impacTEEN

A Policy Research Partnership to Reduce Youth Substance Use

Peer Effects, Tobacco Control Policies, and Youth Smoking Behavior

Lisa M. Powell, PhD
John A. Tauras, PhD
Hana Ross, PhD

February 2003

Research Paper Series, No. 24

ImpacTeen is part of the Bridging the Gap Initiative: Research Informing Practice for Healthy Youth Behavior, supported by The Robert Wood Johnson Foundation and administered by the University of Illinois at Chicago.

Peer Effects, Tobacco Control Policies, and Youth Smoking Behavior

February 2003

Lisa M. Powell, Ph.D.
Associate Professor, Queen's University
and Senior Research Specialist, HRPC, UIC
850 West Jackson Blvd, Suite 400
Chicago, IL 60607-3025
powelll@uic.edu

John A. Tauras, Ph.D.
Assistant Professor of Economics, UIC
and Faculty Research Fellow, NBER
601 S. Morgan St., Room 2103
Chicago, IL 60607-7121
tauras@uic.edu

Hana Ross, Ph. D.
Research Specialist, HPRC, UIC
850 West Jackson Blvd, Suite 400
Chicago, IL 60607-3025
hanaross@uic.edu

Acknowledgements
We gratefully acknowledge funding support for this research from the Robert Wood Johnson Foundation through the Substance Abuse Policy Research Program and ImpacTeen (A Policy Research Partnership to Reduce Youth Substance Use). We thank Frank Chaloupka and Richard Peck for their comments and suggestions. The authors are grateful to Yanjun Bao for her excellent research assistance.

Abstract

This paper expands the youth cigarette demand literature by undertaking an examination of the determinants of smoking among high school students incorporating the importance of peer effects and allowing cigarette prices (taxes) and tobacco control policies to have a direct effect and an indirect effect (via the peer effect) on smoking behavior. To control for the potential endogeneity of our school-based peer measure we implement a generalized least squares estimator for a dichotomous dependent variable. Our results show that peer effects have a significant impact on youth smoking behavior and that there is a strong potential for social multiplier effects with respect to any exogenous change in cigarette taxes or tobacco control policies.

A. Introduction

Numerous econometric studies on the determinants of youth smoking have been conducted over the past two decades. Many have examined the impact of prices and public policies on youth smoking behavior and have been the backbone for formulating anti-smoking policies. (See Chaloupka and Warner (2000), as well as the Surgeon General's Reports USDHHS (1994 and 2000)). However, while such research provides evidence on the overall impact of prices and tobacco control policies on youth smoking, it does not examine the importance of peer influences and, hence, does not allow us to distinguish the direct price/policy effects from the indirect price/policy effects that may operate through the peer effect, referred to as the social multiplier.

A growing body of literature suggests that social interactions may be important determinants of many youth behavioral outcomes. The idea is that the utility that an individual receives from pursuing a given activity depends on the actions of the other individuals in the person's reference or peer group (Manski, 1993, 1995; Becker, 1996; Brock and Durlauf, 2001; Glaeser and Scheinkman, 2001). It is hypothesized that an increase in the prevalence of a given behavior at the peer level may lead to an increased probability of such behavior at the individual youth level. In this regard, the importance of peer effects have been examined empirically in the context of several behaviors including educational outcomes (Case and Katz, 1991; Borjas, 1994; Aaronson, 1998; Sacerdote, 2000; Kremer and Levy, 2002; Hanushek et al., forthcoming), crime (Sah, 1991; Glaeser, Sacerdote, and Scheinkman, 1996), and teenage pregnancy (Evans, Oats, and Schwab, 1992; Crane 1991; Anderson, 1991). A limited number of studies have examined the impact of peer effects on smoking behavior in an econometric framework (Norton, Lindrooth and Ennett, 1998 and Gaviria and Raphael, 2001). Unfortunately, these latter two studies

incorporate neither price nor policy measures into their analyses and, hence, do not account for either the direct or indirect (via the peer effect) impact of cigarette prices or tobacco control policies on youth smoking behavior.

It is the goal of this paper to shed light on the importance of peer smoking effects on individual youth smoking decisions and the extent of the multiplier effect with respect to cigarette prices (taxes) and tobacco control policies on such decisions. In our empirical model of the determinants of youth smoking, a further goal of this project is to establish a causal relationship between our peer measure and individual youth smoking behavior by controlling for the potential endogeneity of the peer effect. The identification of peer effects is complex. As will be explained in greater detail in our literature review section, Manski (1993 and 1995) demonstrates that the observance of social interactions may be explained by several hypotheses and that to draw public policy implications based on a social multiplier effect one must identify a causal relationship between the peer and individual behaviors.

The observed correlation between peer effects and individual behavior may be due to the fact that there is correlation in the unobservable characteristics of the individual and his peers since parents may self-select themselves into particular areas. That is, families may endogenously sort themselves across neighborhoods or school districts. In our empirical analyses, we use a generalized least squares estimation model to account for this potential endogeneity. Further, our estimation procedure accounts for the fact that the individual himself can affect the behavior of his peers, while at the same time his peers affect his own behavior.

Hence, the contribution of this paper to the social interactions and cigarette demand literatures is an examination of the determinants of smoking among high school students incorporating the importance of peer effects and allowing cigarette prices (taxes) and tobacco

control policies to have a direct effect and an indirect effect (via the peer effect) on smoking behavior. This will allow us to determine the extent of the social multiplier effect of changes in cigarette prices and tobacco control policies on the smoking behavior of youths that operate through the peer effect.

The paper is structured as follows. Section 2 provides a detailed literature review of the smoking demand literature and the peer effects literature. Section 3 describes our model, data, and estimation methods. Our results are presented in section 4. Finally, section 5 concludes the paper.

2. Literature Review

2. A. Smoking Demand Literature including Price and Policy Variables

A substantial body of literature has emerged over the last few decades that examines the determinants of smoking behavior in an economic framework of demand incorporating cigarette prices. This economic research has shown that cigarette prices are inversely related to cigarette demand. A National Cancer Institute sponsored gathering of economists and other experts concluded that the overall price elasticity of adult cigarette demand falls in a narrow range of -0.3 to –0.5, suggesting that a 10% increase in the price of cigarettes would decrease overall adult consumption of cigarettes by approximately 4% (National Cancer Institute, 1993). A smaller literature on youth and young adult responsiveness to cigarette prices has also emerged. The consensus from these studies is that youth and young adults are at least as responsive to price as adults are, if not significantly more price responsive (USDHHS, 1994 and 2000).

Using data taken from Cycle III of the Health Examination survey (1966-1970), Lewit, Coate and Grossman (1981) were the first to examine the determinants of youth (12-17 years old) cigarette smoking. They examined the impact of price on smoking prevalence and on the

number of cigarettes smoked by adolescent smokers. The total price elasticity of demand was estimated to be –1.44. In addition, the study found price to have a larger impact on adolescents' decisions to smoke rather than on average amount smoked by smoker. It should be noted that within this study, the authors acknowledged the fact that peer effects are likely to play an important role in the case of youth smoking behavior.

