The Effect of Policy and Social Interaction Variables on Youth Smoking in Low and Middle Income Countries

BY

Silda Nikaj
B.B.A., Grand Valley State University, 2006
B.B.S., Grand Valley State University, 2006
M.A., University of Illinois at Chicago, 2007

THESIS

Submitted as partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Economics
in the Graduate College of the
University of Illinois at Chicago, 2012

Chicago, Illinois

Defense Committee:

John A. Tauras, Chair and Advisor
Hana Ross, American Cancer Society
Frank J. Chaloupka IV
Richard M. Peck
Houston H. Stokes

This thesis is dedicated to my parents, Ferdinand and Suzana, and my brother, Alked.

ACKNOWLEDGMENTS

I would like to thank my thesis committee—John Tauras, Frank Chaloupka, Richard Peck, Hana Ross, and Houston Stokes --for their unwavering support and assistance. I would also like to acknowledge John Tauras, who oversaw the development of the proposal and made contributions important to the study. I am very grateful for the support provided by the University of Illinois at Chicago Department of Economics.

TABLE OF CONTENTS

CHAPTER **PAGE**

TABLE OF CONTENTS (CONTINUED)

CHAPTER **PAGE**

LIST OF TABLES

TABLE **PAGE**

LIST OF TABLES

TABLE **PAGE**

LIST OF TABLES

TABLE **PAGE**

LIST OF ABBREVIATIONS

CDC	Centers for Disease Control and Prevention
EIU	Economist Intelligence Unit
GLM	Generalized Least Squares
GMM	Generalized Method of Moments
GYTS	Global Youth Tobacco Survey
MSA	Master Settlement Agreement
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
IARC	International Agency for Research on Cancer
IV	Instrumental Variables
SHS	Second Hand Smoke
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization

Summary

This dissertation investigates the effect of policy and social interaction variables on youth smoking among countries which conduct the Global Youth Tobacco Survey (GYTS). This is the first study to use GYTS data to investigate the effect of peer smoking on individual smoking. Peer influences and youth smoking have been studied using data from Europe, Canada and the United States. In the second part of the dissertation, I investigate the effect of cigarette prices on youth smoking prevalence and consumption among less developed countries.

The dissertation is organized into two parts. In the first part I examine the effect of peer smoking on individual smoking. The first section of this chapter provides an introduction and motivation of the importance of peer effects as a determinant of smoking among youth.

The second section considers the theoretical background on peer influences and individual behavior. I discuss the different pathways that lead to socially uniform behavior among individuals in the same group and delineate the effect that I am identifying and estimating in my study.

Section three provides a review of the current literature that investigates the effects of peer smoking on individual behavior. In this section I summarize the estimated peer effects and the different methodologies employed in the literature. I summarize their contributions and limitations.

Section four outlines the different data sources used in this study and defines the variables used in the analysis. The primary data source for this study comes from the Global Youth Tobacco Survey, which monitors smoking and tobacco use among middle school students among 140 countries globally. I provide a summary of the data used and also discuss the limitations of the data.

Section five discusses the methodology used for the analysis and relates the methodology to the theoretical models and literature review outlined in sections two and three. Section six provides an alternative specification for estimating peer influences in the presence of measurement error. In section seven I summarize the results from the analysis at the regional level and at the country level. Finally, section eight concludes with a summary of the findings of the analysis. In this section I summarize my contribution to the literature and provide a discussion on the relevant policy implications of peer effects on individual smoking.

In the second part of the dissertation, I estimate the effect of cigarette prices on youth cigarette smoking among a group of less developed countries from the GYTS. A small, but growing number of studies have estimated cigarette demand equations in less developed countries. The contribution of this chapter is to extend current analyses on the effect of cigarette prices on smoking among youth in less developed countries. The chapter is organized in twelve sections. In the first section I provide motivation on the importance of prices as a policy tool in reducing smoking among youth. In section two I summarize the relevant theoretical models. I discuss the current literature in section three. In sections four and five I define the variables for the analysis and discuss the appropriate methodology. Sections six and seven discuss results for smoking prevalence and conditional demand models. In section eight I discuss additional sensitivity analyses that I conducted. In section nine I summarize the findings from the effect of other determinants of smoking, and in section ten I discuss parental influences. Section eleven discusses the results and provides policy implications for the impact of cigarette prices on cigarette use among youth in GYTS countries. I include a list of references in the last section of the chapter.

1. Smoking and Peer Influences among Youth in Low and Middle Income Countries.

1.1. Introduction

Smoking is one of the primary causes of preventable death and disease. The World Health Organization (WHO) attributes approximately 5 million deaths to cigarettes a year. The number is anticipated to rise to 10 million by 2030 (WHO, 2009). In year 2000, total of 2.6 million deaths were in low-income countries (Jha et al., 2006). Some high income countries have developed comprehensive cigarette control programs which aim to (1) prevent initiation among youth and young adults, (2) promote quitting among adults and youth, (3) eliminate exposure to secondhand smoke, (4) identify and eliminate cigarette-related disparities among demographic groups. Policy instruments such as: tobacco taxation, educating the public about the adverse health consequences of tobacco use and exposure, banning the use of tobacco in many public and private places, and other interventions have greatly reduced prevalence and consumption among adult and teen populations in developed countries (Chaloupka, 2011). Despite the evidence that tobacco control programs are effective in reducing the smoking prevalence and consumption, progress has been slow in implementing such programs in low and middle income countries (WHO, 2009; Jha et al. 2006).

Youth smoking is of particular interest because most lifelong users of cigarette initiate smoking in adolescence. The probability of cessation later in life greatly diminishes if cigarette use began at, or prior to age 15 (Chen and Millar, 1998). Youth are more likely to respond to peer and environmental pressures by lighting up, and are more likely to heavily discount the future consequences of their current actions. Tobacco control policies have a direct impact on reducing smoking prevalence and consumption at the individual level. Social influences may serve to amplify the effect of policy intervention and often produce a secondary or indirect effect of intervention. The indirect effect arises because the policy also reduces prevalence and

consumption among an individual's social group. If social influences are important, the reduction in the group's prevalence and consumption will further reduce prevalence and consumption for the individual. This indirect effect implies that any policy intervention at the group level will generally be intensified by the presence of social influences.

A burgeoning literature is concerned with the effect of social influences, and more particularly the effect of peers within one's social group, on health behaviors in general and cigarette use in specific (Powell et. al. 2005; Gaviria and Raphael, 2001, Clark and Loheac, 2007; Lundborg, 2006; Fletcher , 2010). Not surprisingly, the literature finds that peer effects are large and significant determinants of cigarette use among youth in developed countries.

Less developed countries have received little attention in the literature of peer influences. Outside of a handful of studies that look at peer effects among individual countries, the availability of data has limited the ability of researchers to conduct cross-country analyses. This dissertation is the first research to estimate the effect of peers on youth smoking among 109 low and middle income counties. Data are obtained from the Global Youth Cigarette Survey (GYTS), a school-based survey of youth aged 13-15. The methodology employed in this paper addresses the endogeneity of school selection and peer selection within schools. I use school fixed effects to eliminate most of the unobserved heterogeneity in cigarette use that arises because of selection into schools. I define a child's peer group as the students within one's grade. The advantage of this definition over others which define peer groups at the school level is that this is plausibly a more credible measure of one's peer group. The definition allows me to treat allocation of students within grades as semi-random, primarily determined by age. The analysis suggests that peer influences are significant determinants of cigarette use among youth. On average, increasing the share of peers' who smoke by 10 percent increases the probability of smoking for the individual between 2 to 4.5 percentage points. The

paper addresses some puzzling results in the literature, which arise because of measurement error in variables. The use of self-reported data becomes problematic because (1) students often misreport their smoking status and (2) most school-based surveys fail to survey all students within a school. Misreporting in smoking status will lead to measurement error in the peer variable if the peer measure is defined as the percentage of classmates who smoke. The measurement error in right hand side variables will bias OLS estimates toward zero. The paper addresses the bias in OLS estimates by the use of instrumental variables. Finally, because measurement error in bounded endogenous variable is in fact non-classical and by definition mean-reverting I implement a Generalized Method of Moments (GMM) estimation which models measurement error. The GMM procedure produces unbiased estimates of the effect of peers on individual smoking. The contribution of the current work is that it sheds light on the effect of peer smoking on individual smoking prevalence among youth in low and middle income countries. Also the analysis contributes to the literature by modeling measurement error, therefore providing unbiased estimates of peer effects on individual behavior.

1.2. Theoretical Framework

The literature identifies several pathways that give rise to peer influences on individual behavior. (1) Individuals may experience a higher payoff to a behavior if social groups endorse that behavior. (2) Individuals mimic behavior observed within one's social group because of limited information or knowledge of the particular commodity. Group behavior signals appropriate behavior. (3) Social norming implies that individual do not deviate from the average behavior of the group because they fear social sanctions.

Individuals experience a higher payoff to a behavior when the behavior is common within one's social group. There is complementarity between individual preferences and social

capital (Becker & Murphy, 2000). In the context of cigarette consumption, a larger group of smokers in one's social circle changes the marginal utility of smoking for the individual and therefore increases the demand for cigarettes. In the Becker and Murphy formulation of social capital theory the individual maximizes a utility function which includes commodities *x* and *y* and it augments a social capital stock (S) as an argument ($U = U(x, y, S)$). The model assumes that *x* and *S* are complements; hence an exogenous change in *S* will change the marginal utility of consuming commodity *x*. Maximizing the utility function subject to a constraint ($p * x + y = Income$) , where *p* is the price of *x*, produces the following first order condition (FOC):

$$\frac{\partial x}{\partial S} = \frac{p_x U_{yS} - U_{xS}}{-\frac{U_y p_x}{x}} > 0 \text{ if } U_{xS} > U_{yS} p_x$$

The above FOC has two implications. First, an increase in one's social capital will increase one's consumption of *x*, if the social capital increases the marginal utility of *x* relative to the price adjusted marginal utility of *y* (Becker and Murphy, 2000). Secondly, a change in a policy variable that affects the consumption of *x* will produce both a direct and an indirect effect on individual behavior. For example, a price increase will reduce the demand for good *x* for the individual. This is the direct effect of a policy change on individual consumption. At the individual level this effect will be small, but the sum of individual choices will produce a large effect, because the policy change stimulates the demand of other members of the group. The indirect group effect will reduce consumption by the group. The reduction in consumption by the group will further reduce individual consumption. This effect is coined in the literature as the social multiplier effect. The social multiplier effect creates a cascading effect as members of a social group influence and reinforces one another's behavior (Becker and Murphy 2000).

Becker and Murphy (2000) suggest that the social multiplier might work through an information effect even though the effect of information is not explicitly modeled in their analysis. Prior work by Bikhchandani et. al. (1992) investigates the effect of information sharing among social groups and how individual behavior is altered by this information. An information cascade occurs when it is optimal for an individual to follow the behavior of preceding individuals and disregard their own information on a decision. If experienced individuals act first, others frequently imitate. Students may mimic each other's behavior when making decisions about smoking. Individuals interpret the consumption choices of others as "signals" and these signals replace individual calculations of costs and benefits as criteria for consumption decisions. Policy interventions are possible in the presence of false information. Information needs to be credible for cascades to be stable. School level curricula which provide information on the adverse consequences of smoking may reduce individual cigarette consumption by challenging the credibility of the information generated by peer smoking. Such interventions stand to be more successful if they disseminate correct information and do not alter the social distance of individuals within a peer group. Youth often do not deviate from the social norms of the group, even in the presence of misleading information, because they fear social sanction.

The perception of certain social norms within a group may lead an individual belonging to the group not to deviate from the perceived norms, even if the individual is aware of the detrimental effects of his current actions and has fully credible information. Social networks are organized around a system of rewards and punishments, which are utilized to keep members in check and force individuals to adhere to group behavioral expectations. Akerlof (1997) develops a model of conformist behavior where the agent chooses a behavior to maximize an indirect utility function. In this model, utility declines as distance between the individual's behavior and

that of everyone else in the group increases. The optimal solution would be to conform to the average behavior of the group. An explanation of why teens do not quit smoking may arise due to the fact that individuals are alone in their effort to quit which increases the social distance between the agent and his/her social network. Akerlof argues that his model can be used in explaining why there is underinvestment in education among racial minorities, and why in communities where teen moms are prevalent we observe higher teen fertility. This is relevant in our analysis, because policies will be most successful if they try to change attitudes without affecting social distance as a whole. The more successful cessation programs are those who get students to quit in groups as supposed to individually, because the social distance among relationships are not exacerbated but rather maintained.

The social distance model also suggests that as social distance increases, peers effects should diminish. Students are more likely to be affected by peers of the same sex, age and grade. A structural approach of social networks from sociology implies similar effects. Because peers form bonding, horizontal and strong ties with one another, individuals will be primarily influenced by peers of similar age, sex, and grade with effects of peers in higher or lower grades becoming smaller as the age distance between the individual and the group increases[1] .

[1] Horizontal ties are comprised of individuals that hold the same level of authority, knowledge and resources in a social structure. Informal ties are contacts among friends, family, neighbors and colleagues which provide emotional support. Strong ties generally, include individuals that are related to one another by blood, friendship or occupation, who closely occupy the same social class and who frequently maintain such ties. On the other hand, weak ties are generally acquaintances, distant colleagues, and others who occupy positions of authority. The primary characteristic is that contact is far more infrequent among those related by weak ties (Ferlander, 2007). Bonding social capital includes individuals with similar demographic characteristics. Bridging social capital includes people across social groups. Both bonding and bridging social capital refer to capital among horizontal ties. Families constitute strong ties which bridge over age and sex. Bonding social capital refers to ties with people who are similar in age, sex, and social characteristics to oneself. Friends and colleagues of close gender and age would be included in this category (Ferlander, 2007).

1.2.1. Endogeneity in Social Interaction

The social capital literature identifies three pathways that could lead to socially uniform behaviors among social networks (Manski 1993, 2000). The first one is through endogenous interaction. Endogenous interaction implies that the propensity of an agent to behave in some way varies with the behavior of the group. The endogenous effect suggests that an individual is more likely to smoke if his peers smoke. The effect is difficult to identify empirically because of what is termed "the reflection problem" by Manski (1993). Peer smoking and individual smoking are jointly determined within a group; it is difficult to separate whether the group affects the individual or the other way around. Furthermore, smokers tend to seek out other smokers, leading to clusters that are comprised either primarily of smokers or clusters which are smoke-free. This simultaneity and endogenous selection in behavior would lead to upward bias in Ordinary Least Squares (OLS) estimates of peer behavior, because the errors are positively correlated with the peer variable. This analysis employs an instrumental variables methodology similar to that of Fletcher (2010) to address "the reflection problem". Good instruments predict the behavior of peers but are not correlated with the error term in the second stage regression. The analysis uses peer's parental smoking, and the frequency peers see others smoking in their homes to instrument for peer smoking. Parental smoking increases an individual's propensity to smoke. The proportion of one's peers with smoking parents has no direct effect on the individual's smoking choices. Similarly, the frequency of smoking at home should affect the individual, but the percentage of peers who report seeing people smoke frequently at home, should have no direct effect on individual smoking choices. While both instruments would be problematic if the peer group was defined as nominated friends, or a smaller group of peers who may have knowledge of the household environment that the student lives in, both instruments are plausibly exogenous

to peer groups defined at the grade level. It is difficult to imagine that of the 80-150 students that one shares a grade with, all the students in the grade or even a majority of the students have knowledge of the home environment the student lives in or whether his/her parents smoke. This is less plausible, giving credence to the exogeneity of the instruments employed.

Average characteristics of one's peer group (contextual interactions) may predict uniform behavior within a group (Manski, 2000). Contextual interactions imply that the propensity of an agent to behave in some way varies with exogenous characteristics of the group members. For example, this effect would imply that the marital status, wealth, and educational attainment of my peer's parents' will affect my smoking. Contextual effects are assumed to be null in much of the current literature. "Students are less exposed to the family background of their school peers than they are in the characteristics of peers living in the same neighborhood" (Garivia and Raphael, 2001). Nonetheless, one could argue that individual attributes and behaviors may jointly affect peer behaviors. It is likely that parental education of peers affects health outcomes for individual students not merely by reducing cigarette use among peers but also on its own right. Evidence suggests that gender composition within one grade predicts educational achievement (Hoxby, 2000). Omitting the effect that average characteristics of peers may bias the effect of the peer measure. The direction of bias is unknown and it will depend on whether omitted characteristics are positively or negatively correlated with the peer measure.

The final pathway that leads to uniform behavior is through correlated effects or selection into schools. Correlated effects imply that agents in the same group tend to behave similarly because they have similar individual characteristics or face similar institutional environments. In the context of our analysis, families may select into certain school districts, thus indirectly choosing their children's peers. The residential relocation of families from underfunded inner city schools to

well-funded suburban schools in the United Sates is a prime example of how parents implicitly choose their children's peer groups. Using variation of peer behaviors across schools would produce results that are primarily sorting, failing to identify the true effect of peer smoking on youth.

To address the correlated effects problem I control for school fixed effects and use variation in peer behavior across grades within schools. Defining the peer group at the grade level has two distinct advantages: (1) a peer group defined at the school level may be too large, generating error in right hand side variables. The peers within one's grade will provide a more accurate estimate of one's peer group. (2) Whereas there is implicit sorting into schools, there is no sorting into grades among students. One could argue that peer groups defined at the classroom level may be a more appropriate since children are constantly interacting with one another, but classroom level assignments may not be random. This is because tracking may place students with similar classmates not only in terms of educational attainment but also health behaviors[2,3]. Further, parents may have some control over the class in which their child is placed by working closely with teachers and administrators. But placement into grades is primarily determined by age and can be thought as semi-random.

[2] In a tracking system, students are assigned to classes according to the student's overall achievement. Higher ability students are placed in more advanced classes, and often curricula are structured to facilitate college admission. Low ability students may be placed in vocational skill programs which prepare students for the labor market post- graduation.

[3] There is complementarity between ability and health investments (Becker, 2007). Educational achievement serves as a proxy for ability. Tracking may place students into clusters who exhibit similar behaviors not only academically but also in terms of health behaviors. Because ability is often unobserved, as is tracking, sorting of students into classes by school administrators, will muddle the effect of peer influences by including both endogenous effects and correlated effects. The solution here is to control for tracking at the class level via the use of class fixed effects.

Distinguishing between these three effects is important because each effect has different implications about the potential impact of policy interventions. Policy interventions which affect endogenous interaction generate a social multiplier. Increases in cigarette prices will have a direct effect through the individual, and an indirect effect through the peer group. Because a price increase reduces the demand for cigarettes among members of the group, the reduction of the behavior within the group further reduces smoking for the individual.

Failure to control for correlated effects (sorting) will produce biased estimate of peer influences on individual behavior. In the absence of appropriate controls for sorting, researcher will track the effect of sorting along with the effect of peer influences. But since the former is unobserved, the estimates on peer effects will overstate the true effect of peers if we believe that smokers cluster around other smokers.

Finally, contextual effects do not produce multiplier effects. Moving a male student from one school to another will reduce the performance of youth in the receiving school and increase it in the school from which the student was removed. The effect here is rather distributional, but the outcomes for the two schools together should not change, because losses in performance in one school are made up by increases in performance in the other.

The analysis in this dissertation uses a methodology similar to Fletcher (2010) and Lundborg (2006). The use of school fixed effects eliminates the majority of variation in peer behavior that arises because of implicit selection of peer groups by parental residential choices. This eliminates any effects of sorting or correlated effects. The peer variable is defined within school and grade. The relevant group of peers for a 7^{th} grader would be all the peers in the 7^{th} grade cohort. Identification arises because of variation of peer influences between grades within schools. Similarly, to Fletcher (2010) I do not assume the contextual effects are zero. I include

average characteristics of one's peers in the analysis. The characteristics include peer group sex composition, age composition, number of peers in the group, and peers' average pocket cash receipt each month. To address the reflection problem, I include two plausibly exogenous instruments for peer behavior. The first instrument is the frequency peers see people smoking in their home. The second instrument is smoking by peers' parents. Neither should affect individual behavior directly, except through the peer effect. It is important to note that one expects the effect of peers to become smaller after instrumenting for peer behavior. OLS estimates that do not address the reflection problem would be overstating the effect of peers on individual behavior. Because individuals can both affect their peer group and be affected by the peer group, the simultaneity suggests that peer behavior is endogenous. If we believe that smokers cluster around other smokers, and non-smokers around other non-smokers, then in the absence of instruments the error would be positively correlated with the peer variable and one should expect that peer estimates in OLS regressions would in fact be upwardly biased.

The use of self-reported data only allows me to observe a portion of the grades within the school. At times I have the entire population of the students in a particular grade (minus the students who missed that day in class) other times I only observe a few classes of the same grade within a particular school. The fact that we cannot enumerate each student in the school implies that the peer variable may be mis-measured and that estimates may be subject to bias. OLS estimates will be biased downward if the observed peer variable is mis-measured. I correct for measurement error in the peer variable through the use of instrumental variables (IV). The simple IV in the presence of measurement error assumes that the measurement error is classical. This of course may not be the case given that the peer variable is bounded in nature and by definition measurement error in this case would be mean-reverting. I use a GMM technique to

alternatively model the measurement error and I am able to extract consistent estimates of peer effects on individual smoking when measurement error is non-classical (mean-reverting).

1.3. Literature Review

Peer smoking emerges as a strong determinant of cigarette smoking among school-aged youth. Adolescents with peers who smoke are more likely to smoke. Increasing peer smoking by 10 percent increases the probability that a youth smokes by 0- 5.8 percentage points (Powell et. al. 2005; Gaviria and Raphael, 2001, Clark and Loheac, 2007; Lundborg, 2006; Fletcher, 2010; Eisenberg, 2004; McVicar and Polanski, 2010; McVicar, 2011; Soetevent and Kooreman, 2007; Ali and Dwyer, 2009). The wide range of estimates on the influence of peer smoking on individual behavior can be attributed to: (1) the definition of an individual's peer group, (2) the difference in controls for correlated effects and contextual interaction, (3) the use of appropriate instruments, (4) the treatment of measurement error in estimates of peer effects, (5) the use of different data over time, (6) and the use of different statistical models. In this chapter I discuss the findings of the literature, summarize the limitations of studies that have employed different methodologies, discuss the limitation of instruments used in the literature, and outline a new procedure that corrects for measurement error in peer effects estimates.

1.3.1. Peer Group Definitions

The current literature uses different definitions for an individual's peer group. These definitions include: nominated friends, classmates, peers within one's grade, and peers within one's school. Theoretically, the wider the definition of one's peer group the larger the social distance between the agent and the average member of the peer group, suggesting that broadly defined peer

groups exert a smaller effect on individual behavior than narrower peer groups. Because peer groups at the school level tend to be large, it is unlikely that the individual interacts with a large share of one's school mates and he/she may be less affected by this group.

Generally the closer the social ties among friends the larger the impact of peer effects. Few studies utilize nominated friends or perceived smoking by close friends as the relevant peer group (McVicar and Polanski, 2010; Ali and Dwyer, 2009). Ali and Dwyer (2009) estimate the effects of peers on smoking among youth in the National Longitudinal Study of Adolescent Health. Peer effects are defined two ways: (1) nominated friends and (2) peers within the same grade. The estimate for the peer group defined as nominated friends suggest that a 10 percent increase in smoking by one's peer group increases the probability the individual will smoke by 5.2 percentage points. A benefit of using nominated friends is that it plausibly identifies the most important social group for the individual. However, the tradeoff is that nominated friends are highly non-random. Youth may select into groups based on their smoking behavior. If smokers cluster around other smokers, we would be overstating the effect of peers. There is further selection into nominated friends, which would suggest that school fixed effects would not solve the problem that arises because of correlated effects. A more appropriate methodology would have been the inclusion of cluster fixed effects, where the cluster is defined as the nominated group of friends.

Similarly, perceived smoking by close friends is a poor measure of peer effects, because smokers are more likely to report that their friends smoke (confirmation bias). McVicar and Polanski (2010) estimate peer effects among youth in the United Kingdom using the 2003 European School Survey Project on Alcohol and Other Drugs (ESPAD). They define peer effect by asking individuals to report smoking by close friends. When the peer variable is defined as

perceived peer smoking, a 10 percent increase in perceived peer smoking increase the probability a youth smokes by 4.7 percentage points. Clark and Folk (2005) use data from the National Longitudinal Study of Youth and define the peer effect to be 1 if the child reports that more that 10 percent of students within the same grade smoke and zero otherwise, The authors find that having a peer that smokes increases the probability that an individual would smoke by 43.52 percent . First, in models that estimate association between own smoking and perceived friends' smoking selection accounts for half of the overall association, suggesting that the effect of perceived peer smoking may be smaller (Krauth, 2005). Secondly, smokers may overstate the share of their peers who smoke. This too would lead to an upwardly biased estimate of peer effects. Further, using the effect of perceived peer smoking versus actual peer smoking does not solve the effect of sorting of individuals into peer groups. Finally, the assumption that only nominated peers matter in determining individual behavior may be misleading. It could be the case that distant peers may still exert an influence on individual health behaviors, and by assuming these behaviors are zero, we could be understating the true effect of social networks on youth.

Definitions of peer groups at the class level and grade level do away with selection present among nominated friends, because placement of students into classes or grades is thought to be quasi-random. Often, where tracking of students within classes exists, researchers have tried to control for further selection by the use of school-grade effects as is the case in Lundborg (2006). This definition of the peer group seems plausible since youth spend most of their school day with their classmates or peers of the same grade. A few studies define the relevant peer group at the class or grade level. Lundborg (2006) uses a cross-section of Swedish youth aged 12-18 to estimate peer effects in binge drinking, smoking, and drug use. The author uses school-

grade fixed effects to address selection into schools. The results suggest that moving a child from a school where no one smokes to one where 10 percent of the students smoke increases the probability that one will smoke by 4.8 percentage points. Fletcher (2010) using data from the National Longitudinal Study of Adolescent Health and a definition of peers at the grade-level finds that a 10 percent increase in one's peers who smoke would increase the individual's probability that he or she smokes by 3 percentage points. Ali and Dwyer (2009) also include specifications where the peer variable is defined at the grade level. They find that a 10 percent increase in peer smoking increases individual smoking by 3.6 percentage points. Soetevent and Kooreman (2007) use data from the Dutch National School Health Survey to estimate the effect of peer smoking on individual smoking and find no effect of peer smoking on individual smoking. McVicar and Polanski (2010) when defining the appropriate peer group at the class level find that a 10 percent increase smoking by one's classmates increases the probability the individual will smoke by 4.7 percentage points. However, the effect disappears when controlling for perceived smoking by nominated peers suggesting that smoking by classmates in not influential in determining individual smoking behavior. Gaviria and Raphael (2001) use the 10^{th} grade responses of the National Educational Longitudinal Study (NELS). They find that a 10 percent increase in smoking among one's peers increases the probability the individual will smoke by 1.6 percentage points (Gaviria and Raphael, 2001). They do not control for selection into schools because only one grade is surveyed per school, they use variation across schools to identify the peer effect. Thus these estimates should be interpreted with caution as the authors may not capture all the unobserved characteristics at the school level.

