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1 Tobacco Taxes, Smoking Restrictions, and Tobacco Use

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1.1 Introduction

Although the term "smokeless tobacco" (ST) was coined by the tobacco industry to represent snuff and chewing tobacco as safer alternatives to smoking cigarettes, ST use has been linked to increased risk for oral cancers and other types of oral disease (USDHHS 1986a). The prevalence of ST use generally has been increasing over the past 20 years, particularly among young males (USDHHS 1992a, 1992b). Understanding factors affecting the likelihood of ST use thus is important for developing policies aimed at reducing overall tobacco-related mortality and morbidity. Tobacco researchers have focused considerable attention on the evaluation of various mechanisms designed to control cigarette use, including regulation of economic availability through increases in cigarette excise taxes. In contrast, the effects of mechanisms designed to control the availability of ST products on ST use have not been as extensively studied.

This paper presents estimates of the effects of tobacco excise taxes and laws restricting public smoking on the likelihood of current use of different forms of tobacco (moist snuff and cigarettes) obtained from tobacco use data in the Current Population Surveys (CPS) for September 1992, January 1993, and May 1993. The results indicate that individuals living in areas with higher cigarette tax rates tend to be less likely to smoke cigarettes. Similarly, individuals living in areas with higher snuff tax rates tend to be less likely to use snuff.

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Laws restricting smoking in workplaces or other public places appear to affect both cigarette and snuff use. Finally, higher cigarette tax rates are associated with greater snuff use, but higher snuff tax rates are not associated with greater cigarette use.

1.2 Background

A 1986 Surgeon General's report on smokeless tobacco use concluded that the preponderance of evidence suggests numerous adverse health consequences of ST use, including oral cancers, teeth abrasion and discoloration, gum recession, dental caries, leukoplakia, halitosis, and nicotine dependence (USDHHS 1986a, 1986b, 1992a). Despite the Surgeon General's report and the passage of the Comprehensive Smokeless Tobacco Act in 1986 (which mandated warning labels and prohibited television ads for ST products), the prevalence of ST use in the United States increased in the 1980s, particularly among young males (USDHHS 1992a, 1992b; FTC 1993). This growth has been tied to the intensive marketing of moist snuff toward young males. From 1970 to 1985, the percent of males aged 16–19 using moist snuff increased ninefold from 0.3 to 2.9 percent. For all smokeless tobacco products, prevalence of use among this age group increased from 1.4 to 5.9 percent (Marcus et al. 1989). Among older males (aged 20 and older), the prevalence of use increased by 16 percent, from 4.9 to 5.7 percent. By 1991, about 5.6 percent of males aged 18 and older used smokeless tobacco (CDC 1993a).

In contrast, the prevalence of cigarette smoking in the United States has been decreasing. From 1970 to 1985, cigarette smoking declined by 27 percent among male smokers aged 16–19, and among males aged 20 and older, smoking declined by 25 percent, from 44.3 to 33.2 percent. By 1991, about 28.1 percent of males aged 18 and older smoked cigarettes (CDC 1993b). However, there have been some slight increases in prevalence of cigarette use in the 1990s among some population groups.

A number of factors contributed to the general decline in smoking prevalence. Among these factors are various federal and state policies designed to control access to tobacco products. Excise taxes represent an indirect control measure, in that the higher prices caused by taxes make tobacco products less affordable, thereby reducing access. Past studies indicate that higher prices, created in part by increases in federal and state cigarette tax rates, do reduce cigarette consumption (e.g., Becker, Grossman, and Murphy 1994; Baltagi and Levin 1986; Keeler et al. 1990; Chaloupka and Saffer 1992; Emont et al. 1993; Wasserman et al. 1991; Chaloupka 1991; Kenkel 1993; Lewit, Coate, and Grossman 1981).[1]