Using a similar methodology to Lewit, Coate and Grossman (1981), Chaloupka and Grossman (1996) confirmed the finding that youth and young adults are more responsive to price changes than are adults. They employed 1992-1994 Monitoring the Future Surveys of 8^{th}, 10^{th}, and 12^{th} graders in their investigation. They estimated a total price elasticity of demand for individuals mostly aged 12 –18 centered of –1.31. Based on the 1994 Monitoring the Future data, Chaloupka and Pacula (1998) reported a total price elasticity of cigarette demand to be –1.141.

More recently, Tauras and Chaloupka (1999) employed the longitudinal component of the Monitoring the Future Surveys to estimate the impact of price on young adult smoking. Using an individual-level fixed effects model, they conclude that the total price elasticity of demand for young adults is centered on –0.79. Moreover, Harris and Chan (1999) used the 1992-1993 Tobacco Use Supplement of the Current Population Survey to estimate the impact of price on smoking by various age groups. Their estimated price elasticities ranged from –0.996 for individual's aged 15-17 to –0.329 for individual's aged 27-29. In addition, using multiple data sets, Gruber (2001) concludes that older teens (approximately 17-18 years of age) are quite sensitive to price changes with an estimated price elasticity of demand of –0.67. However, he finds price to have an insignificant impact on younger teens (approximately 13-16 years of age) smoking.

Finally, Evans and Huang (1998) estimated a prevalence elasticity of –0.20 for high school seniors using annual state-level measures of smoking prevalence for high school seniors employing the 1977-1992 Monitoring the Future Surveys. However, when only the second half of the data was employed (1985-1992), the prevalence elasticity was estimated to be –0.50.

In contrast to much of the evidence presented above, Wasserman et al. (1991) found insignificant effects of prices on the amount smoked by young smokers. This study was based on a sample of 1,891 youths and the results were attributed to a positive correlation between cigarette prices and state tobacco control policies that were included in the study. However, based on a much larger sample, Chaloupka (1991) similarly found young adults to be less price sensitive compared to older age groups.

Most recently, Ross and Chaloupka (2002) analyzed a youth-specific cigarette price and its effect on smoking behavior among high school students. Previous studies of youth cigarette demand have used price measures relevant for an average smoker, which differs from a youth smoker by smoking intensity, brand choices, and by point-of-sale choices. The results based on their youth specific price measure suggest that youth may be even more price-responsive than previously thought.

While numerous studies of the effects of price on cigarette smoking have been completed in recent years, very few have examined the impact that other tobacco control policies, have on youth and young adult smoking behavior. Chaloupka and Grossman (1996) found that strong restrictions on smoking significantly reduce both the propensity and intensity with which youth smoke**.** Chaloupka and Pacula (1998) examined the effects of limits on youth access on smoking rates controlling for their enforcement and compliance. They found that most state and local non-tax tobacco control policies did not have statistically significant effects on youth smoking with

the exception of relatively strong restrictions. However, the combined effect of all non-tax policies on smoking participation was significant. Chaloupka and Wechsler (1997), and Tauras and Chaloupka (1999) concluded that strong smoking restrictions significantly reduce both smoking prevalence and average daily cigarette consumption among young adults.

Indeed, much has been learned over the past few decades about the effects of cigarette prices on smoking behavior. In general, the single most consistent conclusion from the economic literature on the demand for cigarettes is that consumers react to price changes according to general economic principles – an increase in cigarette prices leads to a decrease in the propensity of smoking and the intensity with which smoker's smoke. Further, recent evidence suggests that tobacco control policies are likely to play an important role in youth smoking behavior. However, while such research provides evidence on the overall price/policy effects on youth smoking, it does not allow us to distinguish the between the direct price/policy effects and the indirect price/policy effects that may operate through the peer effect, referred to as the social multiplier. Our research will build on the current body of economic smoking literature to incorporate the importance of peer effects into the analyses of the determinants of youth smoking behavior.

2. B. Theory of Peer Effects

As noted in the introduction, a growing body of literature suggests that social interactions may be important determinants of many youth behavioral outcomes based on the notion that the utility that an individual receives from pursuing a given activity depends on the actions of the other individuals in the person's reference or peer group. That is, the net benefit of consuming a given good increases with other individuals' consumption of the same good. Hence, the question at hand becomes whether the average behavior in a group affects the behavior of the individuals

in that particular group. It is hypothesized that an increase in the prevalence of a given behavior at the peer level may lead to an increased probability of such behavior (such as crime, educational outcomes, teen pregnancy, substance use, etc.) at the individual youth level. (Manski, 1993, 1995; Becker, 1996; Brock and Durlauf, 2001; Glaeser and Scheinkman, 2001).

Manski (1993 and 1995) demonstrates that the observance of social interactions may be explained by three hypotheses. He shows that only one of these hypotheses gives rise to social multiplier effects and, as will be explained, this has important policy implications.

According to Manski's first hypothesis, the propensity of an individual to engage in a given activity is influenced by the peer group's behavior of this activity which he labels as "endogenous" effects (we refer to it as the causal effect). This is the effect that we are interested in isolating. In our study, this would mean that the individual's smoking behavior is affected by the average smoking behavior of his or her peer group. In this instance, changes in peer group behavior directly influence individual behavior and, hence, give rise to the possibility of social multipliers. That is, any exogenous shock (i.e. a policy change) that reduces the probability of smoking will have a social multiplier effect through the peer effect.

Next, Manski hypothesizes that the propensity of an individual to behave in a given way varies with the exogenous characteristics of the reference peer group, which he refers to as "contextual" effects. For example, this suggests that it may be possible that a given activity is affected not directly by the average group activity but that some exogenous characteristic of that group is directly affecting the individual behavior. This is unlikely in the study of youth smoking of high school students. For example, it is unlikely that the education level of the individual's high school peer group's parents directly affect the individual's smoking behavior but rather it is likely only to have an indirect effect via its effect on the peer group's smoking behavior. Under

contextual influences, any exogenous policy shocks that may reduce peer smoking would not be expected to have a multiplying effect on the individual's smoking behavior.

Finally, Manski discusses the possibility that we observe individuals behaving in the same manner as their peer group based on the fact that they have similar unobserved characteristics which he refers to as the "correlated" effects. Indeed, parents may self-select themselves into particular areas. That is, families may endogenously sort themselves across neighborhoods or school districts. In the context of the study of peer effects on youth smoking, if we do not control for the fact that there may exist correlation in the unobservable characteristics of the individual and his or her peer group, our peer effects estimates will tend to be biased upwards.

Overall, this body of literature makes a clear case for examining the importance of peer effects in the behavioral decisions among youth to smoke, but at the same time highlights the importance of identifying the peer effect in order to establish a causal effect.

2. C. Empirical Smoking Demand Literature with Peer Effects

There are a limited number of studies that examine the importance of peer effects as a determinant of youth smoking behavior in an econometric framework. And, unfortunately, these studies do not incorporate the price of cigarettes or any tobacco control policies in their study of youth cigarette demand. They do, however, find that youth smoking is sensitive to the prevalence of smoking among peer groups.

