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# The impact of tobacco advertising bans on consumption in developing countries

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### ABSTRACT

Tobacco advertising bans have become commonplace in developed nations but are less prevalent in developing countries. The importance of advertising bans as part of comprehensive tobacco control strategies has been emphasised by the Framework Convention on Tobacco Control which calls for comprehensive bans on tobacco advertising. The empirical literature suggests that comprehensive advertising bans have played a role in reducing consumption in developed countries but that limited policies have not. This paper extends this analysis to include 30 developing countries and finds that bans do play an important role in reducing tobacco consumption in these countries. It finds that both comprehensive as well as limited policies are effective in reducing consumption although comprehensive bans have a far greater impact than limited ones. Furthermore, it finds that advertising bans may be even more effective in the developing world than they are in the developed world.

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## 1. Introduction

Possibly the single most important event in the history of tobacco control occurred in 1964 when the United States Surgeon General warned of the proven causal relationship between cigarette smoking and smoking related diseases, particularly lung cancer (United States Department of Health and Welfare, 1964, in Laugesen and Meads, 1991). This encouraged a wave of regulation and legislation in the developed world as governments began to restrict the advertising and promotion of cigarettes, place warnings of the dangers of smoking on packaging and increase prices using taxation (Laugesen and Meads, 1991). It is now generally accepted that smoking, as well as passive smoking, is a significant cause of premature death (United States Department of Health and Human Services, 1989, in Laugesen and Meads, 1991). More and more governments are finding it necessary to strengthen the regulation of advertising and in many cases banning it altogether. This is in line with the obligations and commitments contained in the *Framework Convention on Tobacco Control* which recognizes that a “comprehensive ban on advertising, promotion and sponsorship would reduce the consumption of tobacco products” (World Health Organisation, 2003/2005, p. 11). Furthermore it calls upon all ratifying nations to implement comprehensive bans on advertising. This has seen an increase in the number of developing countries taking steps to restrict and ban the advertising of tobacco products.

By 2030, tobacco is expected to be the single biggest cause of death worldwide. By 2020, 70% of those killed by smoking will be in the developing world (Jha and Chaloupka, 1999). It is becoming important and necessary to understand which

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**Table 1**

Studies investigating the impact of advertising expenditure on tobacco consumption

Study	Country	Time Period
No significant effect of advertising		
Grabowski (1976)	United States	1956–1972
Schneider et al. (1981)	United States	1930–1978
Yuclet and Kaynak (1984)	United States	1955–1979
Baltagi and Levin (1986)	United States	1963–1980
Johnson (1986)	Australia	1961–1986
Godfrey (1986)	United Kingdom	1956–1984
Hoffman (1987)	West Germany	1969–1979
McAuliffe (1988)	United States	1957–1985
Baltagi and Levin (1992)	United States	1963–1988
Wilcox and Vacker (1992)	United States	1991–1990
Duffy (1991)	United Kingdom	1971–1987
Franke (1994)	United States	1961–1990
Wilcox et al. (1994)	South Korea	1988–1992
Duffy (1995)	United Kingdom	1963–1988
Goel and Morey (1995)	United States	1959–1982
Duffy (1996)	United Kingdom	1963–1992
Gallet (1999)	United States	1958–1971
Duffy (2003)	United Kingdom	1963–1996
Significant positive effect of advertising		
Fujii (1980)	United States	1929–1973
Witt and Pass (1981)	United Kingdom	1955–1975
Young (1983)	United States	1929–1973
Bishop and Yoo (1985)	United States	1954–1980
Radfar (1985)	United Kingdom	1965–1980
Leefland and Reuijl (1985)	West Germany	1960–1975
Abernethy and Teel (1986)	United States	1949–1981
Porter (1986)	United States	1947–1982
Chetwynd et al. (1988)	New Zealand	1973–1985
Kao and Tremblay (1988)	United States	1953–1980
Harrison et al. (1989)	New Zealand	1973–1985
Seldon and Doroodian (1989)	United States	1952–1984
Tegene (1991)	United States	1953–1985
Smee (1992)	United Kingdom	1960–1987
Valdes (1993)	Spain	1964–1988
Tremblay and Tremblay (1995)	United States	1955–1990
Bardsley and Olekalns (1999)	Australia	1963–1996

Source: Smee (1992), Saffer and Chaloupka (2000) and Nelson (2006).

interventions succeed in reducing tobacco consumption, especially in the context of developing countries. Although the main driving force behind tobacco control is within the realm of public health it is economic interventions that have been found to be the most successful in reducing tobacco consumption. These interventions have tended to be related to increases in the price of cigarettes through taxation although a larger set of regulations including advertising bans, public smoking bans and restrictive sales practices are now becoming increasingly popular. Thus it is important to assess the effectiveness of these policies to ensure that the best possible policies are put in place to reduce cigarette consumption in developing countries.

This paper attempts to consider the impact that advertising bans have on tobacco consumption, paying particular attention to developing countries. It does so by using a cross-country analysis of demand including 51 countries. The first part considers the prior literature while the second section focuses on the methodology and data. This is followed by an analysis of the data and the estimation of the demand models.

## 2. Literature review

The debate over whether or not advertising affects the consumption of tobacco has for a long time been controversial. Tobacco control advocates and practitioners argue that tobacco advertising has a positive impact on aggregate consumption and that restricting and even banning tobacco advertising altogether can reduce aggregate consumption. The tobacco industry have for a long period of time argued that advertising has no positive impact on aggregate consumption but rather that it influences the relative market shares of individual brands and is thus not a public health issue. Economists have added empirical value to this debate with many studies showing that advertising has had a positive impact on aggregate consumption while equally many studies have shown no significant impact. Table 1 details almost all of the studies (published in peer reviewed journals) that investigate the relationship between tobacco consumption and advertising expenditure.

Saffer (2000) argues that the high level of aggregation of advertising expenditure data used in time series studies leaves very little variation to correlate with consumption data. Generally since the marginal product of advertising is very low (and

possibly even zero) it is not likely that we would find any relationship between advertising expenditure and consumption. The marginal product of advertising is likely to be low since cigarettes are one of the most heavily advertised products (where permitted). Saffer (2000) quotes *Advertising Age* which reports that Philip Morris was the ninth largest advertiser in the world in 1996. Furthermore since the marginal product of advertising is likely to be high at low levels of advertising and fall progressively as advertising increases and it is likely to be non-linear. Few, if any, of the studies that investigate the relationship between tobacco consumption and advertising expenditure take this potential non-linear relationship into account.