Finally, a few studies define the peer effect at the school level. Clark and Loheac (2007) use data from the National Longitudinal Study of Adolescent Health (Add Health) Survey (1994-

1996) to evaluate the effect of peers on alcohol, cannabis, and cigarette use among 7^{th}-12^{th} graders. They use a fixed effects specification to address selection into schools. They find that a 10 percent increase in smoking participation in one's peer group will increase one's smoking by less than 1 percentage point. Similarly, Powell et. al. (2005), look at the potential effect of peers on smoking behaviors among adolescents. The authors use "The Study of Smoking and Cigarette Use among Young People" 1996 portion of the Audits & Surveys, which assesses peer effects among high school students. The paper does not control for school fixed effects but instead the authors merge Census-based characteristics that proxy for the local environment. Their findings suggest that moving a student from a school where no children smoke to a school were 10 percent of the youth smoke, would increase the probability that he or she smokes by 5.8 percentage points. Studies that define the peer measure at the school level should find smaller effects of peers, because a peer group defined at the school level may be in fact too large with too many non-influential peers. The difference in estimates may be attributed to how the literature has been able to control for sorting into schools. The use of school fixed effects in this context may be eliminating most of the variation in peer behaviors, thus understating the true effect of peers. On the other hand, estimates without school fixed effects may not appropriately control for selection and unobserved characteristics at the school level.

Finally, since most analyses are conducted at the school level, very little is known on the effect of other social networks that may affect youth smoking. For example youth may be affected both by school friends and neighborhood friends. Norton et al. (1998) is the only study that estimates of peer effects by defining the peer group at the neighborhood level. He find that a 10 percent increase in smoking by peers in one's neighborhood increase individual smoking by 10 percentage points. The estimates appear to be large, suggesting selection may still be an

issue. While peers at the school level capture a large share of the influences that youth are exposed to on a daily basis, they do not capture all peer influences. Ultimately, no study to date has been able to provide a clear definition of the relevant peer group.

1.3.2. Controlling for Correlated Effects and Contextual Interaction

Another concern in the current literature deals with how researchers address selection of individuals into schools. Two approaches have been widely used. The first solves the selection of individuals across schools by the use of school fixed effects (McVicar and Polanski, 2010; Clark and Loheac, 2007; Soetevent and Kooreman , 2007; Lundborg, 2006; Ali and Dwyer, 2009; Fletcher, 2010). School fixed effects control of unobservable time invariant characteristics that are common to all students in a school. This includes, school smoking policies, school resources spent on tobacco control programs, but also other variables such as common background characteristics which are unobservable to the researcher. In these studies peer effects are identified by variation that arises in peer behavior either between grades or between classes[4]. Oftentimes, additional controls are employed to solve selection into classes. A second approach deals with including a rich set of average characteristics at the school level which are common to all students instead of school fixed effects (Gaviria and Raphael, 2001; Powell et, al. 2005; Nakajima, 2007; McVicar 2011). The second approach is sometimes necessitated by the availability of data. Researchers are unable to identify grade or class groups within schools. Inclusion of fixed effects in this case would eliminate most of the variation necessary to identify peer effects, leading researchers to conclude that peer effects are unimportant. The concern in the context of this literature is that the inclusion of average characteristics at the school level may

[4] Clark and Loheac (2007) is the exclusion to the rule. They used school fixed effects but define the peer group at the school level.

not control for all common unobserved effects at the school level, leading to correlation between the peer variable and the error term, which would produce biased estimates of the peer effects. While most research has controlled for selection by merging in characteristics at the school level, one study included average county characteristics (Nakajima, 2007). Inclusion of county level average characteristics and county fixed effects may be even more problematic in this context because parents have multiple options of schools within a county. Again these estimates would be biased, and the direction of the bias is unknown. Consequently, the best approach would be using variation within schools and controlling for school level unobservables via the use of school fixed effects.

In much of the current literature the school level contextual effects are assumed to be zero. "Students are less exposed to family background characteristics of their school peers" (Gaviria and Raphael, 2001). The assumption that contextual effects are zero may be wrong however. For example, average peer parental education may matter, because educated parents are more likely to be involved in school activities and are more likely to exert a direct impact on their child's school friends. Racial or ethnic composition is likely correlated with unmeasured school level resources that are in turn correlated with tobacco policies and availability (Fletcher, 2010). Evidence suggests that gender composition of one's class predicts educational attainment (Hoxby, 2000). Omission of contextual effects may bias estimates of peer effects, leading to wrong inference about the true impact of peers on individual smoking. Usually, researchers have relied on these average characteristics and used them as instrument to control for the endogeneity of peer behavior. Two issues of concern should be considered in these studies. First, contextual interactions may matter on their own right. Secondly, because researchers are using contextual variables to solve the simultaneity issue, it is unclear whether the effect

identified is the endogenous effect of peers since the estimates may be contaminated by the effect of contextual interaction. This is by far, the most important challenge in the current literature.

1.3.3. Instrumenting for Endogeneity

The availability of exogenous instruments that solves the reflection problem is a large concern in this literature. Two approaches have been identified in this literature, the first one is quasi-experimental and relies on the fact youth may be placed at random in schools with older peers versus younger peers (Eisenberg, 2004; Clark and Folk, 2005). This methodology takes advantage of the fact that in the US students attend schools with a variety of grade spans. For example, an 8^{th} grade class could be placed in a school containing grades 8-12 or in a school containing grades 6-8. The treatment is whether an 8^{th} grader ends up in a school with grades 8-12 ("older school") or a school with grades 6-8 ("younger school"). Given that smoking prevalence rates are higher among grades 8-12 this provides the treatment group, relative to the control of lower grades. This methodology allows students to be exposed to a high prevalence peer group ("older school") and a low prevalence peer group ("younger school"). The difference is interpreted to be the peer effect. The problem here is that researchers may be comparing very different groups of youth, and estimates of differences in peer effects may be muddled by other unobservables that may be correlated with younger versus older peer groups.

A second quasi-experimental approach relies on difference-in-difference methodology to identify the peer effect. Eisenberg (2004) measures the effect of peers by estimating the impact of removing a friend who smokes from one's peer group on the probability of smoking for the

individual. In this approach, youth who have smoking friends who move away are compared to youth who have smoking friends who do not move away. The findings suggest that each time a friend who smokes moves away the probability of individual smoking is reduced by 3.2 percentage points. The contribution of this paper is that it does not rely on average peer characteristics to identify peer influences, thus it plausibly provides a "cleaner"[5] estimate of peer effects. At the same time, it is difficult to generalize the results beyond nominated friends, who may not capture the full social effects that students are exposed to at the school level.

One paper uses lagged peer behaviors to instrument for the endogeneity between peer and individual behaviors (Clark and Loheac, 2007). Current behavior should not affect past peer behavior which should separate true effects of peer influence. The approach is problematic to the extent that current peer smoking is correlated with past peer smoking and past smoking may be a proxy for current smoking.

The majority of studies rely on using average characteristics of peers as instruments in predicting peer behavior (Gaviria and Raphael, 2001; Powell et. al, 2005; Lundborg, 2006; Ali and Dwyer, 2009; Fletcher, 2010). It is assumed that at the school level contextual effects are zero, so peer average characteristics can be used as valid instruments. As discussed under the previous section this assumption may not be valid. Peer parental background characteristics are not good instruments, because one could plausibly argue that they can be included in the main equation. Further, any average characteristic of peers could be interpreted as contextual effects. An argument can be made that in large peer groups some average family background

[5] A cleaner estimate of peer effects because the instruments are not average characteristics and the peer effect represents only the endogenous effect. In many studies the peer effect is often a combination of endogenous and contextual effects, this is especially true if average peer characteristics are used as instruments.

characteristics may not be observable by one's peers, neither can the individual ascertain the peers' home environment. For example Fletcher (2010) uses peers' number of older siblings and the number of peers with household members who smoke as instruments. In large cohorts, peer groups defined at the grade level, these instruments should only impact the individual through peer smoking, because knowledge of home environments of all peers is not plausible. Because of data limitations most researchers have used a combination of average characteristics to identify the peer effect. Because the peer effect is predicted by using average peer characteristics, what researchers have been able to identify as peer effects is a combination of endogenous and contextual effects. This is a critique of the literature as whole. However, absent experimental data or quasi-experimental designs to estimation, this issue will continue being a persistent concern in the literature.

1.3.4. Measurement Error

Often in the peer effects literature, peer estimates become larger once one instruments to solve the endogeneity in peer and individual behavior is quite common. The findings run counter the upward bias that one would expect to find due to the endogeneity of peer behavior as outlined by Manski (1993). However, thesefindings are not the first in the literature to find such effect. Lundborg (2006) finds similar effects in the IV estimation where the coefficient on peers becomes larger. Similarly Case and Katz (1991) and Gaviria and Raphael (2001), McVicar (2011), McVicar and Polanski (2010), Clark and Folk (2005) find similar results in the IV estimation. The authors clearly highlight measurement error in variables as the culprit in these varying estimates, but no studies to date in the reviewed literature classify or model the measurement error.

In the presence of measurement error OLS estimates will be biased downward. The IV method in the literature addresses two problems. It addresses the simultaneity in peer behavior as outlined by Manski (1993), and at the same time it addresses measurement error in the peer variable which produces downward bias in OLS estimates. Definitions of peers at the school level, grade level or class level may not capture the full set of influences. As a result the peer variable is measured with error leading the OLS estimates to understate the effect of peer's on individual behavior. Similarly, because peer variables are constructed from self-reported surveys, misreporting by students of their smoking status will generate error in both outcome and the independent variable. Error in outcome variables reduces the efficiency of estimates but it does not affect the consistency of estimates. Errors in independent variables, however, lead to attenuation in OLS estimates. Since the endogeneity problem and the measurement error run in opposite directions the measurement error problem maybe offsetting any endogeneity biases.

I find similar results between IV and OLS estimates in this paper. IV estimate are often much larger than OLS estimates. I attribute this to measurement error. The IV estimation solves the measurement error problem, under the assumption that measurement error is classical. However, measurement error in smoking participation is misclassification error. Smokers can only underreport their smoking and non-smokers can only over-report it. This implies that the error term is negatively correlated with the youth's true smoking behavior, which produces mean-reverting measurement error (Bound, Brown and Mathiowetz, 2000). Furthermore, IV estimates under a bounded endogenous variable produce upwardly biased results of the true effect of peer smoking on individual behavior (Pischke, 2009). I provide a solution to the measurement error which may produce inconsistent estimates in the aforementioned literature. I model measurement error through the use of a GMM procedure using a technique proposed by

Franzis and Loweinstein (2003), and I am able to provide unbiased estimates of peer influences on youth smoking participation. Another implication of my analysis is that even among studies that use similar methodologies in estimating peer behaviors, the quality of the data and the measurement error that arises because of misreporting in self-administered surveys, could produce largely varying estimates of the true effect of peers on individual behavior. A complete discussion of measurement error and the GMM procedure are outlined in Chapter 6 of this study.

1.4. Data Sources and Variable Construction

The data used in this study are cross sectional data from the he Global Youth Tobacco Survey (GYTS). The GYTS is a school-based survey which examines youth cigarette use, knowledge and attitudes, media exposure and access of cigarette products among middle school students in 140 low and middle income countries and 11 territories from six World Health Organization (WHO) participating regions (Africa, Europe, East Mediterranean, Americas, Southeast Asia and the Pacific). The data are pooled cross sections and the survey is administered over two or three waves in most countries. The survey was first conducted in 1999, with subsequent waves currently available from the Centers for Disease Control and Prevention (CDC) through 2008. The GYTS sampling procedure produces a representative sample of school age children. The survey covers grades 7-9, but in some countries students in grades 10-12 were also surveyed. The GYTS contains 54 core questions designed to gather data on 7 areas of interest: (1) knowledge and attitudes of young people toward cigarette smoking, (2) prevalence of cigarette smoking and other tobacco use among young people, (3) role of the media and advertising in young people's use of cigarettes, (4) access to cigarettes, (5) tobacco related school curriculum, (6) environmental tobacco smoke, and (7) cessation of cigarette smoking. Countries are encouraged to add questions to the core questionnaire, but often core questions are omitted if they are not deemed relevant for the country in which the

survey is administered. The data for the analysis uses surveys from 109 countries, even though the CDC sample includes 140 countries and 11 territories. The sample for the analysis differs from the CDC sample because of one of the analysis variables, the availability of pocket money, was not asked for a large group of countries. The availability of pocket cash is a proxy for family income, and it is used as a control variable in the analysis. Excluding countries that did not ask this question reduces the sample from 140 to 109 countries. Schools where only one grade was surveyed were excluded, because there is no variation between grades to identify the peer effect. There were no significant differences in observables between the excluded observations and the sample where the analysis is run. I also exclude observations where only one or two students were surveyed from a grade.

GYTS is a school-based survey of a defined geographic site that can be a country, a province, a city, or any other geographic entity. GYTS uses a standardized methodology for constructing sampling frames, selecting schools and classes, preparing questionnaires, conducting field procedures, and processing data. GYTS standard sampling methodology uses a two-stage cluster sample design that produces samples of students in grades associated with students aged 13--15 years, even though the actual sample ranges from 11-19 years of age. Each sampling frame includes all schools, both public and private, in a geographically defined area containing any of the identified grades. In the first stage, the probability of schools being selected is proportional to the number of students enrolled in the specified grades. In the second sampling stage, classes within the selected schools are selected randomly. All students in selected classes attending school the day the survey is administered are eligible to participate. Student participation is voluntary and anonymous using self-administered data collection procedures. The GYTS sample design produces independent, cross-sectional estimates that are

representative of each site. A weighting factor is applied to each student record to adjust for nonresponse (by school, class, and student) and variation in the probability of selection at the school and class levels.

Analysis variables are defined in Table 4.1. The outcome variable in this paper is smoking participation. Smoking participation is a binary variable which takes a value of 1 if the individual has smoked any cigarettes in the last 30 days and zero otherwise. The variable of interest is the peer measure within grade. The measure for peer smoking is constructed as the percentage of students who smoke cigarettes within one's grade, excluding the individual.

Individual explanatory variables include age measured in years, gender defined as a dichotomous variable, parental smoking defined as dichotomous, and pocket cash measured in dollars adjusted for purchasing power parity (PPP) using the World Penn Tables. To control for family environment I included not only parental smoking, but also family advice on the dangers of smoking. Students respond to the question, "Has anyone in your family discussed the harmful effects of smoking with you?" The variable is a dichotomous taking the value of 1 if students responded "yes" to the question or zero otherwise. Similarly, I want to measure the effect that school curriculum about the dangers of smoking has on the probability that a youth will smoke cigarettes. Students are asked if in the last year they were taught in school about the dangers of smoking use. The variable if constructed as a binary variable.

Parental smoking is defined as dichotomous variable, taking a value of 1 if any of the parents smoke and, 0 if none smoke. Then the parental smoking variable is broken down if only the father smokes, only the mother smokes, or if both smoke. All parental smoking variables are defined as binary variables. The excluded category is where no parents smoke.

Students report their grade in school. The grade level ranges from 5 to 12. I construct grade dummies for the analysis. The highest grade in the sample is the omitted benchmark. I also control for characteristics of peer such as: age composition of peer group, sex composition of peer group, average amounts of pocket cash received by peers, and the number of students in one's peer group. These variables are all defined to capture the contextual effects of peers. Youth exposed to older peers may be more likely to smoke. The sex composition and income composition of one's peer group may predict smoking behavior. The average amount of pocket cash that peers receive is a proxy for peers' family income, because the data does not include information on parental income. The number of peers in one's group is included as an additional control, because we expect that as the peer group grows larger and social distance increases peer influences become less important.

I am able to identify school clusters in the survey because the primary sampling unit (PSU) variable uniquely identifies a school. The PSU variable was used in constructing school fixed effects for each school in the survey.

Due to the prevalence of incomplete responses I use a multiple imputation chained iterations technique to impute data on the right hand side variables. Multiple imputation techniques are superior to mean substitution or single imputation techniques because they do not alter the structure of the data (mean and variance). For my analysis three imputations were generated in addition to the original data. STATA runs he analysis on all imputations and averages over all results to produce one final result. The outcome variable was not imputed.

Table 4.1: Definition of Analysis Variables

Variables	Definitions
Smoking Participation	1= Reported smoking cigarettes in the last 30 days, 0 = otherwise
Peer Smoking	Percent of peers within one's grade who report having smoked in the past 30 days, excluding the individual
Age	Respondent's age in years
Male	1 = male, 0 = female
Pocket cash	Monthly amount of allowance or pocket money that students receive, measure in 2005 PPP dollars
Mother Smokes	1= if mother smokes, 0 = otherwise
Father Smokes	1 = if father smokes, 0 otherwise
Both Smoke	1 = if both parents smoke, 0 otherwise
No Parental Smoking	1 = if students report no parental smoking, 0 otherwise. The excluded category
Grade	Grade binary variables
Age-i	Age compsition of peer group
Male-i	Sex composition of peer group
Cash-i	Average amount of pocket cash received by peers
Family Advise	1 = if family as discussed with youth the dangers of tobacco, 0 = otherwise
Class on Smoking	1 = if youth has had a class on the dangers of tobacco in the last year, 0 = otherwise
Number of Students	Number of students in one's peer group
School Fixed Effects	School dummies identifying each school, constcuted by using the PSU variable
Instruments	Percent of peers observe smoking from other people at home
	Percent of peers with parents who smoke

The GYTS identifies 6 regions. Tables 4.2 through 4.6 provide summary statistics of the analysis variables for these regions. The analysis is conducted at the regional level. But because within regions there is a lot of variation in behaviors I further provide summary statistics for particular sub-regions of the survey. The analysis is conducted at the regional level, within geographic sub-regions and at the country level. I summarize the data for countries where I was able to conduct the analysis at the country level. In many countries the instruments were not strong in predicting peer behavior. While, the analysis was conducted for this data in all countries, the results in many countries could not be credibly interpreted. I only summarize statistics from the countries where the instruments were strong.

1.4.1. **Summary Statistics - Europe**

The GYTS survey is conducted among 6 global regions: Africa, Europe, East Mediterranean, Americas, Southeast Asia and the Pacific. The European region includes 26 countries. The analysis was conducted on 2490 European schools. I further provide summary statistics for six sub-regions within Europe. The sub-regions are defined as follows: (1) Balkans: Albania, Bosnia, Bulgaria, Croatia, Greece, Kosovo, Macedonia, Montenegro, and Romania. (2) Central Europe: Czech Republic, Hungary, Poland, Slovakia, and Slovenia (3) Baltic States: Estonia, Latvia, Lithuania (4) Caucasus: Armenia, Turkey and Georgia (5) Eastern Europe: Russia, Ukraine, Belarus (4) Kyrgyzstan, Kazakhstan and Tajikistan.

Table 4.2 presents means and standard deviations of the variables of interest. The highest prevalence of smoking in the last month is in the Baltic countries (Latvia, Lithuania, and Estonia). Other countries with high smoking prevalence are Bulgaria, Czech Republic, and Ukraine. The prevalence of smoking cigarettes in the last month is not trivial. The region average is 20 percent. The lowest prevalence is observed among Armenia, Kazakhstan, Kyrgyzstan, and Turkey, all with a

prevalence rates of less than or equal to 10 percent. Maternal smoking is lowest in the region of Kyrgyzstan, Kazakhstan and Tajikistan and highest in the Balkans. More than half of the students receive pocket cash, but more students receive cash in Eastern and Central Europe and the Baltic states. Overall, the average student receives $9.60 each month as pocket cash. Over two thirds of the students have received instruction about the dangers of cigarette at school and more than three fourths have discussed with family the danger of cigarette use. Twenty six percent of students report that their mothers smoke and fifty percent report that their fathers smoke.

TABLE 4.2 - Means and Standard Deviations of Analysis Variables
Europe - Regions

Variable	Europe	Balkans	Central Europe	Baltic	Caucasus	Eastern Europe	Stan*
Smoke	0.20	0.19	0.26	0.34	0.09	0.27	0.07
	(0.40)	(0.40)	(0.44)	(0.47)	(0.28)	(0.44)	(0.26)
Peer	0.20	0.19	0.26	0.34	0.08	0.27	0.07
	(0.17)	(0.16)	(0.17)	(0.18)	(0.11)	(0.19)	(0.10)
Age	14.02	14.43	14.31	14.32	13.41	13.78	13.95
	(1.30)	(1.41)	(1.24)	(1.13)	(1.17)	(1.14)	(1.20)
Male	0.49	0.49	0.48	0.49	0.53	0.50	0.45
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Mother Smokes	0.08	0.11	0.12	0.08	0.05	0.06	0.02
	(0.28)	(0.31)	(0.33)	(0.26)	(0.22)	(0.25)	(0.13)
Father Smokes	0.32	0.29	0.23	0.35	0.40	0.42	0.38
	(0.47)	(0.45)	(0.42)	(0.48)	(0.49)	(0.49)	(0.49)
Both Smoke	0.18	0.23	0.22	0.17	0.15	0.13	0.06
	(0.38)	(0.42)	(0.41)	(0.37)	(0.35)	(0.34)	(0.24)
Pocket Cash	9.60	16.55	8.87	15.91	9.36	4.93	1.77
	(15.80)	(26.80)	(9.24)	(26.18)	(12.63)	(5.30)	(3.94)
Class on Smoking	0.68	0.66	0.72	0.65	0.63	0.67	0.75
	(0.47)	(0.48)	(0.45)	(0.48)	(0.48)	(0.47)	(0.43)
Family Discussions	0.75	0.79	0.70	0.72	0.80	0.76	0.74
	(0.43)	(0.41)	(0.46)	(0.45)	(0.40)	(0.43)	(0.44)

~ Standard deviation in parantheses; Stan* : Kazakhstan, Kyrgyzstan, Tajikistan

1.4.2. Summary Statistics - Americas

The second region under investigation is that of the Americas. The region of the Americas from the GYTS survey includes 26 countries and 2305 schools. I further group countries by geographic proximity into four sub-regions:

(1) South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Uruguay, and Venezuela

(2) Central America: Belize, Guatemala, Honduras, Nicaragua, Panama

(3) The Caribbean: Antigua and Barbuda, Bahamas, Cuba, Dominica, Grenada, Jamaica, St. Lucia, St. Vincent, and Trinidad and Tobago.

(4) Mexico: Because of a large number of observations, the analysis on Mexico is conducted separately.

Table 4.3 presents summary statistics on the analysis variables. The highest prevalence of smoking in the past month is found in South America at 23 percent. In Brazil, Chile, Colombia, Bolivia, and Argentina more than 1 in 4 youth have smoked in the last month. Venezuela has the lowest prevalence among this group where only 7.5 percent of youth have smoked in the past month. The lowest prevalence region is the region of the Caribbean where 13.1 percent of youth report smoking in the last month the survey was conducted.

Sixty percent of all children receive some pocket cash. On average students receive $9.65 a month. Sixty two percent of students have received some school instructions in the last year about the dangers of cigarette use. About 3 out of 4 students have received some family advice on the detrimental effects of cigarette use.

TABLE 4.3 - Means and Standard Deviations of Analysis Variables
America - Regions

Variable	Americas	South America	Central America	Caribbean	Mexico
Smoke	0.22	0.23	0.15	0.13	0.22
	(0.41)	(0.42)	(0.36)	(0.34)	(0.41)
Peer	0.22	0.22	0.15	0.13	0.22
	(0.16)	(0.17)	(0.13)	(0.11)	(0.14)
Age	13.92	14.04	14.00	13.77	13.44
	(1.47)	(1.52)	(1.49)	(1.28)	(1.21)
Male	0.48	0.48	0.46	0.50	0.49
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Mother Smokes	0.11	0.13	0.03	0.08	0.09
	(0.31)	(0.33)	(0.17)	(0.27)	(0.29)
Father Smokes	0.21	0.20	0.20	0.24	0.26
	(0.41)	(0.40)	(0.40)	(0.42)	(0.44)
Both Smoke	0.13	0.15	0.03	0.11	0.12
	(0.34)	(0.36)	(0.18)	(0.31)	(0.32)
Pocket Cash	9.66	9.75	3.07	2.88	14.41
	(13.52)	(11.79)	(6.16)	(6.14)	(20.04)
Class on Smoking	0.63	0.59	0.73	0.64	0.71
	(0.48)	(0.49)	(0.45)	(0.48)	(0.45)
Family Discussions	0.78	0.79	0.77	0.69	0.77
	(0.41)	(0.41)	(0.42)	(0.46)	(0.42)

~Standard deviation in parantheses

1.4.3. Summary Statistics – Asia and Pacific

The Asia and Pacific regions of the GYTS survey include 15 countries. The data includes countries in South East Asia and the West Pacific basin. Administratively the data is divided into two distinct regions, due to the fact that WHO field officers have different logistical channels under which they work through for the two regions. For example Thailand is included under Southeast Asia but Cambodia, Vietnam and Laos are all surveyed under the West Pacific Region. There is no difference in geography between the four countries since they are all situated in Southeast Asia. For purposes of the analysis the data is combined and divided into four sub-regions:

(1) Central Asia: China, Mongolia and South Korea.

(2) Indian Region: India, Bangladesh, Bhutan and Maldives.

(3) The Pacific Basin: East Timor, Indonesia, Micronesia, Papua New Guinea, Philippines.

(4) Southeast Asia: Laos, Thailand, and Vietnam.

Table 4.4 presents summary statistics on the analysis variables. The highest prevalence of cigarette is in the Pacific Basin. The Philippines has smoking prevalence of over 20 percent. The lowest prevalence countries are China, South Korea, Laos and Bangladesh, all with cigarette smoking prevalence rates below 10 percent. However, they may be some underreporting of smoking among youth in this area. In Cambodia in 2010, which is not included in my data, out of a sample of 1000 only 4 students reported smoking, which is hard to believe[6].

All countries have very low smoking prevalence among mothers. Smoking is a male dominated activity as suggested by the high prevalence of smoking by the fathers of the students. Fifty-eight percent of all children receive some pocket cash. The highest prevalence of pocket

[6] Personal communication with CDC personnel.

cash is in Central Asia where almost 80 of students receive some pocket cash. Students receive the equivalent of $3.13 each month. Sixty five percent of students have received some school instructions in the last year about the dangers of cigarette use. About 2 out of three students have received some family advice on the detrimental effects of cigarette use. A total 1842 schools were included in the analysis.