Norton, Lindrooth and Ennett (1998) draw on the 1990 DARE programme survey data to examine the effects of peer substance use on adolescent alcohol and tobacco use defining their peer group based on the behavior of adolescents living in the same neighborhood. Unfortunately, their data set does not permit them to define a more proximal peer group. The authors estimate

both a single equation probit model (assuming the peer effect is exogenous) and a two-stage instrumental variable model to account for the potential endogeneity of the peer effect that may result from the endogenous sorting of households. The authors do not explicitly address the potential endgeneity that may arise due to the correlation in the individual error terms given that the individual may also affect peer behavior. The authors specify the probability that the youth smokes to be a function of the peer smoking measure, youth characteristics, parental characteristics, and neighborhood characteristics. In their two-stage model they include six instrumental variables to identify the peer effect. The instrumental variables used are racial diversity, population density, student-teacher ratio, neighborhood attachment, safety, and drug availability. Based on their exogeneity tests they report that they find that their peer substance use variables do not suffer from endogeneity and hence the relevant results are those based on the single probit models. Within their analyses, the authors implicitly make the reasonable assumption that no "contextual effects" (as defined by Manksi) exist in their model. Their results reveal that peer smoking has a strong positive effect on adolescent smoking: a change in peer smoking use by 10 percentage points is found to increase the probability of youth smoking by approximately 10 percentage points, significant at the 1% level.

Gaviria and Raphael (2001) draw on a sample of tenth graders from the 1988 National Educational Longitudinal Survey to examine the importance of peer-group influences on the likelihood of engaging in a variety of activities including smoking. The authors define the peer group measure for individual *i* as the proportion of students in the school who smoke (excluding the behavior of individual *i*). Based on the assumption that "contextual" effects (as defined by Manski) do not exist, the authors rely on the average background characteristics of individual *i*'s peers as identifiers in a two-stage least squares estimation procedure to account for the potential

endogeneity of the peer smoking measure that may arise due to the fact that individual error terms may be correlated with the peer measure. The authors also estimate an ordinary least squares model assuming that the peer measure is exogenous. However, it would have been more appropriate for the authors to implement probit models versus OLS regression in both their single and two-stage estimation procedures based on the dichotomous nature of their dependent variables. The authors do not deal directly in their two-stage estimation method with the potential endogeneity that may result from the endogenous sorting of households. However, they undertake sensitivity analyses providing separate estimates for families who have recently moved versus those who have not to gauge the extent of this potential source of bias. In these sensitivity analyses they find evidence of bias for two of their five activities (drug use and alcohol drinking) but not for smoking. Their results suggest that if you move a student from school where no student smokes to a school where 50% of the students smoke, the probability that the student will smoke will significantly increase by about 8 percentage points.

Our study builds on the pioneering work by Norton, Lindrooth and Ennett (1998) and Gaviria and Raphael (2001). In their examination of youth smoking behavior, these two studies were the first to incorporate peer-group effects as determinants of youth smoking behavior in an econometric framework. Unfortunately, they did not incorporate price and policy measures and, hence, their results are likely to overestimate the peer effect (confounding the price and policy effects within their peer measures). These two papers do not permit us to draw public policy inferences with respect to the effect (both the direct effect and the indirect effect via the social multiplier of the peer effect) of changes in prices (taxes) and tobacco control policies on the smoking behavior of youths.

3. Methodology

3. A. Framework and Hypotheses

This paper evaluates the importance of peer effects on the smoking behavior of youths. Our goal is to expand the standard empirical economic model of the determinants of youth smoking to simultaneously incorporate the importance of cigarette prices and tobacco control policies, and peer effects. Further, within our analyses it is important to implement appropriate econometric models to account for the potential endogeneity of our peer effect measure so that we can establish a causal relationship between peer smoking behavior and individual smoking behavior.

Traditional empirical behavioral models for examining the determinants of cigarette smoking are based on the economic theory of demand. In the derivation of the cigarette demand equation, it is assumed that an individual's utility is a function of the consumption of cigarettes and other goods, and tastes. An individual is assumed to maximize utility subject to a budget constraint that is comprised of the price of cigarettes, the prices of other goods, and income. Based on this utility maximization process, the cigarette demand equation is hypothesized to be a function of the price of cigarettes, prices of other goods, income, and variables that govern individual tastes (typically reflected by demographic variables). It should be noted here that the price of cigarettes is assumed to incorporate the "full price" of consumption. The "full price" includes both the direct monetary costs (prices inclusive of excise taxes) and indirect costs associated with obtaining and consuming cigarettes (for example, policies related to possession such as minimum legal purchase age restrictions and prohibitions on sale).

While traditional economic models of smoking behavior emphasize price and income, a growing body of literature suggests that social interactions may be important determinants of

consumption patterns. That is, is it hypothesized that an increase in the prevalence of a given behavior at the peer level may lead to an increased probability of such behavior at the individual youth level. In particular, if more peers smoke, then a given individual is more likely to smoke, all else equal.

Hence, we examine the determinants of smoking among youths incorporating the importance of peer influences and allowing cigarette prices (taxes) and other tobacco control policies to have a direct effect and an indirect effect (via the peer effect) on smoking behavior. Controlling for the endogeneity of our peer effect measure, we hypothesize that higher levels of peer smoking behavior will increase the probability of individual youth smoking. We hypothesize that our price and tobacco control policies will have a negative impact on the probability of youth smoking, both directly and indirectly via the peer effect. The results from our empirical model have strong policy implications related to both cigarette tax policy and other tobacco control policies. Further, based on our estimation results, we are able to quantify the social multiplier effect of policy changes that operate through the peer effect.

3. B. Data

To undertake our analyses, we draw on the Audits & Surveys (A&S) 1996 survey data of high school students across the United States from "The Study of Smoking and Tobacco Use Among Young People" as our primary data set. In the A&S survey, a total of 17,287 high school students, from 202 public, private, and parochial high schools, were interviewed between March and July 1996. The high school survey is a nationally representative random sample. All questionnaires were self-administered and respondents were assured of anonymity and confidentiality of their responses. In addition to the teen survey, there also exists a short school administrator survey component providing information on school rules related to smoking. These

are very rich data, including detailed information on individual smoking behavior, student and parental demographics, and school identifiers (which allows one to generate a school-based peer smoking measure). Let us now describe the variables used in this study in terms of our dependent variable of interest, peer measure, and other control variables. Following that, we will describe the external price and policy data and our identifying variables that we have merged with the A&S data set.

Dependent Variable: Our measure of youth smoking participation among high school students is constructed as a 0-1 dichotomous indicator of smoking participation based on the answer to the question: "Think about the last 30 days. On about how many of those days, if any, did you smoke?". Based on an answer to this question that indicated smoking any amount on one or more days in the last 30 days, the student qualified as a current smoker.

Peer Effect Measure: Within our analyses we define a school-based peer smoking measure. Our school-based peer measure for each student is constructed as the prevalence of smoking at the individual student's school not including the given individual in the calculation. That is, for each student the prevalence of school-based peer smoking is the average prevalence of smoking among all other respondents at their school.