1. The most dramatic evidence of this effect is from Canada, where excise tax increases in the 1980s contributed to steep increases in retail cigarette prices; before recent tax roll-backs, taxes represented about 75 percent of the retail price of cigarettes in Canada. Over this period, per capita

Less direct, but potentially substantial, costs are imposed on cigarette smokers by laws restricting smoking in various types of public areas or workplaces. Several studies conclude that laws restricting smoking in public places have contributed to reduced cigarette use (Keeler et al. 1990; Wasserman et al. 1991; Emont et al. 1993), though other studies conclude that public place smoking laws have no effect after taking into account the endogeneity of the laws—that is, areas with low rates of cigarette use are more likely to adopt restrictive smoking laws than areas with high rates of cigarette use (Chaloupka and Saffer 1992; Grossman 1991). However, even after accounting for endogeneity, laws allowing firms to prohibit smoking in the workplace appear to reduce cigarette use (Chaloupka and Saffer 1992).

Considerable attention has been given to increasing excise taxes on products such as alcohol and tobacco as a means of health promotion (e.g., Phelps 1988). In 1985, the excise taxes applied to smokeless tobacco products in many states were low relative to those imposed on cigarettes; at that time, there was no federal excise tax on smokeless tobacco, and only 21 states levied an excise tax on smokeless tobacco products. Between 1985 and 1992, 22 states raised or implemented excise taxes on smokeless tobacco products (Tobacco Institute 1986, 1992). The federal excise tax rate in 1993 was 2.8 cents per 1.2-ounce can of snuff and 2.4 cents per 3-ounce pouch of chewing tobacco.

Although the use of excise taxes to control ST use has been alluded to before (e.g., USDHHS 1992a), relatively few studies have attempted to quantify the potential effects of tax increases on ST use (Ohsfeldt and Boyle 1994; Ohsfeldt, Boyle, and Capilouto 1997; Chaloupka, Grossman, and Tauras 1996). Ohsfeldt, Boyle, and Capilouto (1997), using 1985 Current Population Survey data, find a tax elasticity of snuff participation of about −0.3 among males age 16 and older. Chaloupka, Grossman, and Tauras (1996), using data for teenage males from the 1992, 1993, and 1994 Monitoring the Future Surveys, find a tax elasticity of snuff participation of about −0.4 and an overall tax elasticity of snuff demand of about −0.6. Thus ST use appears to be at least as responsive as cigarette use to changes in its own tax rate.

Studies of alcohol and illicit drug use have noted that an unintended consequence of more stringent alcohol control measures directed at youth is an increase in the risk of illicit drug use (e.g., DiNardo and Lemieux 1992). It is possible that increased cigarette excise taxes may increase ST use, if ST excise taxes remain low relative to cigarette excise taxes. Any impact of a change in an excise tax applied to one type of tobacco product on the use of other tobacco products (i.e., the cross-tax effect) must be taken into account for a complete assessment of the effects of the tax change. Some prior studies find significant cross-tax effects of cigarette excise taxes on ST use (Ohsfeldt and Boyle 1994; Ohsfeldt et al. 1997), whereas others find none (Chaloupka et al. 1996).

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cigarette consumption declined more rapidly in Canada than in the United States (Kaiserman and Rodgers 1991).

1.3 Data

The September 1992, January 1993, and May 1993 Current Population Surveys (CPS) each provide a nationally representative sample of over 100,000 individuals. In addition to detailed economic and demographic data for respondents as individuals and households, these CPS files include questions pertaining to use of snuff or chewing tobacco, as well as other forms of tobacco. Regarding ST use, however, the CPS only provides data for any level of use; it does not indicate the intensity of use among those using ST products. As such, only current participation may be determined from the CPS data; there is no information about frequency or intensity of ST use (i.e., conditional demand). Despite this significant limitation, a key advantage of the CPS data, given the relative rarity of ST use, is its large sample size, which facilitates age cohort subanalyses. The public use CPS file also provides state and metropolitan area identifiers, which permits a reasonably accurate assessment of the tobacco taxes and smoking laws that apply to each survey respondent.