TABLE 4.4 - Means and Standard Deviations of Analysis Variables
Asia Pacific - Regions

Variable	Asia-Pacific	Central Asia	Southeast Asia	Pacific	Indian Region
Smoke	0.09	0.07	0.09	0.19	0.06
	(0.29)	(0.26)	(0.28)	(0.39)	(0.24)
Peer	0.09	0.07	0.09	0.18	0.06
	(0.11)	(0.07)	(0.11)	(0.13)	(0.09)
Age	14.03	13.80	14.24	14.45	13.90
	(1.37)	(1.17)	(1.44)	(1.47)	(1.32)
Male	0.55	0.51	0.45	0.45	0.59
	(0.50)	(0.50)	(0.50)	(0.50)	(0.49)
Mother Smokes	0.02	0.01	0.01	0.02	0.02
	(0.13)	(0.10)	(0.09)	(0.15)	(0.13)
Father Smokes	0.37	0.53	0.48	0.51	0.29
	(0.48)	(0.50)	(0.50)	(0.50)	(0.45)
Both Smoke	0.06	0.03	0.03	0.06	0.06
	(0.23)	(0.17)	(0.17)	(0.24)	(0.24)
Pocket Cash	3.13	21.14	4.52	4.27	0.23
	(8.77)	(19.61)	(7.90)	(5.50)	(0.50)
Class on Smoking	0.65	0.79	0.71	0.72	0.61
	(0.48)	(0.41)	(0.46)	(0.45)	(0.49)
Family Discussions	0.66	0.59	0.79	0.82	0.61
	(0.47)	(0.49)	(0.41)	(0.38)	(0.49)

~Standard deviation in parantheses

1.4.4. Summary Statistics – East Mediterranean

The East Mediterranean Region includes 21 countries. The region includes countries such as Egypt, Lebanon, Libya, Morocco, but also Somalia and Sudan. Included are countries of the Arabian Peninsula (Saudi Arabia, UAE, Yemen), the Persian Gulf region (Kuwait, Iran, Iraq) as well as Afghanistan and Pakistan. A total of 110,078 observations were included in the analysis across 1,444 schools. The data is divided into five geographic sub-regions:

(1) AF-PAK: Afghanistan and Pakistan

(2) Arabian Peninsula: Qatar, Saudi Arabia, United Arab Emirates, and Yemen

(3) The Persian Gulf: Iran, Iraq, and Kuwait

(4) Mid East and North Africa: Egypt, Gaza Strip, Jordan, Lebanon, Libya, Morocco, Syria, West Bank.

(5) Sudan and Somalia.

Table 1G presents summary statistics on the analysis variables. This area has the lowest cigarette prevalence among GYTS participating regions. Part of the reason may be the high concentration of Muslims in this region. In Islam smoking is considered haram - a sin that is outright forbidden or greatly discouraged. Maternal smoking prevalence is low, with the region average at 5.8 percent . A higher share of fathers smoke; 1 of 3 adult males in the survey smoke. Seventy percent all children receive some pocket cash and on average each student receives close to $6 each month. The highest prevalence of pocket cash is in oil rich countries where almost 75 percent of students receive some pocket cash with an average of $17 a month. Only fifty-two percent of students have received some school instructions in the last year about the dangers of cigarette use. Nearly three fourths of students have received some parental advice on the harms of smoking. Schools where only one grade was surveyed were dropped

because there is no variation between grades to identify the effect of peers. The observations dropped were similar in observables to the observations that the analysis was run.

TABLE 4.5 - Means and Standard Deviations of Analysis Variables
East Mediterranean - Regions

Variable	East Mediterranean	AF-PAK	Arabian Peninsula	Gulf Region	Mid East and North Africa	Sudan and Somalia
Smoke	0.06	0.02	0.06	0.04	0.06	0.07
	(0.23)	(0.15)	(0.24)	(0.20)	(0.24)	(0.25)
Peer	0.05	0.02	0.06	0.04	0.06	0.07
	(0.08)	(0.06)	(0.08)	(0.07)	(0.09)	(0.12)
Age	13.66	14.60	13.86	13.72	13.57	14.29
	(1.48)	(1.56)	(1.60)	(1.31)	(1.52)	(1.95)
Male	0.54	0.55	0.61	0.51	0.54	0.53
	(0.50)	(0.50)	(0.49)	(0.50)	(0.50)	(0.50)
Mother Smokes	0.01	0.01	0.02	0.01	0.01	0.01
	(0.11)	(0.10)	(0.12)	(0.10)	(0.11)	(0.10)
Father Smokes	0.33	0.29	0.27	0.30	0.37	0.21
	(0.47)	(0.45)	(0.44)	(0.46)	(0.48)	(0.41)
Both Smoke	0.05	0.02	0.05	0.04	0.05	0.06
	(0.21)	(0.14)	(0.22)	(0.20)	(0.21)	(0.24)
Pocket Cash	5.67	1.24	16.85	2.31	4.46	2.32
	(12.47)	(2.35)	(21.91)	(6.27)	(9.45)	(4.19)
Class on Smoking	0.53	0.61	0.58	0.43	0.56	0.44
	(0.50)	(0.49)	(0.49)	(0.49)	(0.50)	(0.50)
Family Discussions	0.74	0.56	0.68	0.78	0.74	0.78
	(0.44)	(0.50)	(0.47)	(0.41)	(0.44)	(0.42)

~Standard deviation in parantheses

1.4.5. Summary Statistics – Africa

The African Region includes 19 countries. The data is divided into six geographic sub-regions:

(1) Sub-region 1: Benin, Burkina Faso, Ghana, Ivory Coast, Togo

(2) Sub-region (2): Lesotho, South Africa, Swaziland,

(3) Sub-region (3): Botswana and Namibia

(4) Sub-region (4): Malawi, Mozambique, Zambia, Zimbabwe

(5) Sub-region (5): Burundi, Kenya, Uganda

(6) Sub-region (6): Comoros and Mauritius

Table 4.6 presents summary statistics on the analysis variables. Namibia has the highest prevalence of smoking among youth aged 13-15 in the region at 30 percent. High prevalence countries include: Congo, Lesotho, Mauritania, South Africa, Zimbabwe, and Zambia where smoking prevalence is close to or above 20 percent. Half of the students receive some form of pocket cash and on average each receives $1.5 a month. About two-thirds of students have received instruction about the harms of smoking at school in the last year. Fifty-eight percent of students report having received family advice on the dangers of smoking. A total 1246 schools were included in the analysis.

TABLE 4.6 - Means and Standard Deviations of Analysis Variables
Africa - Regions

Variable	Africa	Benin B. Faso Ghana Ivory Coast Togo	Lesotho South Africa Swaziland	Botswana, Namibia	Malawi Mozambique Zambia Zimbabwe	Burundi Kenya Uganda	Comoros Mauritius	Mali Mauritania Niger Nigeria Senegal
Smoke	0.18	0.12	0.24	0.28	0.17	0.13	0.17	0.16
	(0.38)	(0.32)	(0.43)	(0.45)	(0.37)	(0.34)	(0.37)	(0.37)
Peer	0.18	0.12	0.24	0.28	0.17	0.13	0.17	0.16
	(0.15)	(0.12)	(0.15)	(0.20)	(0.16)	(0.14)	(0.15)	(0.14)
Age	14.43	14.19	14.59	14.65	14.18	14.48	14.17	13.90
	(1.98)	(1.75)	(2.38)	(1.60)	(1.70)	(1.54)	(1.38)	(1.87)
Male	0.50	0.56	0.48	0.45	0.47	0.50	0.46	0.54
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Mother Smokes	0.03	0.01	0.06	0.04	0.02	0.01	0.01	0.01
	(0.18)	(0.09)	(0.24)	(0.20)	(0.12)	(0.10)	(0.12)	(0.09)
Father Smokes	0.17	0.07	0.24	0.19	0.21	0.14	0.34	0.12
	(0.38)	(0.26)	(0.42)	(0.39)	(0.40)	(0.35)	(0.48)	(0.33)
Both Smoke	0.05	0.04	0.09	0.06	0.03	0.02	0.03	0.05
	(0.22)	(0.19)	(0.28)	(0.24)	(0.17)	(0.15)	(0.18)	(0.22)
Pocket Cash	1.46	2.24	1.61	1.26	2.19	0.87	5.74	0.92
	(2.90)	(3.57)	(2.31)	(2.56)	(6.03)	(2.18)	(7.18)	(2.81)
Class on Smoking	0.65	0.58	0.55	0.52	0.61	0.82	0.63	0.51
	(0.48)	(0.49)	(0.50)	(0.50)	(0.49)	(0.38)	(0.48)	(0.50)
Family Discussions	0.58	0.51	0.55	0.47	0.51	0.65	0.65	0.63
	(0.49)	(0.50)	(0.50)	(0.50)	(0.50)	(0.48)	(0.48)	(0.48)

~ Standard deviation in parentheses

1.4.6. Enrollment in Secondary Education and Disparities among Population Groups.

This study estimates peer influences on individual smoking among middle school youth in GYTS participating countries. While peer influences at the school level are a significant determinant of youth smoking, the study does not capture peer influences outside of school. Middle school enrollment varies among the regions under investigation. For example, the high net enrollment rates into secondary education in the European region, over 80 percent, can be explained by the existence of compulsory education legislation in the region. In the Americas net enrollment rates stand at 72.8 percent during the period of the study. Enrollment rates, however, are much lower in the regions of Asia and the Pacific, and Africa. Secondary education attainments in Africa are lower than in all other regions of the world. In Sub-Saharan Africa less than one in two children was enrolled in junior secondary education (middle school), even though in a significant share of the countries middle school education is compulsory (Verspoor, 2006; UNESCO 2008, 2011, and 2012). While there has been an increase in secondary education in almost all regions under the period of study, gender, income and ethnic disparities in education persist in many regions.

Gender disparities in education persist in three of the five regions. Boys are often favored in educational investments over girls, even though females tend to perform better in school and are more likely to complete secondary education once enrolled. In Asia and the Pacific, the East Mediterranean region and Africa females are less likely to enroll and complete middle school (UNESCO 2008, 2011, 2012).

Often because middle school education is not entirely financed by the government, large income and ethnic disparities exist in enrollment and completion. In many countries of the region of the Americas income parity and ethnic parity in educational achievement is low, suggesting that poorer youth and youth from indigenous groups are less likely to attend and

complete middle school. A similar story can be told for the African region. Children who attend are plausibly more likely to come from wealthier families who can afford the school dues or can pay for uniforms, textbooks, and transportation (Velspoor, 2006). A greater level of homogeneity in the family background of one's peer group may produce larger peer effects because the social and economic distance among youth from wealthy families is smaller than among a peer group that is highly heterogeneous. But is should be noted that the analysis should only be extended to youth who attend educational institutions and among different countries and regions this implies that the analysis is discussing varying groups of youth aged 13-15.

1.5. Empirical Specification of Smoking Participation

1.5.1. Model Specification

The framework below specifies a model of grade-school based peer effects on the probability a student i, in grade g, and school s, will smoke. S_{igs} is a dichotomous variable indicating smoking participation in the last 30 days.

$$S_{igs} = \beta_0 + \beta_1 P_{igs} + \beta_2 X_{igs} + \beta_3 F + \beta_4 X_{-igs} + \beta_5 G_{is} + \beta_6 C_{igs} + S_i + \varepsilon_{ics}$$

P_{igs} ,the peer effect measure is the percentage of students who smoke within one's grade, excluding the individual. X_{igs} is the vector of personal characteristics (age, sex, pocket money). F_{igs} includes information on parental smoking, and family advice on the harmful effects of smoking. X_{-igs} includes the average characteristics of one's class (age, pocket cash, male and the number of students in one's class excluding the individual). G_{is} are grade dummies within schools. The grade dummies control for effects that are unobserved and particular to one's grade group (i.e. grade specific health curriculum). Because the peer influence is defined at the grade level, absent grade dummies the effect would show up in the peer variable, biasing the effect of peers. C_{igs} is a control for having received instruction in school about the harmful

effects of smoking in the last year. School dummies are indicated by S_i. School dummies are intended to capture the effect of sorting of students into schools and school level variables that all students are exposed (i.e. anti-smoking sentiments, smoking bans on school grounds, common cigarette prices etc.).

As previously stated, one must account for the fact that the individual can affect the behavior of peers, while at the same time his peers affect his own behavior (the reflection problem). The analysis use the proportion of one's peers with parents who smoke and the frequency a peer sees people smoking at home to instrument for peer smoking. These variables predict peer smoking but not individual smoking directly. One could argue that if the analysis was conducted among nominated friends these two instruments would not be exogenous, because nominated or close friends have knowledge of the home environment of the individual. This concern is alleviated given that the average grade size varies between 80-150 individuals. It is highly unlikely that among the 80-150 individuals that one shares a grade with, all or a majority of individuals have knowledge of the particular student's home environment. This gives further credence to the use of the instruments in the analysis.

The second source of endogeneity arises due to selection of students into schools. Implicit sorting into schools and school unobservable characteristics are eliminated through the use of school fixed-effects. Whereas there is implicit sorting into schools, there is no sorting into grades among students. Using this strategy, most peer effects are identified by variation in peer-group behavior between grades within schools.

First the model is estimated using OLS and it assumes that the peer effect measure is exogenous. In a second model, I use two-stage least squares in order to address the endogeneity of the peer measure. Peer smoking is estimated in a first stage by use of instruments and all other

exogenous variables. The second stage includes the predicted values from the peer measure from the first stage regression and all exogenous variables to estimate the effect of peer smoking on youth smoking. I cluster correct the standard errors at the school level since individual errors may be correlated within te school.

I first conduct the analysis among the regions: Africa, Europe, East Mediterranean, Americas, Southeast Asia and the Pacific. Within each region I further group countries is to smaller geographical sub-regions. The benefit of regional analysis is that it includes a larger amount of observations which generally produces consistent estimates. However, analysis at the regional level is only relevant if policy interventions take place at the regional level. Tobacco control policies are usually organized and financed at the country level, therefore, estimating country specific peer effects may be more informative of the effect that national level policies may have on reducing smoking prevalence among youth. Moreover, regional analyses impose the assumption that peer effects are the same among regions. This may not be true. To address this issue I run country specific estimations of peer effects. I only report estimates in countries where the instruments are strong[7].

1.5.2. Limitations

Previous studies have been able to control for a rich set of individual characteristics: parental education, family income, racial and ethnic background, home environment, school level policies and other measures for school level environment. While this paper addresses the school level environment and sorting of youth into schools via the use of school fixed effects, one would argue that lack of rich individual characteristics may be problematic. As stated under the literature review section family background characteristics such as peers' parental income

[7] I report estimates where the Wald F-statistic exceeds 10 and the Hansen J-statistic is greater than 0.1.

and education may matter as they comprise the contextual effects of social interaction. I try to proxy for peer income by the inclusion of the average amount of pocket cash that peers receive in the regression. Similarly, the lack of peer family background characteristics may be mitigated by the inclusion of school fixed effects. However, lack of important covariates may be problematic as endogenous effects are plausibly correlated with contextual effects.

A second limitation of the study is in how it addresses the simultaneity in peer behavior. Because the instruments used are peer parental smoking and the frequency peers observe smoking at home, the reflection problem is solved by the use of average peer characteristics on individual behavior. I previously argued that these instruments are plausibly exogenous, because a peer group defined at the grade level is sufficiently large that it would be unlikely that the individual has knowledge of the home environment for all his peers. However, these are still average peer characteristics, and to the extent that they may matter on their own right, the peer effect identified in the analysis may be a mixture of both endogenous and contextual effects.

The paper identifies the peer influences on individual smoking behavior, but it does not address what gives rise to varying estimates of peer effects among countries. This is an area of investigation that future research may want to explore. Moreover, the analysis is only conducted among middle school students and it should be interpreted only as peer effects at the school level. While school peers may represent the most relevant group of peers for youth who are enrolled in school, the analysis should not be extended to all youth because it excludes youth who are not enrolled in secondary educational institutions.

Finally, while regional analyses are conducted for all regions of the GYTS, country specific analysis are conducted only for those countries where the instruments were strong in predicting peer behavior and were credibly excluded from the main equation. The lack of

evidence on the remaining of the sample should not be interpreted as no evidence of peer effects. Rather the current analysis is limited by the lack of availability of instruments. Peer effects may exist among other countries, but this analysis was unable to identify them.

1.6. Measurement Error

As discussed under the literature review, the divergence between OLS and IV estimates in the literature is a common theme. This is the case for the current analysis, OLS estimates are attenuated relative to IV estimates. This difference is often attributed to measurement error problems. Students may misreport smoking participation because of imperfect recall on their smoking status in the past month or because they do not feel comfortable revealing their true smoking status in the survey. Furthermore, the use of survey data often only allows researchers to observe a portion of the grades within the school. For my analysis, at times I have the entire population of the students in a particular grade (minus the students who missed that day in class) other times however I only observe a few classes of the same grade within a particular school. The fact that we cannot enumerate each student in the school implies that estimates are subject to measurement error[8]. Further, since the literature provides no guidance on which peer groups is the relevant peer group, peer groups are often mis-measured. Finally, if students misreport their smoking the peer variable is going to be measured with error. Measurement error will bias OLS estimates downward for two reasons: (1) the variance of the measurement error is non-zero and (2) if only a portion of the students were surveyed this too leads incomplete information and attenuated OLS. Error in variables may produce not only biased results but often wrong signed

[8] See Micklewright et. al (2010) and Pischke (2009) for a discussion of measurement error when not all students are surveyed. Micklewright (2010) finds that substantial attenuation in OLS estimates due only surveying a share of students in the school.

results, this is especially true of the endogenous variable is correlated with other controls[9] (Bound, Brown and Mathiowetz, 2000). Pischke (2009) investigates the effect of measurement error on peer estimates and suggest that the use of instrumental variables may address the attenuation bias in OLS estimates that arises because of measurement error. While IV estimates address the measurement error problem, it does not address the non-response bias which also biases OLS estimate downward.

If the error in variable is assumed to be classical, we know that measurement error will generate attenuation bias in OLS estimates. Pischke (2009) investigates the extent to which such measurement error in variables will bias estimates in OLS and IV specifications. The discussion which follows summarizes the Pischke (2009) paper on measurement error in estimating peer effects.

Suppose the student smoking variable is X_{igs}, but it is not directly observed. We observe a measure X_{igs}* which is the measure the students report.

$X_{igs}^* = X_{igs} + u_{igs} = \eta_{gs} + v_{igs} + u_{igs}$

u_{igs} is the classical measurement error, η_{gs} is the common component of student background. Since only a portion of the students is observed, v_{igs} is the missing student component. One cannot assume that the students are missing at random. Students may be less likely to report being a smoker if their parents are unaware of their smoking. Assume the students who are

[9] Bound, Brown and Mathiowetz (2000). "The inclusion of other independent variables that are correlated with the mis-measured independent variable accentuates the downward bias. The notion of fixed effects models tend to seriously accentuate the effect of measurement error on parameter estimates represent an important case of this last point" The utilization of school fixed effects in this paper to control for sorting may further increase the bias of OLS estimates because the peer variable is correlated with the school fixed effects.

missing are drawn from a distribution that may differ from the observed student distribution because of background characteristics. Furthermore assume that the distribution is independent of grade assignment. The common component of student background η_{gs} has been absorbed by school fixed effects in some specifications, but σ_η^2 is positive where school fixed effects are not employed. Thus OLS estimates with school-fixed effects will converge to:

$$plim\beta = \beta(\frac{\overline{n}-1}{\overline{N}-1})\frac{\sigma_v^2}{\sigma_v^2+\sigma_u^2}$$

The peer effect is underestimated for two reasons (1) the variance of u_{igs} is not zero, thus we have that the ratio of variances is larger than zero but less than one. This implies that the OLS would exhibit attenuation bias due to the classical error-in-variables. (2) The second source of attenuation arises because $(\frac{\overline{n}-1}{\overline{N}-1})$ is strictly less than or equal to one. If only a portion of the students are surveyed this too will lead to attenuation bias of OLS estimates. Thus the OLS estimates are going to be underestimates of the true value of the parameter leading to downward bias when school fixed effects are employed.

The relationship is more involved when one does not control for selection into schools. This implies that η_{gs} (the common componenet of student background) would affect the OLS estimates. The OLS estimate in the absence of school fixed effects converges to:

$$plim\beta = \beta\frac{(\frac{\overline{n}-1}{\overline{N}-1})\sigma_v^2(\sigma_\eta^2+\sigma_v^2+\sigma_u^2)+(\overline{n}-1)\sigma_\eta^2(\sigma_v^2+\sigma_u^2)}{(\sigma_v^2+\sigma_u^2)(\overline{n}\sigma_\eta^2+\sigma_v^2+\sigma_u^2)}$$

This formulation implies that attenuation bias in the OLS estimate still persists when the peer variable is subject to measurement error, moreover the error is larger when not all students are

surveyed. However when η_{gs} is not partialled out by the use of school fixed effects, OLS will be biased upward.

The use of instrumental variables addresses the measurement error problem. In this case parental smoking and frequency one sees people smoking at home is used to predict the smoking of peers. The IV solves the measurement error problem. It does not solve the fact of not all students have been surveyed. Since σ_u^2 is zero after IV implementation. We have:

$$plim\beta IV = \beta(\frac{\overline{n}-1}{\overline{N}-1})\frac{\sigma_v^2}{\sigma_v^2} = \beta(\frac{\overline{n}-1}{\overline{N}-1})$$

If one cannot adjust the share of students who do not respond to the survey then the IV estimate is still downwardly biased.

Another source of bias which arises in IV estimation is due to the bounded nature of the peer variable. Pischke (2009) and Kane, Rouse and Staiger (1999) indicate that the IV estimator is going to be biased upward when the peer variable is bounded. Thus we are uncertain to the direction of the bias of the IV estimate. The inability of the researcher to enumerate everyone in the school would drive IV estimates downward; the bounded nature of the regressor will drive the IV estimates upward. The direction of bias will depend on the relative size of each bias. For purposes of this analysis the IV and OLS estimate can serve as upper and lower bounds for the peer effect. Pischke (2009) suggest that we can correct IV estimates when we know the share of students in the school relative to those who took the survey. The IV is given by

$$plim\beta IV = \beta(\frac{\overline{n}-1}{\overline{N}-1})\frac{\sigma_v^2}{\sigma_v^2} = \beta(\frac{\overline{n}-1}{\overline{N}-1}).$$

One can estimate an adjusted IV estimate by multiplying the IV estimate by the ratio of all surveyed over the number of complete responses $plim\beta IVadjusted = (\frac{\overline{N}-1}{\overline{n}-1})\beta(\frac{\overline{n}-1}{\overline{N}-1})\frac{\sigma_v^2}{\sigma_v^2} = \beta.$ This estimate will not be downwardly biased because of the non-response to the survey. Table 4 present the results of this adjustment. The adjusted estimates are slightly larger than the IV estimates, once the correction factor has been assigned.

Standard methods of correcting for measurement error bias are valid when errors are classical and the researcher is estimating a linear model. Errors in categorical variables are classification errors. Because the peer variable is bounded the measurement error is by definition non-classical (Pischke, 2009). If the true variable x*=1, then x-x*<=0 and if x*=0 then x-x*>=0, suggesting that the covariance of the true peer variable and the error is negative. This implies that the measurement error is mean-reverting because when x* is a maximum (minimum) of its range, reporting errors can only be negative (positive) (Bound, Brown and Mathiowetz, 2002). This suggests that IV estimates will be upwardly biased in the presence of a mis-measured bounded endogenous variable.

To address the upward bias of the IV, I follow a technique proposed by Kaine, Staiger, Rouse (1999) who show that one can obtain consistent IV estimates using a GMM procedure when one has two reports of the same variable. This methodology was extended by Franzis and Loweinstein (2003) who show that in the presence of a mis-measured endogenous variable a GMM procedure can be implemented by the use of instrumental variables.

In order to obtain consistent estimates of peer influence it is easier to work with Yulized residuals versus the original specified model. I regress the outcome variable, the endogenous variable and the IVs on all right hand side variables and obtain the residuals. Regressing the

residuals provides identical results to running the full model. Now the model becomes $Y_i = \beta X_i + \varepsilon_i$ and the measurement error is $X_i = \gamma X_i^* + u_i$ where the true peer measure X_i^* is uncorrelated with u_i, such that $Cov(X_i^*, u_i) = 0$. Assume the instruments $Z_1 = \alpha_1 X_i^* + \omega_1$ and $Z_2 = \alpha_2 X_i^* + \omega_2$ and that the true peer measure is unrelated with ω_2, ω_1. Hence the $Cov(X_i^*, \omega_i) = 0$. The population moment conditions are:

$$S_{YX} = \beta\gamma Var(X^*) + \gamma Cov(X^*, \varepsilon) \quad (1)$$

$$S_{YZ1} = \beta\alpha_1 Var(X^*) + \alpha_1 Cov(X^*, \varepsilon) \quad (2)$$

$$S_{YZ2} = \beta\alpha_2 Var(X^*) + \alpha_2 Cov(X^*, \varepsilon) \quad (3)$$

$$S_{XZ1} = \gamma\alpha_1 Var(X^*) \quad (4)$$

$$S_{XZ2} = \gamma\alpha_2 Var(X^*) \quad (5)$$

$$S_{Z2Z1} = \alpha_1\alpha_2 Var(X^*) \quad (6)$$

Under mean-reverting measurement error, the covariance of the true peer variable (X*) and the error (ε_i) should be negative. The IV estimates assume that measurement error is classical, and that the covariance between the true peer variable and the error is zero. This is not true in the presence of misclassification error. The above moment conditions model mean-reverting measurement error. The first equation describes the relationship between the true peer variable (X*) and individual smoking (Y). The second and third moment conditions describe the relationship between the instruments and the outcome variable. The fourth and fifth equations

describe how the instruments are related to the true peer variable, and the sixth equation describes the relationship between the instruments. The parameter of interests is β, which maps the relationship between peer influences and individual smoking prevalence. I have six equations and six unknowns. The system is exactly identified. The benefit of the GMM procedure is that it models measurement error in addition to addressing the endogeneity between peer and individual behavior. However, GMM procedures do not solve the problem of weak instruments.

1.7. Results

1.7.1. Results- Europe

Table 7.1 summarizes the OLS results. I provide the results for the entire European region of the survey and then I break down the results by sub-region. The estimates in the specification with school fixed effects range between 0.0 - 2.7 percentage point increase in the probability an individual will smoke for a 10 percent increase in peer smoking. On average a 10 percent increase in peer smoking would increase the individual probability of smoking by less than 1 percentage point. The OLS estimates suggest no effect of peers in almost all sub-regions with the exception of Kazakhstan, Kyrgyzstan and Tajikistan. This is difficult to believe since these areas are high prevalence areas; one would expect that individual behavior would be affected by peer behavior.

Receiving pocket cash increases the smoking prevalence. A dollar increase in pocket cash increases the probability one smokes in a given month by 0.2 to 1.3 percentage points, suggesting that cigarettes are a normal good for youth[10]. Maternal smoking is associated with an

[10] Grossman and Chaloupka (1996) have also found cigarette consumption to be normal good among teens.

increase in the probability of smoking between 4 and 13 percentage points depending on the region. Paternal smoking is associated with a 0 to 7 percentage point increase in the probability of smoking. The largest impact of parental characteristics is when both parents smoke. This effect ranges between 5 and 16 percentage points. It is unclear whether the associated effect of parental smoking arises because of modeling of appropriate behavior or whether it is the result of access to cigarettes at home.