Chapman (1989) also criticised the use of these techniques, and in particular noted the inability of studies to examine all methods of promotion (including non-advertising) used by the tobacco industry. Econometric analysis only examines the effects of advertising on aggregate data, while advertising also has an influence on smoking related cognition and beliefs. In most cases they are unable to examine effects on specific population groups; e.g., youth, women or the poor—some of whom may be particularly vulnerable. He argued that it would be more relevant to analyse the consumers' use of marketing, deploying qualitative and quantitative techniques.

In more recent time economists have begun to focus less on advertising expenditure and more on studies that have attempted to quantify the impact of various advertising restrictions and bans on aggregate consumption. In the simplest context Smeek (1992) and Perkurinen (1989) compared what happened before and after an advertising ban was put in place in Norway and Finland, respectively and found that the ban had a negative impact on per capita consumption. Laugesen and Meads (1991) used 22 OECD countries over the period 1960–1986 to examine the impact of increasing advertising restrictions on per capita consumption. They construct a demand model in which they specify per capita consumption as a function of price, income, a number of demographic factors and an advertising restrictions score. The advertising restriction score was bound by 0 and 10, 0 implying no restrictions whatsoever and 10 implied a total ban on all advertising and sponsorship and strong and varied warnings on cigarette packaging<sup>1</sup>. Laugesen and Meads found that increasing advertising restrictions had, since 1973, been associated with declining tobacco consumptions controlling for rising prices and incomes.

Laugesen and Meads (1991) was written as an improvement on the report of the New Zealand Toxic Substance Board (1989) which was used as evidence in various Canadian court cases and attempted to correct for the flaws in the data and some methodological errors (High, 1999). Yet High (1999, p. 27) indicates that it still “suffers from basic flaws in methodology and data that renders it unintelligible and of no probative value” while Stewart (1992) critique was described by High (1999, p. 37) as “devastating”. Stewart's concerns included the quality of the data, the use of the estimation techniques and the failure to control for country specific influences including different tastes, culture and attitudes. Furthermore, High (1999) raises a major concern with the use of the advertising restriction score since it implies that a ban in one particular media has the same impact as a ban in another media and a restriction half that of a ban. The method implies that a score of two has double the impact of a score of one and a score of three triple the impact.

Stewart<sup>2</sup> (1993b) attempts to correct the data and methodological flaws of both the Report of the New Zealand Toxic Substance Board (1989) and Laugesen and Meads (1991) using annual data from 22 OECD countries for 27 years from 1964 to 1990 (High, 1999). High (1999) indicates that “Stewart has produced among the best studies of advertising and consumption” in the tobacco control literature. Yet High (1999) fails to take into account that Stewart's so called corrections to the flawed data and methodology are considered on data flaws that are in fact not necessarily so since Stewart (1992) critique of the Laugesen and Meads (1991) dataset was in fact based on an incorrect dataset (Laugesen and Meads, 1993). Furthermore the criticism of Laugesen and Meads' (1991) pooling technique by High (1999) remains valid for Stewart (1993a,b) since he does not specify a panel model either.

Interestingly Stewart (1993b) concludes that advertising bans have a positive impact on per capita tobacco consumption. Duffy (1996, p. 15 in High, 1999) indicates that Stewart's result can be explained by the reduction in health warnings associated with reduced cigarette advertising and that it may result in increases in consumption that are associated with the imposition of advertising bans. This could only be based on the assumption that people are therefore less aware of the health implications of smoking as a result of less advertising. This argument is flawed since health warnings have become more prevalent on packaging and at points of sale since advertising bans have been imposed.

When High (1999) argues that Stewart's (1993b) study represented one of the best that investigated the relationship between tobacco consumption and advertising he was wrong. High argues that all those studies (including Laugesen and Meads, 1991) that found advertising bans to have a negative impact of consumption suffered from poor methodology and thus in his definition of flawed he should include Stewart's (1993b). It suffers from many of the same problems as Laugesen and Meads (1991) while many are even more severe.

<sup>1</sup> A point was awarded each for bans on television, radio, cinema, outdoor posters, point of sale (shops), press, magazines and sponsorship while restrictions earned half a point. A further point was scored if package warnings were the same on all packets and a second if the warnings were varied.

<sup>2</sup> It is also important to note that Stewart is a private consultant who has worked for the Confederation of European Community Cigarette Manufacturers (CECCM) (Abbey Management Service, 1996). It is not known whether Stewart's part in this debate was funded by the CECCM but the result of his study would be consistent with other tobacco industry funded research. Scollo et al. (2003), show that studies funded by the tobacco industry that attempted to estimate the impact of clean air legislation on hospitality industries consistently found that regulation had negative effects while studies that did not receive tobacco industry funding found otherwise.

High (1999) argues that Laugesen and Meads (1991) take an incorrect approach to estimate the effect of advertising bans on tobacco consumption. High (1999, p. 28) argues that by using an advertising restriction score the “model would embody the very assumptions about those effects that it was designed to test”. This same criticism stands for Stewart (1993b) in that he uses a single dummy variable to indicate a ban, making no allowance for a partial ban in one media and a complete ban in another. Saffer and Chaloupka (2000) attempt to correct for this problem with two dummy variables, one indicating if a limited ban was applicable in a particular country in a particular year and the second whether a comprehensive ban was applicable (the base case is for a weak policy regime). They indicate the importance of looking at the effect of specific bans since a greater number of countries have implemented more comprehensive bans and restrictions on tobacco advertising since the 1980s. This, to some extent, corrects for High’s concerns about the different effects of different bans. Saffer and Chaloupka (2000) conclude that limited advertising bans have little or no effect on tobacco consumption while comprehensive bans can reduce tobacco consumption.

Regressions were conducted using per capita consumption as the dependent variable and including price, income, the unemployment rate and the percentage of filtered cigarettes as independent variables in addition to dummy variables for limited and comprehensive bans over the period 1970–1992. The regressions were conducted as a two-way fixed effects model including fixed effects for countries and time periods. The coefficients of the limited and comprehensive ban dummies are generally found to be insignificant. Saffer and Chaloupka (2000) indicate that the inconsistent results may reflect a lack of variation in the ban variables in the early years of the dataset prior to 1983. They altered the specification of their model to include only years from 1984 onwards and found that the coefficients of both the limited and comprehensive ban dummies were negative using all four dependent variables. The limited ban coefficients remain somewhat insignificant while the comprehensive ban coefficients are statistically significant. Furthermore, the magnitudes of the comprehensive ban coefficients were consistently greater than those of the limited bans.