A well-known problem is that the CPS data contain a number of proxy responses for tobacco use, particularly for teens. Although all surveys eliciting self-reported tobacco use generally result in systematic underreporting of tobacco use, there is the potential for more substantial underreporting of use by proxy respondents. Though self-reported or proxy-reported tobacco use measures the prevalence of use with error, estimates of the effects of variance in tobacco taxes on variance in prevalence of tobacco use may be unbiased if response error is uncorrelated with tax rates or other variables in the demand model. Using the 1985 CPS data, Ohsfeldt et al. (1997) confirm systematic underreporting by proxy respondents relative to respondents. However, the proxy response bias was essentially uncorrelated with the excise tax variables. Thus, the estimated excise tax coefficients were not substantially affected by proxy response bias, at least in the 1985 CPS data.

The tobacco tax rate data used are from the Tobacco Institute (1992, 1993). An "average" excise tax rate for each MSA is calculated as the population-weighted average of the sum of the state excise tax and the local excise tax (if any), where the weights are each local government's share of the MSA population within a single state. For MSAs spanning state borders, the MSA is split into the portions within each state. Differences in tax rates in each part of these multistate MSAs are used to construct two additional variables: the magnitude of any positive difference (i.e., higher tax rate in another part of the MSA) and the magnitude of any negative difference (i.e., lower tax rate in another part of the MSA). These variables are used to account for tax rates in geographically proximate areas. The state tax rate is used for respondents in non-MSA locations within a state.

At least some studies indicate that state laws restricting smoking in public places reduce the demand for cigarettes (Wasserman et al. 1991). Such laws could encourage the use of smokeless tobacco in place of smoked tobacco products if smokeless tobacco use is not covered by the laws, if smokeless

tobacco use is more difficult to detect, or if laws as they apply to smokeless tobacco are less strictly enforced.[2]

The presence of statutes restricting smoking in numerous general categories of public places is provided by the U.S. Department of Health and Human Services (1993). No published compilation of state laws restricting the public use of smokeless tobacco is available. However, a computer search of state statutes pertaining to ST use before 1994 indicated that a handful of states had statutes specifically prohibiting ST use in public schools; the laws did not prohibit ST use in other places. Also, a review of the smoking restriction statutes in the 10 most restrictive states indicated that the statutes did not specifically prohibit ST use in places where smoking was prohibited. From this, we conclude that ST use in most public places was not restricted by state law in 1992 and 1993. We have no data pertaining to any local laws restricting ST use.

Two alternatives are used to quantify the "intensity" of smoking restrictions. First, a smoking regulation index, similar to the index used in Wasserman et al. (1991), is used.[3] This index ranges from zero to one, with one being the most restrictive. In constructing the index value for a particular MSA, the restriction assumed to apply is the more restrictive of the state law or local laws restricting smoking.[4] A population-weighted average of the regulation index for each jurisdiction within the MSA is used as the MSA's "average" regulatory intensity. For non-MSA areas within states, the state regulation index is used. Alternatively, the components of the smoking regulation index are used as separate variables.

The CPS data are augmented with selected variables pertaining to population characteristics from the Area Resource File (ARF) and religious affiliation data from Bradley et al. (1992). These county-level data are aggregated to the level of MSAs and the non-MSA area within states. Several variables pertaining to the characteristics of state governments, taken from Barone and Ujifusa (1995, 1993), also are added to the CPS data. Finally, the farm value of state tobacco production is added to the database.

1.4 Methods

The empirical analysis is motivated by a conceptual model of tobacco use employed in prior economic studies of cigarette demand (e.g., Wasserman et al. 1991). These demand models assume cigarette use is affected by price, in-

2. Indeed, a recent ad campaign by United States Tobacco, the leading producer of snuff in the United States, encourages smokers to substitute a snuff product for cigarettes "when you can't smoke."

