YOUTH SMOKING PREVALENCE IN DEVELOPED AND DEVELOPING COUNTRIES: The Effect of Advertising Bans

by

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Abstract. This paper examines the effect of tobacco advertising bans on youth smoking prevalence in developed and developing countries. Despite little direct empirical analysis of this issue, public health professionals frequently propose advertising bans as a first step in dealing with youth smoking. Using a Bayesian learning model, the paper first develops a plausible mechanism for an effect of advertising bans on youth smoking. Advertising is hypothesized to alter youth perceptions of the ubiquity of smoking and the risks associated with this behavior. Using survey-based data, several cross-country linear probability models of youth smoking prevalence are estimated, including separate results for developed and developing countries by gender, pooled results, and results by frequency of smoking (weekly, 30-day, ever-smoked). Explanatory variables are included for price, income, demographics, advertising bans, and several other important policy variables (health warnings, prohibition of sales to minors, school classes, anti-smoking messages, access in retail stores). The results demonstrate that advertising bans have had little or no influence on youth smoking prevalence in developed or developing countries. This result holds for complete bans as well as partial bans. Some of the results suggest that school classes and other education efforts would be effective as a means to affect youth perceptions of the risks associated with smoking.

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Introduction

Public concern about the health effects of smoking has prompted a number of countries to adopt policies designed to reduce tobacco use by youth. Among the most common policies are laws prohibiting sale of tobacco products to underage youth, health warnings on packages, and restrictive advertising laws. According to political and public health officials, advertising bans are required to offset the successes of the tobacco industry in enticing children, Third World populations, and disadvantaged groups to smoke (Waxman 1991; Eriksen 1998; Jha and Chaloupka 2000, p. 164). In 2003, the 171 members of the World Health Organization's Tobacco Free Initiative agreed in principle to reduce youth consumption of tobacco products through comprehensive advertising bans and access controls (WHO 2003). If young people are encouraged by advertising to begin smoking at an early age prior to full awareness of the associated risks, stricter controls on advertising might be warranted to correct a market failure.[1] On the other hand, advertising bans would accomplish little if most youth are aware of the risks involved with smoking or if advertising has little influence on their behaviors.

In order to assess the effect of advertising bans, this paper uses data from two recent international surveys of youth smoking prevalence. The *Health Behavior in School-aged Children* (*HBSC*) survey by the European office of the World Health Organization (WHO) provides comparative data for developed countries. Surveys of youth ages 11, 13, and 15 years are conducted every four years to investigate health and health-related behaviors, including tobacco use. The 1997/1998 survey covers 25 countries in Europe, and Canada, Israel, and the United States. The second survey is the *Global Youth Tobacco Survey* (*GYTS*), which is worldwide effort that currently covers about 50 countries. The *GYTS* is administered through regional offices of WHO and the Office on Smoking and Health at the U.S. Centers for Disease Control and Prevention, and is designed to provide comparative data on tobacco use by youth in developing countries. The school-based survey focuses on youth ages 13-15 years. After excluding some countries due to data limitations, the present study examines youth smoking prevalence and advertising bans in 24 developed and 42 developing countries for the years 1997-1998 and 1999-2001, respectively.

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[1] The U.S. Surgeon General's report on youth smoking defines *young people* as ages 10 through 18 (PHS 1994, p. 5). The report views smoking as social behavior, with attendant social causes, functions, and reinforcements. Advertising is classified as a distal risk factor that indirectly affects social acceptability or alters proximal factors, such as gender and knowledge of smoking consequences (PHS 1994, p. 123).

An empirical study of advertising bans is attractive for policy, data, and analytical reasons. First, as mentioned above, strict public control of advertising is frequently cited as an appropriate initial step to reduce youth smoking. Second, systematic data on tobacco advertising expenditures are available for only a few developed countries, such as the U.K. and U.S. Third, advertising bans result in substitution toward permitted media, and a study of bans that vary by severity captures this substitution. Indeed, the position taken by some researchers is that only complete bans of cigarette advertising are effective in reducing adult smoking (Saffer 2000). Four previous cross-country studies of advertising bans have examined smoking among the adult populations in developed countries: Laugesen and Meads (1991); Saffer and Chaloupka (2000); Stewart (1993); and Nelson (2003). The first two studies found that comprehensive advertising bans had modest effects in reducing adult cigarette consumption, while the other two studies found no such effect. In light of the public policy concerns associated with youth smoking, there is a need for an empirical study of the effects of advertising bans on youth smoking behaviors. The present paper is the first econometric study of youth smoking and comprehensive advertising bans for a broad sample of countries.

The remainder of the paper is divided into five sections. Section 1 discusses risk-based reasons for possible adverse behavior on the part of youth due to advertising, which forms the basis for the empirical analysis. This section also reviews four previous econometric studies of advertising and youth smoking prevalence in the United States. Section 2 discusses the data from the two international surveys and presents a preliminary tabular analysis of youth smoking prevalence and advertising bans. The survey data is supplemented with additional cross-country information for the explanatory variables, including prices, income, and various restrictive laws that affect youth. An Appendix summarizes the variables and data sources. Section 3 presents an econometric analysis for the developed countries and Section 4 presents a similar analysis for the developing countries. Results are reported for boys and girls separately, and for pooled samples. Section 5 contains the conclusions. Overall, the analysis indicates that regardless of severity, advertising bans have had little or no effect on youth smoking in either developed or developing countries. Several economic variables are important and the results also suggest that education-based policy interventions may be effective.

1. Youth Smoking, Risk Perceptions, and Advertising

A reported finding in the public health literatures is that many individuals, especially younger smokers, overestimate the ubiquity or pervasiveness of smoking among peers and adults.[2] Social psychologists use the term "false consensus effect" to describe individuals who perceive that their choices are relatively common (Sherman et al. 1983). For example, the 1994 Surgeon General's report concluded that:

> Cigarette advertising appears to affect young people's perceptions of the pervasiveness, image, and function of smoking. Since misperceptions in these areas constitute psycho-social risk factors for the initiation of smoking, cigarette advertising appears to increase young people's risk of smoking (PHS 1994, p. 195).

A recent survey by Tyas and Pederson (1998, p. 416) also concluded that youth smoking is prevalence-driven behavior, which suggests that perceptions of smoking are important. In this section, I use these findings to model the possible adverse effect of advertising on youth smoking prevalence and the associated effect of an advertising ban. The section also reviews four previous econometric studies of youth smoking and exposure to tobacco advertising in the U.S.

Advertising and Risk Perceptions. For a risky product, such as smoking, the increased known risk is an additional private cost associated with consumption of the product (Mishan 1971, p. 164). Purchase of the product implies that private benefits counterbalance the perceived costs, including privately-borne risks. Because smoking is addictive, consumption by some individuals later in life is not entirely voluntary. In the "fully rational" addition model due to Becker and Murphy (1988), individuals plan over time with complete knowledge of the possible effects of present consumption on future preferences. Addiction is simply another private risk, and the anticipated future costs are discounted back to the present. Hence, people who discount the future heavily are more likely to become addicted. Other economic models of addictive behaviors reflect that individuals may experience regret due to myopia, heterogeneity in discounting and planning horizons, imperfect information, and the like.[3] If smokers' misperceive the associated risks, a market failure occurs due to lack of information regarding one or more

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[2] Representative studies are Collins et al. (1987), Sherman et al. (1983), and Sussman et al. (1988). See also FDA (1996, p. 44476), IOM (1994, p. 77), and PHS (1989, p. 335; 1994, p. 192).

[3] See, among others, Arcidiacono et al. (2001), Bishai (2001), Gruber and Koszegi (2000), Kenkel et al. (2002), O'Donoghue and Rabin (2001), Orphanides and Zervos (1995), and Suranovic et al. (1999).

essential characteristics of the product.[4] However, the existence of antismoking campaigns, package warning labels, and other restrictions on smoking suggests that most individuals are likely to be aware of the risks of smoking, although some may misperceive the probability of harm or underestimate the severity of the consequences. Additionally, there may be external social costs associated with smoking, including possible "bandwagon" effects due to the influence of social and peer pressures to engage in smoking.