Control variables: The A&S survey collected a variety of demographic and socioeconomic data. Several potential determinants of youth cigarette smoking have been constructed from these data. Our control variables include: the age of the respondent; his/her gender; race and ethnicity (African American, Hispanic, Asian, White, other [includes also American Indians]); family structure (live alone, live with parents, live with others not including parents); parental education (some high school or less, completed high school, business/technical/professional school, some college, completed college, graduate/professional

school after college); completeness of the family (parents are married, separated, divorced, both deceased, father deceased, mother deceased); how often the student talks with the parents/adults in their home about what they have done during the day (less than once a week, once a week, a few times a week, almost every day); frequency of participation in religious services (frequent participation, infrequent participation, no participation); and, urbanization status (living in a city, in a suburb, in a village/town). And, from the School Administrator survey, we control for what restrictions the school has on cigarette smoking (ban on smoking).

External Price, Policy and Identifying Variables

In addition to the data collected by the A&S survey, a number of other variables from external data sources are utilized in our analyses. These variables include cigarette prices, tobacco control policies, and variables to be used as identifiers to account for the potential endogeneity of the school-based peer effects. Some of these variables are available on a state level, and some on local levels. These various measures are merged with our A&S data set based on state, county, and city identifiers as appropriate.

Price Measure: We have merged the state level average price (in cents) for a pack of cigarettes recorded from the Tax Burden on Tobacco as published by the Tobacco Institute. It is computed as the weighted average of a single pack, carton, and vending machine cigarette prices, including state excise taxes. Prices of both branded and generic cigarettes are used in the average.

Tobacco Control Policies: We have merged in a refined tobacco youth access index based on the measure developed by Alciati, et al. for the National Cancer Institute, as modified by Gruber and Zinman. This index captures the extensiveness and comprehensiveness of state policies aimed at reducing youth access to tobacco products. Twelve separate restrictions

comprise the youth access index variable including minimum age of purchase, packaging, clerk intervention, photo identification, vending machine availability, free distribution of samples, graduated penalties, random inspections, statewide enforcement, advertising, licensing, and restrictions on minors. Each of these restrictions takes on a value of between either 0-4 or 0-5 depending on the strength of the regulation. Summing up the ratings for each of the twelve restrictions and subtracting two points in the various components of the index if states preempt stronger local actions derives the youth access index.

External Socioeconomic Variables: To control for the endogenous sorting of households across areas, we have merged in local socioeconomic variables with the A&S data . We draw on U.S. Census Bureau city-level measures of race, hispanic origin, and population density. From the U.S. Census Bureau Small Area Income and Poverty Estimates, we have merged in a county-level measure of median household income.

3. C. Estimation Methods

Following our framework and hypotheses as outlined in section 3.A. and our variable definitions as described in section 3.B., our empirical model will examine the effect of peer smoking on the probability of individual youth smoking. In our empirical analyses, we incorporate our peer smoking measure into the standard economic model of demand that includes the effects of cigarette prices, tobacco control policies, and demographic variables on the probability of smoking among high school students. Further, within our analyses, we also control for school-level factors such as school-based restrictions on smoking. Without controlling for school-based smoking policies, the peer effect measures may confound differences in such policies. We are also able to control for the extent to which parents/adults in the household discuss the days events with the student – this variable will help to control for

differences in parental preferences that may lead to an endogenous sorting across school district areas.

We begin by specifying a model of school-based peer effects where the probability of individual youth smoking by student *i* at school *s*, S_{is} (a 0-1 dichotomous indicator for smoking participation), is given by:

$$S_{is} = b_0 + b_1 P_{is} + b_2 X_{is} + b_3 R_s + b_4 C_{is} + e_{is} \qquad (1)$$

where P_{is} defines our school-based peer measure for individual *i* attending school *s* as the proportion of individuals in school *s* excluding individual *i* who smoke, X_{is} is a vector of personal and family characteristics, R_s is a vector of school characteristics, and C_{is} is a vector containing cigarette prices and tobacco control policies.

In the empirical estimation of equation 1, it is important to consider two potential sources of endogeneity that may bias our results if we were to estimate equation 1 directly assuming P_{is} is exogenous. First, we must account for the fact that the individual himself can affect the behavior of his peers, while at the same time his peers affect his own behavior. Hence, in this first source of endogeneity, the individual's error term and that of his peer group may be correlated. The second potential source of endogeneity refers to Manski's "correlated" effects where individuals may behave in the same manner as their peer group based on the fact that they have similar unobserved characteristics. In the context of our specification, families may endogenously sort themselves across neighborhoods or school districts. And, if we do not control for the fact that there may exist correlation in the unobservable characteristics of the individual and his or her peer group, our peer effect estimate will tend to be biased upwards.

Hence, to control for the potential existence of endogeneity between our peer measure and our dependent variable of youth smoking, we estimate a generalized least squares model.

Specifically, we will implement Amemiya's Generalized Least Squares (AGLS) estimator for a dichotomous dependent variable. In this model, the endogenous regressor (in our case, the peer smoking measure) is treated as a linear function of the instruments and the other exogenous variables (Newey, 1987). The AGLS estimation procedure requires the inclusion of identifying variables that are an exogenous source of variation in our peer smoking measure but do not directly affect individual smoking behavior. If there exist no contextual effects (that is, that the background characteristics of an individual's peer group do not have a direct effect on his/her smoking behavior but only indirectly through their impact on peer smoking behavior), we can use the average of the peer group's measure of characteristics X_{is} as a set of identifying instruments. Further, to control for our second source of endogeneity, namely the endogenous sorting of households, we use our Census measures (local area measures of racial diversity, population density, medium household income, and poverty) as identifying instruments.[1] Within our AGLS estimation procedure, we will formally test the exogeneity of our peer smoking measure using the Smith and Blundell (1986) exogeneity test and we will test the validity of our instruments based on the Davidson and MacKinnon (1993) over-identification test.

In the next section, we present a full set of results for all of our covariates based on three alternative models: Model 1, a probit model that assumes that the peer effect measure is exogenous; Model 2, an AGLS estimator that accounts for the potential endogeneity of the peer effect measure; and, Model 3, a standard youth smoking model that does not account for peer effects. Further, as a comparison to the existing peer effects smoking literature, we will

[1] Norton, Lindrooth and Ennett (1998) use a two-stage method including area-related identifiers to control for the endogenous sorting of households but they do not explicitly account for the potential reverse causality of the smoking behavior between individuals and their peer group. Gaviria and Raphael (2001) use a two-stage method that assumes the absence of contextual effects and uses the average background characteristics of the individual's peer group as identifiers to control the reverse causality but they do not explicitly account for the endogenous sorting of households.

undertake sensitivity analyses to gauge the potential bias of peer effect estimates based on a model that fails to account for cigarette prices and tobacco control policies.

4. Results

Table 2 presents the probit (Model 1) results in the first column and the AGLS (Model 2) results of our peer effects model of youth smoking in the second column. In the final column of Table 2, for comparative purposes, we present probit results of a corresponding youth smoking model that does not account for peer effects (Model 3).