3. The index is defined as follows: An area with a law restricting smoking in private workplaces is assigned a value of 1; an area that does not restrict private workplaces but requires that at least 75 percent of seating in restaurants be reserved for nonsmoking patrons is assigned a value of .75; an area with neither of these restrictions that restricts smoking in four or more other areas is assigned a value of .5; areas with neither of the initial two restrictions that restrict smoking in one to three other places are assigned a value of .25; all other areas are assigned a value of zero.

4. Local laws generally are more restrictive than state laws.

come, smoking regulations, and certain demographic characteristics, such as age, gender, educational attainment, and household composition. As noted, the CPS data only permit the probability of use of the tobacco product to be estimated—that is, the first part of a standard two-part demand model, where the second part of a two-part model is the level of use among users.

Our model extends the cigarette demand models by examining both cigarette and ST use and by accounting for possible effects of taxes or regulations across tobacco products. Specifically, the model to be estimated consists of two equations:

$$L_S = l_s(P_C, P_S, I, R, D, u_{ls}), \quad (1)$$

$$L_C = l_s(P_C, P_S, I, R, D, u_{lc}), \quad (2)$$

where L_S is the likelihood of any use of snuff and L_C is the likelihood of any cigarette use. The independent variables are prices of cigarettes (P_C) and snuff (P_S), personal income (I), an index of smoking regulation (R), and a set of demographic characteristics (D). The us are random error terms. The likelihood of use models are estimated using a logistic regression model (Maddala 1983).

Retail price data for ST products by state are not available. Variance in retail prices is attributable in part to variance in state and federal ST excise taxes across states and over time. Most state ST excise taxes are expressed as a percentage of the wholesale price. The federal excise tax rate applies per unit of product, not to the wholesale price. Without price data, it is not possible to combine the state and federal tax rates. However, the nominal federal tax rate did not change over the study period, and given the modest rate of inflation over the study period, the real federal tax rate did not change much. Accordingly, the state's snuff tax rate is used to represent P_S in the model.

To determine the effect of tobacco excise taxes or smoking restrictions on tobacco use, the possibility that the size of the excise tax or the intensity of smoking restrictions is affected by the level of use (i.e., endogenous for the use rate) should be considered. We use a Hausman test for the null hypothesis that each of the excise tax rate variables and the regulatory intensity variable is uncorrelated with the error term in the tobacco use models. Smith and Maddala (1983) provide a variation of the Hausman test appropriate for probit models. In cases where the null hypothesis is rejected, an instrumental variable (IV) approach is used to purge the correlation between the excise tax variables and the error term in the smokeless tobacco use equations (Maddala 1988). The impact of proxy responses on estimated tax elasticities is assessed by estimating models with and without proxy responses within population groups.

Personal income, adjusted for differences across states in general price levels, is used to capture the ability to pay for tobacco and other products. Educational attainment, measured as a series of dummy variables (high school graduate or college graduate, with less than high school graduate as the omitted category), also is included in the model.

Several demographic variables and state-level variables are included in the model to capture systematic differences in consumer preferences for smokeless tobacco products. Since white males are thought to be at greater risk than black males (Marcus et al. 1989), a binary variable equal to one for black respondents is included in the model. Marital status is often used as an explanatory variable in smoking studies; thus, a series of dummy variables for marital status are included in the model (never married, divorced/widowed, and separated, with married as the omitted category). Fundamentalist Protestant denominations generally have a negative view of tobacco use. The religious affiliations of individual respondents in the CPS data are not known. Variables indicating the percent of the MSA and non-MSA area population who are adherents to fundamentalist Protestant denominations and the percent of the population with no active religious affiliation, derived from Bradley et al. (1992) and Smith (1990), are used to try to capture prevailing attitudes about tobacco use in the area associated with religious beliefs.