With regard to youth, the Bayesian learning model of addictive behavior due to Orphanides and Zervos (1995) relaxes the assumption of perfect foresight and planning found in Becker and Murphy. Inexperienced individuals are initially uncertain of the potential harm associated with consumption of addictive products. Each individual possesses a subjective belief concerning his/her potential to become addicted, and this belief structure is updated with information gained from consumption, peer behavior, schooling, and advertising. In particular, advertising can affect youths' perception of the pervasiveness of smoking among peers and adults, which alters the prior on the incidence of harmful addiction. Thus, the clues and claims received from advertising, especially persuasive or image-based advertising, might lead youth to overestimate the pervasiveness of smoking and underestimate the potential for addiction. Due to misperceptions, some experimenters with tobacco will become addicted and later experience regret. This model also suggests that it is *quantity* of cigarette advertising that leads to misperceptions as well as the form of the advertising or particular themes utilized. Because advertising bans reduce the quantity of messages in particular media, this policy has the potential to reduce youth smoking prevalence.

An association between advertising and misperception of pervasiveness has been long argued in the public health literature, and this connection is used to justify informational programs such as tobacco education classes (PHS 1994, p. 192; Warner et al. 1986, p. 376). Although studies of the psychosocial effects of advertising suffer from a number of interpretation problems, a few studies provide empirical support for this connection. Botvin et al. (1993) reported positive correlations between youth exposure to cigarette advertising and their estimates

[4] On risk perceptions of smoking, see Hersch (1998), Hersch and Viscusi (1998), Ippolito (1981), Leventhal et al. (1987), Liu and Hsieh (1995), Rindfleisch and Crockett (1999), Schoenbaum (1997), Sloan et al. (2001), Slovic (1998), Smith et al. (2001), Viscusi (1990, 1991, 1992), Viscusi et al. (2000), and Zweifel (2001).

of smoking prevalence among peers. Henriksen et al. (2002), under the guise of testing teen-interest stories, exposed 8th and 9th graders to photographs of convenience storefronts that were either dominated by tobacco advertising or devoid of it. They found that students exposed to the latter photograph believed that more peers tried and approved of smoking. Lastly, Pechmann and Ratneshwar (1994) reported that exposure to cigarette advertising led non-smoking 7th graders to form more positive thoughts about smoking peers, which presumably is correlated with perceptions of pervasiveness. Thus, these studies suggest a plausible mechanism whereby advertising bans might affect youth smoking behaviors – advertising leads youth to overestimate the prevalence of smoking, which thereby reduces their prior on the probability of harmful addiction and results in greater uptake of smoking.[5]

Hence, the case for special restrictions on youth smoking rests on three extensions of the standard decision framework. First, youth lack experience with decisions that involve risky products and activities, and they are more "present oriented" (Fuchs 1983). As a consequence, they are more likely to misperceive the risks due to smoking or apply a high rate of discount to future costs or underestimate the difficulties of quitting (IOM, 1994, p. 14). Second, youth are especially prone to peer pressure, suggesting that the marginal private cost of smoking exceeds the marginal private benefit. In the case of addictive products, group effects also tend to accentuate present benefits relative to future costs.[6] Third, youth may be especially prone to act based on claims and clues contained in repetitive advertising that depict the possible benefits from or social appropriateness of smoking.

This paper does not attempt to measure youth risk perceptions or how they might be changed by cigarette advertising. The exact mechanism by which risk-related perceptions are altered (if at all) is not investigated. The main point is that advertising effects have been demonstrated theoretically in a Bayesian learning model, and a version of this model also is

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[5] This conclusion is not held universally or at least the magnitude of the effect is in doubt. For example, the literature survey by Chaloupka and Warner (2000, p. 1589) concludes that advertising bans have little impact on adult smoking. With regard to youth, Jacobson et al. (2001, p. 159) conclude that "a complete ban on tobacco advertising may have a discernible impact on youth smoking behavior but it would likely be small." See also Burton et al. (1990) for a comparison of Finnish and American youth and the null effect of an advertising ban.

[6] Youth smoking can be associated with several early health problems, but the policy goal is usually expressed as reducing the long-term health effects of adult smoking by reducing or preventing youth smoking (FDA 1996, p. 4439; IOM 1994, p. 1; PHS 1994, p. 6).

accepted, with some empirical support, by the public health community. The present study is concerned with the measurable effect of advertising bans of varying severity on youth smoking prevalence. A negative effect of advertising bans on youth smoking prevalence would be consistent with a "false consensus effect" due to advertising. In this context, there is a substantial literature on the economics of youth smoking, but only a few studies investigate the possible effects of advertising.[7] The remainder of this section provides a review of the methods and results from four econometric studies that examined the effects of tobacco advertising on youth smoking in the United States.

Advertising and Youth Smoking: U.S. Evidence. In a well-known study, Lewit et al. (1981) sought to determine the effects of the Fairness Doctrine and self-reported TV viewing on smoking behaviors. Lewit et al. used a micro-data set for the period 1966-1970, which covered youth between the ages of 12 and 17 years, and they estimated the number of pro- and anti-smoking commercials each youth might have seen. Youth interviewed during 1966-1967 were *not* exposed to the antismoking messages aired on TV under the Fairness Doctrine. Two behaviors were examined: (1) whether or not a youth was a current smoker; and (2) the number of packs smoked per day. Explanatory variables include family background (income, family size, parent's schooling, etc.) and youth characteristics (age, gender, race). However, parents' and peers' smoking behaviors are omitted from the empirical model. The policy variables are the price of cigarettes; antismoking messages under the Fairness Doctrine; and a proxy for cigarette advertising. The variable for the Fairness Doctrine is a time dummy for each year of the sample, which raises an interpretation issue regarding other time-specific effects besides the Fairness Doctrine. The proxy for cigarette advertising is self-reported hours spent watching television programs. In some regressions, hours of TV exposure and the dummies for the Fairness Doctrine are interacted to measure the net effect of pro- and antismoking messages. Separate results also are reported for the annual number of antismoking messages and the number of prosmoking messages to which each youth might have been exposed. These measures are not specific to individuals or region, but cover the entire U.S. The authors' empirical results indicate that the

[7] On youth smoking, see Alchin and Lee (1995), Chaloupka and Warner (2000), Gruber (2001), Gruber and Zinman (2001), Jacobson et al. (2001), and Tyas and Pederson (1998). Surveys of advertising and cigarette demand include Andrews and Franke (1991), Cameron (1998), Duffy (1996), and Simonich (1991).

Fairness Doctrine and television viewing had no effect on the quantity of cigarettes smoked. However, the Fairness Doctrine reduced youth smoking prevalence, especially in the first year. Self-reported TV viewing had a small positive effect on prevalence, which is almost entirely offset by effects of the Doctrine dummies. The number of prosmoking messages had a small positive effect in one regression. The aggregate number of antismoking messages was never significant at conventional levels, which conflicts with the dummy results. Based on the modest effect of prosmoking messages, Lewit et al. (1981, p. 568) concluded that the 1971 ban of TV-radio advertising "... was not a particularly effective policy instrument to curtail teenage smoking."

A second study was conducted by Lewit et al. (1997) using two cross-sectional school-based surveys of 9th grade students (ages 13-16) in 21 communities in Canada and the U.S. for 1990-1992. The two dependent variables were: (1) smoking participation; and (2) non-smokers intention to smoke within a year. Control variables for youth characteristics include age, gender, and race/ethnicity. A number of state and local policy variables are investigated including cigarette prices, indoor clean air restrictions, school smoking policy, number of tobacco-education classes, minimum age for purchase, and vending machine restrictions. Youth exposure to prosmoking and antismoking messages is based on self-reported exposure in 10 media and locations. The results in this study indicate that boys' smoking participation was negatively affected by minimum age laws and higher cigarette prices, unaffected by antitobacco messages, and positively affected by protobacco messages. Girls' participation was negatively affected by minimum age laws, positively affected by antismoking messages, and unaffected by protobacco messages. In the intention-to-smoke regressions, antismoking messages again had a positive sign for girls and the number of tobacco classes had a negative sign, but protobacco media exposure was not significant for either gender. The authors concluded that their results

> give only modest support to the notion that media-focused policy interventions will be effective in reducing smoking among ninth-graders ... [and] this finding gives only limited support to the frequently discussed notion that high levels of exposure to cigarette advertising, targeted at young persons or otherwise, lead to an increase in cigarette smoking among ninth-graders (Lewit et al. 1997, p. S23).

