

THE RISE IN FEMALE SMOKING IN RUSSIA: WHAT TO DO?

OGLOBLIN, Constantin*

BROCK, Gregory

Abstract

Using the latest data (2009) and one historic year (2000) from a Russian nationally representative household survey, a tobit demand model is estimated to examine influences on both the decision to smoke and the quantity of cigarettes bought by Russian women of working age over the past decade. Our results suggest that better educated women smoke significantly less. The estimated price elasticity of women's demand for cigarettes (-0.541) implies that a moderate excise or "sin" tax on cigarettes combined with rising female education levels could effectively halt the recent rise in female cigarette consumption.

JEL: I1, P2, R2

Keywords: smoking, demand for cigarettes, Russia, transnational tobacco companies

1. Introduction

The World Health Organization (WHO) has recently expressed deep concerns about increases in smoking by women in Eastern Europe, calling it "one of the most striking things about smoking prevalence in the WHO European Region in the last two decades" (WHO (2010)). According to the WHO statistics, there has been a sharp increase in tobacco use among women and girls in many countries in the region, while smoking among men and boys is steadily declining. It is now well documented that women are as vulnerable as men to tobacco related diseases, such as cancer, heart disease and respiratory disease. In addition, with Russia's population in absolute decline, the adverse impacts of smoking on female reproductive health present a serious challenge to the nation. While historically in Eastern European countries the prevalence of smoking among women has been substantially lower than among men (Shkolnikov et al. (1998)), much of the previous research on economic and social factors that influence tobacco use has been focused primarily on male experience. Thus there is an urgent need to analyze female tobacco use and the effectiveness of tobacco control measures specifically with regard to female smoking (WHO (2010)).

Russia appears to be typical of other Eastern European countries with respect to overall gender differences in smoking behavior. The prevalence of smoking among men in the country is one of the highest in the world, while the percentage of smoking women has been traditionally one of the lowest. The picture is changing remarkably, however, as female smoking has risen substantially since the Soviet era, during the last decade in particular. Using a nationally representative survey, Perlman et al. (2007) show that the age-adjusted prevalence of smoking among Russian women during 1992-

*Constantin Ogloblin and Gregory Brock, School of Economic Development, Georgia Southern University, USA. E-mail: coglobli@georgiasouthern.edu We thank the Russia Longitudinal Monitoring Survey Phase 2, funded by the USAID and NIH (R01-HD38700), Higher School of Economics and Pension Fund of Russia, and provided by the Carolina Population Center and Russian Institute of Sociology for making the data used in this research available.

2003 more than doubled from 6.9% to 14.8%. Though their estimated trends were not statistically significant, two prior studies (Gilmore et al. (2004) and Bobak et al. (2006)) support Perlman et al.'s findings.

Explaining Russia's rising percentage of women who choose to smoke, researchers have identified several casual factors some of which can be quantitatively measured. One that cannot is the weakening of social and cultural constraints on female smoking as a result of moving from communism to democracy. One that can is an increase in women's spending power combined with falling relative prices of cigarettes during the early transition era. A number of studies (Gilmore and McKee (2004a and 2004b), Perlman et al. (2007)) provide evidence that the unregulated entry of transnational tobacco companies (TTCs) into previously government dominated tobacco markets has been a major factor of rising female smoking. After the tobacco factories were privatized and tobacco control legislation was weakened or did not keep up with the new private sector, TTCs invested heavily in gaining control over Russia's tobacco industry. By 2000, they had invested approximately \$1.7 billion, controlled over 60% of the market, and quadrupled the production capacity of their newly acquired factories (Gilmore and McKee (2004a)). The TTCs viewed the low smoking prevalence among women in Russia as an opportunity to substantially expand their market and partly offset declining demand in the West with aggressive marketing strategies aimed at Russian women (Gilmore and McKee (2004b)). The recent WHO report on the impact of this business strategy calls for more research to understand how policy can be used to protect Russian women. We've chosen 2000 as a base year because it is the year when the Russian economy has overcome the 1998 crisis and the politically stable Putin era begins.