1.5 Results

The logistic regression estimates of the cigarette and snuff use models are presented in tables 1.1 and 1.2. The full sample is restricted to males aged 16 or older who self identify as either white or black (i.e., "other" is excluded). For the September 1992, January 1993, and May 1993 CPS, this yields a usable sample of 165,653 individuals. Sample means for all model variables are reported in the appendix. This large sample is particularly useful given the relative rarity of self-reported snuff use (about 18 percent of those in the sample report current cigarette use but only 2 percent report current snuff use).[5]

Exogeneity of the cigarette tax rate and smoking regulation variables is rejected at the 1 percent level for both current cigarette use and current snuff use, based on a Hausman test using as instruments the exogenous variables in the tobacco use model and several additional variables: state government expenditures per capita, state political liberalism, an index of interparty competition in state government, and the per capita value of state tobacco production. The apparent endogeneity of these variables may reflect omitted variables in the tobacco use model (e.g., attitudes about tobacco and tobacco use) affecting both tobacco use policies regarding cigarette use (cigarette tax rates and smoking restrictions). In contrast, the exogeneity of snuff tax rates cannot be rejected. The tobacco use models are estimated with the cigarette tax and smoking regulation variables treated alternatively as exogenous and endogenous variables.

In terms of tax effects, the results reported in table 1.1 indicate that a 1 percent increase in the cigarette excise tax rate is associated with a reduction

5. Self-reported snuff use among females is too rare to be analyzed effectively, even in the large CPS sample.

Table 1.1 **Logit Estimates of Effects of Tax Rates and Smoking Restriction Index on Current Use of Cigarettes or Snuff (Sept. 1992, Jan. 1993, and May 1993 CPS)**

Variables	Cigarettes (Exogenous) (1)	Cigarettes (Endogenous) (2)	Snuff (Exogenous) (3)	Snuff (Endogenous) (4)
Cigarette tax[a]	−0.0037*	−0.0079*	0.010*	0.044*
Snuff tax	0.0004	0.0004	−0.0001	−0.001*
Regulation index[a]	−0.141*	−0.170*	−0.801*	−1.542*
Family income	−0.014*	−0.014*	−0.0069*	−0.0068*
Occupation				
Farm/forestry	−0.093*	−0.093*	0.333*	0.316*
Management	−0.219*	−0.217*	−0.474*	−0.469*
Sales	−0.132*	−0.131*	−0.316*	−0.314*
Service	0.185*	0.186*	−0.528*	−0.552*
Age 16–19	0.017	0.016	0.943*	0.939*
Age 20–24	−0.087*	−0.087*	0.774*	0.783*
Age 65 or over	−0.621*	−0.620*	0.113*	0.121*
White Hispanic	−0.354*	−0.335*	−1.825*	−1.864*
Black non-Hispanic	−0.313*	−0.309*	−1.494*	−1.476*
Black Hispanic	−0.356*	−0.339*		
High school graduate	0.527*	0.528*	0.376*	0.371*
College graduate	−0.712*	−0.712*	−0.394*	−0.391*
Employed	0.792*	0.790*	1.038*	1.038*
Student	−0.463*	−0.464*	0.313*	0.313*
Never married	0.155*	0.156*	0.085	0.091*
Divorced/widowed	0.743*	0.744*	0.115	0.105
Married with no spouse present	0.421*	0.424*	0.187	0.160
Child age ≤ 5 in household	−0.439*	−0.438*	0.199*	0.202*
Child age 6–17 in household	−0.253*	−0.253*	−0.292*	−0.291*
High school graduates (%)	−0.0095*	−0.0076*	−0.0095	−0.158*
Per capita income	−0.0016	0.0009	−0.113*	−0.118*
Population below poverty level (%)	−0.0016	−0.0024	0.029*	0.017*
Unemployment rate	−0.0084*	−0.0010	−0.031*	−0.068*
Fundamentalists (%)	−0.0016*	−0.0018*	0.0050	0.010*
No active religion (%)	0.0011	0.0005	0.0032	0.018*

[a]Endogenous variable in columns (2) and (4).