A third study was conducted by Beales (1996). Two data sets were employed: a national sample from the *1989 Teenage Attitudes and Practices Survey*, conducted by the U.S. Centers for

Disease Control; and the *1990 California Tobacco Survey*, conducted by the California Department of Health Services. The surveys covered youth ages 12 to 17 years. In contrast to the other studies, Beales had access to a number of variables that capture risk perceptions and peer behavior, including eight variables for youth perceptions of the benefits and risks of smoking; five variables for the influence of peer smoking; and five variables for smoking by siblings and parents. In addition, he included ten demographic variables (age, race, family size, etc.) and family income. For California, he had access to state-level data on total advertising expenditures and brand expenditures. The California survey also included questions regarding youth recall of cigarette brand ads, which Beales compared to the actual expenditure levels. In order to capture lagged effects, advertising expenditures were measured over periods ranging from the prior three months to the prior three years. Price was omitted as a variable, although in the California sample there were no local taxes to generate price variation (Beales 1996, p. 16).

Beales' dependent variables cover four levels of smoking intensity: never smoked; smoked at least one cigarette but not in the last 30 days (experimenters); smoked at least one cigarette in the last 30 days (social smokers); and daily smokers. Logistic regressions are estimated using ordered- and dichotomous-dependent smoking variables. The empirical results indicate strong effects of peer, sibling, and parents' smoking on youth behavior, especially smoking by best friends. Among other findings, the benefit/risk results indicate that teens who enjoy risky activities or who believe that quitting is easy are more likely to smoke. Family income is positive and significant in the California sample, but insignificant in the national sample. The industry- and the brand-advertising variables are uniformly insignificant in the California sample, and many of the coefficients are negative. Additional results indicate that teen smokers are not particularly accurate in reporting which brands are in fact the most heavily advertised. Smokers were somewhat more likely to name Marlboro as the most advertised brand, although smokers and nonsmokers were not significantly different in their ability to name correctly the most advertised brand. The other coefficients did not change much when brand advertising variables are included. Beales (1996, p. 46) concluded that advertising had neither direct nor indirect effects on youth smoking, including brand advertising.

A fourth study of smoking among college students was conducted by Czart et al. (2001) using data from the *1997 Harvard College Alcohol Survey*. The three dependent variables were:

smoking participation (smoker or non-smoker); frequency of cigarette consumption (none, light, moderate, or heavy); and number of cigarettes smoked daily. The explanatory variables include a large number of individual characteristics (20 variables), living arrangements (5 variables), university characteristics (6 variables), and local and state smoking restrictions (9 variables and a summary index). School smoking policies are measured by restrictions on campus smoking (2 variables); availability of cigarettes on campus (2 variables); and advertising restrictions for campus newspapers and bulletin boards (2 variables). Very few of the school-policy variables are statistically significant at conventional levels or have the wrong signs. For advertising policies, prohibition in newspapers is insignificant in two regressions and has the wrong sign in the regression for frequency of consumption. Prohibition on bulletin boards is significant and negative in one regression (frequency of consumption); significant and positive in a second regression (current smoking participation); and insignificant in the third (cigarettes consumed). Based on these mixed results, Czart et al. (2001, p. 135) concluded that "... bans on cigarette advertising on campus as well as bans on the sale of cigarettes on campus have no significant effect on the smoking behavior of college students."

In summary, four previous econometric studies of smoking by youth and young adults have failed to demonstrate strong effects of tobacco advertising or advertising restrictions. Rather, the results are mixed and inconsistent. Lewit et al. (1981) failed to find a strong effect on consumption or prevalence due to TV viewing that might contain tobacco advertisements. Lewit et al. (1997) obtained a similar result for a much broader measure of self-reported exposure to protobacco advertising and, paradoxically, they found that exposure to antitobacco advertising was associated with increased smoking by girls. Using data on actual advertising expenditures, Beales (1996) failed to find a significantly positive effect after controlling for a variety of other influences, including smoking by peers and parents. Lastly, Czart et al. (2001, p. 146) found that bans in college newspapers had no effect on smoking participation or frequency.

These findings conflict generally with the position of the public health community that advertising restrictions are an especially important and effective part of youth tobacco control. However, none of the empirical studies cover comprehensive advertising bans or address youth in countries other than the U.S. In light of these generally unknown consequences, the present study represents the first assessment of the aggregate effect of advertising restrictions on smoking prevalence for youth for a broad sample of developed and developing countries.

2. Survey Data and Variables: *HBSC* and *GYTS*

International data on youth smoking behaviors are available from two surveys. The *HBSC* survey is conducted in the school setting and requires that youth complete a detailed questionnaire on a wide range of health behaviors and health indicators, including family relations, school environment, exercise, eating and leisure-time habits, sexual behavior, and substance use.[8] The target population is young people ages 11, 13, and 15 years. The average sample size for each age level is about 1,500 students. Two measures of prevalence are used in my analysis: (1) ever smoked; and (2) smoked at least weekly. Both measures are reported in *HBSC* by age, gender, and country. Using age-based sample weights, I have combined the data on 13 and 15 year-olds for each gender, but omitted 11 year-olds who have considerably lower smoking rates.[9] Greenland is omitted due to lack of additional data on smoking behaviors from WHO and World Bank reports. The *HBSC* also reports separate survey results for England, Northern Ireland, Scotland, and Wales. In order to match the available supporting data for the United Kingdom, I pooled these data using age-based weights for each country.

The *GYTS* is a school-based survey of a defined geographic site, which can be a country, province, or city. The *GYTS* focuses on students ages 13 to 15 years, but some older and younger students also are included as result of the survey design. The average sample size for each geographic unit is about 1,500 students. The *GYTS* questionnaire is self administered and consists of 50 questions on seven core topics: smoking prevalence, attitudes, advertising, access, school curriculum, environmental tobacco smoke, and cessation. Two reported measures of smoking prevalence are used in my analysis: (1) ever smoked; and (2) smoked within the past 30 days. Separate empirical results are reported by gender and for a pooled sample. I have excluded eleven countries in which the survey was administered to more than four grade levels; three countries for lack of supporting data; and two countries where the larger number of surveys could

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[8] There are a large number of articles and reports by health professionals based on the *HBSC* survey, which are referenced or accessible at the *HBSC* web site, http://www.hbsc.org/index.html; see also Aaro et al. (1986). Due to its newness, there is only one other available study using the *GYTS* survey; see Warren (2002).

[9] Smoking on a weekly (or daily) basis by 11 year-olds is less frequent, which justifies their exclusion from my *HBSC* sample. Weekly prevalence among 13-year-olds is about one-half of the rate among 15 year-olds. Across countries and sexes, the weekly prevalence rates are highly correlated. The ever-smoked rates for 13 and 15 year-olds are similar, and about double the rate for 11 year-olds. Because the empirical analysis is cross-sectional, pooling of 13 and 15 year-olds is designed to eliminate some of the unique country-specific features.

not be combined on a consistent basis (China, India). There are two countries that are in both the *HBSC* and *GYTS* samples: Poland and Russia.

Summary by Ban Severity. Table 1 shows the data on smoking prevalence organized according to the type of advertising ban in each of the developed countries in the *HBSC* sample. By severity, there are four possible types of bans: (1) complete bans (all major media, including print); (2) bans of broadcasting and billboards or print media; (3) broadcasting only (TV and radio); and (4) TV only. None of the 24 countries permits tobacco advertising on television. On average, youth smoking prevalence does not differ greatly across these categories: 55.8% of youth have smoked in the eight countries with complete bans compared to 54.7% in sixteen countries with partial bans. Weekly prevalence is slightly less in the countries with complete bans: 15.8% compared to 16.5%, but the difference is not significant. Weekly smoking by teenage girls is *greater* than the rate for teenage boys in twelve developed countries: Austria, Canada, Denmark, Finland, France, Germany, Greece, Norway, Sweden, Switzerland, United Kingdom, and the United States. Mean adult consumption is lower in the countries with complete bans, reflecting low recorded values for Finland and Sweden. However, tobacco consumption rates in Scandinavian countries are influenced importantly by use of smokeless tobacco and roll-your-own cigarettes (Forey et al., 2002). All of the developed countries require health warnings on packages and sales to minors are banned in all but six countries.