Saffer and Chaloupka (2000) draw some important conclusions indicating that limited bans are not effective in reducing tobacco consumption since it ultimately will result in a substitution of advertising from the banned resources to those that are still allowed and that only comprehensive bans are effective in reducing consumption. This study shows the importance of testing for the effect of specific bans as suggested by High (1999) and also the use of fixed effects to control for heterogeneous differences between countries and time periods.

Nelson (2003) points out that two specific problems exist in the prior literature. He indicates that the early cross-country studies ignored the possibility that advertising bans are endogenously determined together with consumption. He also indicates the possibility of a structural break in the data noting that Saffer and Chaloupka (2000) find that comprehensive bans only become a significant determinant of tobacco consumption post 1984.

Nelson (2003) limits his sample to 20 OECD countries over the time period 1970–1995. The first sets of regressions are estimated to replicate and improve the prior literature. He includes dummy variables for (i) requirements for warnings on packaging and advertising material, (ii) television and radio advertising bans, (iii) moderate bans (if three or four specific media<sup>3</sup> bans existed) and (iv) strong bans (if five or more specific media were banned) as well as country and time dummies. Nelson (2003) diversifies his use of ban dummies to include some bans that he regards as important and is intentionally looking at the difference between broadcast bans and other media bans. Nelson’s (2003) initial conclusions were that none of the bans play a role in the determination of cigarette consumption.

The use of the shortened sample from 1985 to 1995 was based on testing for a structural break, which was done by using a recursive technique successively estimating regressions with one less year indicating a structural break in 1985. Nelson (2003) also tested the individual country autocorrelation in some of the regressions and found the majority of countries to have strong positive autocorrelation. He indicates that this may also account for a downward bias in standard errors and hence may have lead previous studies accepting that advertising bans had had a negative effect on consumption when in fact they had not. Nelson (2003) essentially rejects the previous attempts to measure the effectiveness of advertising bans on consumption in cross-country studies on the grounds of poor econometric techniques.

Based on his conclusion that advertising bans do not play a role in determining consumption Nelson (2003) hypothesises a public choice model arguing that advertising restriction only get implemented once smoking prevalence has fallen such that smokers no longer constitute an “effective economic or political interest group”<sup>4</sup> (Nelson, 2003, p. 20). Nelson (2003) indicates that most comprehensive advertising bans were only legislated once large scale falls in consumption had been seen. To test this hypothesis that advertising bans are a result in a reduction in tobacco consumption Nelson (2003) estimates a two-stage model treating advertising restriction endogenously.

Nelson (2003) finds that income and prices are statistically significant in predicting demand, while warnings are only statistically significant in the first sample period<sup>5</sup> while the advertising restriction score is not statistically significant in any

<sup>3</sup> Nelson (2003) considers a total of nine media, namely: television, radio, cinema, outdoor, newspapers, magazines, shop advertising, sponsorships, and indirect advertising such as brand names on non-tobacco products.

<sup>4</sup> The rationale behind this hypothesis is that since the mid-1960s tobacco consumption has fallen due to the public’s knowledge of the health risks associated with smoking and influenced by, amongst others, government reports, public education programs, health warnings and counter advertising campaign. Together with greater understanding of these risks, combined with higher taxation and direct measures such as age controls, tobacco consumption and prevalence fell resulting in the swing in public opinion that allowed advertising bans to be legislated without much political cost.

<sup>5</sup> Three difference samples are used: 1971–1995, 1977–1995 and 1985–1995.

of the samples. Although not statistically significant, the coefficients are negative in all samples, which are inconsistent with the results Nelson (2003) found in the single equation models. The  $t$ -statistic also decrease over the three samples indicating that advertising restrictions have become less important in determining consumption. Nelson (2003) was unable to reject the null hypothesis that advertising bans were exogenous and concluded that advertising bans and restrictions have had no effect on consumption.

Yet, of this work, very little has been conducted with respect to developing countries. Since a large amount of the work relating to the impact of economic interventions (particularly taxation and price elasticities) on tobacco consumption have shown significantly different results in developing countries as opposed to developed nations there is no reason to suggest that the results of the literature with respect to advertising in developed nations can be generically fitted to developing countries. Thus the purpose of this study is to quantify, if any, the impact of advertising bans and restrictions on tobacco consumption in developed and developing countries. It is important to note that the aim of this paper is not to test the impact of advertising but rather the impact of advertising bans and restrictions on aggregate consumptions with respect to developing countries.

### 3. Methodology and data

The dataset has been drawn from a number of sources. Price data is sourced from the *Economist Intelligence Unit's World Cost of Living Survey* (the largest dataset which includes a significant number of developing countries which collects annual data consistently on the retail prices of cigarettes). Data is collected on a city-wide basis for two different brands, an international or imported brand (usually Marlboro) and a locally produced popular brand, in two different types of retail stores. In order to choose one price from the four available the cheapest is selected in each year and city. This suggestion was made by Blecher and Van Walbeek (2004) when using the same dataset since they suggest that they cheaper brand would in fact be, in most countries, the most popular brand. In many developed nations there is little difference between the prices of the two brands. Where a number of cities are surveyed in a particular country the average price is used. Prices are captured in a common currency, United State Dollars and converted into real term (constant 2000 prices) using the *United States Consumer Price Index City Average for All Items* (United States Department of Labour, 2007). Consumption data is sourced from the *Tobacco Control Country Profiles*<sup>6</sup> (Shafey et al., 2003) dataset and is defined as per capita consumption per adult (aged 15 and older) while income data is sourced from the *World Bank's World Development Indicators* dataset. Per capita Gross Domestic Product in constant 2000 US dollars is used as a proxy of income rather than some measure of personal income since it places a value on free state services and transfers (Laugesen and Meads, 1993). Furthermore, GDP is available for a far broader cross-section of countries (including developing countries) than any other measure.