*Statistically significant at the 1 percent level.

in the probability of current cigarette use by −0.07 percent when the cigarette tax is treated as exogenous (col. 1), or by −0.15 percent when the cigarette tax rate is treated as endogenous (col. 2). The estimated impact of snuff tax rates on snuff use is small in magnitude and not statistically significant when the cigarette tax rate is treated as exogenous (col. 3). However, when the cigarette

Table 1.2 **Estimates of Effects of Tax Rates and Specific Smoking Restrictions on Current Use of Cigarettes or Snuff (Sept. 1992, Jan. 1993, and May 1993 CPS)**

Variables	Cigarettes (Exogenous) (1)	Cigarettes (Endogenous) (2)	Snuff (Exogenous) (3)	Snuff (Endogenous) (4)
Cigarette tax[a]	−0.0033*	−0.0069*	0.011*	0.042*
Snuff tax	0.0004	0.0003	−0.0001	−0.0009*
Workplace law[a]	−0.153*	−0.270*	−0.225	0.578
Restaurants (% nonsmoking)[a]	0.0041	−0.037	0.011*	0.013*
Other places (4+)[a]	0.025	−0.014	−1.089*	−2.150*
Family income	−0.014*	−0.014*	−0.0069*	−0.0068*
Occupation				
Farm/forestry	−0.095*	−0.096*	0.384*	0.405*
Management	−0.219*	−0.217*	−0.470*	−0.471*
Sales	−0.133*	−0.131*	−0.320*	−0.335*
Service	0.184*	0.186*	−0.518*	−0.544*
Age 16–19	0.017	0.014	0.934*	0.945*
Age 20–24	−0.086*	−0.087*	0.775*	0.788*
Age 65 or over	−0.622*	−0.619*	0.119	0.129
White Hispanic	−0.353*	−0.323*	−1.857*	−2.056*
Black non-Hispanic	−0.312*	−0.309*	−1.481*	−1.454*
Black Hispanic	−0.356*	−0.313*		
High school graduate	0.527*	0.528*	0.371*	0.367*
College graduate	−0.712*	−0.710*	−0.395*	−0.406*
Employed	0.792*	0.790*	1.042*	1.046*
Student	−0.463*	−0.464*	0.321*	0.337*
Never married	0.154*	0.158*	0.092	0.087
Divorced/widowed	0.744*	0.744*	0.123	0.113
Married with no spouse present	0.422*	0.427*	0.225	0.197
Child age ≤ 5 in household	−0.439*	−0.437*	0.199*	0.207*
Child age 6–17 in household	−0.253*	−0.252*	−0.295*	−0.294*
High school graduates (%)	−0.0091*	−0.0056*	0.630	0.262
Per capita income	−0.0011	−0.0003	−0.111*	−0.107*
Population below poverty level (%)	−0.0002	−0.0027	0.034*	0.018*
Unemployment rate	−0.0082*	0.0008	−0.018	−0.0048
Fundamentalists (%)	−0.0013*	−0.0013*	0.0098*	0.018*
No active religion (%)	0.0003	0.0012	0.012*	0.020*

[a]Endogenous variable in columns (2) and (4).

*Statistically significant at the 1 percent level.

tax rate is treated as endogenous, a 1 percent increase in the snuff tax rate is estimated to reduce the probability of snuff use by −0.10 percent (col. 4).

In terms of cross-tax effects, as in Ohsfeldt et al. (1997), higher cigarette tax rates are associated with a higher probability of snuff use. This is consistent with the substitution of snuff for cigarettes when the price of cigarettes increases relative to the price of snuff. The cross-tax elasticity, however, is perhaps implausibly large (about 1.0) when the cigarette tax rate is treated as endogenous. Also, no corresponding cross-tax effect of snuff taxes on cigarette use is indicated. It is possible that any substitution into cigarettes by snuff users in response to an increase in the relative price of snuff may, given the relatively small number of snuff users, be swamped by the larger overall prevalence of cigarette use.