Table 2 displays similar information for the developing countries in the *GYTS* sample. Countries again are organized according to severity of restrictions: complete bans (6 countries); partial bans (16 countries); and no media banned (20 countries). The 16 countries with partial bans can be further divided according to the number or type of media banned (TV or radio; TV and radio; TV-radio and other media). Particularly noticeable in the table is the variation in youth prevalence, reflecting widely-varying economic, social, and religious circumstances. For example, current smoking by youth varies from less than 5% of students in four countries (Ghana, Malawi, Nepal, Sri Lanka) to more than 25% in six countries (Argentina, Chile, Kuwait, Mali, Russia, Ukraine). The mean current rate of smoking is 13.9% in countries with complete bans; 15.5% with partial bans; and 16.1% with no bans. The differences are not significant. On average, current smoking prevalence by teenage girls is *greater* than teenage boys in seven countries (Argentina, Barbados, Chile, Costa Rica, Haiti, Uruguay, Venezuela).

The "current use" rates in Table 2 and "weekly use" rates in Table 1 are not comparable, reflecting 30-day and weekly usage, respectively. Conditional on the differences in the design of the two surveys, the prevalence rates for "ever smoked" are comparable. The ever-smoked rate for developed countries with complete bans is 55.8% compared to only 29.7% for developing countries. Mean adult consumption in the developed countries also is higher: 1752 cigarettes per year compared to 1259 for developing countries. On average, the data demonstrate that youth and adult smoking are less prevalent in developing countries (see also Pierce 1989).

Econometric Model. The remainder of this section discusses the econometric model and variables used to analyze youth smoking prevalence. The dependent variables are: (1) weekly smoking prevalence in the developed countries; (2) 30-day smoking prevalence in the developing countries; and (3) ever-smoked prevalence in both groups of countries. Boys and girls may smoke for different reasons and empirical results are reported separately by gender. I also report results for pooled samples for both sexes, which doubles the number of observations. Survey responses of boys and girls are assumed to be independent of each other. For pooled regressions, interaction terms are used to control for slope coefficients that differ importantly by gender.

Linear probability models with smoking prevalence (weekly, 30-day, or ever-smoked rates) as dependent variables, are estimated with the following general form:

$$(1) \qquad S_{ij} = f\,(BAN_i\,, PRICE_i\,, INCOME_i\,, X_i\,, \varepsilon_{ij}\,)$$

where S_{ij} is a smoking prevalence rate for the ith country and jth sex (boys or girls); BAN_i is a set of dummy variables that characterize the advertising restrictions in each country; $PRICE_i$ is the real price of cigarettes; $INCOME_i$ is the real income level in the country; X_i is a vector of economic, demographic, and other policy variables that may affect youth smoking; and ϵ_{ij} is a stochastic error term. Included among the policy variables are health warnings on packages; prohibition of sales to minors; anti-smoking messages; school classes on the dangers of smoking; and retail access to tobacco products. Two dummy variables are included to control for country-specific effects: a binary variable for the former countries of the Soviet Union; and a binary variable for countries where the predominant faith is the Muslim religion.

Explanatory Variables. Depending on the survey, additional variables are specified for the following possible influences on youth smoking (data sources are given in the Appendix):

A. Policy Variables

1. *Advertising ban severity index* – range of 0 to 4 (see the Appendix);
2. *Advertising ban binary* – equals one if total ban of major media, 0 otherwise;
3. *Warning label binary* – one if labels required, 0 otherwise;
4. *Sales to minors prohibited* – one if prohibited, 0 otherwise;
5. *Real price* – domestic brand real price per pack in 1999 (1999 US$).

B. Economic-Demographic Variables

6. *Real income* – real GDP per capita in 1995 (1995 US$);
7. *Health care spending* – health expenditure as % of GDP in 2000;
8. *Urbanization* – % of total population living in urban areas;
9. *Soviet binary* – one if former member of Soviet Union, 0 otherwise;
10. *Muslim faith binary* – one if majority of population is Muslim, 0 otherwise;
11. *Gender binary* – one if male, 0 if female.

C. Social Environment Variables

12. *Around others who smoke* – % around others who smoke;
13. *Adult per capita cigarette consumption* – sticks per capita;
14. *Schooling class on smoking dangers* – % taught in class in past year;
15. *Anti-smoking media seen* – % saw anti-smoking media in last 30 days;
16. *Able to buy smokes in stores* – % report not refused due to age;
17. *Academic interest* – % who like school a lot.

The expected signs on the regression coefficients follow from the theoretical model, aspects of the data, or previous studies of youth smoking. Positive signs are expected for male gender, urbanization, Soviet binary, store-bought smokes, peer smoking, and adult consumption. Negative signs are expected for advertising bans, warning labels, price, health care spending, Muslim binary, school classes, anti-smoking media, and stronger academic interests. The expected sign for income is uncertain due to conflicting effects of the demand for health maintenance and demand for cigarettes. The price data are incomplete for the developing countries. However, prices are not expected to have an important effect on ever-smoked prevalence among adolescents (see below), and possibly not even on 30-day youth smoking prevalence. Further, tax rates on cigarettes should be correlated with the number of advertising media that are banned. Hence, cigarette prices and advertising bans are likely to be positively correlated. Omitting the price variable for developing countries should therefore impart bias in

coefficients for advertising bans toward greater negative values. For other variables, lagged or leading data are used to avoid problems of bias due to simultaneity.[10]

3. Empirical Results: Developed Countries

Weekly Prevalence. I first specify a parsimonious model for the developed countries by gender and smoking prevalence. Pooling the results for boys and girls allows an increase the number of explanatory variables in the regression model. All results are obtained using White's heteroskedasticity-consistent standard errors and covariances, and the fitted values for prevalence are checked to insure that they are positive. Table 3 reports the results for weekly smoking prevalence among youth ages 13 and 15 years. For regressions (1)-(4), the price variable is negative and significant for boys, but insignificant for girls. Real income is positive for both genders, and the coefficient for girls is larger. Health care spending is negative and significant for girls only. This result implies that girls are more likely to respond to negative information about smoking. Further, girls who enjoy school have lower rates of weekly smoking, a result that is common with other studies (PHS 1994, p. 133; Tyas and Pederson, 1998, p. 414). Except for the intercept, none of the other variables are significant. The advertising ban variables have negative signs, but are not significant at conventional confidence levels. Banning sales to minors is not significant.

Regressions (5) and (6) report the results for the pooled regressions. The male binary variable is significantly positive, and two interaction terms are included to facilitate the pooling. The pooled results do not change the basic conclusions. Overall, weekly smoking prevalence in developed countries is explained by gender (boys' positive), price (boys' negative), income (both positive), health expenditures (girls' negative), and the academic interest (girls' negative). Several variables have no effect in the model, including advertising bans, prohibitions on sales to minors, urbanization, and adult smoking levels. A binary variable for the Soviet Union was never significant and was omitted. All of the developed countries in the sample require health warnings on cigarette packages.

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[10] I use a leading value from 1999 for prices in order to reduce the possibility of simultaneity bias, and a lagged value of real income for 1995. Advertising bans change infrequently after 1995, and are unlikely to be correlated contemporaneously with the error term in regressions for youth smoking. Past research (e.g., Nelson 2003) has failed to find strong evidence of simultaneity of advertising bans and adult cigarette consumption .