Data on regulations in each individual country are captured from a number of sources. For European nations, the regional office of the World Health Organisation provides an online *Tobacco Control Database* which includes detailed information on each member country (22 countries). A similar situation exists for some members of the Pan American Health Organisation which provides the *Pan American Tobacco Information Online System (PATIOS)*. This provided data for six countries although this was also supplemented by the *Tobacco Control Country Profiles* (Shafey et al., 2003) since only the current status is indicated in PATIOS, not the historical status which was found in Shafey et al. (2003). Thirteen countries that were not included in either of the aforementioned databases were surveyed using an online survey of eminent persons in each country. In a further 10 countries which were not surveyed due to language barriers or other logistical problems a search of *Tobacco Control Country Profiles* (Shafey et al., 2003), the *Centre for Disease Control's National Tobacco Information Online System (NATIONS)* and source documents was employed. A detailed appendix of all sources in each country is included. In order to maintain consistency between the various sources the dataset was constructed manually by the author using the sources only as an indication. A series was constructed for each country indicating the number of media in which advertising was banned in each particular year. A total of seven media were considered as per Saffer and Chaloupka (2000).

A number of alternatives are available for including advertising bans and restrictions in the model. The first would simply be to create a discrete and bounded score where 10 might represent a total ban on all advertising in all media and zero a free market. This method used by Laugesen and Meads (1991) has a distinct disadvantage in that it implies that a point scored for any reason implies the same generalised impact as any other. An alternative method is to create dummy variables for weak, limited and comprehensive bans as used by Saffer and Chaloupka (2000). The weakness of this methodology would be the subjective nature of the application of a weak, limited or comprehensive ban to a particular country in a particular year. A third method would be to include dummy variables for bans and restrictions in different categories or media (e.g. television, radio, outdoor, cinema, print, etc.) as suggested by High (1999). The inclusion of so many dummy variables would require large dimensions of the dataset to ensure sufficient degrees of freedom. Furthermore, the use of individual dummies for each particular media also removes the ability to examine the interaction between bans in different media which the Saffer and Chaloupka method allows by measuring the overall impact. The Saffer and Chaloupka method is used here since it is relatively easy to use and understand.

<sup>6</sup> Data from 1990 to 2000 is taken from the indicated source while data from 2001 onwards were sourced directly from the author of the indicated source.

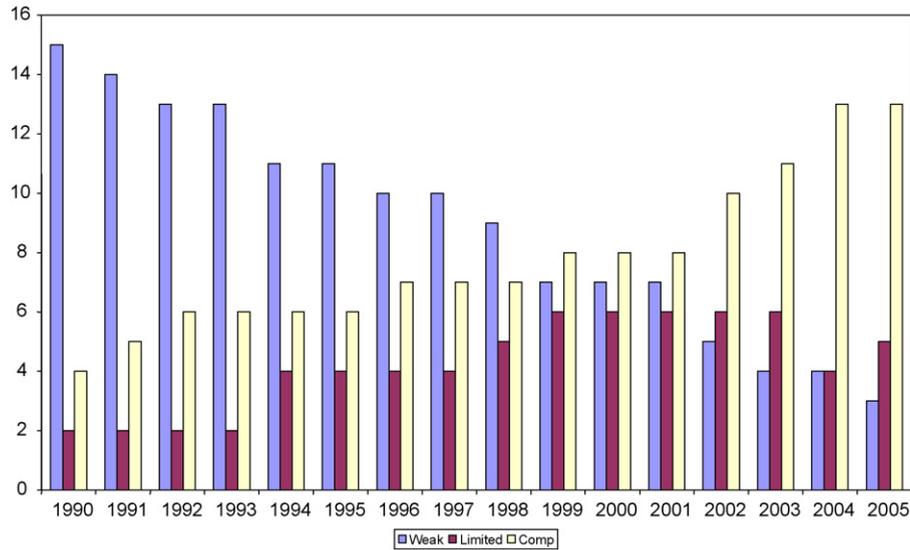


Fig. 1. High income countries (n = 21).

#### 4. Data analysis

The level of regulation in each country and year were measured according to the methodology designed by Saffer and Chaloupka (2000) by classifying the level of regulation in each country in each particular year as being weak, limited or comprehensive. The Saffer and Chaloupka method considers the regulation in seven types of media: television, radio, outdoor (including billboards), print (including magazines, books, newspapers), cinema, point of sale and sponsorships. If bans exist in none, one or two media the regulation is considered weak, three or four bans as limited and five or more being comprehensive.

Data on advertising regulations was collected for 51 countries, of which 21 are considered as high income countries according the World Bank’s list of economies as of July 2006 (World Bank, 2006) while the remaining 30 are considered as upper-middle, lower-middle or low income countries or collectively as developing countries. The analysis of advertising regulations covers the period 1990–2005. During this period there has been a remarkable trend towards the strengthening of advertising regulations with many countries moving from weak, to limited and comprehensive regulations. The trend has been consistent over the entire period in the high incomes countries although it has been more recent in the developing world.

In 1990, 71% of high income countries and 93% of developing countries in the sample had weak policies in place and this number has declined to 14% and 63%, respectively by the 2005. Limited policies are generally not popular and could be found in 10% of high incomes countries in 1990 and in only 3% of developing countries. Countries with limited bans tend to be scarce since they are usually countries in transition from weak to comprehensive policy. By 2005, this number has grown to 24% in high income countries and was non-existent in the developing world. Comprehensive bans occurred in 19% of high income countries in 1990 and in only 3% of developing countries. The number of countries implementing comprehensive advertising bans grew considerably to 62% of high income countries and 37% of developing countries by 2005. Figs. 1 and 2 indicate the number of countries choosing weak, limited and comprehensive advertising ban policies in high income and developing countries, respectively while Fig. 3 represents the same for all countries included in the analysis.

Developing countries have certainly been slower on taking up more rigorous policies. The majority of developing countries still have little or even no regulation of advertising while, since 2002, the majority of high income countries have had comprehensive policies in place. Advertising bans are considered part and parcel of a comprehensive tobacco control strategy. Such strategies are not yet as popular in the developing world as they are in the developed world since tobacco consumption is still relatively low although growing.

Consumption is varied across countries. Developed countries tend to have significantly higher levels of per capita consumption than developing countries. Fig. 4 describes the trends in consumption in developing and developed countries and shows that there has been a consistent decline in consumption in high income countries between 1990 and 2002.<sup>7</sup> In the same period there has been a modest increase in consumption in developing countries although this has occurred since 1995. Prior to 1995 the graph indicates declining consumption in the developing world.

The important question is what happens to consumption when a country implements a stricter policy? Fig. 5 shows the average annual per capita consumption for countries that had weak policies in place in 1990. It indicates three different

<sup>7</sup> The time period under analysis is restricted by the availability of consumption data.