The results based on our probit model assume that the peer effect measure is exogenous, while our AGLS estimation procedure accounts for the endogenous sorting of households and the fact that while peers may influence individual behavior, individual behavior may also influence peer behavior. We begin our discussion by highlighting the fact that the point estimates for our peer measure and control variables between the probit model and the AGLS model as revealed by the reported marginal effects are very similar. This suggests that the endogeneity bias in estimating our peer effects model using a simple probit model is minimal. More formally, we fail to reject the exogeneity of our peer smoking measure based on the results from our Smith-Blundell exogeneity test.[2]

Given that we find that our peer smoking measure is not endogenous, using a two-step model to control for endogeneity versus a single stage probit model is not worth the loss in mean squared error. However, we do draw on the results of our two-stage model to draw out the indirect effects of certain variables that operate through the peer effect. The validity of our

[2] Under the null hypothesis of the Smith-Blundell exogeneity test, the model is appropriately specified with all explanatory variables as exogenous. Under the alternative hypothesis, the suspected endogenous variable (in this case, our school-based peer smoking measure) is expressed as a linear projection of a set of instruments. The residuals from the first-stage regression are added to the model and, under the null hypothesis, they should have no explanatory power. (Smith and Blundell, 1986). The Smith-Blundell test statistic for exogeneity is 0.0365 Chi-sq(1) with a P-value of 0.8486.

results based on the AGLS model and the exogeneity test performed on this model is dependent on the validity of our instrumental variables. We support the validity of our choice of identifying variables based on several diagnostics. First, the t-tests on our instrumental variables confirm that they are correlated with the suspected endogenous variable in the first-stage regression. Second, based on a 2SLS model, we implemented the Davidson and MacKinnon (1993) over-identification test which further confirms the validity of our instruments.[3] And, finally, the explanatory power of the first-stage regression is sufficiently large (R-sqaured of 0.4469) such that we are not replacing the peer measure in the second stage with a noisy measure.

From Table 2, the reported marginal effect of the impact of our peer smoking behavior on individual smoking behavior from our probit model is only slightly higher at 0.5573 compared to the marginal effect based on our AGLS model of 0.5385. Both results are significant at the 1% level, suggesting that peer influences play a key role in youth smoking behavior. Based on the results from our probit model, Model 1, a 10% increase in peer smoking levels would result in a 5.5% increase in probability of smoking by individual youths. Our estimates imply that moving a high-school student from a school where no children smoke to a school where one half of the kids smoke would increase the probability that he or she smokes by about 28 percentage points.

As a comparison to the existing smoking peer effects literature, we undertake sensitivity analyses to gauge the potential bias that may occur due to the variable omission of cigarette prices and tobacco control polices in the peer effects model. Our results show that this omission leads to an over-estimate of the effect of peer influences on youth smoking participation. Re-estimating Model 1 without including cigarette prices or tobacco control policies yields a marginal effect for the peer measure of 0.6176 compared to our reported value for Model 1 of 0.5573.

[3] The over-identification Chi-squared test statistic is 40.389 Chi-sq(32) with a P-value of 0.1467.

Turning to the results of the impact of cigarette prices on youth smoking, the results from Table 2 reveal that youth smoking models that do not account for peer effects over-estimate the direct impact of cigarette prices on individual youth smoking behavior. From Table 2, we see that the marginal effect of cigarette prices on youth smoking is –0.0008 for Model 3 (without the inclusion of a peer measure) versus -0.0005 for Models 1 or 2 that include peer effects.

The results based on our AGLS estimation model (Model 2) allow us to disaggregate the price elasticity of youth smoking participation into a direct effect and indirect effect (that operates through the peer effect). Table 3 shows that based on a youth smoking participation model that does not account for peer influences, the total price elasticity of youth smoking participation is estimated to be –0.4940 which is in the mid-range of estimates found in the existing literature. Based on the estimation results from the AGLS model, the total price elasticity of youth smoking participation is estimated to be –0.4558. This total price elasticity is comprised of a direct price elasticity measure of –0.3119 and an indirect price elasticity measure that operates through the peer effect of –0.1439. The indirect price elasticity measure reflects the social multiplier effect that will result via peer influences (for example, as a result of any policy such as an increase in taxes that, in turn, increases the price of cigarettes). Hence, the results from our AGLS model allow us to disaggregate the price elasticity into a direct and indirect measure and also reveal that empirical models of youth smoking behavior that do not account for peer influences tend not only to over-estimate the direct price elasticity but also to slightly over-estimate the total price elasticity of youth smoking participation at -0.4940 versus –0.4558.

Similarly, for our youth access tobacco control policy measure, our results reveal that this policy measure has a significant impact on youth smoking behavior indirectly via the peer effect. Table 2 reveals that the direct marginal effect of higher limits for youth access to tobacco

significantly reduces individual youth smoking by –0.0052 in Model 3 (without accounting for the peer effect) versus a significant direct effect of approximately only –0.0027 in Models 1 and 2 (accounting for peer effects). Indeed, turning to Table 4, we see that the youth access policy measure significantly reduces the level of peer smoking which, in turn, has an indirect effect of reducing individual youth smoking participation.

Looking at differences across our models in the effect of our school-level smoking policy variable also yields an interesting comparison. Without accounting for peer effects, the results from Model 3 suggest that a school ban on smoking significantly reduces the likelihood of smoking participation by about 5%. However, controlling for peer influences, the results from Model 2 suggest that the impact on youth smoking participation of a school ban on smoking operates through the peer effect. Table 2 shows that once we control for peer influences, the school ban on smoking variable no longer has a significant direct affect youth smoking. Our two-stage estimation procedure reveals that the effect of school bans on individual smoking behavior operates indirectly via the peer effect: Table 4 shows that a school ban on smoking significantly reduces peer smoking levels.

We now turn to the impact of the remainder of our control variables on youth smoking participation focussing our discussion on the results from Model 1 (probit model including peer effects). From the first column of Table 2, the results of the students' personal characteristics show that older students are significantly more likely to smoke but that there are no significant gender differences in smoking participation. Consistent with the youth smoking literature, significant differences are found by race. African American, Hispanic, and Asian youths are significantly less likely to smoke compared to their white counterparts by approximately 19%,

4%, and 11%, respectively. Students who attend religious services at least weekly are about 8% less likely to smoke, while students who live alone are almost 20% more likely to smoke.

With respect to the parental variables, we find that the education level of neither the mother nor father has a significant effect on youth smoking participation, with the exception that youths with mothers who complete high-school versus mothers who have not completed high-school are slightly (3%) more likely to smoke. This may be attributed to the fact that mothers with high-school education compared to those without are more likely to work outside the home (and, hence, may be unable to monitor behavior). However, counter to this line of reasoning, our results show that having a mother with an education level higher than high-school does not significantly affect smoking behavior. The insignificant results for higher levels of education may be a result of the potential negative effect of having a mother work outside the home offset by the increased information on the negative health outcomes from smoking that may be transmitted more rigorously by more highly educated parents to their children. The marital status, however, of the students' parents is found to play a significant role in the smoking status of the youths. Student's with parents who are divorced, separated, or who have one deceased parent are 8-9% significantly more likely to smoke compared to their counterparts with married parents.