For the model specification using the overall smoking regulation index (table 1.1), more restrictive smoking regulations are associated with both lower cigarette use and lower snuff use. Moreover, the magnitude of the estimated effect *increases* when the regulation index is treated as endogenous. (The usual argument is that the failure to account for endogeneity would result in an overestimate of the impact, because areas with low rates of cigarette use could more easily pass laws restricting smoking.) The results using the overall smoking regulation index also run counter to the notion that restrictive smoking laws might cause substitution of cigarettes with snuff. Areas with more restrictive laws have lower estimated probabilities of snuff use. Recall, however, that the smoking restriction laws do not directly constrain the use of snuff. The laws may discourage snuff use indirectly by fostering an "antitobacco" environment for the individual considering snuff use.

In model specifications where the smoking regulation variable is measured as its component parts (table 1.2), the results become a bit more muddled. Consistent with some past studies, the impact of the overall smoking restriction index on cigarette use primarily results from workplace restrictions. However, workplace smoking restrictions have no statistically significant effect on snuff use. It appears that restrictions on smoking in "other" places reduce snuff use. This may be plausible if snuff use is concentrated among young males who spend relatively less time in (indoor) workplaces and relatively more time in "other" places. In contrast, restaurant restrictions appear to increase snuff use. This would seem to be the least plausible source of regulation-induced substitution effects, since snuff typically is not consumed during meals.

Results for other model variables generally are consistent with expectations. Greater family income is associated with a reduced likelihood of current use of either cigarettes or snuff. White Hispanics and blacks are less likely to use either cigarettes or snuff than white non-Hispanics. Individuals in farming and forestry occupations are less likely to use cigarettes but are more likely to use snuff, whereas those in service occupations are more likely to smoke but are less likely to use snuff, compared to reference occupations. Individuals who

Table 1.3 **Summary of Model Estimates, by Age Cohort, for Tobacco Tax Rate and Smoking Restriction Variables**

	All Males ≥ 16	Males 16–24	Males 25–44	Males > 44
Cigarette use				
Cigarette tax (elasticity)	−0.15*	−0.22*	−0.11*	−0.07
Snuff tax (elasticity)	0.001	0.002	0.001	−0.002
Overall regulation index (Δ probability)	−0.13*	−0.09*	−0.19*	−0.12*
Workplace law (Δ probability)	−0.06*	0.02	−0.09*	−0.08*
Restaurants, % nonsmoking (Δ probability)	−0.01	−0.03	0.01	−0.003
Other places, 4+ (Δ probability)	−0.002	−0.07*	−0.001	−0.01
Snuff use				
Cigarette tax (elasticity)	0.98*	1.15*	0.04	0.54*
Snuff tax (elasticity)	−0.01*	−0.24*	−0.05*	0.003
Overall regulation index (Δ probability)	−0.03*	−0.001	−0.03*	0.001
Workplace law (Δ probability)	0.003	0.004	−0.001	−0.001
Restaurants, % nonsmoking (Δ probability)	0.01*	0.02*	0.004	0.01*
Other places, 4+ (Δ probability)	−0.04*	−0.03*	−0.02*	−0.01

*Statistically significant at the 1 percent level.

are not married or have no spouse present are more likely to smoke cigarettes than currently married individuals with the spouse present.

The tax elasticities and smoking regulation effects estimated for cigarette and snuff use models for males by age cohort are summarized in table 1.3. Age cohorts examined include young males (16–24), prime work-age males (25–44), and older males (over 44). The model specifications employed are analogous to the models in tables 1.1 and 1.2 treating cigarette tax rates and smoking regulations as endogenous. The tax elasticities reported correspond to a model using the overall regulation index variable (as in table 1.1) rather than the component variables (as in table 1.2). The incremental probability estimates for the smoking regulations indicate the change in the predicted probability of use given a change in the regulatory variable from 0 to 1, holding other factors constant at their sample mean values.