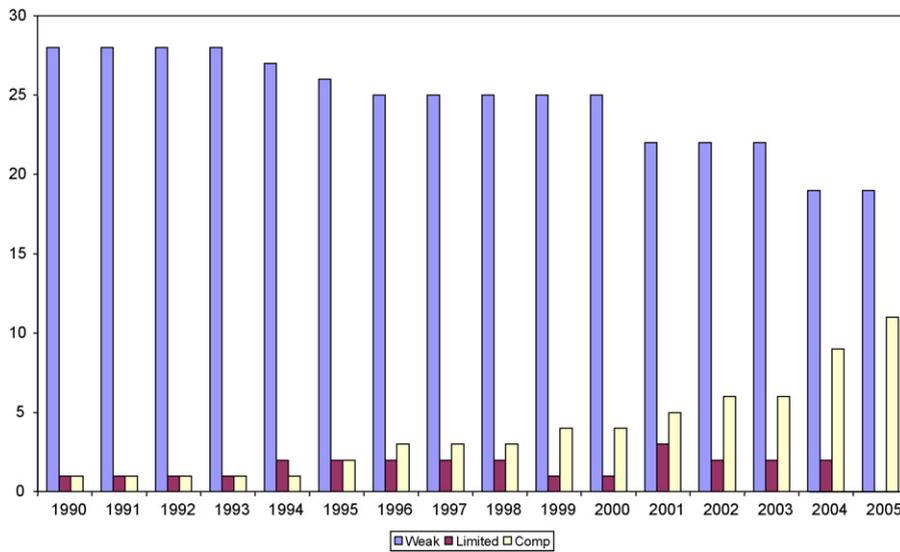


Fig. 2. Developing countries (n = 30).

series, for those countries that by 2002 had implemented limited bans and for those that had implemented comprehensive bans. It also includes those that kept weak policies in place as a baseline. What is immediately noticeable is how countries that changed to limited and comprehensive bans had higher consumption, to begin with, than those who did not—most likely since most countries who implemented limited and comprehensive strategies were more than likely high income countries and those that kept weak policies in place developing countries. Furthermore, countries that implemented limited and comprehensive bans found consistently declining consumption over the period while countries that kept weak bans in place found that consumption consistently rose. It is important to consider that countries which implemented more restrictive advertising regimes were more likely to have other policies in place which discouraged smoking such as higher taxation (and prices).

The above analysis is suggestive of a link between advertising bans and tobacco consumption in that countries that have implemented limited and comprehensive bans have seen tobacco consumption falling while countries that have maintained weak policies have seen consumption not decline and in some cases increase. It must be remembered that countries that implemented limited or comprehensive bans were also likely to have seen increases in the real prices of cigarettes since both are part and parcel of broader tobacco control strategies. The increases in the average real prices for those countries in the sample that moved to comprehensive bans was 16.1% between 1990 and 2002 while those that implemented limited bans increase by only 9.3% while those that maintained weak policies saw prices decline by 4.4%.

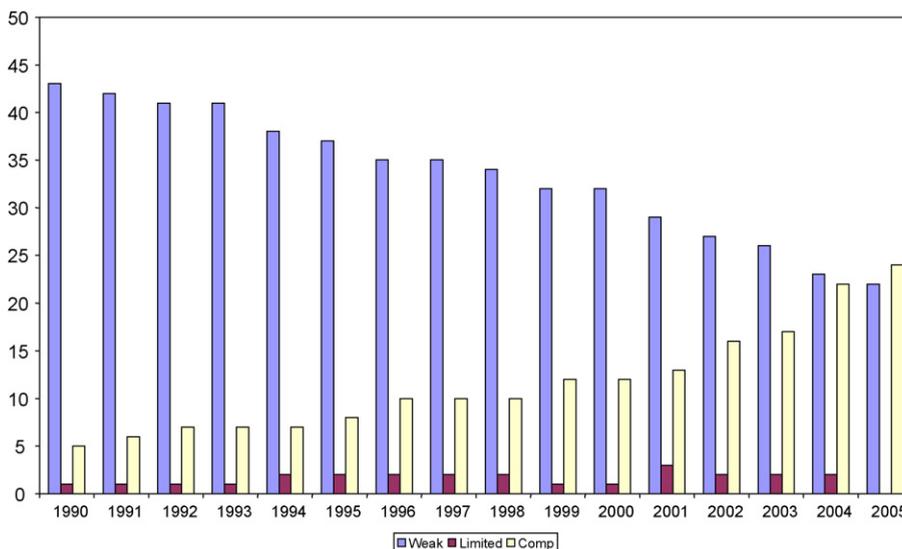


Fig. 3. All countries (n = 51).

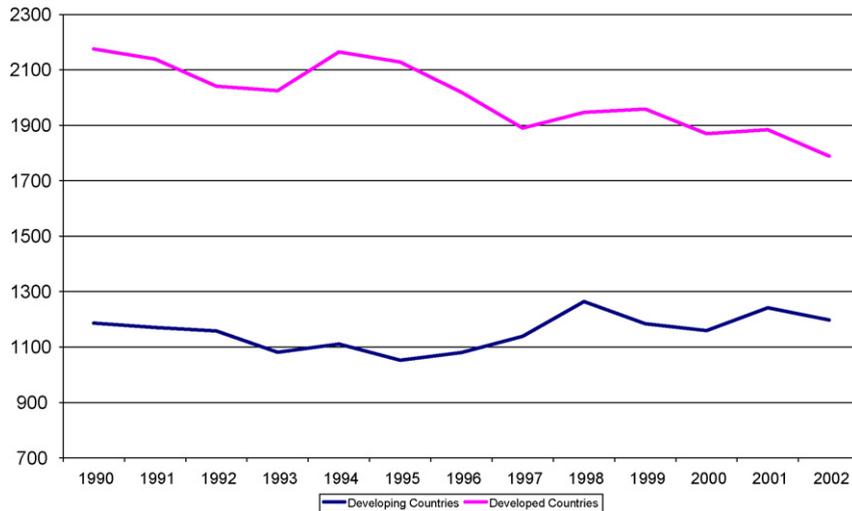


Fig. 4. Average annual per capita consumption for developing and developed countries.

We have also seen evidence that developing countries are less likely to implement limited and comprehensive bans. Fig. 6 breaks down developing countries into three groups based on the status of their policies in the last year of the analysis, 2002. The data indicates robust declines in consumption in those countries that chose to implement limited and comprehensive bans between 1990 and 2002. At the same time it shows that consumption in countries who maintained weak policies rose substantially, particularly since 1995. This indicates that although most developing countries maintained weak policy regimes that limited and comprehensive bans may be as influential in reducing consumption in the developing world as they are in high income countries.