2. Data and Trends

We use data from Phase 2 of the Russia Longitudinal Monitoring Survey (RLMS), a series of nationally representative surveys designed to monitor the effects of Russian reforms on the health and economic welfare of households and individuals. The surveys are designed and implemented by an interdisciplinary partnership of leading Russian and American experts. They survey draws a multi-stage probability sample. First, 1,850 consolidated *rayons* (administrative subdivisions similar to counties) serve as primary sampling units (PSUs). Then, within each selected PSU the population is stratified into urban and rural substrata, and the target sample size is allocated proportionately to the two substrata. In both urban and rural substrata, interviewers were required to visit each selected dwelling up to three times to secure the interviews. They were not allowed to make substitutions of any kind. The household response rate exceeded 80%, and individual questionnaires were obtained from over 97% of the individuals listed on the household rosters. (Detailed project descriptions are available from the RLMS-HSE Web site (<http://www.cpc.unc.edu/projects/rlms-hse>). The data used in the present study were collected in the autumns of 2000 (Round 9) and 2009 (Round 18).

The data are from the individual surveys that contain information on smoking and various individual characteristics of the respondents. To measure cigarette prices and calculate price indices, we use community-level cigarette prices collected through

visits by the RLMS teams to local markets in the communities in which respondents reside. We also use household level data to compose the consumer basket used in our price index calculations. We limit our sample to women aged 18-64 as we believe that the demand for cigarettes by younger and older individuals are determined in different ways and should be studied separately (Chaloupka and Warner (2000)).

Between 2000 and 2009, the percentage of women who smoke increased by 4.7 percentage points while the percentage of men who smoked declined by three percentage points across all age groups (Table 1). In each age group, female smoking rates increased with the most dramatic rise (10.3 points) in the 35-44 age group. The survey data also indicate increased intensity of female smoking. The average daily number of cigarettes smoked by women (excluding non-smokers) increased noticeably in all but the oldest age groups (Table 2). Thus, both the rate and the intensity of smoking among Russian women of working age increased markedly in 2009 compared with 2000.

Table 1. Percentage of smoking individuals by age and gender

Age group	Women		Men	
	2000	2009	2000	2009
All groups	14.7	19.4	65.7	62.8
18-24	17.8	20.9	62.9	55.3
25-34	24.2	26.1	68.2	67.0
35-44	14.3	24.7	69.2	67.0
45-54	13.2	14.4	68.1	64.1
55-64	1.8	9.3	55.2	56.4

Table 2. Average daily number of cigarettes smoked by women ^a

Age group	2000	2009
All groups	9.2	11.3
18-24	7.9	10.1
25-34	9.2	11.0
35-44	9.2	12.2
45-54	10.4	12.2
55-64	7.2	11.6

^a Calculated over those who smoked.

3. Modeling the Demand for Cigarettes

To reflect both the buying decision and the quantity of cigarettes bought, we employ the demand equation known as the tobit model (Tobin (1958)). The model can be written as follows:

$$\begin{aligned}
q_i^* &= \mathbf{x}_i' \boldsymbol{\beta} + e_i, \\
q_i &= 0 \quad \text{if } q_i^* \leq 0 \\
q_i &= q_i^* \quad \text{if } q_i^* > 0
\end{aligned}$$

where q_i^* is the latent variable underlying individual i 's demand for cigarettes decisions, which can be interpreted as a measure of the desire to smoke; $\mathbf{x}_i$ is the vector of factors that influence the demand decisions, $\boldsymbol{\beta}$ is the vector of parameters to be estimated, e_i is the error term, and q_i is the observed quantity of cigarettes smoked by individual i . We are most interested in estimating the marginal effects of the factors $\mathbf{x}$ on the quantity of cigarettes demanded, q :

$$\frac{\partial E[q_i | \mathbf{x}_i]}{\partial \mathbf{x}_i} = \boldsymbol{\beta} \Phi \left(\frac{\mathbf{x}_i' \boldsymbol{\beta}}{\sigma} \right) \quad (1)$$

The explanatory variables ($\mathbf{x}$) in our demand equation include the following variables found to be important in determining smoking prevalence among Russian women in the 1990s (Ogloblin and Brock (2003)). The individual's age and age squared are included to model the expected concave age-smoking profiles. Education dummy variables reflect five levels of educational attainment: (1) incomplete secondary or lower, (2) general secondary (the reference level), (3) secondary with vocational, (4) specialized secondary, and (5) college or advanced degree. Education was associated with lower smoking in the 1990s. Community dummy variables distinguish three community types where a respondent resides: (1) Moscow or St. Petersburg, (2) provincial city or town (the reference category), and (3) rural settlement. Russian women in 1996 and 1998 were found to be smoking much more in political and cultural centers than rural areas perhaps because these centers are where TTCs gained first entry and/or where traditional negative attitudes towards women smoking were less prevalent. A marital status binary variable (1 if married) is also included to see if the 1990s negative effect of marriage on smoking continues to hold in the current decade, which would suggest the traditional attitude toward female smoking as incompatible with a woman's role as wife, mother, and "homemaker" still holds.

