baltagi, BH and Goel, RK, 1987. "Quasi-experimental price elasticities of cigarette demand and the bootlegging effect". *American Journal of Agricultural Economics*, 69(4): 750-754.

Baltagi, BH and Levin, D, 1986. "Estimating dynamic demand for cigarettes using panel data: The effects of bootlegging, taxation and advertising reconsidered". *Review of Economics and Statistics*, 68(1): 148-155.

Bardsley, P and Olekalns, N, 1999. "Cigarette and tobacco consumption: Have anti-smoking policies made a difference?" *The Economic Record*, 75(230): 225-240.

Barnett, PG, Keeler, TE and Hu, T, 1995. "Oligopoly structure and the incidence of cigarette excise taxes". *Journal of Public Economics*, 57(3): 457-470.

Becker, GS and Murphy, KM, 1988. "A theory of rational addiction". *Journal of Political Economy*, 96(4): 675- 700.

Becker, GS, Grossman, M and Murphy, KM, 1994. "An empirical analysis of cigarette addiction". *American Economic Review*, 84(3): 396-418.

Bishop, JA and Yoo, JH, 1985. "'Health scare', excise taxes and advertising ban in the cigarette demand and supply". *Southern Economic Journal*, 52: 402-11.

Blecher, EH and Van Walbeek, CP, 2004. "An international analysis of cigarette affordability". *Tobacco Control*, 13: 339-346.

Bobak, M, Jha, P, Nguyen, S and Jarvis, M, 2000. "Chapter 3: Poverty and smoking" in Jha and Chaloupka (eds.). *Tobacco control in developing countries*. New York: OUP: published by Oxford University Press on behalf of The World Health Organization and The World Bank.

Brink, AJ, 1988. "The smoking trail - research shows a path of death and destruction". *South African Medical Journal*, 73: 385.

British American Tobacco (BAT), various years. *Annual Reports*.

Brooks, JE, 1952. *The mighty leaf: Tobacco through the centuries*. Boston: Little, Brown and Company.

Callander, C and Rocke, DA, 1986. "Smoking habits and attitudes of Durban metropolitan anaesthetists". *South African Medical Journal*, 70: 589-591.

Cameron, S, 1997. "Are Greek smokers rational addicts?" *Applied Economics Letters*, 4: 401-402.

Castillo, A, 1994. *South Africa: Position paper*. Internal RJ Reynolds document. SBU – MENEA.

Cawley, J, Markowitz, S and Tauras, J, 2003. *Lighting up and slimming down: The effects of body weight and cigarette prices on adolescent smoking initiation*. Working Paper 9561, National Bureau of Economic Research, Cambridge, MA: NBER.

Central Statistical Service, various years. *Statistical news release P0141.3: Retail prices*. Government Printer, Pretoria.

Central Statistical Service, various years. *Census of manufacturing*. Pretoria: Government Printer.

Central Statistical Service, various years. *Statistical release P0271: Survey of total employment and earnings*.

Central Statistical Service, 1996. *South African labour statistics 1995*.

Central Statistical Service, various years. *Statistical release P0242.1: Employment and salaries and wages: Mining and quarrying, manufacturing, construction and electricity*.

Central Statistical Service, 1996. *Statistical release P0142.4: Production price index. Base: June 1995 = 100*.

Chaloupka, FJ and Grossman, M, 1996. *Price, tobacco control policies and youth smoking*. Working Paper 5740, National Bureau of Economic Research, Cambridge, MA: NBER.

Chaloupka, FJ and Laixuthai, A, 1996. *US trade policy and cigarette smoking in Asia*. Working paper 5543, National Bureau of Economic Research, Cambridge, MA: NBER.

Chaloupka, FJ and Pacula, RL, 1998. *An examination of gender and race differences in youth smoking responsiveness to price and tobacco control policies.* Working paper 6541, National Bureau of Economic Research, Cambridge, MA: NBER.

Chaloupka, FJ and Warner, KE, 1999. *The economics of smoking*. Working paper 7047, National Bureau of Economic Research, Cambridge, MA: NBER.

Chaloupka, FJ and Wechsler, H, 1995. *Price, tobacco control policies and smoking among young adults*. Working paper 5012, National Bureau of Economic Research, Cambridge, MA: NBER.

Chaloupka, FJ and Wechsler, H, 1997. "Price, tobacco control policies and smoking among young adults". *Journal of Health Economics*, 16: 359-373.

Chaloupka, FJ, 1990a. *Rational addictive behavior and cigarette smoking*. Working paper 3268, National Bureau of Economic Research, Cambridge, MA: NBER.

Chaloupka, FJ, 1990b. *Men, women, and addiction: The case of cigarette smoking*. Working paper 3267, National Bureau of Economic Research, Cambridge, MA: NBER.

Chaloupka, FJ, 1991. "Rational addictive behaviour and cigarette smoking". *Journal of Political Economy*, 99(4): 722-742.

Chaloupka, FJ, 1999. *How effective are taxes in reducing tobacco consumption?* Mimeo.

Chaloupka, FJ, Hu, T, Warner, KE, Van der Merwe, R and Yurekli, A, 2000a. "Chapter 10: The taxation of tobacco products", in Jha and Chaloupka (eds.). *Tobacco control in developing countries*. New York: OUP: published by Oxford University Press on behalf of The World Health Organisation and The World Bank.