Ever-Smoked Prevalence. Table 4 shows the results for youth ever-smoked prevalence in developed countries. In contrast to the results for weekly smoking, price is never significant, while urbanization is significantly negative and the Soviet binary is significantly positive for boys. The result for urbanization is consistent with previous studies for the U.S. (Tyas and Pederson 1998, p. 412), and contrasts with the results for developing countries reported below. In regressions (1)-(4), real income is significantly positive for both genders, and the coefficient is larger for girls. Health care spending is not significant, except in a marginal sense for girls. Academic interest is significantly negative for girls only. The pooled results in regressions (5) and (6) show substantial positive coefficients for the male binary variables. The intercept term is significantly positive, but insignificant results are obtained for prohibitions on sales to minors, real price, adult smoking levels, and advertising bans.

In summary, the results suggest that standard economic variables (price, income) play an important role in the determination of smoking prevalence among youth in developed countries. Education-related variables (health care spending, academic interest) also are important, especially for girls. Youth in countries that were members of the Soviet Union have substantially higher ever-smoked prevalence rates. The results suggest that education programs could have an effect on smoking prevalence among girls, but boys' smoking would more likely be affected by higher tax rates. The insignificant price results for girls are consistent with findings in Lewit et al. (1997). Calculated at the means, the prevalence price-elasticity for boys is -0.14. The empirical results indicate that advertising bans have little or no effect on youth smoking prevalence in developed countries, suggesting that actual smoking by peers is the predominant influence. This result holds for complete and partial bans. According to DeCicca et al. (2002, p. 166), youth smoking is driven by "the demand for peer acceptance," which is shown here to be independent of advertising in the aggregate.

The regressions fit the data reasonably well, with standard errors of estimate (SEE) that are about 10-20 percent of the mean values. The weekly smoking regressions for boys have low R^2 values, which reflects the difficulties inherent in explaining youth smoking in developed countries (Gruber 2001). The intercept terms suggest the extent to which smoking outcome may not be explicable in the causal sense, i.e., roughly 18-22% of 13-15 year olds are likely to be weekly smokers and 60-70% are likely to try smoking under many circumstances.

4. Empirical Results: Developing Countries

Current 30-day Prevalence. Table 5 displays regression results for youth smoking prevalence in developing countries. Current or 30-day prevalence is negatively related to real income for both boys and girls. Both genders are positively affected by smoking by peers, and the effect is substantial. Urbanization is a positive determinate of smoking by both genders. Boys' smoking is negatively affected by higher levels of health care spending. Girls' smoking is negatively affected by school classes on the dangers of smoking, but the effect for boys is only marginally significant. Boys' smoking is negatively affected by bans on sales to minors. Both genders are positively affected by ability to easily buy cigarettes in stores, but the coefficients are only marginally significant. Current smoking prevalence is positively related to the Soviet binary variable and negatively related to the Muslim faith in the case of girls. The Muslim binary was never significant for boys and was omitted. Several of the policy variables in Table 5 are not statistically significant, including advertising bans, health warnings on packages, and youth exposure to anti-smoking messages. The pooled results in regressions (5) and (6) do not change these insignificant policy results, although the coefficient for ability to buys smokes in stores is significantly positive.[11] In the pooled regressions, the binary variable for males has a positive coefficient, which is substantial. The results suggest that tobacco education reduces girls' smoking, while the general health environment reduces boys' smoking. In contrast to the results for developed countries, the effect of income is negative. Smoking by peers and others is strongly positive. Advertising bans have no effect on 30-day smoking prevalence in developing countries, regardless of severity.

Ever-Smoked Prevalence. Table 6 shows the regression results for ever-smoked prevalence in developing countries. The pattern of signs and significance is different in several respects compared to the results for 30-day prevalence. Real income and health care spending are insignificant in all of the regressions. Urbanization is again positive for girls, but not for boys. School classes on the dangers of smoking have negative coefficients, but the results are only marginally significant for either gender. Both boys and girls are positively affected by

[11] In the pooled regressions, I tried including several additional dummy variables for the continental location of each country (Africa, Asia, South America, etc.). However, these variables were not significant. The variable for adult cigarette consumption was never significant.

peers' smoking, and girls are positively affected by being able to easily buy cigarettes in retail stores. The signs and significance for the binary variables for the Soviet Union, Muslim countries, and males are similar in Tables 5 and 6. Among the policy-related variables, school classes on the dangers of smoking have a significantly negative effect and ability to buy smokes in stores has a positive effect on girls' smoking prevalence. Advertising bans and anti-smoking messages are insignificant as determinates of youth smoking prevalence. Health warnings and bans on sales to minors also do not affect youth behaviors in a significant manner.

In summary, the important determinants of youth smoking in developing countries are income (negative), urbanization (positive), peers' smoking (positive), school classes (girls' negative), health care spending (boys' negative), access in retail stores (girls' positive), male binary (positive), Soviet binary (positive), and Muslim faith (girls' negative). The results in Tables 5 and 6 fail to demonstrate that advertising bans have any effect whatsoever on youth smoking prevalence in developing countries, which replicates the results for developed countries. This results holds for complete and partial bans. The regressions fit the data reasonably well and all of the R^2 values are 0.67 or greater. However, there are several outliers in the residuals, and the standard errors of estimate (SEE) are about 35% of the mean value of the dependent variable in Table 5 and about 28% in Table 6. The residual values reflect the underlying variation due to the diverse social and economic conditions present in developing countries.

5. Summary and Conclusion

The objective in this study was to evaluate the effect of advertising bans on youth smoking prevalence in developed and developing countries. Tobacco control specialists frequently discuss or propose control on advertising as if the relationship between cigarette advertising and consumption was without question (e.g., Gilpin and Pierce 1997).[12] Past studies of advertising expenditures in the U.S. reveal only small effects on adult consumption, which may have largely disappeared after the 1964 Report of the Advisory Committee to the Surgeon

[12] The large literature in social and behavioral psychology on advertising and youth smoking is mostly concerned with recall/recognition of advertising messages (humor, self-image, logos); measurement of exposure to cigarette advertising (magazines, sports promotions); content analysis of advertising themes (vitality, independence, adventure, romance); and youth attitudes toward tobacco advertising (see PHS 1994, Ch. 5). Problems of interpretation are common in these studies (Geweke and Martin 2002; Chaloupka and Warner 2000, p. 1592); very little of the literature deals with actual bans; and many studies do not use multivariate techniques.

General (see Andrews and Franke 1991). Four previous econometric studies find little, if any, effect of advertising on youth smoking. However, there is little empirical evidence available on comprehensive advertising bans and youth smoking prevalence.

The present study examined youth smoking prevalence in a sample of 24 developed countries and 42 developing countries, using survey-based data obtained from the World Health Organization for youth between the ages of 13 and 15 years. The survey data on smoking prevalence (weekly, 30-day, ever smoked) were supplemented with data covering policy variables (advertising bans, health warnings, antismoking messages, bans on sales to minors, prices); socio-economic conditions (income, health care spending, urbanization, religion, gender); and social environment (peers' smoking, school classes on smoking dangers, ability to buy smokes in stores). Several variables emerge as important determinants of smoking outcomes among youth, but advertising bans are never statistically significant. For the developed countries, higher cigarette prices and greater health care spending have negative effects on youth smoking prevalence, but income has a positive effect. Girls with a strong liking for school are less likely to smoke, although the same is not true for boys. In the developed countries, urbanization has a negative effect on the ever-smoked prevalence for both boys and girls. In addition, youth in countries that were part of the Soviet Union have higher rates of smoking.

Advertising bans are not a factor in developing countries, regardless of severity. Policy variables of greater importance include bans of sales to minors, health care spending, and school classes on the dangers of smoking, which are associated with reduced smoking prevalence among youth. Ease of purchase from stores also is important, especially for girls. Higher incomes reduce smoking in developing countries, but urbanization has a positive effect. Smoking by peers is especially important in developing countries. Smoking rates in the former Soviet Union countries are much greater. The results suggest a very limited ability of advertising bans to alter youth misperceptions of smoking prevalence among peers, at least for the age group in question. These results agree with the general findings from past econometric studies of youth smoking in the United States. On the other hand, various results in this paper suggest that school classes and other education efforts could be effective as a means to improve youth risk perceptions.