Finally, the extent to which parents or another adult in the household engage in discussions with youths about what they have done during the day significantly reduces the likelihood that they smoke. The increasing frequency of such discussions defined by once a week, a few times a week, or almost every day compared to less than once a week, significantly reduces the probability of youth smoking participation at an increasing rate of 4%, 6%, and 10%, respectively.

5. Conclusions

This paper has offered new evidence on the determinants of youth smoking behavior by jointly examining the importance of cigarette prices, tobacco control policies, and peer influences. The key finding is that peer effects play a significant role in youth smoking decisions. Our results show that moving a high-school student from a school where no children smoke to a school where one half of the kids smoke would increase the probability that he or she smokes by about 28 percentage points.

Our sensitivity analyses suggest that failing to include cigarette prices and/or tobacco control policies in the peer effects model leads to an over-estimate the magnitude of the peer effect. Further, we showed that empirical models of youth smoking behavior that do not account for peer influences tend not only to over-estimate the direct individual price elasticity but also to slightly over-estimate the total price elasticity of youth smoking participation.

We provided a rigorous set of analyses to demonstrate the importance of obtaining unbiased results based on the potential endogeneity of our peer smoking measure. Within our AGLS estimation procedure, we validated our set of identifying variables based on a series of specification tests and, in turn, found that our peer measure was exogenous.

Finally, we showed that cigarette prices and tobacco control policies significantly impact youth smoking behavior both directly and indirectly via the peer effect. Our results revealed a strong potential for social multiplier effects with respect to any exogenous changes in cigarette taxes or tobacco control policies.

References

Aaronson, Daniel (1998). Using Sibling Data to Estimate the Impact of Neighborhoods on Children's Educational Outcomes. *Journal of Human Resources* 33(4): 915-946.

Anderson, Elijah (1991). Neighborhood Effects on Teenage Pregnancy. The Urban Underclass edited by Christopher Jencks and Paul Peterson. Washington D. C., Brookings Institution.

Becker, G. (1996). *Accounting for Tastes* (Cambridge:Harvard University Press).

Borjas, George (1994). Ethnicity, Neighborhoods, and Human Capital Externalities. *American Economic Review* 85(3): 365-390.

Brock, William A. and Steven N. Durlauf (2001). Discrete Choice with Social Interactions. *Review of Economic Studies,* 68: 235-260.

Case, Anne C. and Lawrence F. Katz (1991). The Company You Keep: The Effects of Family and Neighborhood on Disadvantaged Youths. NBER Working Paper 3705.

Chaloupka, Frank J. (1991). Rational Addictive Behavior and Cigarette Smoking. *Journal of Political Economy*, 99: 722-742.

Chaloupka, Frank.J., and Michael Grossman (1996). Price, Tobacco Control Policies, and Youth Smoking, NBER Working Paper 5740.

Chaloupka, Frank J. and Rosalie L. Pacula (1998). Limiting Youth Access to Tobacco: The Early Impact of the Synar Amendment on Youth Smoking, Presented at the 3rd Pacific Rim Allied Economic Organizations Conference, January, 1998, and the Second Annual Chicago & Great Lakes Health Services Research Symposium, March 1998.

Chaloupka, Frank J. and Kenneth E. Warner (2000). *The Economics of Smoking.* In the Handbook of Health Economics, Joseph P. Newhouse and Anthony J. Cuyler (eds.). New York: North-Holland.

Chaloupka, F.J., and H. Wechsler (1997). Price Tobacco Control Policies and Smoking among Young Adults, *Journal of Health Economics,* 16(3): 359-373.

Crane, Jonathan (1991). The Epidemic Theory of Ghettos and Neighborhood Effects on Dropping Out and Teenage Childbearing. *American Journal of Sociology,* 96(5): 1226-1259.

Davidson, Russel and James G. MacKinnon (1993). *Estimation and Inference in Econometrics.* New York: Oxford University Press.

Evans, W. N. and L. X. Huang (1998). Cigarette Taxes and Teen Smoking: New Evidence from Panels of Repeated Cross-Sections. Presented at the 1998 American Economics Association Annual Meeting, Chicago, IL.

Evans, William N., Wallace E. Oates and Robert M. Schwab (1992). Measuring Peer Group Effects: A Study of Teenage Behavior. *Journal of Political Economy* 100(5): 966-991.

Gaviria, Alejandro and Steven Raphael (2001). School-Based Peer Effects and Juvenile Behavior. *The Review of Economics and Statistics*, 83(2): 257-268.

Glaeser, Edward L., Bruce Sacerdote, and Jose A. Scheinkman (1996). Crime and Social Interactions. *The Quarterly Journal of Economics*. 111(2): 507-548.

Glaeser, Edward L. and Jose A. Scheinkman (2001). Measuring Social Interactions. In Social Economics eds., Durlauf and Young, (Cambridge: MIT Press) pp. 83-102.

Gruber, Jonathan (2001). Youth Smoking in the United States: Evidence and Implications. In *Risky Behavior Among Youths* J. Gruber (ed.) Chicago: University of Chicago Press.

Hanushek, Eric A., John F. Kain, Jacob M. Markman, and Steven G. Rivkin, (2002). Do Peers Affect Student Achievement? Forthcoming. *Journal of Applied Econometrics.*

Harris, J. E. and S. W. Chan (1999). The Continuum-of-Addiction: Cigarette Smoking in Relation to Price Among Americans Aged 15-29. *Health Economics,* 8(1): 81-86.

Kremer, Michael and Dan M. Levy (2002). Peer Effects from Alcohol Use Among College Students. Working paper.

Lewit, E.M., D. Coate, and M. Grossman (1981). The Effects of Government Regulation on Teenage Smoking. *Journal of Law and Economics*, 24: 545-69.

Manski, Charles F. (1993). Identification of Endogenous Social Effects: The Reflection Problem. *Review of Economic Studies*, 60: 531-542.

Manski, Charles F. (1995). *Identification Problems in the Social Sciences*, (Cambridge: Harvard University Press).

National Cancer Institute (1993). *The Impact of Cigarette Excise Taxes on Smoking Among Children and Adults: Summary Report of A National Cancer Institute Expert Panel,* Bethesda, Maryland: National Cancer Institute, Division of Cancer Prevention and Control, Cancer Control Science Program.

Newey, W. (1987). Efficient Estimation of Limited Dependent Variable Models With Endogenous Explanatory Variables. *Journal of Econometrics.* 36:231-250.

Norton, Edward. C., Richard C. Lindrooth, and Susan T. Ennett (1998). Controlling for the Endogeneity of Peer Substance Use on Adolescent Alcohol and Tobacco Use. *Health Economics*, 7: 439-453.

Ross, Hana and Frank J. Chaloupka (2002). The Effect of Cigarette Prices on Youth Smoking. *Health Economics*, in press.