Chaloupka, FJ, Tauras, JA and Grossman, M, 2000b. "Chapter 5: The economics of addiction", in Jha and Chaloupka (eds.). *Tobacco control in developing countries*, published by Oxford University Press on behalf of The World Health Organisation and The World Bank, New York: OUP.

Chapman, S and Richardson, J, 1990. "Tobacco excise and declining tobacco consumption: The case of Papua New Guinea", *American Journal of Public Health*, 80(5): 537-40.

Chetwynd, J, Cooper, P, Brodie, RJ and Wells, E, 1988. "Impact of cigarette advertising on aggregate demand for cigarettes in New Zealand". *British Journal of Addiction*, 83: 409-414.

Coetzee, AM, 1978. "Rook en gesondheid - feite en statistiek". *South African Medical Journal*, 54: 425-426.

Coetzee, AM, 1981. "Die rookgewoonte by en gesondheid van dokters wat by die Universiteit van Pretoria gegradueer het". *South African Medical Journal*, 60: 31-34.

Cunningham, R, 1996. *Smoke and mirrors: The Canadian tobacco war*. Ottawa: IDRC.

Da Costa e Silva, VL, 1998. "The Brazilian cigarette industry: Prospects for consumption reduction", in Abedian, et al., *The economics of tobacco control: Towards an optimal policy mix*. Cape Town: AFReC, University of Cape Town.

Davis, RM, 1992. "The slow growth of a movement". *Tobacco Control*, 1: 1-2.

De Beyer, J and Waverley Brigden, L, 2003. *Tobacco control policy: Strategies, successes and setbacks*. Washington and Ottawa: World Bank and Research for International Tobacco Control.

Deaton, A and Grosh, M, 2000. "Chapter 5: Consumption", in Grosh and Glewwe (eds.), *Designing household survey questionnaires for developing countries*. The World Bank: Washington DC.

Deaton, A, 1997. *Analysis of household surveys*. Baltimore: Johns Hopkins University Press on behalf of the World Bank.

Department of Agriculture, various years. *Abstract of agricultural statistics*. Pretoria: National Department of Agriculture.

Department of Statistics, various years. *Report on prices*. Government Printer, Pretoria.

Department of Statistics, various years. *Census of manufacturing*. Pretoria: Government Printer.

Doornik, JA and Hendry, DF, 2000. *Modelling dynamic systems using PcGive: Volumes I and II*. London: Timberlake Consultants Ltd.

Douglas, S and Hariharan, G, 1994. "The hazard of starting smoking: Estimates from a split population duration model". *Journal of Health Economics*, 13(2): 213-230.

Douglas, S, 1998. "The duration of the smoking habit". *Economic Inquiry*, 36(1): 49-64.

Duffy, M, 1991. "Advertising and the consumption of tobacco and alcoholic drink: A system-wide analysis". *Scottish Journal of Political Economy*, 38(4): 369-385.

Duffy, M, 1995. "Advertising in demand systems for alcoholic drinks and tobacco: A comparative study". *Journal of Policy Modelling*. 17(6): 557-577.

Duffy, M, 1996. "Econometric studies of advertising, advertising restrictions and cigarette demand: a survey". *International Journal of Advertising*, 15: 1-23.

Economics of Tobacco Control in South Africa Project (ETCSA) (Phase II), 2002. *The tobacco epidemic can be reversed: Tobacco control in South Africa during the 1990s.* Cape Town: Applied Fiscal Research Centre.

Economics of Tobacco Control in South Africa Project (ETCSA) (Phase II), 2003. *The economics of tobacco control in South Africa.* Cape Town: Applied Fiscal Research Centre.

Economics of Tobacco Control in South Africa Project (ETCSA), 1998. *The economics of tobacco control in South Africa*. Report submitted to the International Tobacco Initiative. Cape Town: Applied Fiscal Research Centre, School of Economics, University of Cape Town.

Enders, W, 2004. *Applied econometric time series*. Second edition. John Wiley and Sons, Inc.

Engle, RF and Granger, CWJ, 1987. "Co-integration and error correction representation". *Econometrica*, 55: 251-276.

Esterhuyse, WP, 1986. *Anton Rupert: Pleitbesorger vir hoop*. Cape Town: Tafelberg.

Fedderke, J, 2003. *Applied time series analysis*. Unpublished notes for Ph.D. students. University of Cape Town.

Flewelling, RL, Kenney, E, Elder, JP, Pierce, J, Johnson, M and Bal, DG, 1992. "First-year impact of the 1989 California cigarette tax increase on cigarette consumption". *American Journal of Public Health*, 82(6): 867-869.

Flisher, AJ, Ziervogel, CF, Chalton, DO, Leger, PH and Robertson, BA, 1993. "Risk-taking behaviour of Cape Peninsula high school students: Part 1 to 5". *South African Medical Journal,* 83: 469-485.

Fourie, J, 1992. *There's sunlight in my leaf*. Report published by request of the Tobacco Board to commemorate the 500th birthday of Nicotiana tabacum.