The figures presented show that high income countries are more likely to implement comprehensive strategies than developing countries. Furthermore per capita consumption is declining in high income countries and this trend has not been shared in the developing world. It is easy to mistake the trend of declining consumption in the developed world with increasing advertising bans. Yet at the same time there is some evidence to suggest that increasing advertising bans occur in countries with declining consumption. A more rigorous analysis will now be undertaken.

## 5. Econometric model

A static fixed effects model is estimated employing country effects only and then employing both country and time effects. The country specific fixed effects model only controls for country specific differences and is called a one-way model. The two-way model includes both country and time effects and controls for differences across countries as well

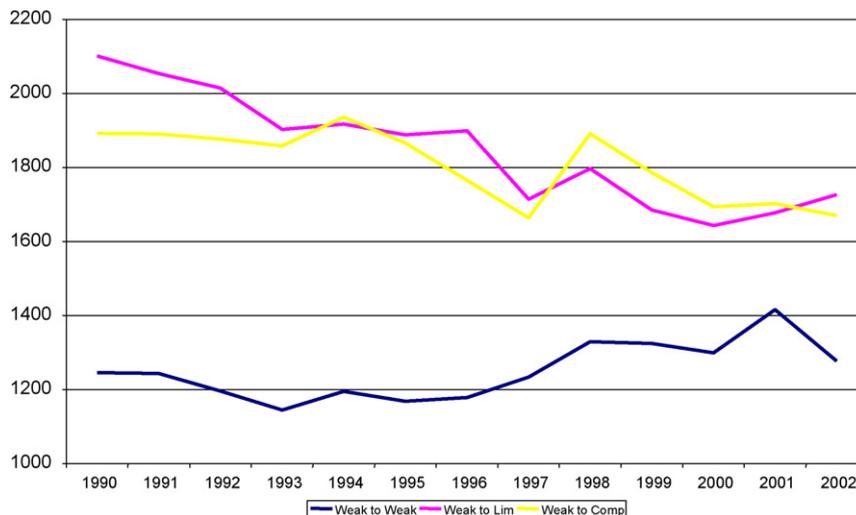


Fig. 5. Average annual per capita consumption for countries which in 1990 had weak policies.

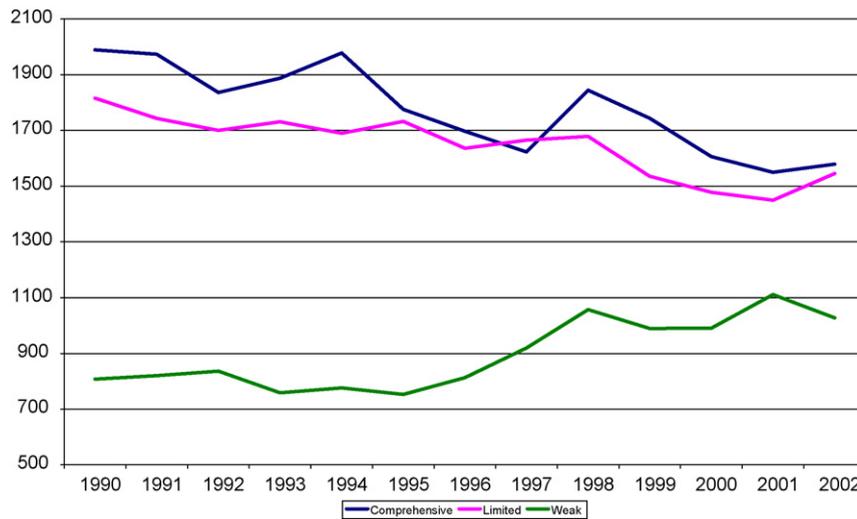


Fig. 6. Average annual per capita consumption for developing countries with weak, limited and comprehensive policies in 2002.

as differences between time periods. 51 countries are included in the model over 14 years (1990–2003). The panel is not balanced since observations are missing for some countries in some years due to unavailable data. The static model is estimated in natural logarithms to allow for interpretation of the coefficients as elasticities and is formalised by the following equation:

$$\ln C_{it} = \alpha_0 + \alpha_1 \ln P_{it} + \alpha_2 \ln Y_{it} + \alpha_3 D(\text{Lim})_{it} + \alpha_4 D(\text{Comp})_{it} + \mu_{it} \quad (1)$$

where  $C$  represents per capita consumption,  $P$  real prices,  $Y$  per capita real income,  $D(\text{Lim})$  and  $D(\text{Comp})$  represent the dummy variables for limited and comprehensive bans, respectively and the subscript  $it$  refers to country  $i$  and time period  $t$ .

In total three models are estimated, a pooled model including no fixed effects, and one- and two-way fixed effects models. The two-way fixed effects model is the preferred model since it is preferred to the one-way fixed effects model since  $\chi^2(13) = 36.75$  ( $P = 0.001$ ). The one-way fixed effects model is preferred to the pooled model since the model selection test is distributed  $\chi^2(49) = 1608.04$  ( $P = 0.000$ ). The results of the estimation of the two-way fixed effects model which includes 617 observations are shown in Table 2.

The price elasticity is negative and statistically significant while the income elasticity is positive and statistically significant and consistent with our expectations that tobacco is price inelastic and a normal good. The absolute magnitude of the price elasticity is relatively low indicating that a 10% increase in the real price results in only a 1.2% reduction in per capita consumption. This result is somewhat unexpected and not consistent with what is found in the literature. It suggests that the impact on consumption of an increase in price is far smaller than expected. There are a number of reasons why this is the case although the high level of aggregation of the data might be to blame. The high level of aggregation reduces our ability to control for many important effects including the interaction between demand and supply, illicit trade, initiation, cessation and the type of tobacco (Chaloupka et al., 2000). The income elasticity indicates that a 10% increase in per capita real income will result in a 1.9% increase in per capita consumption and is in line with what the literature suggests we should expect. Both ban dummies are negative although only the comprehensive ban dummy is significantly different from zero. The results for the static models are unsurprising and consistent with the literature. Limited bans seem to play no significant role in the determination of consumption but comprehensive bans have a significant and negative impact as suggested by Saffer and Chaloupka (2000).