Family discussions about the dangers of smoking are associated with lower prevalence of cigarette in the Caucasus region. In the other regions I find it surprising that the effect is positive and significant. However, this can be because parents in high smoking prevalence areas are more likely to have discussions about the dangers of smoking with their children. Alternatively, parents could be providing advice on the dangers of smoking and benefits of smoking cessation once a youth has already initiated smoking. Furthermore, I am unable to control for the quality of the relationship between family and the individual. Thus I cannot ascertain the extent to which this positive impact may be associated with the quality of relationship between parent and child. Children may be less likely to respond to family advice when they are threatened or punished or if family members are not close to one another (Chaloupka and Powell, 2005).

Finally, I included average peer characteristics. In some specifications the average age in one's peer group is predictive of cigarette initiation. Groups with older peers may be more likely to initiate smoking. But this effect is not consistent throughout.

The IV estimates (Table 7.2) stand in contrast with the OLS estimates. The entire region estimate would suggest a peer effect of 3.7 percentage point increase in the probability one smokes for an increase in peer prevalence of 10 percent (or 9.25 percentage point increase for a

25 percent increase in peer prevalence). The instruments are strong with a Wald-test of 35, but the Hansen J-test P-value implies that they may not be credibly excluded from the main equation. One should be careful about interpreting the results from regions with weak instruments (Balkans, Caucasus, Eastern Europe, and Kyrgyzstan, Kazakhstan and Tajikistan).

In fact the only IV estimate that can be credibly interpreted are those for Central Europe and the Baltic states, both regions have Wald F-tests larger than 10 and Hansen J statistics P-value greater than 0.1. In the Baltic region a 10 percent increase in peer smoking will increase individual smoking by 5.28 percentage points (a 15.5 percent effect off the mean of 0.34). Similarly in the Central European region a 10 percent increase in peer smoking will increase individual smoking by 4.12 percentage points (a 15.8 percent effect off the mean of 0.26). This effect is more in line with the findings of Fletcher (2010), Clark and Loheac (2007), Gaviria and Raphael (2001).

It is important to revisit the estimates for all other control variable in the IV estimation, because measurement error in a right hand side variable may bias the estimates for the other controls (Greene, 2003). The IV procedure solves this problem and generates unbiased estimates for the other right hand side variables. Receiving pocket cash increases the smoking prevalence. A dollar increase in pocket cash increases the probability one smokes in a given month by 0.2 to 3.7 percentage points. Maternal smoking is associated with an increase in smoking between 4 to 16 percentage points, depending on the region. Paternal smoking is associated with a 0 to7 percentage point effect on youth smoking. When both parents smoke, smoking prevalence is associated with an effect between 5 to 15 percentage points. Instruction at school about the dangers of cigarette reduces prevalence by an average of 3 percentage points.

The Table 7.3 summarizes the GMM results which control for mean-reverting measurement error. The GMM procedure produces consistent estimates for the peer effect and these results are the ones that should be interpreted for policy purposes. Since GMM does not solve the problem of weak instruments, I can only interpret results for the Central European region and the Baltic states. The GMM estimates are smaller than the IV estimates and larger than OLS estimates. A 10 percent increase in smoking by one's peers is associated with a 2.3 to 2.86 percentage point increase in smoking by the individual for the regions of Central Europe and the Baltic States. Using the updated GMM estimates a 10 percent increase in peer smoking increases the probability a youth will smoke by 8.6 percent among the Baltic countries and by 8.8 percent among Central European countries.

1.7.2. Country Specific Results – Europe

Up to this point the analysis has estimated the effects of peers at the regional level. Tobacco control policies are generally organized and financed at the country level, therefore, estimating country specific peer effects may be more informative of the effect that national level policies may have on reducing smoking prevalence among youth. Moreover, regional analyses impose the assumption that peer effects are the same among regions. This of course may not be true. To address this issue I run country specific estimations of peer effects. I only report estimates in countries where the instruments are strong. In Europe I estimate peer influence for only one country, Latvia. In most countries, the instruments were not strong, suggesting that any inference using weak instruments would be inappropriate. Table 7.4 provides summary statistics for the Latvian sample of youth.

OLS estimates are summarized in Table 7.5. Similarly to the regional analysis, OLS estimates suggest no effect of peer smoking on individual smoking prevalence. Addressing the endogeneity in peer behavior and treating measurement error as classical produces the IV estimates in Table 7.6. The coefficients on the peer-smoking variable is 0.527, suggesting that a 10 percent increase in peer smoking would increase the probability that the individual smokes by 5.3 percentage points. This effect is overstated due to the bounded nature of the endogenous variable. Treating measurement error as mean reverting under the GMM procedure produces estimates which are much smaller, . (Table 7.7). I find that a 10 percent increase in peer smoking increases individual smoking by 2.6 percentage points in Latvia. This effect implies that youth smoking prevalence increases from 36 percent to 38.6 percent, a 7 percent effect due to an increase in peer smoking by 10 percent.

Parental smoking is associated with an increase in the probability an individual smokes. This is especially true for maternal smoking where if the mother smokes a youth is 17 percentage points more likely to smoke.

This analysis has allowed us to explain the bias in OLS and IV estimates in the presence of measurement error. OLS estimates are downwardly biased and IV estimates upwardly biased in the presence of measurement error. GMM estimates which account for misclassification error provide estimates that are consistent and can explain to some extent differences in estimates among studies that use similar samples and methodologies in determining peer effects. While the analysis for Europe provides estimates for the peer effect for just one out of the original 26 countries, the lack of evidence for the rest of the countries should not be interpreted as lack of peer effects. It is rather the lack of strong instruments that does not allow the analysis to be conducted for the rest of the European countries. The weak instruments will produce estimates

which are biased. Future research among these countries may be able to address the issue of weak instruments and produce peer effect estimates for the remaining countries.

TABLE 7.1 - OLS Results of Peer Effect on Individual Smoking Prevalence
Europe - Regions

Tobacco Incidence	All Countries	Balkans	Central Europe	Baltic	Caucasus	Eastern Europe	Stan*
Peer	0.0851*	0.012	-0.047	-0.047	0.016	0.077	0.274***
	[0.0331]	[0.0869]	[0.0726]	[0.0967]	[0.103]	[0.0582]	[0.0767]
Age	0.023***	0.016***	0.021***	0.026***	0.023***	0.048***	0.006
	[0.003]	[0.004]	[0.006]	[0.007]	[0.004]	[0.006]	[0.0032]
Male	0.036***	0.019*	0.005	0.053***	0.061***	0.061***	0.051***
	[0.005]	[0.010]	[0.011]	[0.013]	[0.007]	[0.011]	[0.006]
Mother smokes	0.090***	0.073***	0.104***	0.160***	0.038**	0.120***	0.127***
	[0.007]	[0.014]	[0.012]	[0.020]	[0.013]	[0.012]	[0.036]
Father smokes	0.039***	0.035***	0.069***	0.059***	0.013*	0.039***	0.003
	[0.004]	[0.007]	[0.011]	[0.013]	[0.006]	[0.007]	[0.004]
Both Par smoke	0.124***	0.118***	0.155***	0.143***	0.050***	0.136***	0.122***
	[0.006]	[0.011]	[0.011]	[0.015]	[0.008]	[0.012]	[0.026]
Pocket Cash	0.004***	0.002***	0.008***	0.003***	0.003***	0.015***	0.013***
	[0.000]	[0.000	[0.000]	[0.000]	[0.000]	[0.001]	[0.001]
Age-i	0.004	0.0188*	0.045	0.004	-0.021	0.008	0.008
	[0.007]	[0.009]	[0.024]	[0.033]	[0.015]	[0.025]	[0.009]
Cash-i	0.000	0.000	0.000**	0.002*	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.004]	[0.000]
Male-i	0.022	0.112*	0.045	0.129	0.003	0.125**	-0.0464*
	[0.021]	[0.049]	[0.024]	[0.072]	[0.040]	[0.044]	[0.022]
Nr classmates	0.000	0.000	[0.000]	0.001	-0.00109***	-0.00274***	0.000143*
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Class on Smoking	-0.0280***	-0.011	-0.0511***	-0.024	-0.007	-0.0449***	-0.0220**
	[0.004]	[0.008]	[0.010]	[0.014]	[0.006]	[0.009]	[0.008]
Family advise	0.0287***	-0.004	0.0341***	0.105***	-0.0153*	0.0909***	0.005
	[0.005]	[0.010]	[0.010]	[0.011]	[0.007]	[0.009]	[0.007]
Observations	165,175	38,178	40,221	14,572	17,369	30,179	24,656
Schools	2,490	567	603	250	247	546	277

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001; Stan* : Kazakhstan, Kyrgyzstan, Tajikistan

TABLE 7.2 - IV Results of Peer Effect on Individual Smoking Prevalence
Europe - Regions

Tobacco Prevalence	All Countries	Balkans	Central Europe	Baltic	Cacasus	Eastern Europe	Stan*
Peer	0.374**	0.400*	0.412***	0.528***	0.669***	0.386*	0.692***
	[0.079]	[0.190]	[0.116]	[0.113]	[0.174]	[0.153]	[0.080]
Age	0.023***	0.015***	0.020**	0.026***	0.023***	0.047***	0.006
	[0.003]	[0.004]	[0.006]	[0.007]	[0.005]	[0.006]	[0.003]
Male	0.036***	0.018	0.005	0.048***	0.061***	0.059***	0.051***
	[0.005]	[0.010]	[0.011]	[0.013]	[0.007]	[0.011]	[0.006]
Mother smokes	0.09***	0.071***	0.102***	0.161***	0.037**	0.119***	0.123***
	[0.007]	[0.014]	[0.012]	[0.021]	[0.013]	[0.020]	[0.035]
Father smokes	0.039***	0.035***	0.068***	0.061***	0.014*	0.038***	0.002
	[0.004]	[0.007]	[0.011]	[0.013]	[0.006]	[0.008]	[0.004]
Both Par smoke	0.123***	0.116***	0.153***	0.143***	0.049***	0.135***	0.118***
	[0.006]	[0.011]	[0.011]	[0.016]	[0.008]	[0.012]	[0.025]
Pocket Cash	0.037***	0.002***	0.008***	0.003***	0.003***	0.015***	0.013***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000	[0.0016]	[0.0016]
Age-i	-0.005	0.005	0.017	-0.016	-0.0218**	-0.014	0.003
	[0.006]	[0.008]	[0.016]	[0.018]	[0.008]	[0.019]	[0.006]
Cash-i	0.000	0.000	0.000	0.000	0.000	-0.005	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.004]	[0.000]
Male-i	0.002	0.0687*	-0.034	0.012	-0.0465*	0.061	-0.0473***
	[0.018]	[0.034]	[0.031]	[0.040]	[0.023]	[0.046]	[0.013]
Nr classmates	0.000	0.000	-0.001***	0.001	0.000	-0.001***	0.000
	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]
Class on Smoking	-0.0281***	-0.010	-0.0498***	-0.0307*	-0.009	-0.0441***	-0.0230**
	[0.004]	[0.008]	[0.010]	[0.013]	[0.006]	[0.009]	[0.008
Family advise	0.0289***	-0.004	0.0341**	0.103***	-0.0140*	0.0914***	0.007
	[0.005]	[0.010]	[0.010]	[0.010]	[0.007]	[0.010]	[0.007]
Observations	165,175	38,178	40,221	14,572	17,369	30,179	24,656
Schools	2,490	567	603	250	247	546	277
Underidentification P-Value	0.000	0.002	0.000	0.000	0.022	0.000	0.030
Wald F test	35.032	7.799	15.233	15.360	5.838	8.959	8.117
Hansen J Stat P-Value	0.030	0.110	0.110	0.251	0*	0.197	0*

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001; Stan* : Kazakhstan, Kyrgyzstan, Tajikistan

The effect for Cacasus, and the countries of Kazakhstan, Kyrgyzstan, and Tajikistan is exactly identified, using The frequency peers see smoking at home.

TABLE 7.3 - OLS, IV, GMM Estimates for the Effect of Peer Effect on Individual Smoking Prevalence
Europe - Regions

Tobacco Incidence	OLS	IV	GMM
Europe	0.0851*	0.374**	0.33**
	[0.033]	[0.079]	[0.001]
Balkans	0.012	0.400*	0.311***
	[0.087]	[0.190]	[0.003]
Central Europe	-0.047	0.412***	0.233***
	[0.073]	[0.116]	[0.003]
Baltic	-0.047	0.528***	0.286***
	[0.097]	[0.113]	[0.002]
Caucasus	0.016	0.669***	0.288***
	[0.103]	[0.174]	[0.003]
Eastern Europe	0.077	0.386*	0.22***
	[0.058]	[0.153]	[0.003]
Kyrgyzstan, Kazakhstan, Tajikistan	0.274***	0.692***	0.403***
	[0.077]	[0.080]	[0.003]

~ School fixed Effects; Errors clusters at the school; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.4 - Means and Standard Deviations of Analysis Variables Europe - Countries

Variable	Latvia
Smoke	0.36
	(0.48)
Peer	0.36
	(0.17)
Age	14.42
	(1.16)
Male	0.48
	(0.50)
Mother Smokes	0.07
	(0.25)
Father Smokes	0.37
	(0.48)
Both Smoke	0.16
	(0.36)
Pocket Cash	23.43
	(35.84)
Class on Smoking	0.72
	(0.45)
Family Discussions	0.75
	(0.43)

~Standard deviation in parentheses

TABLE 7.5 - OLS Results of Peer Effects on Individual Smoking Prevalence
Europe - Countries

Tobacco Incidence	Latvia
Peer	-0.150
	[0.138]
Age	0.0215*
	[0.00992]
Male	0.0565***
	[0.0164]
Mother smokes	0.174***
	[0.0355]
Father smokes	0.0611***
	[0.0171]
Both Par smoke	0.141***
	[0.0223]
Pocket Cash	0.00229***
	[0.000279]
Age-i	0.019
	[0.0470]
Cash-i	0.00319**
	[0.00109]
Male-i	0.089
	[0.0928]
Nr classmates	0.002
	[0.00184]
Class on Smoking	-0.003
	[0.0188]
Family advise	0.128***
	[0.0143]
Observations	5,247
Schools	100

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.6 - IV Results of Peer Effect on Individual Smoking Prevalence
Europe - Countries

Tobacco Incidence	Latvia
Peer	0.527***
	[0.140]
Age	0.0221*
	[0.00981]
Male	0.0523**
	[0.0167]
Mother smokes	0.172***
	[0.0357]
Father smokes	0.0616***
	[0.0174]
Both Par smoke	0.141***
	[0.0228]
Pocket Cash	0.00221***
	[0.000275]
Age-i	0.000
	[0.0223]
Cash-i	0.000
	[0.000770]
Male-i	-0.014
	[0.0449]
Nr classmates	0.001
	[0.000840]
Class on Smoking	-0.012
	[0.0183]
Family advise	0.131***
	[0.0144]
Observations	5,247
Schools	100
Underidentification P-Value	0.001
Wald F test	15.074
Hansen J Stat P-Value	0.469

~ Errors clusters at the school level; * implies p <0.05, ** implies p <0.01 and *** implies p <0.001

TABLE 7.7 - OLS, IV, GMM Results of Peer Effects on Individual Smoking Prevalence
Europe - Countries

Tobacco Incidence	OLS	IV	GMM
Latvia	-0.150	0.527***	0.262***
	[0.138]	[0.140]	[0.004]

Errors clusters at the school; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

1.7.3. Analysis - Americas

There are no theoretical or empirical reasons to suggest that peer effects may be different in the region of the Americas relative to the European region. For example, the estimated effects from Swedish youth are in the middle of the range of the estimated peer effects among US youth (Lundborg, 2006; Fletcher, 2010; Powel et. al, 2005). Another issue that may impact the peer estimates deals with compulsory schooling laws among the different regions of the world. In Europe middle school attendance is compulsory. Middle school attendance is compulsory among countries in the region of the Americas. However, evidence suggests that youth from low income countries and youth of indigenous background are less likely to attend.

I use the same specification for the region of the Americas as was used for the European region. The use of school fixed effects controls for sorting, the instruments are peers parental smoking and the frequency peers observe smoking at home. The same contextual effects are used as controls (age of peers, sex of peers, and pocket cash that peers receive).

1.7.3.1. Results – Americas

Table 7.8 summarizes OLS results from the region of the Americas. The results for the entire region suggest that taking increasing the share of peers who smoke by 10 percent increases the probability one will smoke by 1.4 percentage points. In the OLS regression I find no peer effects for Mexico and the Caribbean region. In fact the estimates are negative, albeit insignificant. Staiger, Kane and Rousse (1999) and Pischke (2009) argue that in the presence of measurement error the OLS estimates will exhibit attenuation bias and may even be wrong signed. The attenuation bias that arises because of measurement error may be further accentuated because of the use of school fixed effects. School fixed effects address the sorting of families into schools. Implicitly families are choosing their children's peer group. While school fixed

effects make the bias in OLS estimates worse, exclusion of school fixed effects would not appropriately control for sorting into schools, convoluting the endogenous effects with correlated effects and vastly overstating the effect of peer influence on individual behavior. While OLS estimates are helpful for comparison purposes, they can only be useful for bounding the effect of peers.

Table 7.9 summarizes the IV estimates. The instruments are percent of peers with a smoking parent and percent of peers who observe smoking at home. The IV estimates vary from OLS estimates. The IV estimates suggest that a 10 percent increase in smoking among peers will increase the probability a youth will smoke by 4.3 percentage points. Among South American youth a 10 percent increase in the share of peers that smoke increase the probability that the individual will smoke by 4.5 percentage points. In Mexico, a 10 percent increase in peers that smoke would increase the probability that the individual smoked by 4.6 percentage points. The estimates from Central America and the Caribbean are not very useful. Wald F-statistics suggests that in these two regions the instruments may be week predictors of peer smoking.

The estimates on the other covariates remain largely unaffected by measurement error. OLS and IV estimates are not statistically different from one another. Maternal smoking is associated with an increase in smoking prevalence of 6.45 percentage points among youth. Smoking by fathers increases the probability a child will smoke by 5 percentage points, whereas if both parents smoke the probability a youth will smoke increases by 9.6 percentage points. Instruction in school about the dangers of smoking decreases the probability that a youth will smoke by 6 percentage points for Mexico, but is insignificant in the other regions. Family advice on the dangers of cigarette is associated with a decrease in probability a youth will smoke by 2.5

percentage points. One of the main drives of smoking use among youth is the availability of pocket cash. This is associated with an increase in probability a youth will smoke by 0.02 percentage points for a dollar increase in pocket cash.

The IV and OLS estimates bound the effect of peer smoking on individual smoking. However, GMM estimates provide consistent estimates in the presence of mean-reverting measurement error. The GMM estimates, Table 7.10, range between 2-3.25 percentage point increase in the probability an individual will smoke due to a 10 percent increase in peer smoking. Using the GMM estimates a 10 percent increase in peer smoking increases individual prevalence from 22 to 25.25 percent, which is a 3.25 percentage point increase or a 15 percent increase in individual smoking.

1.7.3.2. Country Specific Results – Americas

I estimate country specific peer effects for the countries where the instruments are strong. For the region of the Americas, this includes two countries: Cuba, and Mexico.
Table 7.11 summarizes the analysis variables. Tables 7.12 -7.14 summarize OLS, IV and GMM estimates. In the OLS specification I find no effect of peer smoking on individual smoking. The IV estimates suggest that a 10 percent increase in smoking by one's peer group increases individual smoking between 4.6 percentage points in Mexico and 6.5 percentage points in Cuba. These effects are large as expected because of the upward bias in IV estimates of a bounded endogenous variable. In the GMM results a 10 percent increase in peer smoking increases the probability that an individual will smoke by 2.8 percentage points in Mexico and 4 percentage points in Cuba. Using the GMM estimates which account for mean-reverting measurement error

would imply that a 10 percent increase in youth smoking would increase individual smoking by 36 percent in Cuba, and 14 percent in Mexico.

The IV estimates suggest that maternal smoking is associated with an 11 percentage point increase in the probability a youth will smoke in Mexico. The effect of Cuba is not significant. Paternal smoking is associated with a 2.7 and 5.4 percentage point increase in the likelihood a youth will smoke for Cuba and Mexico, respectively. The availability of pocket money increase the probability a youth will smoke. Instruction in school about the dangers of smoking in the last year reduces the probability will smoke by 6 percentage points.

TABLE 7.8 - OLS Results of Peer Effect on Individual Smoking Prevalence
Americas - Regions

Tobacco Incidence	All Countries	South America	Central America	Caribbean	Mexico
Peer	0.140*	0.152*	0.314***	-0.088	-0.045
	[0.0554]	[0.0712]	[0.0871]	[0.130]	[0.0912]
Age	0.0425***	0.0475***	0.0307***	0.005	0.0354***
	[0.00295]	[0.00399]	[0.00415]	[0.00485]	[0.00517]
Male	-0.006	-0.0246***	0.0648***	0.0325***	0.0155*
	[0.00505]	[0.00689]	[0.00970]	[0.00973]	[0.00737]
Mother smokes	0.0645***	0.0536***	0.0936***	0.0449**	0.112***
	[0.00951]	[0.0116]	[0.0224]	[0.0155]	[0.0170]
Father smokes	0.0494***	0.0481***	0.0505***	0.0398***	0.0540***
	[0.00559]	[0.00791]	[0.0121]	[0.0109]	[0.0111]
Both Par smoke	0.0970***	0.0990***	0.0813***	0.104***	0.0848***
	[0.00978]	[0.0125]	[0.0234]	[0.0158]	[0.0152]
Cash	0.00228***	0.00205***	0.00874***	0.00915***	0.00197***
	[0.000227]	[0.000423]	[0.000710]	[0.00242]	[0.000222]
Age-i	0.017	0.023	0.015	0.027	-0.040
	[0.0113]	[0.0167]	[0.0133]	[0.0146]	[0.0222]
Cash-i	0.001	0.002	-0.005	-0.00965***	0.000
	[0.00132]	[0.00274]	[0.00288]	[0.00242]	[0.00196]
Male-i	-0.010	-0.022	0.028	0.026	0.046
	[0.0310]	[0.0415]	[0.0362]	[0.0646]	[0.0485]
Nr classmates	0.000	0.000	0.000	-0.001	0.001
	[0.000257]	[0.000337]	[0.000221]	[0.000557]	[0.000564]
Class on Smoking	-0.009	-0.012	-0.006	-0.010	-0.0606***
	[0.00482]	[0.00643]	[0.00861]	[0.0120]	[0.0109]
Family Discussions	-0.0245***	-0.010	-0.0643***	0.000	0.002
	[0.00637]	[0.00873]	[0.0122]	[0.0109]	[0.00811]
Observations	177,396	101,855	22,756	12,032	40,753
Schools					

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.9 - IV Results of Peer Effect on Individual Smoking Prevalence
Americas - Regions

Tobacco Incidence	All Countries	South America	Central America	Caribbean	Mexico
Peer	0.432***	0.451**	0.524***	0.346*	0.457***
	[0.114]	[0.145]	[0.135]	[0.163]	[0.106]
Age	0.0421***	0.0470***	0.0305***	0.004	0.0361***
	[0.00294]	[0.00397]	[0.00416]	[0.00495]	[0.00526]
Male	-0.006	-0.0239***	0.0645***	0.0322***	0.014
	[0.00503]	[0.00687]	[0.00970]	[0.00944]	[0.00743]
Mother smokes	0.0647***	0.0541***	0.0915***	0.0436**	0.111***
	[0.00952]	[0.0117]	[0.0223]	[0.0154]	[0.0169]
Father smokes	0.0498***	0.0485***	0.0507***	0.0410***	0.0544***
	[0.00558]	[0.00788]	[0.0121]	[0.0108]	[0.0113]
Both Par smoke	0.0963***	0.0983***	0.0801***	0.103***	0.0840***
	[0.00983]	[0.0126]	[0.0232]	[0.0159]	[0.0149]
Cash	0.00227***	0.00201***	0.00878***	0.00937***	0.00197***
	[0.000227]	[0.000423]	[0.000709]	[0.00244]	[0.000223]
Age-i	-0.002	0.000	0.001	0.016	-0.0425**
	[0.0109]	[0.0158]	[0.0136]	[0.0109]	[0.0132]
Cash-i	0.000	0.001	-0.00588**	-0.00984***	-0.001
	[0.00100]	[0.00210]	[0.00214]	[0.00201]	[0.00102]
Male-i	0.001	0.002	0.002	-0.001	0.014
	[0.0228]	[0.0313]	[0.0322]	[0.0384]	[0.0276]
Nr classmates	0.000	0.000	0.000	0.000	0.000
	[0.000211]	[0.000281]	[0.000145]	[0.000359]	[0.000283]
Class on Smoking	-0.009	-0.011	-0.006	-0.009	-0.0590***
	[0.00472]	[0.00631]	[0.00855]	[0.0117]	[0.0109]
Family Discussions	-0.0243***	-0.010	-0.0634***	0.000	0.000
	[0.00640]	[0.00874]	[0.0122]	[0.0105]	[0.00790]
Observations	177,396	101,855	22,756	12,032	40,753
Schools	2,305	1,349	244	198	514
Underidentification P-Value	0.000	0.000	0.006	0.001	0.000
Wald F test	19.271	12.022	7.044	9.973	11.578
Hansen J Stat P-Value	0.451	0.487	0.179	0.427	0.860

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.10 - OLS, IV, GMM Results of Peer Effect on Individual Smoking Prevalence
Americas - Regions

Tobacco Incidence	OLS	IV	GMM
All	0.140*	0.432***	0.303***
	[0.0554]	[0.114]	[0.002]
South America	0.152*	0.451**	0.325***
	[0.0712]	[0.145]	[0.004]
Central America	0.314***	0.524***	0.302***
	[0.0871]	[0.135]	[0.004]
Caribbean	-0.088	0.346*	0.205***
	[0.130]	[0.163]	[0.002]
Mexico	-0.045	0.457***	0.282***
	[0.0912]	[0.106]	[0.003]

Errors clusters at the school; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.11 - Means and Standard Deviations of Analysis America - Countries

Variable	All	Cuba	Mexico
Smoke	0.21	0.11	0.22
	(0.41)	(0.31)	(0.41)
Peer	0.21	0.11	0.22
	(0.14)	(0.10)	(0.14)
Age	13.43	13.36	13.44
	(1.20)	(1.07)	(1.21)
Male	0.50	0.52	0.49
	(0.50)	(0.50)	(0.50)
Mother Smokes	0.10	0.13	0.09
	(0.29)	(0.34)	(0.29)
Father Smokes	0.26	0.23	0.26
	(0.44)	(0.42)	(0.44)
Both Smoke	0.12	0.21	0.12
	(0.33)	(0.41)	(0.32)
Pocket Cash	13.11	0.93	14.41
	(19.45)	(1.25)	(20.04)
Class on Smoking	0.72	0.86	0.71
	(0.45)	(0.35)	(0.45)
Family Discussions	0.77	0.81	0.77
	(0.42)	(0.39)	(0.42)

~Standard deviation in parentheses

TABLE 7.12 - OLS Results of Peer Effect on Individual Smoking Prevalence
Americas - Countries

Tobacco Incidence	All	Cuba	Mexico
Peer	-0.037	0.020	-0.045
	[0.088]	[0.149]	[0.0912]
Age	0.034***	0.012	0.0354***
	[0.005]	[0.00971]	[0.00517]
Male	0.014*	0.004	0.0155*
	[0.007]	[0.0107]	[0.00737]
Mother smokes	0.104***	0.0335*	0.112***
	[0.016]	[0.0156]	[0.0170]
Father smokes	0.052***	0.0275*	0.0540***
	[0.009]	[0.0127]	[0.0111]
Both Par smoke	0.085***	0.0742***	0.0848***
	[0.013]	[0.0148]	[0.0152]
Pocket Cash	0.002***	0.0355***	0.00197***
	[0.0002]	[0.00786]	[0.000222]
Age-i	-0.036*	0.006	-0.040
	[0.022]	[0.0373]	[0.0222]
Cash-i	0.000	0.000	0.000
	[0.001]	[0.0184]	[0.00196]
Male-i	0.039	-0.032	0.046
	[0.048]	[0.0955]	[0.0485]
Nr classmates	0.000	-0.001	0.001
	[0.000]	[0.000843]	[0.000564]
Class on Smoking	-0.060***	-0.0576***	-0.0606***
	[0.011]	[0.0117]	[0.0109]
Family Discussions	0.000	-0.021	0.002
	[0.008]	[0.0190]	[0.00811]
Observations	44,665	3,912	40,753
Schools	564	50	514

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.13 - IV Results of Peer Effect on Individual Smoking Prevalence

Americas - Countries

Tobacco Incidence	All	Cuba	Mexico
Peer	0.482***	0.619***	0.457***
	[0.117]	[0.0827]	[0.106]
Age	0.034***	0.012	0.0361***
	[0.005]	[0.00993]	[0.00526]
Male	0.013	0.006	0.014
	[0.0073]	[0.0104]	[0.00743]
Mother smokes	0.103***	0.030	0.111***
	[0.0158]	[0.0154]	[0.0169]
Father smokes	0.0525***	0.0272*	0.0544***
	[0.009]	[0.0123]	[0.0113]
Both Par smoke	0.0836***	0.0716***	0.0840***
	[0.013]	[0.0157]	[0.0149]
Pocket Cash	0.002***	0.0356***	0.00197***
	[0.0002]	[0.00803]	[0.000223]
Age-i	-0.04***	-0.009	-0.0425**
	[0.013]	[0.0179]	[0.0132]
Cash-i	-0.001	-0.0236*	-0.001
	[0.0008]	[0.0114]	[0.00102]
Male-i	0.010	-0.015	0.014
	[0.0256]	[0.0386]	[0.0276]
Nr classmates	0.000	0.000	0.000
	[0.0002]	[0.000328]	[0.000283]
Class on Smoking	-0.058***	-0.0558***	-0.0590***
	[0.0114]	[0.0121]	[0.0109]
Family advise	0.000	-0.020	0.000
	[0.008]	[0.0199]	[0.00790]
Observations	44,665	3,912	40,753
Schools	564	50	514
Underidentification P-Value	0.000	0.001	0.000
Wald F test	14.661	14.107	11.578
Hansen J Stat P-Value	0.881	0.782	0.860

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.14 - OLS, IV, GMM Results of Peer Effect on Individual Smoking Prevalence
Americas - Countries

Tobacco Incidence	OLS	IV	GMM
All	-0.037	0.482***	0.316***
	[0.088]	[0.117]	[0.003]
Cuba	0.020	0.619***	0.398***
	[0.149]	[0.0827]	[0.004]
Mexico	-0.045	0.457***	0.282***
	[0.0912]	[0.106]	[0.003]

Errors clusters at the school; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

1.7.4. Analysis - Asia Pacific

1.7.4.1. Results – Asia Pacific

Table 7.15 summarizes OLS results from the Asia and Pacific region. Increasing one's share of peers who smoke by 10 percent increase the probability a youth will smoke by 2.8 percentage points. OLS estimates suggest almost no effect of peers for China, South Korea and Mongolia (Central Asia). The largest effect is found in the South East Asia, where a 10 percent increase in peers who smoke increases the probability an individual will smoke by 3.2 percentage points.