Fujii, ET, 1980, "The demand for cigarettes: Further empirical evidence and its implications for public policy". *Applied Economics*, 12: 479-89.

Gajalakshmi, CK, Jha, P, Ranson, K and Nguyen, S, 2000. "Chapter 2: Global patterns of smoking and smoking-attributable mortality" in Jha and Chaloupka (eds.). *Tobacco control in developing countries*. New York: OUP: published by Oxford University Press on behalf of The World Health Organization and The World Bank.

Glantz, SA and Charlesworth, A, 1999. "Tourism and hotel revenues before and after passage of smoke-free restaurant ordinances". *Journal of the American Medical Association*, 281(20): 1911-1918.

Griffiths, ML and Koa-Peng, JM, 1980. "Smoking habits of black school teachers". *South African Medical Journal*, 58:793.

Grosh, M and Glewwe, P (editors), 2000. *Designing household survey questionnaires for developing countries*. The World Bank: Washington DC

Grossman, M. and Chaloupka, FJ, 1997. "Cigarette taxes: The straw to break the camel's back". *Public Health Reports*, 112: 291-297.

Grossman, M, Chaloupka, FJ and Anderson, R, 1998. "A survey of economic models of addictive behaviour". *Journal of Drug Issues*, 28(3): 631-43.

Gruber, J and Köszegi, B, 2000. *Is addiction "rational"? Theory and evidence*. Working paper 7507, National Bureau of Economic Research, Cambridge, MA: NBER.

Gruber, J and Zinman, J, 2000. *Youth smoking in the US: evidence and implications*. Working paper 7780, National Bureau of Economic Research, Cambridge, MA: NBER.

Gruber, J, 2000. *Risky behavior among youths: An economic analysis*. Working paper 7781, National Bureau of Economic Research, Cambridge, MA: NBER.

Guindon, GE, Perucic, A and Boisclair, D, 2003. "Higher tobacco prices and taxes in South-East Asia". *Economics of tobacco control paper no. 12*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Guindon, GE, Tobin, S and Yach, D, 2002. "Trends and affordability of cigarette prices: Ample room for tax increases and related health gains". *Tobacco Control*, 11: 35-43.

Hamilton, JL, 1972. "The demand for cigarettes: Advertising, the health scare, and the cigarette advertising ban". *The Review of Economics and Statistics*, 54: 401-411.

Hammond, R and Rowell, A, 2000. *Trust us, we're the tobacco industry*. Action on Smoking and Health and Campaign for Tobacco-Free Kids.

Harris, JE and Chan, SW, 1999. "The continuum-of-addiction: Cigarette smoking in relation to price among Americans aged 15-29". *Health Economics*, 8(1): 81-86.

Harris, RID, 1995. *Using cointegration analysis in econometric modelling*. London: Prentice Hall.

Harris, R and Sollis, R, 2003. *Applied time series modelling and forecasting*. Chichester: John Wiley and Sons.

Harrison, R and Chetwynd, J, 1990. *Determinants of aggregate demand for cigarettes in New Zealand*. Discussion paper 9002, Department of Economics, Canterbury, NZ: University of Canterbury.

Harrison, R, Chetwynd, J and Brodie, R, 1989. "The influence of advertising on tobacco consumption: a reply to Jackson and Ekelund". *British Journal of Addiction*, 84: 1251-1254.

High, H, 1999. *Does advertising increase smoking? Economics, free speech and advertising bans*. London: The Institute of Economic Affairs.

Hirschowitz, R, 1997. *Earning and spending in South Africa: Selected findings of the 1995 Income and Expenditure Survey*. Pretoria: Statistics South Africa.

Holak, SL and Reddy, SK, 1986. "Effects of a television and radio advertising ban: A study of the cigarette industry". *Journal of Marketing*, 50: 219-227.

Hoogeveen, JG and Ozler, B, 2004. *Not separate, not equal: Poverty and inequality in post-apartheid South Africa*. Washington, DC: World Bank working paper.

Hsieh, CR and Hu, T, 1997. *The demand for cigarettes in Taiwan: Domestic versus imported cigarettes*. Discussion paper no. 9701. Nankang, Taipei. The Institute of Economics, Academia Sinica.

Hu, T and Mao, Z, 2002. "Economics analysis of tobacco and options for tobacco control". *Economics of tobacco control paper no. 3*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Hu, T, Bai, J, Keeler, TE, Barnett, PG and Sung, H, 1994. "The impact of California Proposition 99, a major anti-smoking law, on cigarette consumption". *Journal of Public Health Policy*, 15(1): 26- 36.

Hu, T, Sung, H and Keeler, TE, 1995a. "The state antismoking campaign and the industry response: The effects of advertising on cigarette consumption in California". *AEA Papers and Proceedings*, 85(2): 85-90.

Hu, T, Keeler, TE, Sung, H and Barnett, PG, 1995b. "The impact of California anti-smoking legislation on cigarette sales, consumption, and prices". *Tobacco Control, 4* (suppl. 1): S34-S38.

International Tax and Investment Centre, 2003. *Special Report: The relationship between taxation, consumption and smuggling of tobacco.* Unpublished report by ITIC and Oxford Economic Forecasting.