The price variable used in our demand equation is the real average PSU price of the cheapest domestic cigarettes calculated by dividing the nominal price obtained from the RLMS community data by the PSU price index. The PSU price indices are calculated as follows. First, we constructed a national consumer basket that includes 16 main food items. We used the RLMS household survey data to determine the composition of the basket based on an average Russian household's consumption pattern in 2000. Then, we calculated the cost of this basket in 2000 and 2009 for each PSU. Finally, we computed the price indices by dividing the cost of the basket in each PSU and each year by its cost in the reference PSU in 2000. Price indices calculated this way account for both inter-temporal and cross-sectional differences in price levels. To estimate the income elasticity of demand for cigarettes, we include a variable that measures an individual's real monthly income as the number of consumer baskets that the amount of money received by that individual in the last 30 days before the interview could buy. All variables included in the demand equation are described in Table 3.

Table 3. Descriptions of the variables in the tobit model ^a

Variable	2000 (N = 3701)		2009 (N = 4978)	
	Mean	Median	Mean	Median
Cigarettes smoked	1.33(0.06)	0.00	2.20(0.07)	0.00
Age	40.29(0.22)	40.42	40.34(0.19)	39.50
Price of cigarettes	4.27(0.03)	3.99	5.56(0.03)	4.86
Income	4.11(0.10)	2.64	15.41(0.47)	11.24
Percentage of observations				
Married	58.9(0.81)		51.5 (0.71)	
<i>Education</i>				
Incomplete secondary	15.1 (0.59)		10.6 (0.44)	
General secondary	21.0 (0.67)		20.2 (0.57)	
Secondary vocational	15.8 (0.60)		16.0 (0.52)	
Specialized secondary	29.6 (0.75)		27.5 (0.63)	
College	18.6 (0.64)		25.8 (0.62)	
<i>Community type</i>				
Rural	26.3 (0.72)		12.8 (0.47)	
Provincial city/town	68.4 (0.76)		75.8 (0.61)	
Moscow/St. Petersburg	5.3 (0.37)		11.4 (0.45)	

^a Standard errors are in parentheses.

The average per capita daily number of cigarettes smoked by women increased by 0.87 in 2009 compared with 2000—a 66.0% increase. The average and median age of women remained virtually unchanged over time, but the percentage of married women decreased by 7.4 points, which, if the 1990s evidence is unchanged, could be a factor leading to increased cigarette consumption. The same can be said about the clearly visible movements of women from rural areas to urban centers. Women's educational attainments are also higher in 2009. The percentage of respondents with a college degree increased by 7.1 percentage points, while the percentage of those who have not completed secondary school decreased by 4.5 percentage points.

The real price of cigarettes in 2009 is 30.2% higher than in 2000, which, other things being equal, should have reduced women's demand for cigarettes. The price elasticity of female demand for cigarettes estimated from the tobit equation will quantify the effect of the real price of cigarettes on women's cigarette consumption. As the literature suggests, cigarettes are a normal good, but with a very income inelastic demand. Given the large (270%) increase in female real monthly income (Table 3), we expect income to contribute to increased cigarette consumption, with the exact effect quantified using income elasticity estimates from the tobit model.

4. Estimation Results

The tobit demand equation was estimated separately for 2000 and 2009. The results are reported in Table 4.