Estimated tax elasticities tend to be larger in magnitude for young males relative to tax elasticity estimates for other males. The elasticity of the probability of cigarette use with respect to the cigarette tax rate is twice as large in magnitude for males aged 16–24 than for males aged 25–44. For males over age 44, the estimated cigarette tax elasticity is not statistically significant. For snuff, the estimated own tax elasticity is almost five times greater in magnitude for young males than for males aged 25–44. The large cross-tax effect of ciga-

rette tax rates on snuff use indicated in the full sample appears to be mainly attributable to a large cross-tax effect among young males.

The estimated impact of the overall smoking regulation index on cigarette use is consistently negative and statistically significant for all three age groups. Workplace laws appear to have a greater impact on males over age 24 than on males aged 16–24, whereas restrictions on smoking in "other" places have more impact on the probability of smoking among young males than among males over age 24. For snuff use, the impact of the overall regulation index is most evident among prime work-age males. The odd restaurant restriction substitution effect found in the full sample is indicated for both young and older males.

Although in many respects the results are not dramatically different across age cohorts, in general, tobacco use appears to be more responsive to tax rates among young males than males over age 24, whereas males over age 24 appear to be more responsive to smoking regulations than young males.

1.6 Conclusion

Both tobacco tax rates and tobacco use regulations appear to affect the use of specific types of tobacco products. There appear to be some important interrelationships among types of tobacco products in terms of the impact of policies designed to affect use of a particular tobacco product. In particular, cigarette tax changes may result in changes in the prevalence of snuff use, at least among young males. Model estimates suggest that some types of restrictions on smoking may encourage snuff use, again among young males.

An important limitation of this study is that only current use of tobacco can be examined using cross-sectional data. It is possible that cross-sectional associations between tax rates or smoking restrictions and tobacco use would not be replicated using longitudinal data. Moreover, due to lack of data, the conditional demand for tobacco (intensity of use among users) could not be analyzed. Thus, only part of the potential response to tax changes or changes in smoking regulations may be analyzed. Given the relative rarity of snuff use and the inherent difficulty in quantifying the intensity of snuff use, analyzing conditional snuff demand will remain a challenge for future studies.

Appendix

Table 1A.1 **Means and Standard Deviations for Model Variables (Sept. 1992, Jan. 1993, and May 1993 CPS)**

Variables	Mean	Standard Deviation
Cigarette use	0.184	0.371
Snuff use	0.019	0.101
Cigarette tax*	28.63	13.22
Snuff tax	17.98	14.92
Regulation index*	0.565	0.409
Family income	36.69	27.74
Occupation		
Farm/forestry	0.030	0.170
Management	0.139	0.346
Sales	0.062	0.243
Service	0.040	0.197
Age 16–19	0.053	0.224
Age 20–24	0.100	0.017
Age 65 or over	0.139	0.034
White Hispanic	0.075	0.263
Black non-Hispanic	0.0017	0.041
Black Hispanic	0.105	0.306
High school graduate	0.579	0.494
College graduate	0.159	0.366
Employed	0.465	0.499
Student	0.068	0.253
Never married	0.212	0.409
Divorced/widowed	0.073	0.260
Married with no spouse present	0.0051	0.0071
Child age $\leq$ 5 in household	0.243	0.429
Child age 6–17 in household	0.402	0.490
High school graduates (%)	74.90	7.04
Per capita income	5,855.6	10,067.1
Population below poverty level (%)	19.29	3.81
Unemployment rate	7.37	4.72
Fundamentalists (%)	9.38	12.34
No active religion (%)	44.54	10.93

*Statistically significant at the 1 percent level.

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