Jackson, JD and Ekelund, RB, 1989. "A comment on Chetwynd et al's study on the influence of advertising on tobacco consumption". *British Journal of Addiction*, 84(11): 1247-1250.

James I of England, 1604[2003]. *Counterblast to tobacco*. Accessed at http://www.jesus-is-lord.com/kjcounte.htm

Jha, P and FJ Chaloupka (eds.) 2000. *Tobacco control in developing countries*. New York: OUP: published by Oxford University Press on behalf of The World Health Organisation and The World Bank.

Jha, P, Musgrove, P, Chaloupka, FJ and Yurekli, A, 2000. "Chapter 7: The economic rationale for intervention in the tobacco market", in Jha and Chaloupka (eds.). *Tobacco control in developing countries*, published by Oxford University Press on behalf of The World Health Organisation and The World Bank, New York: OUP

Jimemez, S and Labeaga, JM, 1994. "Is it possible to reduce tobacco consumption via alcohol taxation?" *Health Economics*, 3: 231-241.

Johnson, LW, 1986. "Advertising expenditure and aggregate demand for cigarettes in Australia". *International Journal of Advertising*, 5: 45-58.

Johnston, J, 1980. "Advertising and the aggregate demand for cigarettes: A comment". *European Economic Review*, 14: 117-125.

Joossens, L and Raw, M, 1995. "Smuggling and cross border shopping of tobacco in Europe". *British Medical Journal*, 310: 1393-1397.

Joossens, L and Raw, M, 1998. "Cigarette smuggling in Europe: who really benefits?" *Tobacco Control,* 7(1): 66-71.

Joossens, L, 1998. "International cigarette trade and smuggling", in ETCSA, *The Economics of Tobacco Control in South Africa*, report submitted to the International Tobacco Initiative, School of Economics, University of Cape Town.

Kao, K and Tremblay, VJ, 1988. "Cigarette 'health scare', excise taxes, and advertising ban: Comment". *Southern Economic Journal*, 54(3): 770-776.

Karki, YB, Dev Pant, K and Raj Pande, B, 2003. "A study on the economics of tobacco in Nepal". *Economics of tobacco control paper no. 13*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Kazem, A, 1993. *Excise taxes in Egypt: Case study of cigarettes*. Thesis submitted to the Department of Economics at Cairo University in partial fulfilment of the requirements for the degree of Master of Arts in Economics.

Keeler, T, Hu T, Barnett, P and Manning, W, 1993, "Taxation, regulation and addiction: A demand function for cigarettes based on time-series evidence". *Journal of Health Economics*, 12: 1-18.

Keeler, TE, Hu, T, Barnett, PG, Manning, WG and Sung, H, 1996. "Do cigarette producers price-discriminate by state? An empirical analysis of local cigarette pricing and taxation". *Journal of Health Economics*, 15(4): 499-512.

Koutsoyiannis, AP, 1963. "Demand functions for tobacco". *The Manchester School of Economic and Social Studies*, 31: 1-20.

Kyaing, NN, 2003. "Tobacco economics in Myanmar". *Economics of tobacco control paper no. 14*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Lal, A and Scollo, M, 2002. "The Big Mac index of cigarette affordability". *Tobacco Control*, 11: 280-282.

Laugesen, M and Meads, C, 1991. "Tobacco advertising restrictions, price, income and tobacco consumption in OECD countries, 1960-1986". *British Journal of Addiction*, 86(10): 1343-54.

Laugesen, M and Meads, C, 1993. "The authors' reply to 'Tobacco consumption and advertising restrictions: A critique of Laugesen and Meads (1991)' by M.J. Stewart". *International Journal of Advertising*, 12: 75-80.

Leach, D, 1998. Submission to parliamentary commission on the Tobacco Products Control Amendment Bill. Unpublished.

Leaver, R, 2003. "Tobacco control policy in South Africa through the eyes of the print media", in Economics of Tobacco Control in South Africa Project (Phase II), *The Economics of Tobacco Control in South Africa.* Report submitted to Research for International Tobacco Control and the World Bank. Cape Town: Applied Fiscal Research Centre, School of Economics, University of Cape Town.

Leeflang, PSH and Reuijl, JC, 1985. "Advertising and industry sales: An empirical study of the West German cigarette market". *Journal of Marketing*, 49: 92-98.

Lewit, EM and Coate, D, 1981. *The potential for using excise taxes to reduce smoking*. Working paper 764, National Bureau of Economic Research, Cambridge, MA: NBER.

Lewit, EM, Coate, D and Grossman, M, 1981. "The effects of government regulation on teenage smoking". *Journal of Law and Economics*, 24: 545-569.

Ling, PM, Landman, A and Glantz, SA, 2002. "It is time to abandon youth access programmes". *Tobacco Control*, 11: 3-6.

Malan, M and Leaver, R, 2003. "Political change in South Africa: New tobacco control and public health policies", in De Beyer and Waverley Brigden, *Tobacco control policy: Strategies, successes & setbacks.* Washington and Ottawa: World Bank and Research for International Tobacco Control.

Mao, Z, Hsieh, C, Hu, T and Jiang, J, 1999. *The demand for cigarettes in China*. Mimeo.