The IV estimates, Table 7.16, suggest that a 10 percent increase in smoking among peers will increase the probability a youth will smoke by 5.4 percentage points. The highest effect is found in the Pacific Region where a 10 percent increase in smoking by peers will increase the probability of smoking for youth by 6.6 percentage points.

Maternal smoking is associated with an increase in smoking prevalence of 8.2 percentage points among youth. The largest effect of maternal smoking is found in the Southeast Asia (Laos, Thailand, Vietnam). Smoking by fathers increases the probability a child will smoke by 2.5 percentage points. Smoking by both parents is associated with an increase in smoking by 11 percentage points. Instruction in school about the dangers of smoking decreases the probability that a youth will smoke by 1.5 - 2.5 percentage points. A dollar increase in pocket cash is associated with 0.2 percentage point increase in the probability a youth will smoke in a given month.

The GMM estimates are between OLS and IV estimates (Table 7.17). The region average suggests that a 10 percent increase in peer smoking increases individual smoking by 3.2

percentage points. The highest estimate is that of the Pacific Region of 4.3 percentage point increase due to an increase in peer smoking by 10 percent. This is the equivalent of 22 percent effect of a mean of 0.19. A 10 percent increase in peer smoking increase the probability that the individual will smoke by 22 percent.

1.7.4.2. Country Specific Results - Asia Pacific

I conduct the analysis at the country level since these estimates may be more informative from a policy perspective. The OLS estimates are summarized in Table 7.19. A 10 percent increase in peer smoking increases individual smoking by 3 percentage points. The largest effect is found in Thailand (3.12 percentage points). The IV estimates, Table 7.20, highlight how significant the bias generated by IV estimates may be in the presence of a bounded endogenous variable. A 10 percent increase in peer smoking increases the probability that the individual smokes by 6.6 percentage points. The highest effect is found in Indonesia and the smallest effect is found in the Philippines. The result for the Indonesia is large with a coefficient of 0.8, a 10 percent increase in peer smoking increases the probability an individual will smoke by 8 percentage points.

Maternal smoking is associated with an increase in the probability a youth will smoke. Smoking by the mother is associated with an increase in smoking prevalence of 12.6 percentage points. Paternal smoking is associated with an increase in the probability an individual will smoke by 4.8 percentage points. The availability of pocket cash increases the probability of smoking by the individual. Instruction is school about the dangers of smoking reduces the probability of smoking in the Philippines and Thailand by 3 percentage points.

Table 7.21 summarizes GMM estimates. The all region average effect is 0.423. The highest effect is found in Thailand (coefficient of 0.453). A 10 percent increase in peer smoking

increases individual smoking by 37.5 percent in Thailand, and 18.4 percent in Philippines. While the percentage point estimates are not very different among the three regions investigated up to this point in the analysis (Europe, Americas), the percent increase estimated at the mean of the samples is larger for Asia because smoking prevalence rates are lower in this region relative to Europe and the Americas.

TABLE 7.15 - OLS Results of Peer Effect on Individual Smoking Prevalence
Asia Pacific - Regions

Tobacco Incidence	All Countries	Central Asia	Southeast Asia	Pacific	Indian Region
Peer	0.283***	-0.145	0.313***	0.286***	0.274***
	[0.042]	[0.091]	[0.062]	[0.073]	[0.058]
Age	0.001	0.003	-0.003	0.004	0.000
	[0.002]	[0.005]	[0.004]	[0.004]	[0.002
Male	0.0866***	0.0475***	0.114***	).204***	0.0297***
	[0.007]	[0.007]	[0.015]	[0.012]	[0.006]
Mother smokes	0.084***	0.051	0.142***	0.123***	0.067**
	[0.017]	[0.027]	[0.028]	[0.024]	[0.022]
Father Smokes	0.025***	0.014**	0.034***	).049***	0.018***
	[0.004]	[0.005]	[0.005]	[0.006]	[0.005]
Both Par Smoke	0.109***	0.073***	0.087***	).095***	0.122***
	[0.015]	[0.015]	[0.017]	[0.017]	[0.021]
Pocket Cash	0.002***	0.002***	0.002**	).004***	0.024***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.005]
Age_i	0.006	0.012	-0.004	0.012	0.002
	[0.00333]	[0.0160]	[0.00695]	[0.0131]	[0.00310]
Cash_i	0.000	0.002	-0.002	-0.005	0.036*
	[0.001]	[0.001]	[0.001]	[0.004]	[0.014]
Male-i	-0.0587***	-0.0599*	-0.0758**	-0.063	-0.013
	[0.014]	[0.030]	[0.029]	[0.048]	[0.014]
Number in Class	-0.000415*	0.000	0.000	-0.001	-0.000455*
	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]
Class on Smoking	-0.0236***	-0.0154*	-0.0232**	-0.016	-0.025
	[0.005]	[0.007]	[0.008]	[0.009]	[0.006]
Family Advise	-0.008	0.005	-0.017	-0.016	-0.006
	[0.004]	[0.006]	[0.010]	[0.012	[0.006]
Observations	153,795	21,970	43,832	30,887	57,106
Schools	1,842	251	515	391	685

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.16 - IV Results of Peer Effect on Individual Smoking Prevalence
Asia-Pacific - Regions

Tobacco Incidence	All Countries	Central Asia	Southeast Asia	Pacific	Indian Region
Peer	0.540***	0.460	0.634***	0.660***	0.574**
	[0.077]	[0.281]	[0.087]	[0.065]	[0.192]
Age	0.001	0.003	-0.004	0.004	0.000
	[0.002]	[0.005]	[0.004]	[0.004]	[0.002]
Male-i	0.087***	0.048***	0.114***	0.204***	0.030***
	[0.007]	[0.007]	[0.015]	[0.012]	[0.006]
Mother smokes	0.082***	0.051	0.138***	0.123***	0.063**
	[0.017]	[0.028]	[0.028]	[0.025]	[0.024]
Father Smokes	0.025***	0.014**	0.034***	0.048***	0.018***
	[0.004]	[0.004]	[0.005]	[0.006]	[0.005]
Both Par Smoke	0.107***	0.074***	0.083***	0.092***	0.120***
	[0.015]	[0.015]	[0.017]	[0.017]	[0.021]
Pocket Cash	0.002***	0.002***	0.002**	0.004***	0.023***
	[0.000]	[0.000]	[0.001]	[0.001]	[0.005]
Age_i	0.003	0.005	0.001	0.004	0.001
	[0.003]	[0.010]	[0.006]	[0.008]	[0.002]
Cash_i	-0.001	0.000	-0.002	-0.00509**	0.002
	[0.001]	[0.001]	[0.001]	[0.002]	[0.021]
Male-i	-0.0695***	-0.0554***	-0.110***	-0.138***	-0.019
	[0.010]	[0.015]	[0.022]	[0.031]	[0.011]
Nr in Class	0.000	0.000	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Class on Smoking	-0.0230***	-0.0173***	-0.0242**	-0.017	-0.0233***
	[0.005]	[0.007]	[0.007]	[0.010]	[0.006]
Family Discussions	-0.008	0.005	-0.017	-0.015	-0.005
	[0.004]	[0.005]	[0.010]	[0.012]	[0.006]
Observations	153,795	21,970	43,832	30,887	57,106
Schools	1,842	251	515	391	685
Underidentification P-Value	0.000	0.160	0.000	0.000	0.000
Wald F test	14.240	2.010	16.497	22.269	12.017
Hansen J Stat P-Value	0.123	0.112	0.403	0.354	0*

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001. *In Indian region only frequence peers see people smoking used as an instrument.

TABLE 7.17 - OLS, IV, GMM Results of Peer Effect on Individual Smoking Prevalence
Asia Pacific - Regions

Tobacco Incidence	OLS	IV	GMM
All Countries	0.283***	0.540***	0.315***
	[0.042]	[0.077]	[0.002]
Central Asia	-0.145	0.460	0.308***
	[0.091]	[0.281]	[0.003]
Southeast Asia	0.313***	0.634***	0.395***
	[0.062]	[0.087]	[0.002]
Pacific	0.286***	0.660***	0.428***
	[0.073]	[0.065]	[0.003]
Indian Region	0.274***	0.574**	0.381***
	[0.058]	[0.192]	[0.003]

~ Errors clusters at the school; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.18 - Means and Standard Deviations of Analysis Variables
Asia Pacific - Countries

Variable	All	Indonesia	Philippines	Thailand
Smoke	0.18	0.14	0.21	0.12
	(0.38)	(0.35)	(0.41)	(0.32)
Peer	0.18	0.14	0.21	0.12
	(0.13)	(0.11)	(0.14)	(0.13)
Age	14.41	13.79	14.89	14.14
	(1.48)	(1.12)	(1.51)	(1.55)
Male	0.46	0.45	0.45	0.44
	(0.50)	(0.50)	(0.50)	(0.50)
Mother Smokes	0.02	0.01	0.03	0.01
	(0.15)	(0.10)	(0.17)	(0.10)
Father Smokes	0.50	0.58	0.46	0.44
	(0.50)	(0.49)	(0.50)	(0.50)
Both Smoke	0.06	0.04	0.07	0.04
	(0.23)	(0.19)	(0.26)	(0.18)
Pocket Cash	4.46	4.73	3.98	6.65
	(5.99)	(4.92)	(5.85)	(9.34)
Class on Smoking	0.71	0.69	0.74	0.64
	(0.45)	(0.46)	(0.44)	(0.48)
Family Discussions	0.81	0.81	0.83	0.80
	(0.39)	(0.40)	(0.37)	(0.40)

~Standard deviation in parentheses

TABLE 7.19 - OLS Results of Peer Effect on Individual Smoking Prevalence
Asia Pacific - Countries

Tobacco Incidence	All	Indonesia	Philippines	Thailand
Peer	0.299***	0.275*	0.262**	0.312***
	[0.065]	[0.130]	[0.0964]	[0.067]
Age	0.003	0.019	0.001	-0.006
	[0.003]	[0.001]	[0.004]	[0.007]
Male-i	0.199***	0.248***	0.171***	0.155***
	[0.011]	[0.023]	[0.012]	[0.024]
Mother smokes	0.126***	0.110**	0.123***	0.185***
	[0.023]	[0.042]	[0.028]	[0.038]
Father Smokes	0.049***	0.051***	0.046***	0.050***
	[0.005]	[0.010]	[0.007]	[0.007]
Both Par Smoke	0.094***	0.170***	0.0696***	0.0897***
	[0.016]	[0.041]	[0.015]	[0.021]
Pocket Cash	0.0034***	0.001	0.006***	0.001*
	[0.0005]	[0.001]	[0.001]	[0.001]
Age_i	0.009	0.006	0.019	-0.010
	[0.001]	[0.051]	[0.014]	[0.019]
Cash_i	-0.004	0.001	-0.008	-0.001
	[0.002]	[0.006]	[0.005]	[0.001]
Male-i	-0.083***	-0.041	-0.075	-0.113**
	[0.034]	[0.130]	[0.056]	[0.035]
Nr in Class	0.000	0.000	-0.001	-0.001
	[0.000]	[0.000]	[0.001]	[0.000]
Class on Smoking	-0.018**	-0.004	-0.0285**	-0.0289**
	[0.008]	[0.017]	[0.011]	[0.011]
Family Advise	-0.018	-0.018	-0.013	-0.027
	[0.010]	[0.022]	[0.011]	[0.015]
Observations	45,365	11,167	16,384	17,814
Schools	580	133	206	241

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.20 - IV Results of Peer Effect on Individual Smoking Prevalence
Asia-Pacific - Countries

Tobacco Incidence	All	Indonesia	Philippines	Thailand
Peer	0.658***	0.788***	0.507***	0.625***
	[0.059]	[0.061]	[0.146]	[0.091]
Age	0.004	0.019	0.000	-0.006
	[0.004]	[0.010]	[0.004]	[0.007]
Male-i	0.20***	0.248***	0.171***	0.156***
	[0.011]	[0.023]	[0.012]	[0.024]
Mother smokes	0.126***	0.103*	0.124***	0.180***
	[0.024]	[0.043]	[0.028]	[0.038]
Father Smokes	0.0478***	0.0488***	0.0459***	0.494***
	[0.005]	[0.010]	[0.007]	[0.007]
Both Par Smoke	0.091***	0.165***	0.0680***	0.856***
	[0.016]	[0.042]	[0.015]	[0.022]
Pocket Cash	0.00354***	0.001	0.006***	0.117*
	[0.0005]	[0.001]	[0.001]	[0.001]
Age_i	0.003	0.000	-0.00776*	0.110
	[0.0072]	[0.002]	[0.003]	[0.001]
Cash_i	-0.004*	-0.015	0.013	0.002
	[0.001]	[0.023]	[0.011]	[0.016]
Male_i	-0.15***	-0.207***	-0.107*	0.147***
	[0.024]	[0.060]	[0.044]	[0.028]
Number in Class	0.000	0.000	0.000	0.000
	[0.0002]	[0.000]	[0.000]	[0.000]
Family Advise	-0.016	-0.015	-0.013	-0.026
	[0.010]	[0.023]	[0.012]	[0.015]
Class on Smoking	0.000	-0.007	-0.0282*	-0.0300**
	[0.0002]	[0.018]	[0.011]	[0.010]
Observations	45,365	11,167	16,384	17,814
Schools	580	133	206	241
Underidentification P-Value	0.0000	0.0063	0.0006	0.0000
Wald F test	27.102	11.279	10.311	14.820
Hansen J Stat P-Value	0.284	0.952	0.657	0.304

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.21 - OLS, IV, GMM Results of Peer Effect on Individual Smoking Prevalence

Asia Pacific - Countries

Tobacco Incidence	OLS	IV	GMM
All	0.299***	0.658***	0.423***
	[0.065]	[0.079]	[0.002]
Indonesia	0.275*	0.788***	0.373***
	[0.130]	[0.061]	[0.005]
Philippines	0.262**	0.508***	0.387***
	[0.0964]	[0.145]	[0.005]
Thailand	0.312***	0.625***	0.453***
	[0.067]	[0.091]	[0.007]

Errors clusters at the school; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

1.7.5. Analysis - East Mediterranean

1.7.5.1. Results – East Mediterranean

Table 7.22 summarizes OLS results from the East Mediterranean Region. The region results suggest that increasing one's share of peers who smoke by 10 percent exerts no effect on individual smoking. In fact, the null results persist among all sub-regions, which are highly insignificant. Maternal smoking is associated with an increase in smoking prevalence of 10 percent among youth. The largest effect of maternal smoking is found in Somalia and Sudan, where maternal smoking is associated with 18.5 percentage point increase in smoking among youth. Smoking by fathers increases the probability a child will smoke by 3 percentage points. Smoking by both parents is associated with an increase in smoking by 7.6 percentage points. A dollar increase in pocket cash is associated with 0.2 percentage point increase in the probability a youth will smoke in a given month.

Table 7.23 summarizes the IV estimates for the East Mediterranean Region. The all country average peer estimate is 0.324 but this estimate is insignificant. The instruments appear to be weak and often not credibly excluded from the second stage regressions. This is true for all the sub-regions under examination. The instruments are very weak, suggesting that it is not reliable to interpret the results. Table 7.24 summarizes the GMM results, which are between OLS and IV estimates, but given the weak instruments the estimates cannot be credibly interpreted.

1.7.5.2. Country Specific Results – East Mediterranean

Given the weak results of the pooled analysis, the individual level analysis may shed light into the effect of peers at the country level. Three countries had strong enough instruments: Iraq, Jordan, and United Arab Emirates. Table 7.25 provides summary statistics. Jordan has the

highest prevalence of smoking (17 percent). About half the students have had a class on smoking and three-fourths have received some family advice on the dangers on cigarette.

Table 7.26 summarizes the OLS results. The results suggest that the effect may be close to 0.17 but considering that none of the estimates are significant, one cannot rule out no effect of peer smoking on the probability and individual will smoke. IV estimates are summarized in Table 7.27. The all country average suggest that a 10 percent increase in peer smoking increase the probability an individual will smoke by 5.4 percentage points. The largest impact is found for Iraq (7.6 percentage points) and the smallest in Jordan (2.8 percentage points) but the estimate is insignificant. The instruments appear reasonably strong, F values range between 10-28 and Hansen J-statistic P-value are larger than the cutoff value of 0.1.

Maternal smoking is associated with an increase in the probability a youth smokes by 12.2 percentage points. Smoking by fathers is associated with an increase in individual smoking by 4 percentage points. The availability of pocket cash increases the probability a youth will smoke. Instruction in school about the dangers of tobacco reduces smoking prevalence by 2 percentage points.

GMM estimates (Table 7.27) suggest an all country average effect of 3.3 percentage points. The largest effect is found for UAE where a 10 percent increase in peer smoking increases the probability of smoking for the individual by 4.5 percentage points. In Jordan a 10 percent increase in peer smoking increases the probability a youth will smoke by 2.6 percentage points. A 10 percent increase in peer smoking will increase the individual's probability of smoking by 23 percent in Iraq, 15 percent in Jordan, and 50 percent in the United Arab Emirates (UAE). These effects are large suggesting that peer influences have a large impact on youth smoking. The failure of the analysis at the regional level to identify peer effects can be

attributed to the weak relationship between instruments and peer smoking. However, the lack of results does not imply that peer effects do not exists, but rather that the analysis cannot produce consistent estimates at the regional level. The evidence from the country specific analysis mitigates the lack of evidence at the regional levels by providing estimates for peer effects that are large.

TABLE 7.22 - OLS Results of Peer Effect on Individual Smoking Prevalence
East Mediterranean - Regions

Tobacco Incidence	All Countries	AF-PAK	Arabian Peninsula	Mid East and North Africa	Gulf	Sudan & Somalia
Peer	0.026	0.197	-0.129	0.102	-0.358	-0.068
	[0.079]	[0.147]	[0.144]	[0.08]	[0.357]	[0.214]
Age	0.007**	0.003	0.004	0.012***	0.000	-0.005
	[0.002]	[0.002]	[0.003]	[0.003]	[0.005]	[0.006]
Male	0.025**	-0.013	0.027	0.024**	0.024	0.017
	[0.008]	[0.014]	[0.018]	[0.009]	[0.028]	[0.019]
Mother smokes	0.099***	0.045	0.093*	0.099**	0.099	0.185*
	[0.026]	[0.039]	[0.04]	[0.036]	[0.057]	[0.085]
Father smokes	0.026***	0.009	0.034**	0.026***	0.022*	-0.003
	[0.005]	[0.007]	[0.010]	[0.006]	[0.009]	[0.016]
Both Par smoke	0.076***	0.051*	0.119***	0.074***	0.036	0.067
	[0.013]	[0.020]	[0.033]	[0.017]	[0.024]	[0.037]
Cash	0.002***	0.005*	0.001***	0.002***	0.003***	0.003*
	[0.000]	[0.002]	[0.000]	[0.000]	[0.001]	[0.001]
Age-i	0.030**	0.002	0.019	0.039*	0.016	-0.006
	[0.010]	[0.008]	[0.012]	[0.017]	[0.015]	[0.021]
Cash-i	0.001	0.008	0.001	0.001	-0.002	0.026*
	[0.001]	[0.005]	[0.001]	[0.001]	[0.003]	[0.012]
Male-i	-0.000435**	-0.000522*	0.000	-0.001	0.151	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.118]	[0.000]
Nr class	0.034	-0.146	-0.011	0.039	0.000	0.025
	[0.028]	[0.112]	[0.021]	[0.033]	[0.000]	[0.069]
Class on Smoking	-0.003	0.006	-0.002	-0.007	0.002	-0.012
	[0.004]	[0.004]	[0.008]	[0.006]	[0.006]	[0.007]
Family Discussions	-0.00795*	0.016***	0.007	-0.0128*	-0.007	-0.017
	[0.004]	[0.004]	[0.005]	[0.006]	[0.009]	[0.011]
Observations	110,078	7,626	35,019	49,944	14,296	3,193
Schools	1,444	101	403	678	186	46

~Errors clusters at the school level; * implies p <0.05, ** implies p <0.01 and *** implies p <0.001

TABLE 7.23 - IV Results of Peer Effect on Individual Smoking Prevalence
East Mediterranean - Regions

Tobacco Incidence	All Countries	AF-PAK	Arabian Peninsula	Mid East and North Africa	Gulf Region	Sudan Somalia
Peer	0.324	0.802***	0.403	0.423*	0.842***	0.465*
	[0.213]	[0.140]	[0.331]	[0.172]	[0.140]	[0.225]
Age	0.00655**	0.003	0.005	0.0119***	0.000	-0.005
	[0.002]	[0.003]	[0.003]	[0.003]	[0.005]	[0.006]
Male	0.0247**	-0.007	0.026	0.0242**	0.020	0.017
	[0.008]	[0.013]	[0.018]	[0.009]	[0.028]	[0.019]
Mother smokes	0.099***	0.040	0.090*	0.099**	0.115	0.170*
	[0.026]	[0.039]	[0.040]	[0.036]	[0.057]	[0.078]
Father smokes	0.026***	0.009	0.034**	0.026***	0.023*	-0.004
	[0.005]	[0.007]	[0.010]	[0.006]	[0.009]	[0.017]
Both Par smoke	0.076***	0.051*	0.116***	0.074***	0.037	0.066
	[0.013]	[0.020]	[0.033]	[0.017]	[0.024]	[0.037]
Cash	0.002***	0.005*	0.001***	0.002***	0.003***	0.003*
	[0.000]	[0.002]	[0.000]	[0.000]	[0.001]	[0.001]
Age-i	0.022	0.001	0.010	0.025	0.004	0.004
	[0.011]	[0.004]	[0.011]	[0.014]	[0.005]	[0.009]
Cash-i	0.000	-0.002	0.000	0.000	-0.004	0.006
	[0.001]	[0.004]	[0.001]	[0.001]	[0.001]	[0.0102]
Male-i	0.015	-0.029	-0.016	0.013	-0.019	0.008
	[0.029]	[0.041]	[0.018]	[0.027]	[0.032]	[0.042]
Nr class	0.000	0.000	0.000	-0.001	0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Class on Smoking	-0.003	0.006	-0.002	-0.007	0.004	-0.013
	[0.004]	[0.004]	[0.008]	[0.006]	[0.006]	[0.007]
Family Discussions	-0.008*	0.015***	0.007	-0.013*	-0.007	-0.017
	[0.004]	[0.004]	[0.005]	[0.006]	[0.009]	[0.012]
Observations	110,078	7,626	35,019	49,944	14,296	3,193
Schools	1,444	101	403	678	186	46
Underidentification P-Value	0.004	0.099	0.071	0.007	0.078	0.120
Wald F test	5.566	2.369	3.221	6.944	3.157	3.291
Hansen J Stat P-Value	0.006	0.963	0.275	0.049	0.028	0.255

~Errors clusters at the school level; * implies p <0.05, ** implies p <0.01 and *** implies p <0.001

TABLE 7.24 - OLS, IV, GMM Results of Peer Effect on Individual Smoking Prevalence