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Table 1 – Youth Smoking Prevalence and Advertising Bans: Developed countries

Category & Country	Ever Smoked Both	Weekly Girls	Weekly Boys	Weekly Both	Adult: cigs per capita	Advertising Ban Type (Yr)	Health Warn?	Minors Ban?
Countries with Complete Bans								
Canada	54.0%	19.6%	16.6%	18.1%	2133	Direct (1991-95, 97)	Yes	Yes
Finland	66.0	21.3	17.3	19.3	1255	Complete (1978)	Yes	Yes
France	53.6	20.3	17.9	19.1	1997	Complete (1993)	Yes	No
Lithuania	62.1	5.9	16.8	11.4	1672	Complete (1996)	Yes	Yes
Norway	54.6	17.6	15.6	16.6	1825	Complete (1975)	Yes	Yes
Portugal	42.2	9.0	12.0	10.5	1993	Complete (1984)	Yes	Yes
Slovakia	63.8	8.3	14.4	11.4	1899	Complete (1993)	Yes	Yes
Sweden	50.4	13.7	10.4	12.1	1241	Complete (1994)	Yes	Yes
Mean (s.d.)	55.8 (8)	14.5 (6)	15.1 (3)	15.8 (4)	1752 (339)			
Countries with Partial Bans (TV & Other Media)								
Austria	59.4	21.3	19.5	20.4	2021	TV+radio (1974)	Yes	Yes
Belgium	42.1	18.1	19.1	18.6	2321	TV+radio (1983)	Yes	No
Czech Rep	62.8	12.4	15.9	14.1	2497	TV (1989)	Yes	Yes
Denmark	52.8	17.2	12.4	14.8	1991	TV+radio+board(86)	Yes	No
Estonia	58.8	6.1	14.0	10.1	1983	TV+radio	Yes	Yes
Germany	61.5	23.0	21.0	22.0	2191	TV+radio (1975)	Yes	Yes
Greece	36.3	12.0	11.5	11.8	3230	TV+radio (1987)	Yes	No
Hungary	61.6	14.3	21.0	17.7	3313	TV+radio	Yes	Yes
Ireland	59.8	18.5	19.5	19.0	2381	TV+radio+board(86)	Yes	Yes
Israel	39.8	9.5	18.0	13.8	2162*	TV+radio	Yes	No
Latvia	70.4	13.2	26.3	19.7	1653	Mass media (1993)	Yes	Yes
Poland	51.9	12.1	17.6	14.9	3394	TV+radio (1996)	Yes	Yes
Russia	54.6	14.4	18.4	16.4	1177	TV (1995)	Yes	Yes
Switzerland	55.7	16.1	15.0	15.6	2691	TV+radio (1964)	Yes	No
UK	57.0	23.6	17.6	20.6	1793	TV+radio+board(92)	Yes	Yes
USA	51.3	15.0	14.0	14.5	2516	TV+radio (1971)	Yes	Yes
Mean-TV (s.d.)	54.7 (9)	15.4 (6)	17.6 (4)	16.5 (3)	2332 (609)			
Mean-all (s.d.)	55.1 (8)	15.1 (5)	16.7 (4)	15.9 (4)	2139 (596)			
Median-all	55.2	14.7	17.0	16.0	2009			

See Appendix Table for data sources. Health warnings required = Yes. Sales to minors banned = Yes.

Table 2 – Youth Smoking Prevalence and Advertising Bans: Developing countries

Category & Country	Ever Smoked Both	Current Girls	Current Boys	Current Both	Adults: cigs per capita	Advertising Ban Type	Health Warn?	Minors Ban?
Countries with Complete Bans								
Fiji	37.2%	9.6%	18.8%	14.2%	976	Complete	Yes	Yes
Jordan	36.4	11.4	22.6	18.3	2255*	All direct	Yes	No
Kuwait	28.8	18.4	33.3	27.0	2816	Complete	Yes	Yes
Niger	29.6	6.5	24.8	16.7	170	Complete	No	No
Sudan	20.1	2.1	14.1	8.1	150*	All direct	Yes	No
Singapore	26.0	8.8	13.4	11.3	1185	Complete	Yes	Yes
Mean (s.d.; n=6)	29.7 (6)	7.7 (3)	19.1 (5)	13.9 (4)	1259 (1088)			
Countries with Partial Bans (TV or Other Media)								
Barbados	36.3	11.8	9.6	10.8	542	TV	Yes	Yes
Burkina Faso	43.5	8.8	31.0	20.4	221	Boards	Yes	No
Cuba	29.9	11.9	13.0	12.7	1914	TV+radio	Yes	Yes
Dominica	37.1	11.4	13.7	13.0	657	TV	No	No
Ghana	14.3	3.8	5.3	4.8	161	TV+radio+ print	Yes	Yes
Indonesia	43.9	4.4	37.1	20.4	1183	TV+radio	Yes	No
Kenya	14.9	4.2	10.1	7.2	200	TV+radio	Yes	No
Malawi	17.9	2.3	7.1	4.8	232	Radio	No	No
Mali-Bamako	39.8	7.6	43.7	28.0	223	TV+radio	Yes	No
Nepal	8.7	0.6	6.3	4.1	619	Radio	Yes	No
Poland	65.9	21.8	27.1	24.9	3394	TV+outdoor	Yes	Yes
Russia	66.7	28.7	38.3	33.5	1177	TV	Yes	Yes
Saudi Arabia	34.5	na	10.8	10.8	1368*	Local media	Yes	No
Sri Lanka	12.5	1.7	6.8	4.5	407	TV+radio	Yes	Yes
Ukraine	77.3	33.8	46.8	41.1	1171	TV+radio	Yes	Yes
Venezuela	20.2	7.0	6.1	6.8	1079	TV+radio	Yes	Yes
Mean (s.d.; n=16)	35.2 (21)	10.7 (10)	19.6 (15)	15.5 (11)	909 (842)			
Countries with No Media Banned								
Antigua & Barbuda	23.6	4.2	5.9	5.2	1515	No	No	No
Argentina	60.0	31.8	27.8	30.2	1576	No	Yes	Yes
Bahamas	30.9	6.0	9.0	7.8	438	No	Yes	No
Bolivia	54.6	20.2	30.5	25.2	274	No	Yes	Yes
Chile	66.1	37.4	30.2	34.4	1123	No	Yes	No
Costa Rica	46.4	20.0	19.1	19.6	690	No	Yes	Yes
Grenada	27.8	6.8	9.7	8.6	1130	No	No	No

Table 2 Continued								
Guyana	29.5	5.5	11.1	8.7	590	No	Yes	No
Haiti	23.7	12.1	11.0	11.8	172	No	No	No
Lebanon	32.6	7.4	16.1	11.1	2930	No	Yes	No
Mauritania	31.8	10.6	24.1	17.7	315	No	No	No
Mexico	50.5	14.6	22.3	18.7	856	No	Yes	Yes
Panama	31.6	10.7	13.2	12.5	960	No	Yes	Yes
Peru	50.2	12.6	23.8	18.2	205	No	Yes	Yes
Phillippines	42.8	12.9	32.6	21.6	1849	No	Yes	Yes
Suriname	54.3	10.0	23.4	16.3	2627	No	No	No
St. Kitts & Nevis	18.8	2.5	8.0	5.6	400	No	Yes	No
St. Vincent	35.7	11.5	17.6	15.2	480	No	No	No
Uruguay	48.8	23.3	18.8	21.7	1396	No	Yes	Yes
Zimbabwe	24.1	9.9	12.1	11.3	363	No	Yes	Yes
Mean (s.d.; n=20)	39.2 (14)	13.5 (9)	18.3 (8)	16.1 (8)	994 (789)			
Mean–all (s.d)	36.3 (16)	11.6 (9)	18.9 (11)	15.5 (9)	1000 (840)			
Median - all	33.6	9.90	16.8	13.6	773			

See the Appendix Table for data sources. Health warnings required = Yes. Sales to minors banned = Yes. Current smoking is smoked within the past 30 days.