Marks, AS, Steyn, K and Ratheb, E, 2001. *Tobacco use by black women in Cape Town*. Medical Research Council Policy Brief, no. 3.

Martin, G, Steyn, K and Yach, D, c.1992. *Beliefs about smoking and health and attitudes toward tobacco control measures.* Unpublished South African Medical Research Council (Essential Health Research Group) report.

Martin, G, Steyn, K and Yach, D, no date. *Smoking behaviour of pregnant women and children, and perceptions of smoking and its health effects*. Unpublished South African Medical Research Council (Essential Health Research Group) report.

McGuinness, T and Cowling, K, 1975. "Advertising and the aggregate demand for cigarettes". *European Economic Review*, 6: 311-328.

McIntyre, DE and Taylor, SP, 1989. "Economic aspects of smoking in South Africa". *South African Medical Journal*, 75: 432-435.

Medical Association of South Africa (MASA), 1981. "Statement on smoking". *South African Medical Journal,* 59: 471.

Medical Association of South Africa (MASA), 1985. "News from the secretariat: Statement on smoking". *South African Medical Journal,* 67: 519.

Metra Consulting Group Ltd., 1979. *The relationship between total cigarette advertising and total consumption in the United Kingdom*. Volumes 1 and 2. London.

Meyer-Weitz, A, Reddy, P and Levine, J, c.1997. *A comparison of the effects of South Africa's first tobacco control legislation on adult South Africans' smoking status, their knowledge of smoking-related diseases and perceptions regarding this legislation: February 1995 – October 1996.* Unpublished South African Medical Research Council report.

Nassar, H, 2003. "The economics of tobacco in Egypt". *Economics of tobacco control paper no. 8*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Nkuchia, JM, Giovino, GA and Malarcher, AM, 1996. "Epidemiological surveillance of tobacco use in South Africa". *CHASA Journal of Comprehensive Health*, 7(2): 73-76.

Oettlé, AG, 1963a. "Cigarette smoking as the major cause of lung cancer: Part 1". *South African Medical Journal,* 37: 935-941.

Oettlé, AG, 1963b. "Cigarette smoking as the major cause of lung cancer: Part 2". *South African Medical Journal,* 37: 958-963.

Oettlé, AG, 1963c. "Cigarette smoking as the major cause of lung cancer: Part 3". *South African Medical Journal,* 37: 983-987.

Onder, Z, 2002. "The economics of tobacco in Turkey". *Economics of tobacco control paper no. 2*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Patterson, K, 2000. *An introduction to applied econometrics: A time series approach*. Houndmills, Basingstoke: Palgrave.

Pechman, JA and Okner, BA, 1974. *Who bears the tax burden?* Washington, DC: The Brookings Institution.

Pechman, JA, 1985. *Who paid the taxes, 1966-85?* Washington, DC: The Brookings Institution.

Peck, RM, c.2002. "Equity issues, tobacco and the poor". *Economics of Tobacco Toolkit* (Tool 6). Washington, DC: World Bank.

Pesaran, MH and Pesaran, B, 1997. *Working with MicroFit 4.0*. Oxford: Oxford University Press.

Peterson, DE, Zeger, SL, Remington, PL and Anderson, HA, 1992. "The effect of state cigarette tax increases on cigarette sales, 1955 to 1988". *American Journal of Public Health*, 82(1): 94-96.

Peto, J, 1974. "Price and consumption of cigarettes: A case study for intervention". *British Journal of Preventative and Social Medicine*, 28: 241-245.

Peto, R, Lopez, AD, Boreham, J, Thun, M, Heath, C and Doll, R, 1996. "Mortality from smoking worldwide". *British Medical Bulletin*, 52(1): 12-21.

Pindyck, RS and Rubinfeld, DL, 1998. *Econometric models and economic forecasts*. Fourth edition. McGraw-Hill International Editions.

Prest, AR, 1949. "Some experiments in demand analysis". *Review of Economics and Statistics*, 31: 34-49.

Prout, S and Benatar, SR, 1983. "Smoking in white high school children in Cape Town". *South African Medical Journal*, 63: 981-982.

Radfar, M, 1985. "The effect of advertising on total consumption of cigarettes in the UK: A comment". *European Economic Review*, 29 :225-231.

Reddy, P and Swart, D, 2003. *Preliminary report on the global youth tobacco survey: 2002*. Available online at http://www.cdc.gov/tobacco/global/GYTS/reports/SouthAfrica2002.pdf.

Reddy, P, Meyer-Weitz, A and Yach, D, 1996. "Smoking status, knowledge of health effects and attitudes towards tobacco control in South Africa". *South African Medical Journal*, 86(11): 1389-1393.

Reekie, WD and Wang, LFS, 1992. "The benefits and costs of cigarette smoking – a state dependent approach". *Journal for Studies in Economics and Econometrics*, 16(1): 1-12.

Reekie, D, 1992. "Smokers pay their way, and are not a burden on society". *Business Day*, 12 November.

Reekie, WD, 1994. "Consumers' surplus and the demand for cigarettes". *Managerial and Decision Economics*, 15: 223-234.

Rembrandt Group Limited, 2000. *Annual report 2000*.

Rembrandt Group, 1996. *An open letter to dr. Nkosazana Zuma*. Advertisement in *The Sunday Times*, 20 October.