East Mediterranean - Regions

Tobacco Incidence	OLS	IV	GMM
All Countries	0.026	0.324	0.256***
	[0.079]	[0.213]	[0.003]
AF-PAK	0.197	0.802***	0.214***
	[0.147]	[0.140]	[0.002]
Arabian Peninsula	-0.129	0.403	0.302***
	[0.144]	[0.331]	[0.002]
Mid East North Africa	0.102	0.423*	0.398***
	[0.08]	[0.172]	[0.006]
Gulf Region	-0.358	0.842***	0.272***
	[0.357]	[0.140]	[0.012]
Sudan, Somalia	-0.068	0.465*	0.463***
	[0.214]	[0.225]	[0.008]

Errors clusters at the school; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.25 - Means and Standard Deviations of Analysis Variables
East Mediterranean - Countries

Variable	All	Iraq	Jordan	UAE
Smoke	0.13	0.10	0.17	0.09
	(0.33)	(0.30)	(0.38)	(0.29)
Peer	0.13	0.10	0.17	0.09
	(0.14)	(0.13)	(0.15)	(0.12)
Age	14.15	14.39	14.10	13.76
	(1.60)	(1.72)	(1.49)	(1.42)
Male	0.55	0.59	0.52	0.49
	(0.50)	(0.49)	(0.50)	(0.50)
Mother Smokes	0.02	0.02	0.03	0.02
	(0.15)	(0.15)	(0.16)	(0.12)
Father Smokes	0.34	0.32	0.42	0.23
	(0.47)	(0.47)	(0.49)	(0.42)
Both Smoke	0.06	0.05	0.08	0.03
	(0.24)	(0.22)	(0.26)	(0.17)
Pocket Cash	17.76	0.77	27.80	29.61
	(25.61)	(1.35)	(19.22)	(42.08)
Class on Smoking	0.54	0.49	0.58	0.57
	(0.50)	(0.50)	(0.49)	(0.48)
Family Discussions	0.74	0.74	0.76	0.69
	(0.44)	(0.44)	(0.43)	(0.46)

~Standard deviation in parantheses

TABLE 7.26 - OLS Results of Peer Effect on Individual Smoking
East Mediterranean - Countries

Tobacco Incidence	All	Iraq	Jordan	UAE
Peer	0.173	0.115	0.050	0.022
	[0.102]	[0.221]	[0.129]	[0.093]
Age	0.005	0.007	-0.005	0.0263***
	[0.0039]	[0.007]	[0.005]	[0.005]
Male	0.004	0.0679*	-0.0463*	-0.002
	[0.017]	[0.030]	[0.021]	[0.015]
Mother smokes	0.123***	0.087	0.149***	0.126***
	[0.027]	[0.051]	[0.036]	[0.030]
Father smokes	0.039***	0.0364**	0.0424***	0.0347***
	[0.007]	[0.011]	[0.011]	[0.008]
Both Par smoke	0.076***	0.030	0.104***	0.0864***
	[0.017]	[0.035]	[0.020]	[0.024]
Cash	0.0008***	0.023**	0.001***	0.0004***
	[0.0001]	[0.006]	[0.000]	[0.000]
Age-i	-0.001	0.001	-0.008	0.014
	[0.016]	[0.027]	[0.028]	[0.016]
Cash-i	0.000	0.011	0.002	0.000
	[0.0004]	[0.020]	[0.001]	[0.000]
Male-i	0.063	0.236**	-0.191	0.082**
	[0.042]	[0.079]	[0.128]	[0.026]
Nr classmates	0.000	0.000	0.000	0.000
	[0.000]	[0.000)	[0.000)	[0.000)
Class on Smoking	-0.019***	0.002	-0.0428***	-0.003
	[0.006]	[0.00789]	[0.0118]	[0.00681]
Family advise	-0.008	-0.002	-0.017	-0.008
	[0.0065	[0.011]	[0.012]	[0.006]
Observations	27,247	4,755	8,029	14,463
Schools	381	43	124	214

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.27 - IV Results of Peer Effect on Individual Smoking Prevalence
East Mediterranean - Countries

Tobacco Incidence	All	Iraq	Jordan	UAE
Peer	0.536**	0.765***	0.284	0.482***
	[0.068]	[0.070]	[0.206]	[0.111]
Age	0.005	0.006	-0.005	0.026***
	[0.004]	[0.007]	[0.005]	[0.005]
Male	0.004	0.0625*	-0.0445*	-0.004
	[0.017]	[0.029]	[0.021]	[0.015]
Mother smokes	0.122***	0.093	0.147***	0.126***
	[0.027]	[0.053]	[0.037]	[0.029]
Father smokes	0.037***	0.033**	0.042***	0.035***
	[0.0067]	[0.012]	[0.011]	[0.008]
Both Par smoke	0.074***	0.026	0.103***	0.086***
	[0.018]	[0.035]	[0.021]	[0.025]
Cash	0.001***	0.022***	0.001***	0.000***
	[0.0001]	[0.006]	[0.000]	[0.000]
Age-i	-0.006	-0.006	-0.007	-0.004
	[0.009]	[0.009]	[0.022]	[0.011]
Cash-i	0.000	-0.016	0.001	0.000
	[0.0003]	[0.011]	[0.001]	[0.000]
Male-i	0.027	0.003	-0.140	0.048*
	[0.024]	[0.031]	[0.115]	[0.022]
Nr classmates	0.000	0.000	0.000	0.000
	[0.000]	[0.000]	[0.001]	[0.000]
Class on Smoking	-0.017**	0.004	-0.0419***	-0.003
	[0.006]	[0.007]	[0.012]	[0.007]
Family Discussions	-0.009	-0.001	-0.018	-0.010
	[0.007]	[0.011]	[0.012]	[0.006]
Observations	27247	4,755	8,029	14,463
Schools	381	43	124	214
Underidentification P-Value	0	0	0	0
Wald F test	28.339	14.944	10.206	15.055
Hansen J Stat P-Value	0.204	0.552	0.291	0.159

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.28 - OLS, IV, GMM Results of Peer Effect on Individual Smoking Prevalence

East Mediterranean - Countries

Tobacco Incidence	OLS	IV	GMM
All	0.173	0.536**	0.331***
	[0.103]	[0.068]	[0.0026]
Iraq	0.115	0.765***	0.23***
	[0.221]	[0.070]	[0.003]
Jordan	0.050	0.284	0.258***
	[0.129]	[0.206]	[0.003]
UAE	0.022	0.482***	0.448***
	[0.093]	[0.111]	[0.002]

Errors clusters at the school; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

1.7.6. Analysis - Africa

1.7.6.1. Results – Africa

Table 7.29 summarizes OLS results from the African Region. The region average effect of peers is insignificant. The two sub-regions where the effect is significant are the Gulf of Guinea countries and Malawi, Mozambique, Zambia and Zimbabwe, where a 10 percent increase in peer smoking increases youth smoking from 2.5-2.7 percentage points. Maternal smoking increases youth smoking by 14.5 percentage points. Smoking by fathers is associated with an 8 percentage point increase in individual smoking. The largest impact is found where both parents smoke, which increases smoking by 19 percentage points. A dollar increase in pocket cash increases the probability a youth smokes by 2.6 percentage points. Instruction in school about the dangers of smoking reduces the probability of smoking by an average of 4 percentage points. IV results are summarized in Table 7.30. The all region average effect implies that a 10 percent increase in smoking by peers will increase the probability an individual smokes by 3.7 percentage points. The IV estimates for the Gulf of Guinea countries do change much from the OLS estimates. The largest effect is found for Comoros and Mauritius where a 10 percent increase in smoking by peers increases the propensity that the individual will smoke by 6.4 percentage points. The estimates for other covariates suggest no difference between OLS and IV estimates. Table 7.31 summarizes the GMM estimates. The GMM estimates suggest that the effect ranges between 2.6-4 percentage point increase in the probability of individual smoking due to an increase in smoking by 10 percent in one's peer group. The largest effect is found for the countries of Burundi, Kenya and Uganda.

1.7.6.2. Country Specific Results - Africa

I conduct the analysis at the country level for the countries where the instruments are strong. Thirteen countries had strong instruments. Table 7.32 summarizes the data. Namibia, Zimbabwe and Lesotho have a high prevalence of smoking in the past month. The lowest incidence of cigarettes smoking is found in Eritrea. Seventy two percent of youth have had a class on the dangers of smoking in the past year. Sixty percent of individuals have discussed with family the dangers of tobacco. On average, students receive $1.18 each month. Parental smoking is low in this region.

Table 7.33 summarizes the OLS results. On average a 10 percent increase in smoking by peers increases smoking prevalence for the individual by 3.4 percentage points. Some estimates are wrong sided, but this is due to measurement error and the attenuation it produces in OLS estimates. Maternal smoking increases smoking by the individual by 24 percentage points. Smoking by fathers increases smoking by 10 percentage points. Being taught in school about the dangers of tobacco reduces the probability a youth will smoke by 5 percentage points. Family advice on the dangers of tobacco is associated with a reduction in the probability a youth will smoke by 2 percentage points. Receiving one more dollar in pocket cash, increases the probability a youth will smoke by 2 percentage points.

Table 7.34 summarizes the IV estimation. The all country average implies that a 10 percent increase in peer smoking increases the smoking prevalence for the individual by 5.7 percentage points. The estimates for Cape Verde are larger than one to one. Clearly this effect is associated with the fact that the IV estimate is an upper bound for the effect when the endogenous variable is measured with error. The smallest effects are found in Ghana and Zambia, where a 10 percent increase in peer smoking increases the probability a youth will

smoke by 2.66 and 2.84 percentage points. The estimated coefficients on other controls are no different than the OLS estimates. GMM estimates are presented in Table 7.35. These effects range between 1.7 -3.4 percentage point increase in the probability an individual will smoke due to a 10 percent increase in peer smoking. The largest effects are found in Cape Verde, Ivory Coast, and Kenya where a 10 percent increase in peer smoking increases the probability a youth will smoke by 3.2-3.4 percentage points. The smallest effect is found in Burundi, where individual smoking increases by 1.7 percentage points due to a 10 percent increase in smoking by peers.

TABLE 7.29 - OLS Results of Peer Effect on Individual Smoking Prevalence
Africa - Regions

Tobacco Incidence	Africa	Benin B.Faso Ghana Ivory Coast Togo	Lesotho South Africa Swaziland	Botswana Namibia	Malawi Mozambique Zambia Zimbabwe	Burundi Kenya Uganda	Comoros Mauritius	Mali Mauritania Niger Nigeria Senegal
Peer	0.079	0.274*	-0.273	0.013	0.252**	0.184	0.152	0.159
	[0.0763]	[0.119]	[0.143]	[0.224]	[0.0948]	[0.147]	[0.157]	[0.155]
Age	-0.002	0.003	-0.00610*	0.0128**	-0.002	0.00839**	0.0319***	0.0164***
	[0.00184]	[0.00295]	[0.00248]	[0.00451]	[0.00362]	[0.00285]	[0.00764]	[0.00365]
Male	0.0833***	0.0276**	0.113***	0.0404*	0.0443***	0.0515***	0.0751**	0.158***
	[0.00847]	[0.00863]	[0.0156]	[0.0157]	[0.00950]	[0.0131]	[0.0258]	[0.0188]
Mother smokes	0.145***	0.404***	0.0997***	0.269***	0.351***	0.161***	0.193**	0.429***
	[0.0191]	[0.0504]	[0.0220]	[0.0373]	[0.0509]	[0.0427]	[0.0658]	[0.0755]
Father smokes	0.0801***	0.172***	0.0426***	0.107***	0.101***	0.0875***	0.0730***	0.0959***
	[0.00863]	[0.0264]	[0.0121]	[0.0179]	[0.0152]	[0.0169]	[0.0154]	[0.0138]
Both Par smoke	0.189***	0.248***	0.132***	0.183***	0.236***	0.263***	0.186***	0.0928*
	[0.0172]	[0.0311]	[0.0201]	[0.0281]	[0.0317]	[0.0490]	[0.0421]	[0.0364]
Pocket Cash	0.0260***	0.00922***	0.0545***	0.0236***	0.0152***	0.0287***	0.00461***	0.0195***
	[0.00207]	[0.00137]	[0.00385]	[0.00513]	[0.00169]	[0.00393]	[0.000931]	[0.00422]
Age-i	-0.001	-0.025	0.004	-0.053	-0.036	0.010	0.004	-0.027
	[0.00668]	[0.0247]	[0.0113]	[0.0285]	[0.0199]	[0.0291]	[0.0412]	[0.0169]
Cash-i	0.0104*	-0.002	0.0292*	0.010	-0.001	0.0335*	-0.0125***	0.0267*
	[0.00469]	[0.00366]	[0.0121]	[0.0265]	[0.00966]	[0.0152]	[0.00359]	[0.0111]
Male-i	-0.009	0.017	-0.068	0.003	-0.054	0.125*	-0.027	-0.063
	[0.0385]	[0.0344]	[0.0787]	[0.114]	[0.0450]	[0.0601]	[0.0799]	[0.0648]
Nr classmates	-0.000521*	0.000	-0.001	0.000	-0.001	0.000	-0.001	-0.00197**
	[0.000212]	[0.000148]	[0.000682]	[0.000609]	[0.000347]	[0.000338]	[0.000802]	[0.000617]
Family Advise	0.006	-0.007	0.0282**	-0.014	-0.0311**	-0.0251*	0.006	0.004
	[0.00584]	[0.00835]	[0.00999]	[0.0165]	[0.00972]	[0.0102]	[0.0123]	[0.0151]
Class on Smoking	-0.0371***	-0.0215*	-0.0244*	-0.013	-0.010	-0.0720***	-0.0331*	0.004
	[0.00735]	[0.0107]	[0.0112]	[0.0164]	[0.0115]	[0.0159]	[0.0145]	[0.0176]
Observations	118,095	19,680	38,063	6,011	11,801	21,360	4,891	8,189
Schools	1,246	178	368	89	168	185	66	106

~Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.30 - IV Results of Peer Effect on Individual Smoking Prevalence
Africa - Regions

Tobacco Incidence	Africa	Benin B.Faso Ghana Ivory Coast Togo	Lesotho South Africa Swaziland	Botswana Namibia	Malawi Mozambique Zambia Zimbabwe	Burundi Kenya Uganda	Comoros Mauritius	Mali Mauritania Niger Nigeria Senegal
Peer	0.369***	0.297*	0.614**	0.421*	0.489***	0.526***	0.639***	0.499*
	[0.0896]	[0.133]	[0.191]	[0.166]	[0.0811]	[0.101]	[0.113]	[0.217]
Age	-0.002	0.003	-0.00666**	0.0137**	-0.002	0.00817**	0.0316***	0.0170***
	[0.00185]	[0.00295]	[0.00243]	[0.00453]	[0.00367]	[0.00291]	[0.00768]	[0.00381]
Male	0.0831***	0.0275**	0.116***	0.0400*	0.0452***	0.0499***	0.0757**	0.158***
	[0.00848]	[0.00867]	[0.0154]	[0.0157]	[0.00939]	[0.0130]	[0.0262]	[0.0190]
Mother smokes	0.145***	0.404***	0.101***	0.271***	0.344***	0.160***	0.190**	0.430***
	[0.0194]	[0.0506]	[0.0229]	[0.0374]	[0.0510]	[0.0427]	[0.0656]	[0.0754]
Father smokes	0.0791***	0.172***	0.0415**	0.108***	0.0999***	0.0867***	0.0723***	0.0946***
	[0.00864]	[0.0263]	[0.0126]	[0.0180]	[0.0154]	[0.0169]	[0.0157]	[0.0135]
Both Par smoke	0.187***	0.248***	0.130***	0.183***	0.234***	0.260***	0.183***	0.101**
	[0.0172]	[0.0310]	[0.0201]	[0.0275]	[0.0324]	[0.0489]	[0.0441]	[0.0345]
Pocket Cash	0.0259***	0.00922***	0.0542***	0.0234***	0.0152***	0.0283***	0.00484***	0.0191***
	[0.00207]	[0.00137]	[0.00389]	[0.00508]	[0.00168]	[0.00389]	[0.000936]	[0.00418]
Age-i	-0.001	-0.024	0.002	-0.0394*	-0.022	-0.003	-0.021	-0.019
	[0.00496]	[0.0251]	[0.00465]	[0.0156]	[0.0149]	[0.0185]	[0.0193]	[0.0118]
Cash-i	-0.001	-0.002	-0.023	-0.005	-0.004	0.004	-0.00756***	0.008
	[0.00425]	[0.00382]	[0.0126]	[0.0152]	[0.00653]	[0.0111]	[0.00192]	[0.0117]
Male-i	-0.036	0.017	-0.120**	-0.023	-0.037	0.061	-0.050	-0.089
	[0.0302]	[0.0328]	[0.0386]	[0.0757]	[0.0331]	[0.0398]	[0.0493]	[0.0507]
Nr classmates	-0.000355*	0.000	0.000	0.000	0.000	0.000	0.000	-0.00121*
	[0.000155]	[0.000149]	[0.000272]	[0.000358]	[0.000251]	[0.000188]	[0.000398]	[0.000576]
Family Advise	0.007	-0.007	0.0309**	-0.015	-0.0304**	-0.0243*	0.008	0.001
	[0.00587]	[0.00844]	[0.0105]	[0.0167]	[0.00972]	[0.0102]	[0.0123]	[0.0154]
Class on Smoking	-0.0370***	-0.0215*	-0.0266*	-0.013	-0.009	-0.0713***	-0.0375**	0.006
	[0.00731]	[0.0106]	[0.0112]	[0.0159]	[0.0116]	[0.0160]	[0.0141]	[0.0168]
Observations	118,095	19,680	38,063	6,011	11,801	21,360	4,891	8,189
Schools	1,246	178	368	89	168	185	66	106
Underidentification P-Value	0.0000	0.0018	0.0451	0.0018	0.0000	0.0000	0.0010	0.0184
Wald F test	34.392	13.451	4.020	22.644	48.638	13.464	10.341	5.532
Hansen J Stat P-Value	0.354	0.584	0.186	0.444	0.258	0.440	0.924	0.103

~Errors clusters at the school level; * implies p <0.05, ** implies p <0.01 and *** implies p <0.001

TABLE 7.31 - OLS, IV, GMM Results of Peer Effect on Individual Smoking Prevalence Africa - Regions

Tobacco Incidence	OLS	IV	GMM
Africa	0.079	0.369***	0.261***
	[0.0763]	[0.0896]	[0.003]
Benin, Burkina Faso, Ghana, Ivory Coast, Togo	0.274*	0.297*	0.277***
	[0.119]	[0.133]	[0.003]
Lesotho, South Africa, Swaziland	-0.273	0.614**	0.286***
	[0.143]	[0.191]	[0.095]
Botswana, Namibia	0.013	0.421*	0.252***
	[0.224]	[0.166]	[0.004]
Malawi, Mozambique, Zambia, Zimbabwe	0.252**	0.489***	0.28***
	[0.0948]	[0.0811]	[0.005]
Burundi, Kenya, Uganda	0.184	0.526***	0.398***
	[0.147]	[0.101]	[0.004]
Comoros, Mauritius	0.152	0.639***	0.272***
	[0.157]	[0.113]	[0.004]
Mali, Mauritania, Niger, Nigeria, Senegal	0.159	0.499*	0.31***
	[0.155]	[0.217]	[0.008]

~ School fixed Effects; Errors clusters at the school; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.32 - Means and Standard Deviations of Analysis Variables
Africa - Countries

Variable	All	Burundi	Cape Verde	Eritrea	Ghana	Ivory Coast	Kenya
Smoke	0.14	0.11	0.09	0.04	0.12	0.16	0.13
	(0.35)	(0.32)	(0.28)	(0.20)	(0.32)	(0.37)	(0.34)
Peer	0.14	0.12	0.09	0.04	0.12	0.16	0.14
	(0.15)	(0.12)	(0.07)	(0.06)	(0.12)	(0.09)	(0.14)
Age	14.31	14.44	13.60	13.44	14.15	14.19	14.47
	(1.64)	(2.03)	(1.61)	(1.83)	(1.75)	(1.64)	(1.52)
Male	0.51	0.57	0.44	0.61	0.55	0.54	0.50
	(0.50)	(0.50)	(0.50)	(0.49)	(0.50)	(0.50)	(0.50)
Mother Smokes	0.01	0.09	0.02	0.00	0.01	0.00	0.01
	(0.10)	(0.29)	(0.15)	(0.07)	(0.10)	(0.06)	(0.08)
Father Smokes	0.13	0.13	0.13	0.05	0.07	0.01	0.14
	(0.33)	(0.33)	(0.34)	(0.22)	(0.26)	(0.09)	(0.35)
Both Smoke	0.03	0.10	0.02	0.03	0.03	0.16	0.02
	(0.17)	(0.31)	(0.15)	(0.17)	(0.17)	(0.37)	(0.14)
Pocket Cash	1.18	0.29	2.81	0.39	2.29	2.04	0.85
	(2.80)	(1.12)	(11.33)	(1.54)	(3.34)	(3.48)	(2.11)
Class on Smoking	0.72	0.60	0.40	0.44	0.56	0.76	0.83
	(0.45)	(0.49)	(0.49)	(0.50)	(0.50)	(0.43)	(0.38)
Family Discussions	0.60	0.51	0.73	0.45	0.51	0.52	0.65
	(0.49)	(0.50)	(0.44)	(0.50)	(0.50)	(0.50)	(0.48)

~ Standard deviation in parentheses

TABLE 7.32 Continued - Means and Standard Deviations of Analysis Africa - Countries

Variable	Lesotho	Mali	Namibia	Zambia	Zimbabwe
Smoke	0.21	0.17	0.35	0.17	0.21
	(0.41)	(0.38)	(0.48)	(0.38)	(0.41)
Peer	0.21	0.17	0.35	0.17	0.21
	(0.13)	(0.14)	(0.21)	(0.14)	(0.18)
Age	14.89	13.73	14.47	14.27	14.54
	(1.66)	(1.87)	(1.67)	(1.69)	(1.61)
Male	0.40	0.56	0.45	0.47	0.45
	(0.49)	(0.50)	(0.50)	(0.50)	(0.50)
Mother Smokes	0.04	0.01	0.05	0.01	0.02
	(0.20)	(0.08)	(0.22)	(0.11)	(0.13)
Father Smokes	0.24	0.13	0.17	0.16	0.29
	(0.43)	(0.33)	(0.38)	(0.37)	(0.45)
Both Smoke	0.05	0.06	0.07	0.03	0.03
	(0.21)	(0.24)	(0.26)	(0.17)	(0.18)
Pocket Cash	0.64	0.92	0.44	0.91	3.89
	(0.93)	(2.33)	(0.73)	(3.14)	(8.06)
Class on Smoking	0.51	0.51	0.41	0.58	0.58
	(0.50)	(0.50)	(0.49)	(0.49)	(0.49)
Family Discussions	0.44	0.68	0.45	0.45	0.50
	(0.50)	(0.47)	(0.50)	(0.50)	(0.50)

~ Standard deviation in parentheses

TABLE 7.33 - OLS Results of Peer Effect on Individual Smoking Prevalence
Africa - Countries

Tobacco Incidence	All	Burundi	Cape Verde	Eritrea	Ghana	Ivory Coast	Kenya
Peer	0.336***	-0.473*	-0.488*	-0.424***	0.268**	0.237	0.169
	[0.078]	[0.173]	[0.173]	[0.106]	[0.0764]	[0.124]	[0.150]
Age	0.0067***	0.00635*	0.0211**	0.00407*	-0.001	0.0448***	0.00902*
	[0.002]	[0.00258]	[0.00602]	[0.00172]	[0.00226]	[0.00612]	[0.00383]
Male	0.0490***	0.037	-0.002	0.0125**	0.007	0.159***	0.0519***
	[0.008]	[0.0200]	[0.0186]	[0.00396]	[0.00839]	[0.0154]	[0.0131]
Mother smokes	0.242***	0.041	0.060	0.292***	0.428***	0.281*	0.202**
	[0.032]	[0.0395]	[0.0652]	[0.0565]	[0.0476]	[0.109]	[0.0629]
Father smokes	0.105***	0.0930*	0.030	0.0685*	0.192***	0.0951*	0.0866***
	[0.014]	[0.0356]	[0.0238]	[0.0265]	[0.0242]	[0.0402]	[0.0157]
Both Par smoke	0.237***	0.134*	0.066	0.171***	0.326***	0.045	0.281***
	[0.0287]	[0.0485]	[0.0617]	[0.0281]	[0.0322]	[0.0221]	[0.0511]
Pocket Cash	0.019***	0.034	0.00259**	0.0370***	0.00919***	0.0118***	0.0299***
	[0.002]	[0.0155]	[0.000670]	[0.00663]	[0.00194]	[0.00213]	[0.00458]
Age-i	-0.010	-0.117*	0.050	0.012	-0.0393***	0.0772*	0.025
	[0.010]	[0.0474]	[0.0331]	[0.00955]	[0.0105]	[0.0335]	[0.0262]
Cash-i	0.004	-0.029	0.0128**	0.031	-0.001	-0.014	0.0417*
	[0.004]	[0.0422]	[0.00288]	[0.0344]	[0.00491]	[0.0116]	[0.0188]
Male-i	0.056	0.001	-0.265	0.035	0.013	-0.103	0.118
	[0.028]	[0.294]	[0.215]	[0.0396]	[0.0329]	[0.0715]	[0.0699]
Nr classmates	0.000	0.000	0.001	-0.00149***	0.000	0.000	0.000
	[0.000]	[0.000869]	[0.00115]	[0.000271]	[0.000116]	[0.000656]	[0.000458]
Family Advise	-0.0189**	-0.001	-0.016	0.0132**	-0.010	-0.0329*	-0.0258*
	[0.007]	[0.0151]	[0.0122]	[0.00388]	[0.00725]	[0.0131]	[0.0110]
Class on Smoking	-0.0481***	0.009	0.027	-0.004	-0.0271**	0.016	-0.0772***
	[0.01]	[0.0130]	[0.0153]	[0.00272]	[0.00812]	[0.0116]	[0.0161]
Observations	56,086	1,194	1,229	5,068	10,096	3,300	14,659
Schools	501	20	16	54	75	25	116

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.33 Continued - OLS Results of Peer Effect on Individual Smoking Prevalence
Africa - Countries