Table 3 – Developed Countries: Weekly smoking prevalence by youth 13 & 15 years old

Variable	**(1) Boys**	**(2) Boys**	**(3) Girls**	**(4) Girls**	**(5) Both**	**(6) Both**
Constant	18.44 (2.76)*	17.05 (2.52)*	21.99 (3.13)*	21.40 (3.28)*	18.01 (3.52)*	17.06 (3.41)*
Advertising ban index (1 to 4)	-0.679 (1.20)	---	-0.618 (0.81)	---	-0.647 (1.42)	---
Total ban dummy (=1 if total ban)	---	-1.736 (1.04)	---	-1.844 (0.92)	---	-1.777 (1.40)
Sales to minors banned (=1 if ban)	1.005 (0.50)	1.091 (0.53)	-0.736 (0.40)	-0.667 (0.35)	0.139 (0.11)	0.216 (0.16)
Real price domestic pack (US$ 1999)	-0.830 (1.98)**	-0.909 (2.12)*	0.171 (0.23)	0.102 (0.14)	0.753 (1.36)	0.683 (1.27)
Real income/capita (thous. US$ 1995)	0.573 (2.03)*	0.571 (1.98)**	1.247 (4.84)*	1.248 (4.98)*	0.910 (4.61)*	0.909 (4.59)*
Health care spend, % GDP	-1.233 (1.64)	-1.178 (1.56)	-1.898 (3.78)*	-1.848 (3.76)*	-1.550 (3.59)*	-1.497 (3.44)*
Urbanization, % pop.	0.032 (0.71)	0.034 (0.74)	-0.037 (0.91)	-0.040 (1.03)	-0.003 (0.10)	-0.003 (0.11)
Adult cigarettes per capita	0.001 (0.83)	0.001 (0.87)	0.001 (0.75)	0.001 (0.71)	0.001 (1.12)	0.001 (1.12)
Academic interest, % likes school a lot	-0.009 (0.10)	-0.012 (0.13)	-0.158 (2.45)*	-0.162 (2.87)*	-0.149 (2.84)*	-0.156 (3.10)*
Male (=1 if male)	---	---	---	---	4.551 (2.11)*	4.463 (2.06)*
Male* Real price	---	---	---	---	-2.148 (3.90)*	-2.154 (4.03)*
Male* Academic interest	---	---	---	---	0.106 (1.02)	0.111 (1.06)
R-squared	0.334	0.326	0.787	0.790	0.639	0.640
F-stat (p-value)	0.559	0.579	0.001	0.001	0.001	0.001
Mean dep var.	16.33	16.33	15.19	15.19	15.76	15.76
SEE	3.048	3.064	3.022	2.999	2.931	2.929

Notes: Dependent variable is % smoked in the past week. T-statistics in parentheses; one and two asterisks indicate significance at the 95% and 90% confidence level, respectively. Standard errors are based on White's heteroskedastic-consistent method. Latvia has been omitted as an outlier in the data.

Table 4 – Developed Countries: Ever-smoked prevalence for youth 13 and 15 years old

Variable	**(1) Boys**	**(2) Boys**	**(3) Girls**	**(4) Girls**	**(5) Both**	**(6) Both**
Constant	70.38 (3.62)*	71.91 (4.12)*	61.01 (4.87)*	64.80 (5.13)*	58.45 (5.22)*	60.83 (5.69)*
Advertising ban index (1 to 4)	0.045 (0.03)	---	0.233 (0.20)	---	0.050 (0.05)	---
Total ban dummy (=1 if total ban)	---	-0.547 (0.13)	---	-1.174 (0.33)	---	-1.030 (0.39)
Sales to minors banned (=1 if ban)	-1.203 (0.37)	-1.250 (0.40)	2.290 (0.62)	2.069 (0.54)	0.444 (0.18)	0.339 (0.14)
Real price domestic pack	0.379 (0.35)	0.378 (0.34)	0.954 (0.54)	0.963 (0.56)	0.634 (0.62)	0.627 (0.63)
Real income/capita (thous. US$)	1.640 (2.72)*	1.654 (2.79)*	2.029 (3.15)*	2.089 (3.43)*	2.454 (5.73)*	2.486 (5.92)*
Health care spend % GDP	-0.653 (0.49)	-0.676 (0.53)	-2.031 (1.56)	-2.112 (1.75)	-1.408 (1.52)	-1.447 (1.64)
Urbanization, % pop.	-0.273 (2.19)*	-0.283 (2.30)*	-0.210 (1.93)**	-0.235 (2.27)*	-0.243 (2.81)*	-0.259 (3.10)*
Soviet binary (=1 if Soviet country)	27.89 (4.88)*	27.95 (5.00)*	12.52 (1.55)	12.94 (1.67)	20.44 (4.40)*	20.63 (4.48)*
Adult cigarettes per capita	-0.005 (1.32)	-0.006 (1.40)	0.001 (0.06)	-0.001 (0.23)	-0.003 (1.22)	-0.003 (1.42)
Academic interest, % like school a lot	-0.263 (0.81)	-0.255 (0.76)	-0.485 (2.43)*	-0.453 (2.36)*	-0.420 (2.36)*	-0.401 (2.35)*
Male (=1 if male)	---	---	---	---	14.21 (2.72)*	14.38 (2.76)*
Male* Real income	---	---	---	---	-1.182 (2.70)*	-1.183 (2.66)*
Male * Academic interest	---	---	---	---	0.175 (0.46)	0.170 (0.45)
R-squared	0.761	0.762	0.717	0.718	0.716	0.717
F-stat (p)	0.007	0.007	0.017	0.017	0.001	0.001
Mean dep var.	57.34	57.34	51.52	51.52	54.43	54.43
SEE	6.231	6.225	6.059	6.041	6.008	5.992

Notes: Dependent variable is % smoked in the past week. T-statistics in parentheses; one and two asterisks indicate significance at the 95% and 90% confidence level, respectively. Standard errors based on White's heteroskedastic-consistent method. Latvia has been omitted as an outlier in the data.

Table 5 – Developing Countries: Current 30-day smoking prevalence by youth 13 to 15 years old

Variable	(1) Boys	(2) Boys	(3) Girls	(4) Girls	(5) Both	(6) Both
Constant	-3.528 (0.33)	-4.223 (0.41)	8.306 (1.28)	7.862 (1.22)	-7.499 (1.11)	-7.842 (1.18)
Advertising ban index (0 to 4)	-0.215 (0.36)	---	0.100 (0.20)	---	0.077 (0.17)	---
Total ban dummy (=1 if total ban)	---	0.434 (0.18)	---	1.044 (0.61)	---	1.516 (0.84)
Warning on packs (=1 if required)	---	---	---	---	-0.251 (0.14)	-0.246 (0.14)
Sales to minors banned (=1 if ban)	-4.533 (2.17)*	-4.515 (2.16)*	-1.819 (0.57)	-1.876 (0.60)	-3.074 (1.29)	-3.236 (1.39)
Real income (thous. US$ 1995)	-1.330 (2.22)*	-1.334 (2.22)*	-0.852 (2.20)*	-0.853 (2.23)*	-0.918 (2.52)*	-0.939 (2.62)*
Health care spend, % GDP	-1.315 (2.55)*	-1.255 (2.50)*	0.294 (0.85)	0.312 (0.90)	0.180 (0.48)	0.223 (0.61)
Urbanization, % pop.	0.146 (1.77)**	0.146 (1.78)**	0.139 (2.47)*	0.137 (2.50)*	0.137 (2.73)*	0.135 (2.78)*
Around others who smoke, %	0.437 (5.34)*	0.436 (5.13)*	0.252 (5.02)*	0.253 (4.90)*	0.370 (6.71)*	0.369 (6.52)*
School class on dangers, %	-0.164 (1.58)	-0.160 (1.42)	-0.187 (1.93)**	-0.184 (1.90)**	-0.153 (2.15)*	-0.148 (2.02)*
Anti-smoking media observed, %	0.073 (0.43)	0.070 (0.41)	-0.143 (1.52)	-0.142 (1.51)	-0.020 (0.20)	-0.023 (0.23)
Able buy smokes in store, %	0.140 (1.64)	0.143 (1.64)	0.144 (1.62)	0.147 (1.69)	0.132 (1.87)**	0.140 (2.00)*
Soviet (=1 if Soviet country)	10.47 (2.37)*	10.49 (2.26)*	8.076 (2.10)*	8.240 (2.20)*	9.147 (3.13)*	9.373 (3.17)*
Muslim (=1if Muslim country)	---	---	-8.631 (2.91)*	-8.855 (3.10)*	-10.17 (4.35)*	-10.59 (4.64)*
Male (=1 if male)	---	---	---	---	12.94 (3.70)*	12.95 (3.44)*
Male* Muslim	---	---	---	---	11.45 (4.14)*	11.50 (4.19)*
Male* Health care	---	---	---	---	-1.488 (2.93)*	-1.489 (2.99)*
R-squared	0.756	0.756	0.812	0.814	0.771	0.772
F-stat (p-value)	0.001	0.001	0.001	0.001	0.001	0.001
Mean dep var.	19.04	19.04	11.94	11.94	15.47	15.47
SEE	6.225	6.231	4.594	4.583	5.552	5.531

Notes: Dependent variable is % smoked in past 30 days. T-statistics in parentheses; one and two asterisks indicate significance at the 95% and 90% confidence level, respectively. Standard errors are based on White's heteroskedastic-consistent method. Singapore has been omitted as an outlier in the data.