Rembrandt Tobacco Manufacturing Corporation of South Africa Limited, 1976. *Quality above all. The story of Rembrandt.* Stellenbosch: Rembrandt Tobacco Manufacturing Corporation of South Africa Limited.

Remgro Limited, 2001. *Annual report 2001*.

Republic of South Africa, various years. *Budget review*. Pretoria: Government Printer.

Ross, H and Chaloupka, FJ, 2000. *The effect of cigarette prices on youth smoking.* Paper presented at the 11th World Conference on Tobacco or Health, Chicago.

Royal College of Physicians, 1962. *Smoking and health. Summary and report of the Royal College of Physicians of London on smoking in relation to cancer of the lung and other diseases.* New York: Pitman Publishers.

Rupert, A, 1967a. *Wie in wondere glo*. Cape Town: Nasionale Boekhandel.

Rupert, A, 1967b. *Progress through partnership.* Cape Town: Nasionale Boekhandel.

Russell, MA, 1973. "Changes in cigarette price and consumption by men in Britain, 1946-74." *British Journal of Preventative and Social Medicine*, 27: 1-7.

Saffer, H and Chaloupka, F, 2000. "The effect of tobacco advertising bans on tobacco consumption." *Journal of Health Economics*, 19: 1117-1137.

Saffer, H, 2000. "Chapter 9: Tobacco advertising and promotion", in Jha and Chaloupka (eds.). *Tobacco Control in Developing Countries*. New York: OUP: published by Oxford University Press on behalf of The World Health Organisation and The World Bank.

Saloojee, Y and Yach, D, 1992. "Public interest in curtailing smokers' rights undeniable". *Business Day*, 23 November.

Saloojee, Y, 1994. "Tobacco control: A case study", in Yach and Harrison, *Proceedings of the All Africa Conference on Tobacco or Health*, 14-17 November 1993, Harare, Zimbabwe. Unpublished SAMRC report.

Salter, D, 1981. "The demand for cigarettes in New Zealand - an econometric analysis of the effects of increased taxation", in *Economics and health: Proceedings of the second Australian conference of health economists*, Canberra: Australian National University.

Sarntisart, I, 2003. "An economic analysis of tobacco control in Thailand". *Economics of tobacco control paper no. 15*, Health, Nutrition and Population Discussion Paper Series. Washington, DC: World Bank.

Sayginsoy, O, Yürekli, A and De Beyer, JA, 2000. *An economic analysis of poverty and demand for cigarettes in Bulgaria.* Paper presented at the 11th World Conference on Tobacco or Health, Chicago.

Schmalensee, R, 1972. *The economics of advertising*. Amsterdam: North-Holland.

Scollo, M, 1996. "The Big Mac index of cigarette affordability". *Tobacco Control*, 5: 69.

Scollo, M, Lal, A, Hyland, A and Glantz, SA, 2003. "Review of the quality of studies on the economic effects of smoke-free policies on the hospitality industry". *Tobacco Control*, 12: 13-20.

Seftel, HC, 1981. "The smoking epidemic – what you can do". *South African Medical Journal*, 59: 617-618.

Seidel Marks, A, 1998. *Submission in support of the Tobacco Product Control Amendment Bill*. Submission to the parliamentary committee on the Tobacco Products Control Amendment Bill.

Seldon, BJ and Boyd, R, 1991. "The stability of cigarette demand". *Applied Economics*, 23: 319-326.

Seldon, BJ and Doroodian, K, 1989. "A simultaneous model of cigarette advertising: Effects on demand and industry response to public policy". *The Review of Economics and Statistics,* 71: 673-677.

Shafey, O, Dolwick, S and Guindon, GE, 2003. *Tobacco control country profiles*. American Cancer Society, World Health Organisation and International Union Against Cancer.

Simester, D and Brodie, R, 1994. "The effects of advertising on brand and industry demand for tobacco: A meta-analysis of econometric research". *New Zealand Journal of Business*, 16(1): 21-37.

Smith, A, 1776 [1937]. *An inquiry into the nature and causes of the wealth of nations.* New York: The Modern Library.

South African Medical Research Council (SAMRC), 1988. *Smoking and health in South Africa: The need for action*. Pretoria: SAMRC.

South African Medical Research Council (SAMRC), 1992. *Smoking in South Africa: Health and economic impact*. Pretoria: SAMRC.

South African Reserve Bank, various years. *Quarterly bulletin*.

Statistics South Africa, 1998. *Statistical release P0302: Mid-year estimates 1991-1998*, The Government Printer, Pretoria.

Statistics South Africa, 1999. *Census of manufacturing, 1996*. Report no. 30-01-01 (1996).

Statistics South Africa, 2001-2003 (various years). *Discussion paper 2: Comparative labour statistics, survey of employment and earnings in selected industries*.

Statistics South Africa, various years. *Statistical release P0141.1: Consumer price index (CPI)*.

Statistics South Africa, various years. *Statistical release P0142.1: Production price index (PPI).*

Statistics South Africa, various years. *Statistical release P0275: Survey of employment and earnings*.

Stavrinos, VG, 1987. "The effects of an anti-smoking campaign on cigarette consumption: Empirical evidence from Greece". *Applied Economics*, 19: 323-329.