The model is then re-estimated, this time including only developing countries. Twenty-nine countries are included in the model over 14 years (1990–2003). The panel is not balanced since observations are missing for some countries in some

Table 2  
 Results of the econometric models

Model	Ln $P$	Ln $Y$	$D(\text{Lim})$	$D(\text{Comp})$	Constant	$R^2$
All countries						
OLS $D_i$ & $D_t$	-0.123 (-4.512)***	0.192 (1.999)**	-0.026 (-0.709)	-0.067 (-1.830)*	5.543 (6.745)***	0.96
Developing countries						
OLS $D_i$	-0.099 (-2.928)***	0.086 (1.040)	-0.136 (-2.199)**	-0.235 (-4.434)***		0.97

Notes: Asymptotic  $t$ -statistics in parenthesis.  $D_i$  and  $D_t$  represent country and time effects included in the model. Dependent variable is Ln  $C$ . \*\*\*Significant at 1%, \*\*significant at 5% and \*significant at 10%.

**Table 3**

Summary of advertising ban dummies

	Weak	Limited	Comprehensive
Restricted alternative	0, 1, 2, 3	4, 5	6, 7
Saffer and Chaloupka (2000)	0, 1, 2	3, 4	5, 6, 7
Relaxed alternative	0, 1	2, 3	4, 5, 6, 7

years due to unavailable data. Again a total three models are estimated, a pooled model including no fixed effects, and one- and two-way fixed effects models.

The one-way fixed effects model is preferred to the pooled model since  $\chi^2(28) = 977.82$  ( $P = 0.000$ ) although the two-way fixed effects model is not preferred to the one-way fixed effects models since  $\chi^2(13) = 17.35$  ( $P = 0.184$ ). The preferred one-way fixed effects model is estimated with 331 observations and the result also shown in Table 2.

The results from this model is interesting. In the full model, the preferred two-way fixed effects model indicates the important influence of price and income on tobacco consumption. It indicates that the demand for tobacco is inelastic and normal albeit with small magnitudes. Furthermore it indicates that comprehensive bans have a negative impact on consumption but limited bans have a very small negative, if any, impact on consumption. Yet when we move into a model including only developing countries the results change somewhat. In the preferred one-way fixed effects model prices still have an important influence indicating the inelastic nature of tobacco but income seems to have a less important influence and although it is a normal good the magnitude is small and not significantly different from zero.

The ban dummies indicate that both limited and comprehensive advertising bans have a negative and impact on consumption and that the comprehensive bans have a far greater impact on consumption than limited bans. The imposition of a limited ban is associated with a 2.6% reduction in per capita consumption in the full sample (albeit not statistically significant) while this increases to a 13.6% reduction in developing countries. The movement to a comprehensive ban results in a 6.7% decline in per capita consumption in the full sample while in the sub sample of developing countries this decline is a larger 23.5%. Thus one can conclude that advertising bans have a greater impact on consumption in the developing world than high income countries and that they could indeed be a very useful tool in curbing tobacco consumption in the aggregate.

A sensitivity analysis of the limited and comprehensive ban dummies can be conducted to test the robustness of the results. This analysis is conducted by deriving two alternative specifications of the ban dummies, the first being more restrictive by requiring a greater number of individual media bans to be considered limited or comprehensive and the second being less restrictive by requiring fewer individual media bans to be considered limited or comprehensive. As an example in the year 2000, 12 countries were considered as comprehensive, 6 as limited and 33 as weak by the original Saffer and Chaloupka (2000) method while using the “restrictive” alternative 9, 3 and 39 countries were considered as having comprehensive, limited and weak policies, respectively. Using the “relaxed” alternative model, 14, 15 and 22 countries were considered as having comprehensive, limited and weak bans respectively in the year 2000. Table 3 summarises all three alternatives while the results of the regressions of the alternatives are shown in Tables 4 and 5 below.

In both cases the two-way fixed effects model is preferred to the one-way fixed effects models when all countries are included in the model since  $\chi^2(13) = 39.62$  ( $P = 0.002$ ) in the “restrictive” model and  $\chi^2(13) = 36.40$  ( $P = 0.001$ ) in the “relaxed” model. When only the developing countries are included the two-way fixed effects model is not preferred to the one-way fixed model since  $\chi^2(13) = 17.74$  ( $P = 0.274$ ) in the “restrictive” model and  $\chi^2(13) = 17.13$  ( $P = 0.193$ ) in the “relaxed” model.

**Table 4**

Sensitivity tests on advertising ban dummy variables: alternative 1

Model	Ln P	Ln Y	D(Lim)	D(Comp)	Constant	R <sup>2</sup>
All countries						
OLS $D_i$ & $D_t$	-0.120 (-4.419)***	0.197 (2.089)**	0.083 (2.181)**	0.032 (0.753)	5.398 (6.622)***	0.96
Developing countries						
OLS $D_i$	-0.091 (-2.757)***	0.069 (0.842)	0.203 (3.430)***	0.029 (0.405)		0.96

Notes: Asymptotic *t*-statistics in parenthesis.  $D_i$  and  $D_t$  represent country and time effects included in the model. Dependent variable is Ln C. \*\*\*Significant at 1%, \*\*significant at 5% and \*significant at 10%.

**Table 5**

Sensitivity tests on advertising ban dummy variables: alternative 2

Model	Ln P	Ln Y	D(Lim)	D(Comp)	Constant	R <sup>2</sup>
All countries						
OLS $D_i$ & $D_t$	-0.127 (-4.598)***	0.209 (2.205)**	0.017 (0.526)	-0.069 (-1.866)*	5.375 (6.611)***	0.96
Developing countries						
OLS $D_i$	0.097 (-2.987)***	0.107 (1.257)	-0.017 (-0.289)	-0.208 (-3.805)***		0.97

Notes: Asymptotic *t*-statistics in parenthesis.  $D_i$  and  $D_t$  represent country and time effects included in the model. Dependent variable is Ln C. \*\*\*Significant at 1%, \*\*significant at 5% and \*significant at 10%.

The price and income elasticities remain remarkably robust using both alternative models and in neither case are the estimated coefficients significantly different to the original model. However the estimated coefficients on the limited and comprehensive ban dummies have changed. In the “relaxed” model both the limited and comprehensive ban dummies have positive coefficients although only the limited ban dummy is significantly different from zero. In the “restrictive” model the coefficients on the comprehensive ban dummies are similar to the original model with a negative sign and statistically different from zero. The magnitude of the coefficient in the model including developing countries only is greater (in absolute terms) than the model including all countries. The limited ban dummies are both not statistically different from zero.