Table 6 – Developing Countries: Ever-smoked prevalence by youth 13 to 15 years old

Variable	(1) Boys	(2) Boys	(3) Girls	(4) Girls	(5) Both	(6) Both
Constant	-5.943 (0.38)	-7.861 (0.37)	5.488 (0.40)	4.429 (0.31)	-17.10 (1.17)	-18.71 (1.29)
Advertising ban index (0 to 4)	-1.415 (1.41)	---	-1.116 (1.02)	---	-0.694 (0.73)	---
Total ban dummy (=1 if total ban)	---	-2.562 (0.69)	---	-2.068 (0.51)	---	-0.261 (0.08)
Warnings on packs (=1 if required)	---	---	---	---	-4.075 (1.20)	-4.354 (1.28)
Sales to minors banned (=1 if ban)	-6.441 (1.46)	-6.382 (1.45)	-1.443 (0.29)	-2.003 (0.43)	-3.921 (1.04)	-4.299 (1.18)
Real income (thous. 1995 US$)	-0.958 (0.77)	-0.995 (0.78)	-0.812 (1.22)	-0.834 (1.25)	-0.656 (0.94)	-0.658 (0.95)
Health care spend, % GDP	-1.164 (1.16)	-0.983 (0.99)	1.069 (1.21)	1.142 (1.25)	1.050 (1.32)	1.131 (1.42)
Urbanization, % pop.	0.216 (1.19)	0.221 (1.19)	0.232 (2.09)*	0.238 (2.14)*	0.214 (2.14)*	0.216 (2.17)*
Around others who smoke, %	0.612 (3.39)*	0.618 (3.34)*	0.416 (3.57)*	0.430 (3.58)*	0.559 (5.20)*	0.569 (5.31)*
School classes on dangers, %	-0.225 (1.50)	-0.226 (1.46)	-0.287 (1.60)	-0.291 (1.58)	-0.228 (2.02)*	-0.228 (1.98)**
Anti-smoking media seen, %	0.225 (0.74)	0.217 (0.70)	-0.093 (0.46)	-0.101 (0.48)	0.099 (0.53)	0.100 (0.52)
Buy smokes in store, %	0.185 (1.01)	0.186 (0.99)	0.235 (1.60)	0.244 (1.80)**	0.261 (2.13)*	0.275 (2.20)*
Soviet (=1 if Soviet country)	22.88 (3.74)*	21.90 (3.39)*	21.31 (3.36)*	20.17 (3.21)*	21.32 (4.89)*	20.70 (4.77)*
Muslim (=1if Muslim country)	---	---	-12.47 (2.57)*	-13.58 (4.56)*	-15.27 (3.95)*	-16.31 (4.39)*
Male (=1 if male)	---	---	---	---	22.18 (3.07)*	22.18 (3.07)*
Male* Muslim	---	---	---	---	13.78 (2.72)*	13.81 (2.73)*
Male* Health care	---	---	---	---	-2.212 (2.01)*	-2.212 (2.00)*
R-squared	0.675	0.668	0.801	0.797	0.754	0.752
F-stat (p-value)	0.001	0.001	0.001	0.001	0.001	0.001
Mean Dep Var.	42.61	42.61	30.35	30.35	36.64	36.64
SEE	11.54	11.67	9.24	9.32	10.17	10.20

Notes: Dependent variable is % smoked ever. T-statistics in parentheses; one and two asterisks indicate significance at the 95% and 90% confidence level, respectively. Standard errors are based on White's heteroskedastic-consistent method. Singapore has been omitted as an outlier in the data.

Appendix Table– Variables and Data Sources

Variable	Units of Measurement	Data Sources
Students who had ever smoked	% of students, male or female	(a) HBSC, p. 96, (b) GYTS
Students who smoke at least weekly	% of students, male or female	(a) HBSC, p. 100
Students who smoked in past 30 days	% of students, male or female	(b) GYTS, by country
Advertising ban severity index (0 to 4): 0 = no major media banned; 1 = broadcast ban (TV and/or radio);	2 = TV+billboards or print; 3 = TV+ newspapers and print or billboards; 4 = all major mass media banned	(a) HBSC, p. 123, (c) TFI, (d), (e)
Advertising binary (0 or 1)	1 = all major mass media banned	Author constructed
Warning label binary (0 or 1)	1 = health warning labels	(c) TFI, (d)
Sales to minors banned	1 = sales to minors banned	(c) TFI
Real domestic price per pack (1999)	1999 US$ for 20 cigarettes with tax	(c) TFI
Real income (GDP-PPP) per capita (1995)	GDP per capita in thousands of 1995 US$	(c) TFI Penn World Table, (f), (h)
Health care spending (2000)	% of GDP	(f) CSI, (h)
Urbanization	% of total population	(g) TOH, (h)
Adult consumption (1995)	Adult cigarettes per capita (ages 15+)	(c) TFI, (g), (j)
Around others who smoke	% of students, male or female	(b) GYTS
School class on smoking in past year	% of students, male or female	(b) GYTS
Anti-smoking media seen in last 30 days	% of students, male or female	(b) GYTS
Able to buy smokes in stores	% of students, male or female	(b) GYTS
Likes school a lot	% of students, male or female	(a) HBSC, p. 50
Soviet binary (0 or 1)	1 = former member of Soviet Union	Author constructed
Muslim binary (0 or 1)	1 = majority are of Muslim faith	(i) CIA
Gender binary (0 or 1)	1= male, 0= female	(a) HBSC , (b) GYTS

(a) World Health Organization Europe, *Health and Health Behavior Among Young People – Health Behavior in School-Aged Children (HBSC)*, EUR/ICP/IVST 06 03 05(A), http://www.hbsc.org/overview_studydesign.html#idf.
(b) World Health Organization and U.S. Centers for Disease Control and Prevention, *Global Youth Tobacco Survey (GYTS), Country Fact Sheets*, http://www.cdc.gov/tobacco/global/GYTS.htm.
(c) World Health Organization, Tobacco Free Initiative (TFI), *The Tobacco Atlas, Tobacco Control Country Profiles*, http://www5.who.int/tobacco/page.cfm?sid=57.
(d) U.S. Centers for Disease Control and Prevention, *National Tobacco Information Online System (NATIONS), Country Data*, http://apps.nccd.cdc.gov/nations/index.asp.
(e) Health New Zealand Ltd. (HNZ), *International Tobacco Control Database*, http://www.healthnz.co.nz.
(f) World Health Organization, *Country Selected Indicators (CSI)*, http://www.who.int/country/en/.
(g) World Health Organization, *Tobacco or Health: Global Report*, http://www.cdc.gov/tobacco/who/whofirst.htm.
(h) World Bank Group, *World Development Indicators Online*, http://devdata.worldbank.org/dataonline/.
(i) U.S. Central Intelligence Agency, *The World Fact Book*, http://www.cia.gov/cia/publications/factbook/index.html.
(j) Forey, B., et al., *International Smoking Statistics*, Oxford University Press, 2002.