Steenkamp, HJ, Jooste, PL and Christopher, KJ, 1988. "The prevalence of smoking and its relation to coronary risk factors in a rural white community". *South African Medical Journal,* 73: 402-405.

Stewart, MJ, 1992. "Tobacco consumption and advertising restrictions: A critique of Laugesen and Meads (1991)". *International Journal of Advertising*, 11: 97-118.

Stewart, MJ, 1993a. "The effect on tobacco consumption of advertising bans in OECD countries". *International Journal of Advertising*, 12: 155-180.

Stewart, MJ, 1993b. "Comment on the authors' reply to 'Tobacco consumption and advertising restrictions: A critique of Laugesen and Meads (1991)'". *International Journal of Advertising*, 12: 81-84.

Steyn, F, Engelbrecht, M, Ngwena, C and Van Rensburg, D, 2003. *Assessing the levels of compliance of public places with current tobacco legislation.* Bloemfontein, Report to the National Department of Health by the Centre for Health Systems Research and Development, University of the Free State.

Steyn, K, Bourne, LT, Jooste, PL, Fourie, JM, Lombard, CJ and Yach, D, 1994. "Smoking in the black community of the Cape Peninsula, South Africa". *East African Medical Journal,* 71: 784-789.

Steyn, K, Bradshaw, D, Norman, R, Laubscher, R, and Saloojee, Y, 2002. "Tobacco use in South Africans during 1998: The first Demographic and Health Survey". *Journal of Cardiovascular Risk,* 9: 161-170.

Steyn, K, Yach, D, Stander, I and Fourie, JM, 1997. "Smoking in urban pregnant women in South Africa". *South African Medical Journal*, 87(4): 460-463.

Stone, R, 1945. "The analysis of market demand". *Journal of the Royal Statistical Society*, 108: 286-346.

Strebel, P, Kuhn, L and Yach, D, 1989. "Smoking practices in the black township population of Cape Town". *South African Medical Journal,* 75: 428-432.

Sumner, MT, 1971. "The demand for tobacco in the UK". *The Manchester School of Economic and Social Studies*, 39: 23-36.

Sung, H, Hu, T and Keeler, TE, 1994. "Cigarette taxation and demand: an empirical model". *Contemporary Economic Policy*, 12: 91-100.

Sunley, EM, Yurekli, AA and Chaloupka, FJ, 2000. "Chapter 17: The design, administration and potential revenue of tobacco excises", in Jha and Chaloupka (eds.). *Tobacco control in developing countries*. New York: OUP: published by Oxford University Press on behalf of The World Health Organisation and The World Bank.

Swart, D, Reddy, SP, Panday, S, Philip, JL, Naidoo, N and Ngobeni, N, 2004. *The 2002 global youth tobacco survey (GYTS): The second GYTS in South Africa - a comparison between GYTS (SA) 1999 and GYTS (SA) 2002*. Cape Town: SAMRC.

Tansel, A, 1993. "Cigarette demand, health scares and education in Turkey". *Applied Economics*, 25: 521-529.

Tauras, JA, and Chaloupka, FJ, 1999. *Price, clean indoor air laws, and cigarette smoking: Evidence from longitudinal data for young adults*, Working Paper 6937, National Bureau of Economic Research, Cambridge, MA: NBER.

Tauras, JA, O'Malley, PM and Johnston, LD, 2001. *Effects of price and access laws on teenage smoking initiation: A national longitudinal analysis*. Working paper 8331, National Bureau of Economic Research, Cambridge, MA: NBER.

Tegene, A, 1991. "Kalman filter and the demand for cigarettes". *Applied Economics*, 23: 1175-1182.

The Golden Leaf, 1970. *The golden leaf: A survey of the tobacco industry in South Africa.* Pretoria: Muller and Retief (Pty) Ltd. Published for the Tobacco Control Board.

Thursby, JG and Thursby, MC, 1994. *Interstate cigarette bootlegging: extent, revenue losses, and effects of federal intervention*. Working Paper 4763, National Bureau of Economic Research, Cambridge, MA: NBER.

Tobacco Board, various years. *Annual report.*

Townsend, J, 1987. "Cigarette tax, economic welfare and social class patterns of smoking". *Applied Economics*, 19: 355-65.

Townsend, J, Roderick, P and Cooper, J, 1994. "Cigarette smoking by socioeconomic group, sex, and age: effects of price, income and health publicity". *British Medical Journal*, 309: 923-7.

Townshend, GS and Yach, D, 1988. "Anti-smoking legislation - an international perspective applied to South Africa". *South African Medical Journal,* 73: 412-416.

Tremblay, CH and Tremblay, VJ, 1995. "The impact of cigarette advertising on consumer surplus, profit, and social welfare". *Contemporary Economic Policy*, 13: 113-24.

US Department of Health and Human Services (USDHHS), 1990. *The health benefits of smoking cessation: A report of the Surgeon-General.* Atlanta, Georgia. Centers for Disease Control, Office on Smoking and Health. (DHHS Publication No (CDC) 90-8416).

US Department of Health and Human Services (USDHHS), 2000. *Reducing tobacco use: A report of the Surgeon-General.* Atlanta, Georgia. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, and Office on Smoking and Health.