Table 4. Tobit estimates of the demand for cigarettes equation ^a

	2000	2009
Age	1.773 (0.241)*	1.818 (0.204)*
Age squared	-0.0269 (0.0032)*	-0.0255 (0.0025)*
<i>Education</i> ^b		
Incomplete secondary	3.836 (1.358)*	7.079 (1.231)*
Secondary vocational	0.803 (1.216)	3.298 (1.123)*
Specialized secondary	-1.223 (1.100)	-1.911 (1.051)
College	-4.722 (1.320)*	-7.215 (1.130)*
Married	-5.630 (0.808)*	-5.532 (0.722)*
<i>Community type</i> ^c		
Rural	-4.648 (0.991)*	-5.548 (1.178)*
Moscow/St. Petersburg	9.427 (1.424)*	9.942 (1.112)*
Price of cigarettes	-0.747 (0.217)*	-0.887 (0.184)*
Income	0.146 (0.054)*	0.022 (0.008)*
Constant	-33.56 (4.34)*	-35.06 (3.85)*
N	3701	4978
N-uncensored	543	962
Likelihood ratio	362.2*	464.7*
Pseudo R ²	0.056	0.041
^a The dependent variable is the daily number of cigarettes smoked. Standard errors are in parentheses. ^b The base category is general secondary. ^c The base category is provincial city/town. * Indicates statistical significance at 0.01 level.		

The coefficients in the table show how the (unobserved) potential demand for cigarettes (the latent variable q^*) changes with respect to changes in each regressors ($\mathbf{x}$). Although these estimates may shed some light on the factors underlying women's *potential* demand for cigarettes, our main interest is what determines the *actual* quantity of cigarettes consumed (i.e. the marginal effects of the $\mathbf{x}$ factors on the quantity of cigarettes demanded (q) in equation (1). These marginal effects, evaluated as the average partial effects of the factors on q are presented in Table 5. The signs and statistical significance of the effects in Table 5 are essentially the same as in Table 4, so what we say about the directions of the influences on the actual demand for cigarettes (q) also applies to the potential (latent) demand (q^*). The marginal effects of categorical variables are measured as proportional changes in the quantity of cigarettes consumed in response to a change in a factor's level (semi-elasticities of the demand for cigarettes with respect to the factor), while the marginal effects of price and income are computed as the price and income elasticities of the demand for cigarettes, respectively. Since the age variable is included in the equation in its quadratic form, the marginal effect of age varies depending on age, so the average marginal effect of this factor is not very informative. Therefore, we do not report this effect in the table. We discuss the effect of age on the demand for cigarettes separately, presenting our estimates in a different way.

An important result shown by our demand equation estimates is that education has a significant negative influence on smoking in both 2000 and 2009, with the 2009 effect appearing more pronounced. For example, given the marginal effects in Table 5, we can conclude that in 2000, other factors being equal, women with a college degree smoked 68.6% less than women with general secondary education, while women with below-secondary education smoked 50.3% more than those with general secondary education. In 2009, the respective percentages are 83.0% and 69.4%. Thus, education appears to be an increasingly important factor of reducing women's smoking. That is, the rising human capital of Russian women not only benefits Russia's GDP, but also can help slow the rise in women's smoking.

Table 5. Marginal effects on demand for cigarettes ^a

	2000	2009
<i>Education</i> ^b		
Incomplete secondary	0.503 (0.176)*	0.694 (0.118)*
Secondary vocational	0.109 (0.165)	0.338 (0.115)*
Specialized secondary	-0.170 (0.153)	-0.207 (0.114)
College	-0.686 (0.193)*	-0.830 (0.130)*
Married	-0.783 (0.112)*	-0.603 (0.079)*
<i>Community type</i> ^c		
Rural	-0.670 (0.146)*	-0.648 (0.144)*
Moscow/St. Petersburg	1.144 (0.155)*	0.978 (0.100)*
Price of cigarettes	-0.454 (0.134)*	-0.541 (0.114)*
Income	0.080 (0.029)*	0.037 (0.013)*
^a The marginal effects of categorical variables are proportional changes in the daily number of cigarettes smoked; the marginal effects of price and income are elasticities. Standard errors are in parentheses. ^b The base category is general secondary. ^c The base category is provincial city/town. * Indicates statistical significance at 0.01 level.		

Consistent with evidence from previous studies, the marginal effects of marriage on women's smoking is significantly negative in both 2000 and 2009, with a difference between the two years being within the standard error. The same is true about the effects of community type on smoking, with rural women smoking substantially less and women in Moscow and St. Petersburg substantially more than those in provincial Russian cities. Thus, increased cigarette consumption by women in 2009 cannot be explained by changes in the attitudes toward wives smoking or smaller rural/urban cultural differences. But this result also implies that if the trends toward fewer married women and more women moving to urban areas continue, female smoking will continue to rise.