Ross, Hana, Frank J. Chaloupka, and Melanie Wakefield (2002). Youth Smoking Uptake Progress: Price and Public Policy Effects. ImpacTeen Reports Paper Series.

Sacerdote, Bruce (2000). Peer Effects With Random Assignment: Results For Dartmouth Roommates. NBER Working Paper 7469.

Sah, Raaj K. (1991). Social Osmosis and Patterns of Crime. *Journal of Political Economy*, 99(6): 1272-1294.

Smith, Richard J. and Richard W. Blundell (1986). An Exogeneity Test for A Simultaneous Equation Tobit Model With An Application To Labor Supply. *Econometrica* 54: 679-686.

Tauras, John A. and Frank J. Chaloupka (1999). Price, Clean Indoor Air Laws, and Cigarette Smoking: Evidence from Longitudinal Data for Young Adults, NBER Working Paper 6937.

US Department of Health and Human Services (1994). *Preventing Tobacco Use Among Young People*: *A Report of the Surgeon General.* Atlanta Georgia: Public Health Service, Center for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

US Department of Health and Human Services (2000). *Reducing Tobacco Use*: *A Report of the Surgeon General.* Atlanta Georgia: Public Health Service, Center for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

Wasserman, Jeffrey, Willard G. Manning, Joseph P. Newhouse and John D. Winkler (1991). The Effects of Excise Taxes and Regulations on Cigarette Smoking. *Journal of Health Economics* 10(1): 43-64.

Table 1: Summary Statistics

Variables:	Full Sample	Smokers	Non-Smokers
Smoked in the last 30 days	0.2870	-	-
Peer Measure	0.2870	0.3156	0.2755
	(0.105)	(0.103)	(0.104)
Cigarette Price	187.90	186.41	188.55
	(21.626)	(22.51)	(21.23)
Youth Access Measure	14.20	13.48	14.49
	(5.839)	(5.790)	(5.834)
School ban on smoking	0.9618	0.9591	0.9628
Age	16.21	16.37	16.15
	(1.200)	(1.198)	(1.195)
Male	0.4672	0.4833	0.4607
Race:			
White	0.5909	0.6984	0.5477
Black	0.1284	0.0554	0.1578
Hispanic	0.1915	0.1705	0.1999
Asian	0.0393	0.0243	0.0453
Other race	0.0499	0.0514	0.0493
Living Arrangement:			
Living with parents	0.9656	0.9609	0.9675
Not living with parents	0.0312	0.0333	0.0303
Living alone	0.0032	0.0058	0.0022
Frequency of Religious Service Attendances:			
None	0.1546	0.1846	0.1425
Few Times A Year	0.4354	0.4978	0.4102
More Than Once A Week	0.4100	0.3175	0.4472
Parents' Education Level:			
Father with some high-school	0.1602	0.1618	0.1596
Father complete high-school	0.2925	0.3099	0.2855
Father with some college	0.1807	0.1684	0.1857
Father complete college	0.2329	0.2274	0.2351
Father with post-college education	0.1337	0.1325	0.1342
Mother with some high-school	0.1467	0.1401	0.1494
Mother complete high-school	0.3184	0.3469	0.3069
Mother with some college	0.1953	0.1879	0.1983
Mother complete college	0.2349	0.2274	0.2380
Mother with post-college education	0.1046	0.0978	0.1074
Parents' Marital Status:			
Married	0.6692	0.6148	0.6911
Never married	0.0416	0.0315	0.0458
Separated	0.0482	0.0532	0.0462
Divorced	0.2045	0.2610	0.1817
Parents deceased	0.0017	0.0025	0.0013
Father deceased	0.0258	0.0268	0.0254
Mother deceased	0.0090	0.0103	0.0086
Household Location:			
Living in a village	0.2716	0.2933	0.2629
Living in the city	0.4674	0.4345	0.4806
Living in the suburbs	0.2610	0.2723	0.2565
Discussion with Parents on Daily Issues:			
Less than weekly	0.1441	0.1691	0.1341
Once a week	0.0769	0.0844	0.0739
A few times a week	0.2580	0.2600	0.2572
Almost everyday	0.5210	0.4866	0.5348
Sample Size	9624	2762	6862

Note: Standard deviations are shown in brackets for non-dummy variables.

Table 2: Marginal Effects for Youth Smoking Outcomes

Variables:	Model 1: Probit Model (With Peer Measure)	Model 2: AGLS Two-Stage Peer Model	Model 3: Probit Model (Without Peer Measure)
Peer Measure	0.5573*** (0.050)	0.5385*** (0.094)	-
Cigarette Price	-0.0005** (0.0002)	-0.0005** (0.0002)	-0.0008*** (0.0002)
Youth Access Measure	-0.0026*** (0.001)	-0.0027*** (0.001)	-0.0052*** (0.001)
School-ban on smoking	-0.0167 (0.026)	-0.0177 (0.026)	-0.0501* (0.027)
Age	0.0285*** (0.004)	0.0285*** (0.004)	0.0305*** (0.004)
Male	-0.0079 (0.009)	-0.0078 (0.010)	-0.0068 (0.009)
Black	-0.1886*** (0.011)	-0.1888*** (0.012)	-0.2129*** (0.010)
Hispanic	-0.0410*** (0.013)	-0.0416*** (0.014)	-0.0611*** (0.013)
Asian	-0.1114*** (0.020)	-0.1116*** (0.020)	-0.1201*** (0.020)
Other race	-0.0126 (0.021)	-0.0129 (0.021)	-0.0269 (0.020)
Not living with parents	0.0158 (0.028)	0.0155 (0.028)	0.0089 (0.027)
Living alone	0.1964** (0.092)	0.1958** (0.092)	0.1960** (0.092)
Religious services: few annual attendance	0.0118 (0.013)	0.0118 (0.013)	0.0094 (0.013)
Religious services: more than weekly	-0.0818*** (0.014)	-0.0818*** (0.014)	-0.0830*** (0.014)
Father complete high-school	0.0031 (0.016)	0.0033 (0.016)	0.0075 (0.016)
Father with some college	-0.0159 (0.018)	-0.0158 (0.018)	-0.0133 (0.018)
Father complete college	0.0018 (0.018)	0.0018 (0.018)	0.0034 (0.018)
Father with post-college education	0.0147 (0.022)	0.0148 (0.022)	0.0173 (0.022)
Mother complete high-school	0.0332** (0.017)	0.0332* (0.017)	0.0339** (0.017)
Mother with some college	0.0149 (0.019)	0.0148 (0.019)	0.0128 (0.019)
Mother complete college	0.0200 (0.020)	0.0200 (0.020)	0.0221 (0.020)
Mother with post-college education	0.0074 (0.024)	0.0075 (0.024)	0.0088 (0.024)
Parents never married	0.0415 (0.028)	0.0414 (0.028)	0.0391 (0.028)
Parents separated	0.0796*** (0.024)	0.0794*** (0.024)	0.0785*** (0.024)
Parents divorced	0.0824*** (0.012)	0.0824*** (0.013)	0.0834*** (0.012)
Parents deceased	0.1804 (0.138)	0.1806 (0.138)	0.1863 (0.139)
Father deceased	0.0706** (0.032)	0.0705** (0.033)	0.0702** (0.032)
Mother deceased	0.0887* (0.055)	0.0888* (0.055)	0.0851* (0.054)
Living in the city	0.0146 (0.012)	0.0142 (0.012)	-0.003 (0.012)
Living in the suburbs	0.0110 (0.013)	0.0107 (0.013)	0.0002 (0.013)
Discuss with parents: weekly	-0.0401** (0.019)	-0.0400** (0.019)	-0.0382* (0.019)
Discuss with parents: a few times a week	-0.0641*** (0.014)	-0.0640*** (0.014)	-0.0641*** (0.014)
Discuss with parents: almost everyday	-0.0950*** (0.014)	-0.0948*** (0.014)	-0.0928*** (0.014)

Note: Standard errors are shown in brackets.