US Department of Health, Education and Welfare, 1964. *Smoking and health: Report of the advisory committee to the Surgeon-General of the Public Health Service.* Washington: US Department of Health, Education, and Welfare, Public Health Service.

Valdés, B, 1993. "Cigarette consumption in Spain: Empirical evidence and implications for public health policy". *Applied Economics*, 25: 149-156.

Van der Berg, S and Louw, M, 2003. *Changing patterns of South Africa's income distribution: Towards time series estimates of distribution and poverty*. Paper presented at the 2003 Conference of the Economic Society of South Africa. Stellenbosch, September.

Van der Burgh, C, 1979. "Smoking behaviour of white, black, coloured and Indian South Africans". *South African Medical Journal*, 55: 975-978.

Van der Merwe, R and Abedian, I, 1999. "A reduction in consumer expenditure on cigarettes and its effects on employment: a case study of South Africa". *Contemporary Economic Policy*, 17(3): 412-422.

Van der Merwe, R and Annett, N, 1998. "Chapter 4: The effects of taxation on consumption in South Africa", in ETCSA, *The economics of tobacco control in South Africa*, report submitted to the International Tobacco Initiative, School of Economics, University of Cape Town.

Van Walbeek, CP, 1996. "Excise taxes on tobacco: How much scope does the government have?" *South African Journal of Economics*, 64(1): 20-42.

Van Walbeek, CP, 2001. *Arguments for and against advertising bans and clean indoor air policies: The South African experience.* Unpublished paper.

Van Walbeek, CP, 2002a. "Recent trends in smoking prevalence in South Africa: Some evidence from AMPS data". *South African Medical Journal*, 92(6): 468-472.

Van Walbeek, CP, 2002b. "The distributional impact of changes in tobacco prices". *The South African Journal of Economics*, 70(3): 560-578.

Van Walbeek, CP, 2003. *Tobacco excise taxation in South Africa*. Geneva: Tobacco Free Initiative, WHO. Report WHO/NMH/TFI/FTC/03.4.

Viscusi, WK, 2003. *Principles of cigarette taxation*. Paper presented at the Conference on Excise Taxation, sponsored by the National Treasury of South Africa. Centurion. 11-13 June.

Warner, KE, 1977. "The effects of the anti-smoking campaign on cigarette consumption". *American Journal of Public Health*, 67(7): 645-50.

Warner, KE, 1981. "Cigarette smoking in the 1970's: The impact of the antismoking campaign on consumption". *Science*, 211: 729-731.

Warner, KE, 1987. "Health and economic implications of a tobacco-free society". *Journal of the American Medical Association*, 258(15): 2080-2086.

Warner, KE, 1989. "Effects of the antismoking campaign: An update". *American Journal of Public Health*, 79(2): 144-151.

Warner, KE, 1990. "Tobacco taxation as health policy in the Third World". *American Journal of Public Health*, 80(5): 529-530.

Wasserman, J, Manning, WE, Newhouse, JP and Winkler, JD, 1991. "The effects of excise taxes and regulation on cigarette smoking". *Journal of Health Economics*, 1: 43-64.

Weber, MD, Bagwell, DAS, Fielding, JE and Glantz, SA, 2003. "Long term compliance with California's smoke-free workplace law among bars and restaurants in Los Angeles County". *Tobacco Control*, 12: 269-273.

Wilcox, GB and Vacker, B, 1992. "Cigarette advertising and consumption in the United States, 1961-1990". *International Journal of Advertising*, 11: 269-278.

Wilcox, GB, Tharp, M and Yang, K, 1994. "Cigarette advertising and consumption in South Korea, 1988-1992". *International Journal of Advertising*, 13: 333-346.

Witt, SF and Pass, CL, 1981. "The effects of health warnings and advertising on the demand for cigarettes". *Scottish Journal of Political Economy*, 28(1):86-91.

Worgotter, GF and Kunze, M, 1986. "Cigarette prices and cigarette consumption in Austria 1955-83". *New York State Journal of Medicine*, 3: 478-479.

World Bank, 1999. *Curbing the epidemic: Governments and the economics of tobacco control*. Washington, D.C.: The World Bank.

Yach, D and Harrison, S, c.1994. *Proceedings of the All Africa Conference on Tobacco or Health, 14-17 November 1993, Harare, Zimbabwe.* Unpublished SAMRC report.

Yach, D and Joubert, G, 1988a. "Deaths related to smoking in South Africa in 1984 and projected deaths among coloureds and blacks in the year 2000". *South African Medical Journal*, 73: 400-402.

Yach, D and Joubert, G, 1988b. "Determinants and consequences of alcohol abuse and cigarette consumption in Mamre". *South African Medical Journal*, 74: 348-351.

Yach, D and Townshend, GS, 1988. "Smoking and health in South Africa". *South African Medical Journal*, 73: 391-399.

Yach, D, 1982. "Economic aspects of smoking in South Africa". *South African Medical Journal*, 62: 167-170.

Yach, D, McIntyre, D and Saloojee, Y, 1992. "Smoking in South Africa: the health and economic impact". *Tobacco Control*, 1: 272-280.