The estimated marginal effects also show that demand for cigarettes, although price inelastic, is still rather sensitive to changes in the real price of cigarettes. And the estimated price elasticity is somewhat higher in 2009 than in 2000. This suggests higher real cigarette prices in 2009 helped prevent an even greater increase in female smoking. Our estimate of the price elasticity of demand for cigarettes also implies that a reasonably large excise tax on cigarettes would be rather effective in reducing female

smoking. For example, using the 2009 estimated elasticity we can predict that a tax that raises the price of cigarettes by 50% would decrease the average daily number of cigarettes smoked by about 27% (assuming that the price elasticity is constant, although it may even increase as the price rises, leading to an even greater reduction in cigarette consumption). The income elasticity estimates show that cigarettes are a normal good for Russian women, but with very income inelastic demand. Still, women's real female income contributed to their increased cigarette consumption.

The age-smoking profiles of Russian women are obtained using predictions from the tobit equation of the average expected daily number of cigarettes smoked (q) for women at different ages. These age-smoking profiles are shown in Figure 1.

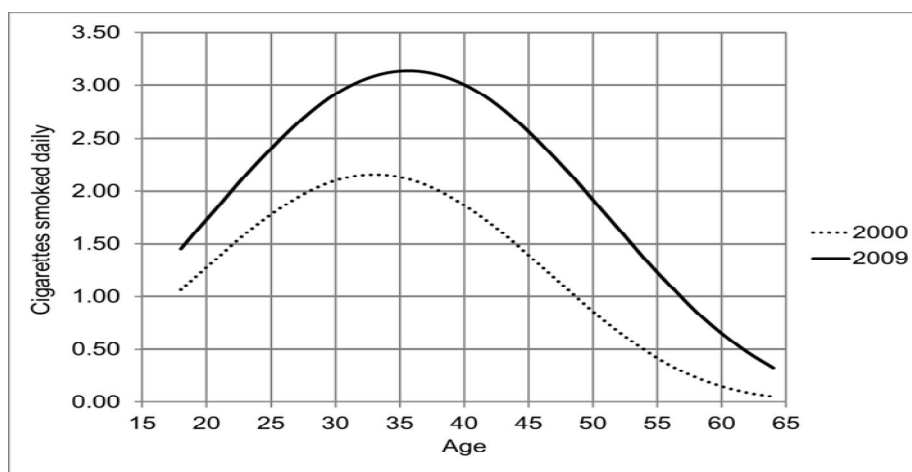


Figure 1. Age-smoking profiles estimated from the tobit model ^a

^a Average predicted number of cigarettes smoked for women aged 18-64.

These profiles are concave—as expected from the literature—reaching their maximums at around 35 years of age. In 2000 there is a slight shift toward younger ages while in 2009 the shift is reversed toward older women. Also, the 2009 curve is steeper, indicating that, other things being equal, the daily number of cigarettes smoked in 2009 grew faster with age and then declined faster than it did in 2000, with the difference between 2009 and 2000 reaching its maximum at age 44 years of age. Although these age-smoking profiles may suggest women's changing attitudes toward smoking—with older women becoming more liberalized and impacted by Western culture at a later stage of Russia's socio-economic reforms—they also support the view that the TTCs' shifted their marketing strategies more toward older women.

To see how women's smoking would change if the demand factors included in our equation were held at a fixed level, we estimated our model with the 2000 and 2009 samples pooled and a dummy variable for year 2009 added. We estimated the marginal effect of year 2009 on the number of cigarettes smoked using the methodology for categorical variables described above. The estimated effect (statistically significant at the 0.01 level) indicates that holding the variables included in the equation and their effects on smoking constant, the average number of cigarettes smoked in 2009 would

increase 45.2% compared with 2000. This differential could include the effect of weakened social and cultural constraints on female smoking in general, but based on the evidence of the marketing strategies of the TTCs described in the WHO report and above, we believe that much of this increase is due to TTC activity in Russia.

5. Conclusions

In response to an alarming WHO report about the increase in smoking by women in Eastern Europe, we have examined women's demand for cigarettes in Russia where female smoking is traditionally at low levels, but rising as the country is undergoing economic transition and cultural liberalization. The RLMS data used in this study indicate that during the second decade of Russia's transition (2000-2009), both prevalence and intensity of female smoking increased substantially, leading to a 66% increase in per capita cigarette consumption by women aged 18-64. To see what could be responsible for this dramatic rise in female smoking, we have examined both the purchasing decision and the quantity of cigarettes bought.