Table 3: Price Elasticity of Youth Smoking Participation

Estimation Model	Direct Elasticity	Indirect Elasticity	Total Effect
AGLS Two-Stage Model of Youth Smoking Behavior Including Peer Measure (Model 2)	-0.3119	-0.1439	-0. 4558
Probit Model of Youth Smoking Behavior Without Peer Measure (Model 3)	-0.4940	--	-0. 4940

Table 4: First-Stage OLS Regression Estimate for Peer Smoking
(Results for Selected Instruments, Price and Policy Variables)

Variables:	OLS Estimates
Cigarette Price	-0.0004*** (0.00005)
Youth Access Measure	-0.0032*** (0.0002)
School-ban on smoking	-0.0421*** (0.0055)
Instruments:	
-Proportion of Population Being White	0.0395*** (0.0065)
-Proportion of Population Being Hispanic	-0.0297*** (0.0090)
-Medium Household Income	-0.00008 (0.0001)
-Population Density	3.87e-06*** (3.32e-07)

Note: Standard errors are shown in brackets.

Recent ImpacTeen and YES! Research Papers

Effects of Price and Access Laws on Teenage Smoking Initiation: A National Longitudinal Analysis, Tauras JA, O'Malley PM, Johnston LD, April 2001.

Marijuana and Youth, Pacula R, Grossman M, Chaloupka F, O'Malley P, Johnston L, Farrelly M, October 2000.

Recent ImpacTeen Research Papers

Peer Effects, Tobacco Control Policies, and Youth Smoking Behavior, Powell LM, Tauras JA, Ross H, February 2003.

Assessment of Youth Responses to Anti-Smoking Ads: Description of a Research Protocol, Wakefield M, Balch GI, Terry-McElrath Y, Szczypka G, Clegg Smith K, Ruel E, Flay B, Emery S, July 2002.

Projected Smoking-Related Deaths Among U.S. Youth: A 2000 Update, Hahn EJ, Rayens MK, Chaloupka FJ, Okoli CTC, Yan J, May 2002.

Coding the News: The Development of a Methodological Framework for Coding and Analyzing Newspaper Coverage on Tobacco Issues, Clegg Smith K, Wakefield M, Siebel C, Szczypka G, Slater S, Terry-McElrath Y, Emery S, Chaloupka F, May 2002.

Binge Drinking and Violence among College Students: Sensitivity to Correlation in the Unobservables, Powell LM, Ciecierski C, Chaloupka FJ, Wechsler H, February 2002.

Study Habits and the Level of Alcohol Use Among College Students, Powell LM, Williams J, Wechsler H, February 2002.

Does Alcohol Consumption Reduce Human Capital Accumulation? Evidence from the College Alcohol Study, Williams J, Powell LM, Wechsler H, February 2002.

Habit and Heterogeneity in College Students' Demand for Alcohol, Williams J, January 2002.

Are There Differential Effects of Price and Policy on College Students' Drinking Intensity? Williams J, Chaloupka FJ, Wechsler H, January 2002.

Alcohol and Marijuana Use Among College Students: Economic Complements or Substitutes? Williams J, Pacula RL, Chaloupka FJ, Wechsler H, November 2001.

The Drugs-Crime Wars: Past, Present and Future Directions in Theory, Policy and Program Interventions, McBride DC, VanderWaal CJ, Terry-McElrath, November 2001.

State Medical Marijuana Laws: Understanding the Laws and their Limitations, Pacula RL, Chriqui JF, Reichmann D, Terry-McElrath YM, October 2001.

The Impact of Prices and Control Policies on Cigarette Smoking among College Students, Czart C, Pacula RL, Chaloupka FJ, Wechsler H, March 2001.

Youth Smoking Uptake Progress: Price and Public Policy Effects, Ross H, Chaloupka FJ, Wakefield M, February 2001.

Adolescent Patterns for Acquisition and Consumption of Alcohol, Tobacco and Illicit Drugs: A Qualitative Study, Slater S, Balch G, Wakefield M, Chaloupka F, February 2001.

State Variation in Retail Promotions and Advertising for Marlboro Cigarettes, Slater S, Chlaoupka FJ, Wakefield M, February 2001

The Effect of Public Policies and Prices on Youth Smoking, Ross H, Chaloupka FJ, February 2001.

The Effect of Cigarette Prices on Youth Smoking, Ross H, Chaloupka FJ, February 2001.

Differential Effects of Cigarette Price on Youth Smoking Intensity, Liang L, Chaloupka FJ, February 2001.

Association of Point of Purchase Tobacco Advertising and Promotions with Choice of Usual Brand Among Teenage Smokers, Wakefield MA, Ruel EE, Chaloupka FJ, Slater SJ, Kaufman NJ, January 2001.

Changes at the Point-of Sale for Tobacco Following the 1999 Tobacco Billboard Ban, Wakefield MA, Terry YM, Chaloupka FJ, Barker DC, Slater SJ, Clark PI, Giovino GA, July 2000.

Do Restriction on Smoking at Home, at School and in Public Places Influence Teenage Smoking? Wakefield MA, Chaloupka FJ, Kaufman NJ, Orleans CT, Barker DC, Ruel EE, June 2000.

Effectiveness of Comprehensive Tobacco Control Programs in Reducing Teenage Smoking: A Review, Wakefield M, Chaloupka F, July 1999.

Local Governments and Tobacco Control Policies: Role Variations and Sources of Data, Gardiner J, Kuhns LM, Hubrich J, and Kreps B, February 1999.

ImpacTeen
Coordinating Center
University of Illinois at Chicago
Frank Chaloupka, PhD
www.impacteen.org

Health Research and Policy Centers
850 West Jackson Boulevard
Suite 400 (M/C 275)
Chicago, Illinois 60607

312.413.0475 phone
312.355.2801 fax

State Alcohol Research
University of Minnesota
Alexander Wagenaar, PhD
www.epl.umn.edu/alcohol

State Tobacco Research
Roswell Park Cancer Institute
Gary Giovino, PhD
www.roswellpark.org

State Illicit Drug Research
Andrews University
Duane McBride, PhD
www.andrews.edu