Tobacco Incidence	Lesotho	Mali	Mauritius	Namibia	Nigeria	Zambia	Zimbabwe
Peer	0.175	0.229	0.068	-0.170	-0.098	0.103	0.123
	[0.171]	[0.168]	[0.262]	[0.179]	[0.107]	[0.129]	[0.125]
Age	0.005	0.0192***	0.0306**	0.00955*	-0.002	0.005	-0.011
	[0.00948]	[0.00332]	[0.00965]	[0.00365]	[0.00215]	[0.00272]	[0.00635]
Male	0.145***	0.191***	0.025	0.013	-0.030	0.021	0.0592**
	[0.0234]	[0.0165]	[0.0341]	[0.0216]	[0.0208]	[0.0153]	[0.0157]
Mother smokes	0.018	0.416***	0.266***	0.213***	0.751***	0.282***	0.451***
	[0.0434]	[0.0636]	[0.0624]	[0.0353]	[0.0374]	[0.0577]	[0.0657]
Father smokes	0.0660*	0.0871***	0.0713**	0.108***	0.167***	0.115***	0.0929***
	[0.0290]	[0.0143]	[0.0206]	[0.0183]	[0.0114]	[0.0175]	[0.0218]
Both Par smoke	0.051	0.038	0.190***	0.218***	0.373***	0.228***	0.239***
	[0.0361]	[0.0372]	[0.0463]	[0.0294]	[0.0243]	[0.0258]	[0.0540]
Pocket Cash	0.0859***	0.0248***	0.00355***	0.163***	0.0331**	0.0401***	0.0124***
	[0.0158]	[0.00303]	[0.000930]	[0.0120]	[0.00561]	[0.00224]	[0.00150]
Age-i	0.017	-0.0353**	0.042	-0.055	0.054	0.050	-0.056
	[0.0346]	[0.00857]	[0.0720]	[0.0301]	[0.0326]	[0.0254]	[0.0289]
Cash-i	-0.0949*	0.025	-0.0165***	0.198*	0.0417**	0.020	-0.002
	[0.0417]	[0.0119]	[0.00392]	[0.0895]	[0.00543]	[0.0141]	[0.0116]
Male-i	-0.214	-0.080	0.052	-0.082	-0.161*	-0.022	-0.091
	[0.134]	[0.0369]	[0.0757]	[0.144]	[0.0370]	[0.0600]	[0.0434]
Nr classmates	-0.002	-0.00175***	0.001	-0.001	-0.00253*	0.001	-0.00304***
	[0.00149]	[0.000279]	[0.00103]	[0.000591]	[0.000435]	[0.000371]	[0.000686]
Family Advise	0.017	-0.002	-0.002	0.019	-0.013	-0.004	-0.0628***
	[0.0128]	[0.0195]	[0.0126]	[0.0152]	[0.0133]	[0.00755]	[0.0135]
Class on Smoking	0.000	0.009	-0.0431*	0.017	0.002	-0.014	0.009
	[0.0122]	[0.0212]	[0.0187]	[0.0121]	[0.0128]	[0.00976]	[0.0185]
					-0.208		
Observations	3,618	3,362	3,435	5,054	1,224	6,380	2,126
Schools	42	35	45	72	25	89	35

~Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.34 - IV Results of Peer Effect on Individual Smoking Prevalence
Africa - Countries

Tobacco Incidence	All	Burundi	Cape Verde	Eritrea	Ghana	Ivory Coast	Kenya
Peer	0.567***	0.556***	1.048***	0.480***	0.266	0.764***	0.513***
	[0.053]	[0.0949]	[0.0769]	[0.0886]	[0.136]	[0.0891]	[0.123]
Age	0.007**	0.0101*	0.0189*	0.00389*	-0.001	0.0434***	0.00861*
	[0.002]	[0.00331]	[0.00663]	[0.00171]	[0.00227]	[0.00635]	[0.00385]
Male	0.048***	0.034	0.007	0.0117**	0.007	0.161***	0.0505***
	[0.008]	[0.0209]	[0.0191]	[0.00399]	[0.00846]	[0.0156]	[0.0131]
Mother smokes	0.24***	0.029	0.069	0.279***	0.428***	0.272*	0.201**
	[0.030]	[0.0376]	[0.0762]	[0.0585]	[0.0476]	[0.112]	[0.0630]
Father smokes	0.103***	0.0821*	0.006	0.0678*	0.192***	0.0996*	0.0861***
	[0.014]	[0.0326]	[0.0313]	[0.0266]	[0.0241]	[0.0417]	[0.0158]
Both Par smoke	0.235***	0.129*	0.096	0.172***	0.326***	0.046	0.279***
	[0.028]	[0.0475]	[0.0658]	[0.0298]	[0.0321]	[0.0223]	[0.0511]
Pocket Cash	0.019***	0.0362*	0.00212*	0.0370***	0.00918***	0.0120***	0.0294***
	[0.002]	[0.0151]	[0.000689]	[0.00682]	[0.00194]	[0.00201]	[0.00456]
Age-i	-0.009	-0.0429*	-0.0338***	0.003	-0.0394**	-0.008	0.004
	[0.007]	[0.0175]	[0.00537]	[0.00405]	[0.0112]	[0.0185]	[0.0176]
Cash-i	-0.004	-0.024	0.001	-0.018	-0.001	-0.0120**	0.009
	[0.002]	[0.0229]	[0.00132]	[0.0139]	[0.00531]	[0.00301]	[0.0144]
Male-i	0.027	-0.089	0.030	-0.001	0.013	-0.145***	0.060
	[0.021]	[0.0931]	[0.0392]	[0.0146]	[0.0336]	[0.0226]	[0.0476]
Nr classmates	0.000	0.000	0.000	-0.000526**	0.000	0.000	0.000
	[0.000]	[0.000269]	[0.000159]	[0.000133]	[0.000114]	[0.000224]	[0.000261]
Family Advise	-0.018**	0.003	-0.012	0.0120**	-0.010	-0.0313*	-0.0249*
	[0.007]	[0.0180]	[0.0155]	[0.00394]	[0.00729]	[0.0132]	[0.0109]
Class on Smoking	-0.047***	0.002	0.018	-0.005	-0.0271**	0.014	-0.0765***
	[0.010]	[0.0150]	[0.0134]	[0.00255]	[0.00812]	[0.0113]	[0.0162]
Observations	56,086	1,194	1,229	5,068	10,096	3,300	14,659
Schools	579	20	16	54	75	25	116
Underidentification P-Value	0.000	0.012	0.070	0.001	0.006	0.024	0.000
Wald F test	32.104	27.430	13.860	11.454	10.852	10.117	10.132
Hansen J Stat P-Value	0.369	0.742	0.340	0.814	0.470	0.180	0.610

~Errors clusters at the school level; * implies p <0.05, ** implies p <0.01 and *** implies p <0.001

TABLE 7.34 Continued - IV Results of Peer Effect on Individual Smoking Prevalence
Africa - Countries

Tobacco Incidence	Lesotho	Mali	Namibia	Zambia	Zimbabwe
Peer	0.659***	0.763***	0.433*	0.284*	0.404**
	[0.0995]	[0.0662]	[0.172]	[0.134]	[0.0963]
Age	0.004	0.0202***	0.0108**	0.005	-0.010
	[0.00991]	[0.00332]	[0.00375]	[0.00264]	[0.00629]
Male	0.148***	0.191***	0.014	0.021	0.0612**
	[0.0226]	[0.0164]	[0.0219]	[0.0154]	[0.0158]
Mother smokes	0.014	0.411***	0.212***	0.280***	0.444***
	[0.0437]	[0.0665]	[0.0368]	[0.0580]	[0.0673]
Father smokes	0.0640*	0.0838***	0.108***	0.115***	0.0910**
	[0.0293]	[0.0136]	[0.0177]	[0.0174]	[0.0222]
Both Par smoke	0.051	0.051	0.220***	0.229***	0.237***
	[0.0356]	[0.0294]	[0.0270]	[0.0259]	[0.0549]
Pocket Cash	0.0867***	0.0243***	0.159***	0.0399***	0.0124***
	[0.0156]	[0.00296]	[0.0124]	[0.00222]	[0.00152]
Age-i	0.006	-0.0185*	-0.0343*	0.040	-0.036
	[0.0139]	[0.00574]	[0.0143]	[0.0217]	[0.0192]
Cash-i	-0.0925***	-0.007	0.005	0.007	-0.006
	[0.0192]	[0.00496]	[0.0563]	[0.0133]	[0.00819]
Male-i	-0.235**	-0.138***	-0.055	-0.017	-0.0595*
	[0.0811]	[0.0222]	[0.0749]	[0.0538]	[0.0261]
Nr classmates	-0.001	-0.000594***	0.000	0.000604*	-0.00176*
	[0.000691]	[0.000116]	[0.000305]	[0.000295]	[0.000601]
Family Advise	0.023	-0.009	0.019	-0.004	-0.0627***
	[0.0129]	[0.0197]	[0.0150]	[0.00747]	[0.0138]
Class on Smoking	0.001	0.015	0.016	-0.014	0.011
	[0.0130]	[0.0159]	[0.0127]	[0.00961]	[0.0194]
Observations	3,618	3,362	5,054	6,380	2,126
Schools	42	35	72	89	35
Underidentification P-Value	0.016	0.007	0.001	0.001	0.004
Wald F test	15.484	22.516	25.507	14.138	20.639
Hansen J Stat P-Value	0.892	0.212	0.712	0.188	0.447

~ Errors clusters at the school level; * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 7.35 - OLS, IV, GMM Results of Peer Effect on Individual Smoking Prevalence
Africa - Countries

Tobacco Incidence	OLS	IV	GMM
All	0.339***	0.569***	0.258***
	[0.0754]	[0.0509]	[0.003]
Burundi	-0.473*	0.556***	0.169***
	[0.173]	[0.0949]	[0.004]
Cape Verde	-0.488*	1.048***	0.322***
	[0.173]	[0.0769]	[0.033]
Eritrea	-0.424***	0.480***	0.256***
	[0.106]	[0.0886]	[0.014]
Ghana	0.268**	0.266	0.218***
	[0.0764]	[0.136]	[0.003]
Ivory Coast	0.237	0.764***	0.336***
	[0.124]	[0.0891]	[0.008]
Kenya	0.169	0.513***	0.338***
	[0.150]	[0.123]	[0.003]
Lesotho	0.175	0.659***	0.237***
	[0.171]	[0.0995]	[0.004]
Mali	0.229	0.763***	0.250***
	[0.168]	[0.0662]	[0.006]
Namibia	-0.170	0.433*	0.265***
	[0.179]	[0.172]	[0.004]
Nigeria	-0.098	1.060*	0.286***
	[0.107]	[0.309]	[0.018]
Zambia	0.103	0.284*	0.230***
	[0.129]	[0.134]	[0.002]
Zimbabwe	0.123	0.404**	0.294***
	[0.125]	[0.0963]	[0.005]

Errors clusters at the school; * implies p <0.05, ** implies p <0.01 and *** implies p < 0.001

1.8. Conclusion

This analysis is the first study to estimate the effect of peer influences on individual smoking behavior among GYTS participating countries. Overall the results provide evidence on the importance of peer influences on youth smoking behaviors. I find consistent estimates that youth smoking is responsive to peer influences and that a 10 percent increase in peer smoking increases the probability of youth smoking by 2- 4.5 percentage points. The results interpreted in the analysis are those from GMM estimates which control both for the reflection problem and mean-reverting measurement error.

The findings provide further support for the theoretical literature which suggests that youth may receive a higher payoff to a behavior if the behavior is prevalent in one's peer group. While I do not distinguish among the different theoretical models outlined in the theoretical section, the evidence implies that peer influences are an important determinant of youth smoking, and that they are more important than parental smoking.

I address several challenges in estimating peer influences at the school level. Selection into schools and unobserved school characteristics are controlled by the use of school fixed effects. This methodology removes variation that arises in behavior among groups because of sorting into schools. I argue that sorting of students within grades is quasi-random, primarily determined by age. I then use variation in behaviors between grades within schools to identify the effect of peers smoking on individual smoking. OLS estimates suggest that increasing the share of smokers in one's grade by 10 percent would increase the prevalence of smoking by 0- 2 percentage points. But these estimates are attenuated because of the presence of measurement error. I use an instrumental variables approach to address selection and simultaneity between peer and individual behavior. It is unclear whether peers affect the individual's behavior or the

other way around. I expect that peer effect will become smaller after the use of instruments. Nonetheless the use of self-reported surveys suggest that the peer measure may be measured with error (1) because students may over or under-report smoking (2) because not all students within schools were surveyed, (3) or because the peer group at the grade level may not be capturing all the effect of peer influences. I correct for measurement error in the peer variable through the use of instruments. I find that IV peer estimates are larger than OLS estimates. The effects range between 4 -7 percentage point increase in individual smoking for a 10 percent increase in peer smoking in one's grade. In some countries the IV estimates suggest more than a one to one effect of peers on youth smoking. These results arise due to the fact that IV methods in the presence of measurement error in a bounded endogenous variable produce upwardly biased estimates. Measurement error is modeled as classical error in variables and non-classical (mean reverting) measurement error though the use of GMM estimation. In estimations where I assume classical measurement error the peer estimates are over-estimates of the true effect of peers on individual smoking. Modeling the measurement error as mean reverting measurement error produces estimates that are in the range of 1.6 to 4.5 percentage point increase. The large divergence in estimates among OLS, IV and GMM estimates implies that measurement error is significant in a large share of the data used in the analysis. Furthermore, the analysis implies that in the presence of measurement error researchers may wish to model the effect of peers along with measurement error in order to provide consistent estimates of peer influences on individual behaviors.

Modeling measurement error provides estimates that are in the middle of the range from the findings of the literature for North America and Europe. The estimates for the GYTS sample range between 1.6-4.5 percentage point increase in youth smoking prevalence due to a 10

percent increase in peer smoking, or between 4 to 11.25 percentage point increase due to a 25 percent increase in peer smoking. The North America and Europe estimates suggest that a 25 percent increase in peer smoking increases youth smoking by 2-14.5 percentage points. The findings imply that besides the regional variation in smoking prevalence and cultural and economic differences among countries, peer effects on smoking prevalence do not vary by very much among countries.

While I was able to conduct the analysis on peer effects among a large share of the GYTS countries, in many countries the instruments were weak. Lack of evidence in this sense, does not imply that peer effects do not exist, but rather the analysis is limited by the lack of strong instruments that would produce consistent estimates of peer influences on individual smoking. Among the countries where the instruments are strong the evidence implies that peer effects matter and the spillovers generated by peer groups are large. Any policy interventions at the aggregate level will be effective in reducing smoking prevalence among youth because part of the intervention will run through peer effect. Increases on cigarette prices and taxes will both directly and indirectly reduce prevalence for the individual. The direct effect will be on individual demand, but since higher prices on cigarettes reduce the demand of cigarettes for the peer group, a share of the impact of the policy intervention runs through the peer influences. Policy interventions such as antismoking campaigns, bans on smoking in public and private places, and bans on tobacco advertising which reduce youth smoking will be further reinforced through peer influences. Because the presence of peer effects, any policy intervention that reduces youth smoking will be even more cost-effective because the impact is magnified by the social multiplier effect of peers.

While this chapter was able to address some important issues in estimating peer effects on individual behaviors, limitations arise. It may be the case that the relevant peer group is narrower, or broader. Secondly, while the paper finds some variation in the estimated effect of peers smoking on individual smoking among countries and regions, I am unable to explain why such variation exists. It is not clear why in some countries peer estimates are large while in others they are smaller.

Another direction of the current research is to study the differential impact of peer effects by gender. Clark and Loheac (2007) conduct this analysis and find that both boys and girls are influenced by boys but the female group is not influential in determining individual behaviors. This implies that resources spent to reduce female smoking participation may be less cost effective than those spent on males because smoking participation by one's female peer groups is not as important and does not generate a large social multiplier effect. Nakajima (2007) however finds that youth are influenced more by within gender and racial group peers than between gender and racial group peers. Finally, gender composition is only a small facet of the differential impact of peers. Other analyses may wish to stratify peer groups by racial or ethnic composition. If we believe that social distance may matter in the magnitude of peer effects we would expect that youth may be affected more by similarly aged and gendered peers or peers with whom they share ethnic or racial backgrounds. Future research may want to focus on the effect of social distance within countries as to shed light into the cross country variation in the estimated peer effects.

1.9. References

Ali MM, and Dwyer, D. 2009 “Estimating Peer Effects in Adolescent Behavior: A Longitudinal Analysis” Journal of Adolescent Health 45: 402-408.

Akerlof, George. "Social Distance and Social Decisions". Econometrica, 65(5) 1997: 1005-1027.

Becker, G. and Murphy K., Social Economics: Market Behavior in Social Environment. Harvard University Press: Cambridge, 2000. Print.

Bikhchandarni, S., David Hirshleifer, and Ivo Welch. "A Theory of Fads, Custom, and Cultural Change as Information Cascades". Journal of Political Economy 100(5) 1992: 992-1026.

Bound, J., Brown C. and Mathiowetz N., 2002. “Measurement Error in Survey Data”. In Handbook of Econometrics, Volume 5, ed. James Heckman and Ed Learner, 3705-3843. New York: Springer-Verlag.

Case A, and Katz L. 1991.“ The company you keep: the effects of family and neighborhood on disadvantaged youth.” NBER Working Paper 3705.

Chaloupka FJ, and Peck RM. “The Value of the 1964 Surgeon General's Report” In Handbook of Research on Cost-Benefit Analysis, RJ Brent editor. Northampton MA: Edward Elgar Publishing Limited 2009.

Chaloupka (forthcoming). “The Effects of Pricing and Tax Policy on Youth Cigarette Use”, Geneva: World Health Organization.

Chen J, **Millar WJ**. “Age of smoking initiation: implications for quitting”. Health Reports 1998, 9:39–46

Clark, C. and J. Folk. “Do Peers Matter? Evidence form the Sixth Grade Experiment” Working Paper.

Clark, A.E., and Loheac Y., ""It wasn't me, it was them!" Social Influence in Risky Behavior by Adolescents". Journal of Health Economics 26, 2007: 763-784.

Eisenberg, D. “Peer Effects for Adolescent Substance Use: Do They Really Exist?” Berkeley School of Public Health, Working Paper, March 2004

Ferlander S. “The Importance of Different Forms of Social Capital for Health”. Acta Sociol. 2007: 50(2):115-128.

Fletcher, JM. "Social Interactions and Smoking: Evidence Using Multiple Student Cohorts, Instrumental Variables, and School Fixed Effects". Health Economics 19, 2010: 466-484.

Frazis, H. and Loewenstein MA., 2003, "Estimating Linear Regressions with Mismeasured, Possibly Endogenous, Binary Explanatory Variables" Journal of Econometrics, 117, pp. 151-178

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

Hoxby, C., 2000. Peer effects in the classroom: Learning from gender and race variation. Working Paper no. 7867, National Bureau of Economic Research, Cambridge, MA.

Jha P, Chaloupka FJ, Moore J, Gajalakshmi V, Gupta PC, Peck R, Asma S, Zatonski W. "Cigarette Addiction," in Disease Control Priorities in Developing Countries, 2nd Edition, edited by DT Jamison, JG Breman, AR Measham, G Alleyne, M Claeson, DB Evans, P Jha, A Mills, and PR Musgrove. Washington DC: The International Bank for Reconstruction and Development, The World Bank, and Oxford University Press, pages 869-885, 2006. on-line at: http://files.dcp2.org/pdf/DCP/DCP46.pdf

Kane T, Rouse C.E., and D. Staiger. 1999 "Estimating Returns to Schooling when Schooling is Misreported" Working paper no. 7235, National Bureau of Economic research, Cambridge, MA.

Lundborg P. 2006. Having the wrong friends? Peer effects in adolescent substance use. Journal of Health Economics 25: 214-233.

Manski, C.F., 1993. "Identification of endogenous social effects: the reflection problem". Review of Economic Studies 60, 531–542.

Manski, Charles F. "Economic Analysis of Social Interactions ". The Journal of Economic Perspectives 14(3), 2000: 115-136.

McVicar D, and Polanski A, 2010 "Peer Effects in UK Adolescent Substance Use: Never Mind the Classmates?" Available at: http://www.qub-efrg.com/fs/doc/working-papers/mcvicarpolanski2010-nevermindtheclassmates1.pdf. Accessed on June, 3rd 2012.

McVicar D. 2011, "Estimates of Peer Effects in Adolescent Smoking Across Twenty Six European Countries" Social Science and Medicine, 73: 1186-1193.

Micklewright, J., Schnepf. S.V. and Silva, P.N. (2010). 'Peer Effects and Measurement Error: The Impact of Sampling Variation in School Survey Data.' Mimeo, Institute of Education, University of London.

Nakajima, Ryo.2007 "Measuring Peer Effects on Youth Smoking Behavior". Review of Economic Studies, 74: 897-935.

Norton, E.C., Lindrooth, R.C., Ennett, S.T., 1998. Controlling for the Endogeneity of Peer Substance Use on Adolescent Alcohol and Tobacco Use. Health Economics 7, 439–453.

Pischke J.S. and Ammermueller A., "Peer Effects in European Primary Schools: Evidence from the Progress in International Reading Literacy Study." Journal of Labor Economics, 27(3): 315-348.

Powell, Lisa, and Frank J. Chaloupka . "Parents, Public Policy, and Youth Smoking". Journal of Policy Analysis and Management 24(1) 2005: 93--112.

Powell, LM., Tauras JA, and Ross H., "The Importance of Peer Effects, Cigarette Prices and Cigarette Control Policies for Youth Smoking Behavior". Journal of Health Economics, 24(5), 2005: 950-968.

Soetevent, A.R. and Kooreman, P. (2007). 'A Discrete Choice Model With Social Interactions: An Application to High School Teen Behavior.' *Journal of Applied Econometrics* 22: 599-624.

UNESCO, (2008). "Regional Overview: Central and Eastern Europe, and Central Asia." Education for All Global Monitoring Report.

UNESCO, (2008). "Regional Overview: Central and Eastern Europe, and Central Asia." Education for All Global Monitoring Report.

UNESCO, (2011)**. "**Participation in Education". Statistical Yearbook for Asia and the Pacific.

UNESCO, (2012). "Regional Monitoring Report on Progress Toward Quality Education for All in Latin America and the Caribbean." EFA.

Verspoor A. (2006). "At the Crossroads: Choices of Secondary Education is Sub-Saharan Africa". The World Bank. Washington D.C., USA.

World Health Organization, *WHO Report on the Global Cigarette Epidemic, 2009*. Geneva: World Health Organization. http://www.who.int/cigarette/mpower/2009/en/index.html

2. THE EFFECT OF PRICES ON CIGARETTE USE AMONG YOUTH IN LESS DEVELOPED COUNTRIES

2.1. Introduction

An estimated 1 billion people are expected to die of premature smoking-related disease in the 21st century. Most of these deaths will occur among developing countries (Jha et al., 2006). Although cigarette use is a major public health problem in low and middle income countries, the majority of the evidence on the effect of cigarette control policies on curbing cigarette consumption and prevalence comes from high income countries. The price elasticities of cigarettes smoking among youth range between zero to -1.44, suggesting that a 10 percent increase in price will lower smoking prevalence and consumption by zero to 14 percent (Lewit et al., 1981; Lewit and Coate, 1982; Wasserman et al., 1991; Chaloupka and Grossman, 1996; Chaloupka and Pacula, 1999;Chaloupka and Wechsler, 1997;Tauras and Chaloupka, 1999; Ross and Chaloupka, 2004; Gruber and Zinman, 2001; Tauras, 2005; Carpender and Cook, 2008; DeCicca et al., 2008; Townsend et al., 1994;Schnorhr et al., 2008). Few studies estimate the price responsiveness of youth smoking among low and middle income countries and find that youth smoking is responsive to cigarette price changes (Krasovsky et al., 2002; Karki et al., 2003; Ross, 2004a; Ross 2004b; Kyaing, 2003; Kostova et al., 2012).

This paper is the second paper that employ GYTS data to estimate the effect of cigarette prices on cigarette use among youth in low and middle income countries using cross sections of multiple countries over time. The first paper was published by Kostova et al. (2012). Kostova and colleagues (2010) found that a 10 percent increase in price reduces cigarette smoking by 18 percent in a sample of countries that contained both developed and less developed nations. When the sample was restricted to include only low and middle income countries, they find a price

elasticity of cigarette demand of -2.1, suggesting that a 10 percent increase in price would reduce youth smoking by 21 percent (Kostova et al., 2012).

My analysis follows a methodology similar to Kostova et al. (2010 and 2012). I use data from 38 GYTS participating countries instead of the 20 countries that were used by Kostova and colleagues (2010). This chapter extends the analysis by including a larger set of observations and more recent data. Cigarette price data are merged at the country or city level using data from the Economist Intelligence Unit. Similarly to Kostova and colleagues (2010 and 2012), I control for several factors that may affect smoking at the local level. The analysis includes controls for exposure to cigarette advertising and counter-advertising, local controls on access to commercial cigarettes, and sentiment about smoking.

Conducting the analysis among the group of countries which includes both high income and low and middle income countries, I find that a 10 percent increase in price reduces smoking prevalence by 5.62 percent and average consumption by 9.39 percent. I then estimate price elasticities of cigarette demand only for youth in low and middle income countries. Consistent with theoretical models which suggest that smoking among the poor will be more sensitive to changes in prices, I find a -total price elasticity of cigarette demand of -2.196 . A 10 percent increase in price among less developed countries would reduce smoking prevalence by 5.89 percent and consumption by 16.07 percent. Disaggregating the effect by gender, I find that males are more price-responsive to cigarette prices than females, even though the cigarette prices are found to significantly reduce smoking for both males and females. The findings from this chapter provide additional evidence on the importance of cigarette prices as a tool in reducing cigarette use among youth.

.

2.2. Theoretical Background

Theoretically the negative relationship between price and quantity demanded arises from the law of demand. Holding other things constant, an agent will consume less of a good if the price of the good rises. Treating cigarette consumption under traditional demand analysis however, omits the addictive nature of smoking. Because smoking is an addictive behavior, the physiological response to nicotine, may mitigate the effect of economic behavior to price. It is believed that the addictive nature of smoking would make smokers less responsive to changes in cigarette prices. In the literature, the economic behavior of addictive substances has been discussed under four distinct theoretical models: (1) traditional demand models, (2) myopic addiction models, (3) rational addiction models, (4) and consumption under time inconsistent preferences.

Under traditional demand models agents are assumed to be fully rational and autonomous in their decision making and smoking is optimal because the person has rationally chosen it. Given these assumptions, government intervention is limited because smoking does not generate market failures. Under traditional demand models, current demand is specified as a function of current prices and current values of other economically relevant explanatory variables. Traditional demand models omit the effect of past and future consumption on an individual's current smoking behavior. Past consumption should matter as smoking is addictive, and it usually generates dependency or habit formation. Future consumption, should matter if the individual is assumed to be optimizing behavior not only contemporaneously but over one's life cycle. Plus, the assumption that the individual is autonomous in decision making seems implausible given that smoking is addictive (IARC, 2011; Chaloupka 1991).

Later modeling of consumption under myopic addiction models attempted to address the addictive nature of smoking. Myopic addiction models specify cigarette consumption, by incorporating prices for cigarettes, other observable characteristics which may explain the demand for smoking and a lagged dependent variable or an IV approach to model the effect of past consumption on current consumption. This is an improvement to the traditional models because a person's current consumption is determined by his past consumption which is a more realistic representation of addictive behaviors. However, in myopic models the person does not consider the future consequences of current consumptions in making the decision to use the substance. People live for the current period and infinitely discount their futures, meaning that future health consequences of smoking do not matter in decision making (IARC, 2011). Under these assumptions, smokers would never attempt to quit smoking except in the case that smoking bestows no contemporaneous utility. Behavioral responses under myopic models fail to identify the effect of future consequences of the addictive substance on current behavior. They omit a large portion of the cost on the individual who will experience worse health outcomes due to smoking. Improvements on myopic models are later models that treat addictive behavior under a rational addiction framework.