The estimates from our demand equation suggest that education is an increasingly important factor of reducing women's demand for cigarettes. Thus, women's increasing educational achievements can help prevent female smoking from rising further. The effect of marriage on women's smoking is significantly negative, with practically no difference between 2000 and 2009. Russia's rural areas still appear to have more conservative female smoking behavior compared to urban areas, especially Moscow and St. Petersburg. These findings suggest that measures against female smoking should focus more on unmarried women and women living in big cities.

The estimated price elasticity of Russian women's demand for cigarettes is -0.541 (2009). This is well within the general range of price elasticities found in other smoking studies (Chaloupka and Warner (2000)). Our elasticity estimate can be used by policy makers to forecast excise tax revenues that can be used to fund anti-smoking campaigns. According to the literature, such measures could be especially effective if they are combined with enforceable restrictions on tobacco promotion (Laugesen and Meads (1991)). The literature also suggests that a "sin" tax on cigarettes could work as an important self-control mechanism, not only helping women to avoid or reduce smoking, but also making them happier (Gruber and Mullainathan (2002)).

Our estimate of the income elasticity of women's demand for cigarettes (0.037 in 2009) can be used to forecast the impact of rising incomes on female smoking, which, as the estimate suggests, is very small. Still, cigarettes are marginally a normal good for Russian women, whereas in OECD countries they are typically an inferior good, which some researchers suggest is a sign of a fully-fledged market economy (Chaloupka and Warner (2000)).

The estimated age-smoking profiles imply that older women are becoming more liberalized and impacted by Western smoking culture, thanks to unregulated TTCs marketing campaigns. The 45.2% increase in per capita female cigarette consumption, which we largely attribute to TTC marketing activities, calls for legislation that would effectively restrict tobacco marketing. This and other measures aimed at reduction in

female smoking can be included in demographic policies designed to halt Russia's absolute population decline as well.

References

- Bobak, M. et al. 2006. "Changes in Smoking Prevalence in Russia, 1996-2004." *Tobacco Control*, Vol. 15, pp. 131–135.
- Chaloupka, Frank J. and Kenneth E. Warner. 2000. "The Economics of Smoking." NBER Working Paper No. 7047.
- Gilmore, A. and M. McKee. 2004a. "Moving East: How the Transnational Tobacco Industry Gained Entry to the Emerging Markets of the Former Soviet Union, Part I: Establishing Cigarette Imports." *Tobacco Control*, Vol. 13, pp. 143–150.
- Gilmore, A. and M. McKee. 2004b. "Moving East: How the Transnational Tobacco Industry Gained Entry to the Emerging markets of the former Soviet Union, Part II: An Overview of Priorities and Tactics Used to Establish a Manufacturing Presence." *Tobacco Control*, Vol. 13, pp. 151–160.
- Gilmore A. et al. 2004. "Prevalence of Smoking in 8 countries of the Former Soviet Union: Results from the Living Conditions, Lifestyles and Health Study. *American Journal of Public Health*, Vol. 94, pp. 2177–2187.
- Gruber, Jonathan and Sendhil Mullainathan. 2002. "Do Cigarette Taxes Make Smokers Happier?" NBER Working Paper No. 8872.
- Laugesen, Murray and Chris Meads. 1991. "Tobacco Advertising Restrictions, Price, Income and Tobacco Consumption in OECD Countries, 1960-1986." *British Journal of Addiction*, Vol. 86, pp. 1343-1354.
- Ogloblin, Constantin and Gregory Brock. 2003. "Smoking in Russia: The 'Marlboro Man' Rides but Without 'Virginia Slims' for Now." *Comparative Economic Studies*, Vol. 45, pp. 87–103.
- Perlman et al. 2007. "Trends in the Prevalence of Smoking in Russia During the Transition to a Market Economy." *Tobacco Control*, Vol. 16, pp. 299–305.
- Shkolnikov, Vladimir M. et al. 1998. "Educational Level and Adult Mortality in Russia: An Analysis of Routine Data 1979 to 1994." *Social Science and Medicine*, Vol. 47(3), pp. 357-369.
- Tobin, J. 1958. "Estimation of Relationships for Limited Dependent Variables." *Econometrica*, Vol. 26, pp. 24-36.
- World Health Organization. 2010. *Combating Tobacco Industry Marketing in the WHO European Region*. WHO Regional Office for Europe.