Of great interest here is that the conclusions that one is able to draw from the models do not change significantly with the sensitivity analysis. In both cases we find the very small price elasticities. This may be a result of a number of factors each of which is difficult to isolate. Only the “restrictive” model gives us results which do not support the proposition that advertising bans have a negative impact on tobacco advertising. The “restrictive” model does not allow us to classify many countries as having comprehensive advertising bans and as the majority of countries are now considered weak they form part of the base case. Thus many countries which in fact do have substantial advertising restrictions are considered in the same category as those which have no restrictions whatsoever.

## 6. Discussion and conclusion

The principle question asked in this paper is what impact do advertising bans have on tobacco consumption. Secondary to that is what impact they have specifically in the context of developing countries. This paper has attempted to estimate cross-country demand models to quantify the impact of limited and comprehensive advertising bans on consumption controlling for changing prices and incomes. The static models show that comprehensive bans have a significant negative impact on consumption in that the imposition of a comprehensive ban results in a 6.7% decline in per capita consumption. It also indicates that limited bans have no significant impact on consumption. This is consistent with Saffer and Chaloupka's (2000) conclusion that only comprehensive bans have an impact on consumption since the imposition of limited bans only causes a substitution of advertising away from those media which have been banned towards those media that are still allowed. When considering only the sub sample of developing countries we find that the comprehensive bans have a significant negative influence on consumption but we also find that limited bans now have a significant negative impact too. Limited bans reduce per capita consumption by 13.6% while comprehensive bans result in a larger 23.5% reduction in per capita consumption (relative to the base case of a weak policy regime). The result is relatively robust when the definition of limited and comprehensive bans are relaxed although the result is not robust when the ban definitions are made more restrictive.

An interesting question arises, why should advertising bans have such a large impact on consumption in the developing world relative to the entire sample? For one the literature indicates that the impact of price changes have a larger impact on consumption in developing countries vis-à-vis developed countries. Van Walbeek (2005, p. 80) indicates that “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”. Furthermore, changes in income also have a greater impact on consumption in the developing world than the developed world. Thus it can be said that tobacco demand is more sensitive to its determinants in the developing world relative to the developed world. Consumers are more sensitive to demand sided interventions, whether it be price increases as a result of tax increases or non-price measures including advertising bans, public smoking bans and social factors. There are a number of reasons for this greater sensitivity, firstly the price of cigarettes takes up a greater portion of a consumer's income in the developing world than in a rich country (Blecher and Van Walbeek, 2004). Thus as a result an increase in price has a relatively greater impact on a person's relative budget. Furthermore, consumers in poorer countries are likely to have lower education levels and thus have a poorer understanding of the health consequences of smoking. Thus the impact of advertising may be weaker in high income countries since a fewer number of smokers are enticed by advertising due to the better understanding of the health consequences.

This study provides an important ratification of prior literature as well as extending the validity of its conclusions to include a larger set of countries, particularly developing countries. Yet the study does suffer from some limitations and drawbacks. Firstly the dataset is not as robust as one would wish it to be. Data on prices, consumption and advertising bans all suffer from one weakness or another. The price data is of a specific price rather than the average price paid. The consumption data is not complete and almost all of the missing observations are as a result of missing consumption data. The dataset on advertising bans is complete although it not necessarily as consistent as one might like in that it is compiled from a number of sources. The econometric methodology suffers in that the panel is unbalanced meaning that missing observations have been ignored. Most of these missing observations occur in developing countries. Furthermore, the unbalanced panel combined with the shortness of the sample has excluded the use of dynamic specifications which would have allowed us to consider the time series properties of the data and better account for the addictive properties of tobacco.

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**Appendix A**

See Appendix Table A1.

**Table A1**  
Sources of information on advertising bans in individual countries

Argentina	Survey
Australia	TCCP; Acts of parliament
Austria	WHO Regional Office for Europe Tobacco Control Database
Bangladesh	Survey
Belgium	WHO Regional Office for Europe Tobacco Control Database
Canada	Survey
Chile	Pan American Health Organisation PATIOS Database; TCCP
China	Survey
Colombia	Pan American Health Organisation PATIOS Database; TCCP
Czech Republic	WHO Regional Office for Europe Tobacco Control Database
Denmark	WHO Regional Office for Europe Tobacco Control Database
Ecuador	Pan American Health Organisation PATIOS Database; TCCP
Eqypt	Survey
Finland	WHO Regional Office for Europe Tobacco Control Database
France	WHO Regional Office for Europe Tobacco Control Database
Gabon	TCCP; NATIONS
Germany	WHO Regional Office for Europe Tobacco Control Database
Greece	WHO Regional Office for Europe Tobacco Control Database
Guatemala	Pan American Health Organisation PATIOS Database; TCCP
Holland	WHO Regional Office for Europe Tobacco Control Database
Hungary	WHO Regional Office for Europe Tobacco Control Database
India	Survey
Indonesia	TCCP; NATIONS
Iran	TCCP; NATIONS; World Health Organisation (undated)
Ireland	WHO Regional Office for Europe Tobacco Control Database
Israel	WHO Regional Office for Europe Tobacco Control Database
Italy	WHO Regional Office for Europe Tobacco Control Database
Kenya	TCCP; Acts of parliament
Malaysia	Survey
Mexico	Survey
New Zealand	Survey
Nigeria	TCCP; NATIONS
Norway	WHO Regional Office for Europe Tobacco Control Database
Pakistan	TCCP; NATIONS
Panama	Pan American Health Organisation PATIOS Database; TCCP
Paraguay	TCCP; Acts of parliament
Peru	Pan American Health Organisation PATIOS Database; TCCP
Poland	WHO Regional Office for Europe Tobacco Control Database
Portugal	WHO Regional Office for Europe Tobacco Control Database
Russia	WHO Regional Office for Europe Tobacco Control Database
Senegal	TCCP; NATIONS; Acts of parliament
South Africa	Survey
Spain	WHO Regional Office for Europe Tobacco Control Database
Sweden	WHO Regional Office for Europe Tobacco Control Database
Switzerland	WHO Regional Office for Europe Tobacco Control Database
Thailand	Survey
Tunisia	TCCP; Survey
Turkey	WHO Regional Office for Europe Tobacco Control Database
United Kingdom	WHO Regional Office for Europe Tobacco Control Database
United States	TCCP; NATIONS; Nelson (2003)
Uruguay	Survey

Note: The names and details of the persons surveyed are available on request from the author.

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