The rational addiction framework was developed by Becker and Murphy (1988). Under this framework, people rationally choose to consume addictive substances, because such behavior increases lifetime utility. Consumption of the addictive good exhibits "adjacent complementarity", which implies that quantities of addictive goods consumed in different time periods are interdependent. A rationally addicted person's current consumption is determined not only by past consumption but also future consumption. Future consumption depends on future prices and the future adverse health consequences of current smoking. A rationally

addicted person will smoke less today if he anticipates the price of cigarettes to rise in the future. The model extends the definition of prices to include the negative health effects of consumption and social or legal sanction of consumption. A higher cost to the consumption of the addictive good in the future alters the present behavior for the individual. The model implies that current consumption of the addictive good is negatively related to past, present, and future prices of the addictive good. Furthermore, the long run effect of a permanent change in price will exceed the short run effect of price. Finally, an anticipated price increase will have a higher impact on individual behavior than unanticipated price increases.

The Becker and Murphy (1988) model incorporates three distinct characteristics of addictive behavior: tolerance, reinforcement, and withdrawal. In their model, utility depends on current addictive consumption, current non-addictive consumption, and a stock of past addictive consumption. Tolerance is included by assuming that the marginal utility of the addictive stock is negative, which implies that greater cumulative past consumption lowers current utility. Reinforcement is incorporated by assuming that an increase in the addictive stock raises the marginal utility of current addictive consumption. Withdrawal is captured by the fact that total utility falls when the individual quits.

The model includes some important implications about addictive behavior and time preferences. The higher the individual's discount rate for the future, the more likely the person will consume the addictive good. Further, individuals with higher discount rates will be more responsive to changes in prices than those with lower discount rates because changes in prices are realized currently. These two results explain why young people and the poor are more likely to initiate smoking than older and richer people, and typically have higher price elasticities of demand. On the other hand those with low discount rates, will be relatively more responsive to

new information on the health consequences of smoking. One criticism to the model is that rational people should never choose to become addicted in the first place. Becker and Murphy address this by highlighting that while people recognize the implications of addiction, they consume the addictive substance because its consumption increases utility. Often addictive consumption arises because of stressful situations, but they would have been unhappier had they not consumed the good. People recognize the addictive nature of the products consumed, but the gains from consumption exceed the cost of future addiction (IARC, 2011).

Another criticism of the rational addiction model is the assumption of perfect foresight. The model does not allow for smokers to regret ever initiating smoking, and smokers often indicate wanting to quit, or regretting having started smoking in the first place. Furthermore, because the individual may lack full information on which to base the consumption of the good, often people underestimate both the addictive nature of smoking and the harmful health outcomes associated with it. This is especially true among youth, who often lack full knowledge on the detrimental effects of smoking (IARC, 2011).

The rational addiction framework assumed that consumers discount their future exponentially. Exponential discounting assumes that people have time-consistent preferences, meaning that they derive a higher level of utility from current consumption and that deferred consumption does not produce the same level of utility. Emerging evidence suggest that preferences may be time-inconsistent, meaning that people display different relative preferences in different time periods. This inconsistency in preferences over time is first described by Schelling (1978). Schelling describes a smoker trying to quit as "two people, one who wants clean lungs and a long life and another who adores tobacco… The two are in continual contest

for control." The far-sighted self may enroll in a smoking cessation program, only to be outdone by the relapse of the short-sighted personality (Chaloupka and Warner, 2000).

Most people exhibit present-biased preferences and discount hyperbolically. Hyperbolic discounting implies that people will make relatively far-sighted decisions when planning in advance, but they will make relatively short-sighted decisions when some benefits are realized immediately (Camerer and Lowenstein, 2002). People have a tendency to pursue immediate gratification even if this imposes a large cost in the future. This arises because people exhibit self-control problems, where the objectives of the current self are in competition with the objectives of a future self (Gruber and Koszegi, 2002). Smokers indicate they want to quit in the future but they find it difficult to quit right now. The future self realizes the benefit of quitting, but he is in competition with the gratification derived from the current self, even if the benefit from quitting is larger than the benefit of continued consumption. Time-inconsistency in preferences generates an "internality" which markets fail to correct. From a policy perspective addiction can be viewed as not only a market failure because it generates "externalities" (ie. higher costs to society in the form of health care costs and lost productivity) but also an "internality" which arises from this duality in behavioral responses. Taxation is justified on the grounds of both the external costs smoking generates for society and also the internal cost generated at the individual level (Gruber and Koszegi, 2002; IARC, 2011).

2.3. Literature Review[11]

A large share of smokers initiate smoking during adolescence[12]. According to the models outlined in the theoretical section, youth are expected to have a larger response to price changes than adults. Several reasons have been provided in the literature for why youth may be more price-responsive. First, the fraction of disposable income sent on cigarettes by young smokers is greater than that of adult smoker and economic theory implies that the larger share of disposable spent on a good, the more responsive the individual will be to price changes (Grossman and Chaloupka, 1997). Secondly, youth have a higher propensity to discount the future. The higher the discount rate youth place on the future consequences of smoking, the more important are short-term costs of smoking, such as the monetary price of cigarettes. As a result youth will respond more to the short-term consequences of smoking, than long-term consequences (IARC, 2011). Adolescents have shorter smoking histories and are plausibly less addicted, suggesting that they will be more responsive to price changes (Lewit et al., 1981). Finally, youth are more responsive to peer pressures, and they are more likely to smoke if their peer group smokes (Fletcher, 2010; Powell et al., 2005; Lundborg, 2006). In this context, an increase in price would not only reduce individual smoking, but since the price increase would reduce the cigarette smoking for the group, a price increase would indirectly reduce individual smoking through peer smoking (Becker and Murphy, 2000). This implies that youth are going to be more responsive the changes in cigarette prices. The findings from the empirical literature suggest that youth are more price-responsive to changes in cigarette prices than adults (IARC, 2011).

[11] This literature review draws heavily on a review form the International Agency for Research on Cancer, on the "Effectiveness of Tax and Price Policies for Tobacco Control", Handbook 14, 2011.

[12] The Surgeon General Report (2012) suggest that 88 percent of smokers initiate smoking prior to age 18 and 99 percent of smokers initiate prior to age 26.

The majority of empirical estimates of price elasticity of demand among youth come from studies conducted among high income countries. There is a large literature in the United States that focuses on the effect of prices on cigarette use among youth. The first study to estimate price elasticities of cigarette demand is Lewit et al. (1981). The authors use the data from Cycle III of the Health Examination Survey. The authors control socioeconomic status and demographic characteristics, and also for factors that may confound the effect of price such as tobacco advertising and anti-smoking advertising. They estimate a two part model where they separately model smoking prevalence and conditional demand, and estimate a price elasticity of -1.44. A ten percent increase in price reduces smoking prevalence by 12 percent and conditional demand by 2.5 percent. They find a large impact of price on reducing smoking among youth, however, the main impact of price on youth smoking is found to be through cutting prevalence rates.

Lewit and Coate (1982) used the 1976 National Health Interview Survey to examine the effects on price on cigarette smoking. Among young adults aged 20-25, they found that most of the effect of price for young adults was on the decision to smoke with a participation elasticity of -0.74 and conditional demand elasticity of -0.2. Males were found to be more price responsive, with an estimated total price elasticity of -1.4. Females were not found to be responsive to changes in price.

The conclusion that youth cigarette demand is more price elastic that adult cigarette demand was widely accepted until a study by Wasserman et al. (1991). Using data from the Second National Health and Nutrition Examination Survey, Wasserman and colleagues found no statistically significant impact of price on youth smoking. The estimated price elasticities for youth were no different than the estimates for the adult population. The difference between

Wasserman et al. (1991) and previous studies relies on how these studies controlled for factors that may be correlated with prices. Wassernan et al. included in their models an index of restrictions on smoking. These restrictions, which tend to be positively correlated with price, had not been included in most previous studies of cigarette demand. They argued that price elasticity estimates were subject to an omitted variable bias when the smoking restrictions measures were not included. This conclusion was however, short lived, as later studies which controlled for sentiment and other variables that confound the effect of prices found large effects of prices in curbing smoking among youth.

Chaloupka and Grossman (1996) examined the impact of price, and controlled for several tobacco control policies (smoking restrictions, youth access restrictions) using data from the 1992-1994 Monitoring the Future Survey of 8-12th grade students. They estimate a total price elasticity of -1.3. In contrast to Lewit et al. (1981) they found that the effect of price is split evenly between smoking participation and conditional demand. The additional controls contradict the argument posed by Wasserman et al. that price effects were subject to omitted variable bias. Conducting the analysis by gender and race Grossman and Chaloupka (1996) and Chaloupka and Pacula (1999) concluded that young men and African American youth are more responsive to price than young women and white youth.

Chaloupka and Wechsler (1997) reached similar conclusions using data from the Harvard Alcohol Study. They controlled for numerous other determinants of smoking including restrictions on smoking and estimated a price elasticity of smoking participation of -0.53 and total price elasticity of -1.11. The authors also concluded that strong restrictions on public places reduce smoking prevalence rates among college students, while some restrictions on public smoking reduce the quantity of cigarettes smoked.

Farrelly and Bray (1998) found similar evidence for young adults, based on 13 waves of the National Health Interview Survey conducted between 1976 and 1992. They estimated that demand was more than twice as elastic for the sample of young adults. In a later paper using the same data Farelly et al. (2001) included state-specific effects in their model to control for state level, time-invariant heterogeneity, such as sentiment towards tobacco. The findings from this analysis were similar to the Farelly and Bray (1998) study.

Additional support for the inverse relationship between price elasticities and age are provided by Lewit et. al (2000) who used data for ninth grade students from 22 North American communities involved in the National Cancer Institute's Community Intervention Trial for Smoking Cessation (COMMIT). They found that both youth smoking participation and intention to smoke among non-smokers were inversely related to price with estimate elasticities of -0.87 and -0.95. Tauras and Chaloupka (1999) used longitudinal data from Monitoring the Future Surveys of high school seniors conducted from 1976 through 1995. They controlled for state and individual unobserved factors affecting demand, and estimated an overall price elasticity of -0.79. A subsequent study by Ross and Chaloupka (2004) using the same data, but controlling for the level of compliance with respect to youth-access laws, resulted in similar findings.

Grueber and Zinman (2001) controlled for state and year fixed effects in their analysis of youth smoking. They use three separate data sets (1) Monitoring the Future Surveys (2) Youth Risk Behavior Survey (3) Vital Statistics Natality Detail Files. They found the youth smoking responds to changes in cigarette price. The prevalence elasticities range between -0.38 in the Natality data to -1.5 in the YRBS data, with the MFS estimate being -0.66.

Tauras et al. (2005) investigate the impact of cigarette prices and tobacco control policies on youth and young adult smoking. They use data from the National Longitudinal Survey of Youth (NLSY97) and control for unobserved individual and year effects. They find that the total price elasticity of cigarette demand is -0.83, with a prevalence elasticity of -0.31 and conditional demand elasticity of -0.52.

DeCicca et al. (2008) developed a direct smoking measure of sentiment using a factor analysis procedure that employed data from the Tobacco Use Supplements to the Current Population Survey. They merge the measure of sentiment to the National Educational Longitudinal Study waves 1992 and 2000. The authors found that including the new measure for sentiment, rendered estimates of smoking prevalence insignificant, even though the price variable in conditional demand models was significant. They argue that proxies that control for state level heterogeneity may not be adequate measures of sentiment.

Carpenter and Cook (2008) addressed the concerns of DeCicca et al. (2008) by estimating several models that controlled for heterogeneity. First they estimated a cross-sectional model and relied on intrastate variation in cigarette taxes to identify the impact of price on youth smoking. They estimated a two way fixed effect model that controlled for area (state and municipality) fixed effects and year fixed effects. Finally, they estimated a model using the DeCicca sentiment variable. They found consistent evidence of the negative effect of cigarette taxes on smoking prevalence. Using Decicca's measure of anti-smoking sentiment they found a strong negative effect of tax on smoking prevalence on youth alleviating any concerns raised by DeCicca et al.

2.3.1. Smoking Prevalence and Intensity among other High Income Countries

Townsend et al. (1994) estimates the effect of cigarette prices using data from the British General Household Survey. They conclude the smoking prevalence among young females was responsive to prices, but male smoking prevalence was not. Dupont and Ward (2002) studied the impact of price on smoking behavior among Canadian youth. They use the National Population Health Data and estimate a price elasticity of smoking prevalence of -0.91.

Schnorhr et al. (2008) pooled data from 27 European countries to examine the effects of prices and tobacco control policies on daily smoking prevalence. In contrast to US studies, the authors found no significant impact of prices on youth smoking prevalence. The authors suggest that the lack of relationship between price and prevalence may arise from their inability to adequately control for inter-country factors correlated with price and youth smoking.

2.3.2. Smoking Prevalence and Intensity among Low and Middle Income Countries

Few studies investigate the effect of price and tax on youth smoking behavior among low and middle income countries. The majority of the studies find similar results with those of developed counties: youth are more sensitive to price changes that adults. Krasovsky et al. (2002) estimate price elasticities of cigarette demand in the Ukraine and find larger price elasticities for younger smokers. Karki et al. (2003) estimated the joint demand for cigarettes and bidis in Nepal, and find that young people were more than twice as responsive to changes in price as the overall population. Kyaing (2003) estimated price elasticities of smoked tobacco in Myanmar and found that the price elasticities of younger people were 50 percent larger in

magnitude than the elasticities for the overall population. Ross (2004 a and 2004 b) estimates price elasticities of cigarette demand for youth in the Ukraine. She finds that price elasticities of smoking prevalence range between -0.29 and -0.51 and elasticities of conditional which range between -1.42 and -1.83. Similarly, she conducts analysis for Moscow, Russia. She finds a price elasticity of -1.15.

Kostova et al. (2012) uses data from the Global Youth Tobacco Survey from 17 low and middle income countries, and finds a total price elasticity of demand of -2.2. Joseph (2010) using GYTS data from India and finds a total price elasticity of demand of -0.4 with price influencing the decision to smoke more strongly than the intensity of smoking. She finds that price had a greater impact on smoking prevalence among girls than boys. Lance et al. (2004) use data from Russia and China and find that total price elasticities are -0.35 and -0.26.

Consistent with theory the empirical evidence suggests that youth smoking is more sensitive to cigarette price changes. A price increase will reduce both prevalence and consumption among youth. This implies that increases in cigarette prices are an effective policy in reducing smoking among youth. There is variation in estimates among studies, which can be explained by the use of cross-sectional and longitudinal data among different analyses. Furthermore, analyses differ on how they control for effects that may be confounding the effect of prices. Tobacco advertising and counter-advertising, sentiment toward smoking, and youth access restrictions are plausibly correlated with the price variable. It is likely that regions who support restrictions of smoking in public places and private workplaces levy higher taxes on cigarettes. It is therefore difficult to separate the effect of prices from that of sentiment and the estimates of price would be overstating the true effect of prices on smoking. To identify the causal effect of prices on smoking the current literature has addressed sentiment toward tobacco either

directly by merging variables correlated with sentiment (i.e. tobacco producing state, or lagged state level consumption) at the state level or indirectly through the use of state fixed effects. Both of these methodologies try to address the impact that unobservable heterogeneity among regions may have on youth smoking.

2.3.3. Price and Tobacco Use Among the Poor

The prevalence of tobacco use is higher among the poor. The poor tend to be less aware of the adverse health consequences of smoking, and often use smoking as an outlet for releasing stress which arises from material deprivation. The poor may see smoking as a way of rewarding themselves, and because the productivity loss associated with smoking tends to be smaller among low income people, the poor are more likely to adopt smoking as a lifestyle (IARC, 2011).

It is believed that the poor will be more responsive to price changes than the rich because tobacco expenditures take up a larger share of their income. The percentage of income spent on tobacco is larger among the poor (Kyaing, 2003; Adiemoto et al., 2005; Onder, 2002, Aloui, 2003; Efroymsmon et al., 2001; Wang et al., 2006). Taxation of tobacco products is regressive, however taxation is believed to reduce tobacco use among the poor at higher rates, and as such it can reduce health disparities between the poor and the rich. In the same context, while cigarette taxes are regressive, taxation of cigarettes may be progressive depending on how sensitive the poor are to price changes. If the poor respond by reducing their cigarette consumption by more than high income individuals, then higher taxes may in fact reduce the regressivity of taxes (Wang, 2006; Gruber and Koszegi, 2008).

The evidence that investigates the relationship between price responsiveness and tobacco products among people of different socioeconomic status finds that price elasticities of demand are higher in absolute value among the poor than the rich in high income countries. This finding can be explained by two reasons. First, the poor face a higher opportunity cost to smoking tobacco, and when the price increases they tend to respond more to the price increases than the rich. Secondly, the poor tend to be more present-oriented and tend to discount the future at higher rates, leading them to respond more to a contemporaneous price increase or current costs, rather than future costs such as adverse health outcomes (Becker and Murphy, 1988; IARC, 2011). The evidence among low and middle income countries tends to be mixed on the effect of price changes on the demand of people from lower socioeconomic groups. Part of this effect can be attributed to the availability of untaxed and cheaper tobacco products, which are consumed more by the poor (IARC, 2011).

2.3.4. Evidence from High-Income Countries

Chaloupka (1991) investigates the effect of price changes among different socio-economic groups using data from the National Health and Nutrition examination Survey. He finds that price elasticities tend to be greater among those with less than a high school education, with an estimated elasticity ranging from -0.57 to -0.62. Later studies also tend to support the negative relation between socioeconomic status and price responsiveness of tobacco demand (Evanst et al., 1999; Hersch, 2000; Farrelly et al., 2001; Gruber and Koszegi, 2002; DeCicca and McLeod, 2008).

One study by Franks et al. (2007) finds that while price responsiveness prior to the Master Settlement Agreement (MSA) of 1998 was higher for the low income group, after the

MSA the price responsiveness of the low income group and the rest of the population were no different, and in fact estimates for both groups were insignificant, meaning that increasing cigarette prices may no longer be an effective tool and may lead the poor to disproportionately share the burden of tobacco taxation. Farrelly and Englen (2008) use the data from Franks et al. (2007) and find that the size of the price elasticity declines post the MSA but this is only true for high and middle income individuals. The low income group was found to be price responsive.

Gruber et al. (2003) used data from Canada and find that the price sensitivity estimates were greater in the lowest two quartiles of the income distribution. Gospodinov and Irvine (2009) use Canadian data and show the highest price responsiveness is found among high school graduates, but people with less or more than a high school degree are less responsive. Similarly, Schaap et al. (2008) using data from 18 European countries find no significant difference in the price elasticity of demand for tobacco among high and low education groups. Lee (2008) using data from Taiwan finds similar results to those of Schaap et al. (2008) when comparing among different educational groups. However, when socioeconomic status is measured by income levels, Lee finds that the poor tend to be more responsive to price changes. Similarly Siahpush et al. (2009) using data from Australia found consistently greater price elasticities among lower income groups.

2.3.5. Estimates from Low and Middle Income Countries

The evidence of the price elasticity of demand among low and middle income countries is less conclusive on the relationship between socioeconomic status and price sensitivity. Kyaing (2003) used data from Myanmar and finds that price sensitivity and income follow an inverse-U relationship. A later study by Kyaing et al. (2005) using data from Myanmar finds the highest

price elasticity among the lowest income group for cheroots and second lowest income group for cigarettes.

Karki et al. (2003) using data from Nepal, estimated that smoking intensity was greatest among the second poorest income groups, but there was no different among income groups when it came to the price sensitivity and smoking prevalence. Nassar (2003) using data from Egypt, found no systematic relationship between price elasticity and income groups, but when price estimates were calculated by educational levels, low education groups were found to be more price responsive than high education groups. Similarly, studies from Turkey and Bulgaria find no systematic relationship between income and price responsiveness (Sayginsoy et. al. 2002; Onder, 2002). Kinh et al. (2006) estimated that the poor have higher prevalence and higher conditional demand elasticities in Vietnam. Similarly, van Walbeek (2005) finds that in South Africa the poor are more responsive to price than higher income groups. Kostova et al, (2010, 2012) using data from 20 GYTS countries find that youth from low and middle income are more responsive to prices than youth from high income countries. Most of the difference in price elasticities between poor youth and youth from high income countries is driven by sensitivity of average consumption to price, suggesting that poorer youth respond to cigarette price increases by more because they are poor.

Several reasons may explain the mixed evidence between the socioeconomic status and price responsiveness. The studies discussed above do not take into account the possibility of substitution from high priced cigarettes to low priced cigarettes which are often the ones consumed by the poor. Lower income individuals would also be likely to seek tobacco products that are available through illicit trade at prices cheaper than the market rate, suggesting that they may be able to maintain their consumption even after a price increase. In the presence of tax

avoidance behavior among tobacco users would be less responsive to changes in price (IARC, 2011). These reasons may explain the difference in price responsiveness among the poor between high income and low income countries.

In this paper I test for price responsiveness of smoking among youth for a group of 38 GYTS countries[13]. I then exclude high income countries to get an estimate of the effect that prices have on poorer youth. Consistent with theoretical predictions, I find that youth smoking among low and middle income countries is more price responsive to changes in cigarette prices.

2.3.6. The Effect of Sentiment, Tobacco Advertising and Anti-Smoking Advertising and Youth Access Restrictions

The literature identifies other variables that affect youth smoking. More specifically, tobacco advertising in the literature is causally liked with increases in smoking initiation and progression among youth. Anti-smoking mass media campaigns are linked to reduced smoking prevalence among youth. The evidence is mixed on the effect of youth access restrictions on smoking among youth. Some studies seem to suggest that the mixed effects may be the results of lax enforcement of such restrictions. In this section I also discuss the impact of smoke-free air laws on smoking participation and average consumption. The evidence in this end is clear that smoke-free air laws reduce consumption among smoker and increase the probability of smoking cessation. Some evidence further suggests that smoke-free air laws may reduce smoking

[13] The GYTS data are available for 140 countries. Price data are merged in at the country or city level using the Economist Intelligence Unit World Cost of Living Survey (EIU). In this paper I rely on variation of prices over time to identify the price effect. Countries where the survey was conducted only once were excluded because there is no variation in prices over time and space to identify the price effect. Further, because the EIU does not survey all GYTS countries, the analysis was conducted only for the countries where data were available. This reduced the number of countries to 38.

prevalence among youth, especially when applied as part of more comprehensive tobacco control programs.

2.3.7. Sentiment

Smoke-free air laws are an important tobacco control policy instrument. The evidence shows that they are successful in reducing cigarette consumption among smokers and may reduce smoking prevalence among youth. Governments have enacted legal restriction on smoking in response to scientific evidence documenting that secondhand smoke (SHS) causes premature death and disease. Exposure to SHS causes harm to health including lung cancer, cardiovascular disease in adults, respiratory disease in adults and children, and Sudden Infant Death Syndrome (SID). There is no established risk-free level of SHS exposure (Surgeon General, 2012). However, as of January 2008, sixteen countries and dozens of sub-national jurisdictions have implemented legislation globally suggesting that much work remains to be done in curbing exposure to SHS (Surgeon General, 2012).

The primary public health purpose of smoke-free air laws is to protect non-smokers from involuntary exposure to SHS. However, smoke-free air laws can also affect the smoking behavior of smokers by making it more difficult to smoke. The International Agency for Research on Cancer (IARC) completed a comprehensive review on the effect of mandated smoking restriction on smoking behavior. Generally the findings suggest that smoke-free policies lead to substantial reductions on exposure to SHS. They appear to cause a decline in heart disease, and decrease respiratory disease symptoms in workers, but the research discusses the importance of longer-term studies on the impact of smoke-free air laws on health outcomes.

In terms of the impact of smoke-free policies on smoking behavior, the findings suggest that smoke-free air laws reduce cigarette consumption among continuing smokers and lead to increased successful cessation among smokers (IARC, 2009).

Tauras (2004) uses data on young adults from Monitoring the Future Survey and finds that stronger restrictions on private worksites and public places increase the probability of smoking cessation among young adults. Chaloupka and Wechsler (1997) conducted a study focused on the smoking behaviors of college students using data from the 1993 Harvard College Alcohol Study. Restrictions of smoking in restaurants and schools were found to have a negative and significant effect on smoking participation. And the indictor for restriction in other public places was associated with a significant decrease in average consumption. Chaloupka and Grossman (1996) using data from Monitoring the Future Survey analyzed the impact of restrictions of smoking at school among 8-12th grade students and found that the effect of restrictions was negative and significant on average consumption. Smoke-free policies may reduce tobacco use among youth, and tend to be more effective in reducing smoking when included as a part of comprehensive tobacco control programs. The evidence on smoking restrictions on prevalence is somewhat mixed and less conclusive, although the more recent evidence suggests that smoke-free workplaces lead to reductions in prevalence and increased quitting (IARC, 2009) The IARC review discusses public attitudes toward smoke-free air laws and compliance. They find that in developed countries, the majority support smoke-free air laws in public and workplaces. In developed countries, the GYTS has identified majority student support for smoke-free policies in public places. Smokers usually comply with these policies, but compliance is related to poor enforcement of policies (IARC, 2009).

2.3.8. Tobacco Advertising

The evidence on the effect of the tobacco industry's marketing activities clearly shows that marketing activities have been a key factor in leading young people to take up tobacco, achieving higher consumption among users and keeping users from quitting. In 2008, $9.94 billion was spent on marketing cigarettes in the United Sates alone (Surgeon General, 2012). . Marketing efforts by tobacco companies have generally focused on advertising in newspapers, magazines, billboards, points of sale, but also through price discounts, promotional allowances for retail and wholesale suppliers as well as individual promotional allowances. In addition the industry spends a share of its marketing budget on sponsoring events and public entertainment activities, distributing merchandise with company logos, product placement in television and movies, and cigarette giveaways.

There is strong evidence that tobacco advertising affects awareness of smoking and of particular brands, the recognition and recall of cigarette advertising, attitudes about smoking, intentions to smoke, and actual smoking behavior. In a 2003 review of published longitudinal studies Lovato et al. (2003) find that tobacco advertising and promotion increases the likelihood that a youth will start smoking. Moreover, there is strong and consistent evidence to suggest that marketing influences adolescent smoking behavior, including selection of brands, initiation of smoking and overall consumption of cigarettes (Lovato et al,, 2003; Difranza et al., 2006; Goldberg, 2008; NCI, 2008).

Lewit et al. (1981) study the effect of cigarette advertising on television and youth smoking. They find that holding other factors constant, for every 10 hours per week that the adolescent watched television in the previous year, he was 11 percent more likely to be a smoker

in the following year. Another way to assess the impact of advertising is to estimate the effect of advertising bans. Saffer and Chaloupkla (2000) reported a 7.4 percent reduction in cigarette consumption among 22 Organization of Economic Co-Operation and Development countries that had enacted a comprehensive ban on advertising and promotion. However, the study concludes that partial bans have little effect on smoking behavior, given that the tobacco industry can shift its resources from banned media to other media that are not banned.

Lancaster and Lancaster (2003) reviewed 21 studies on advertising bans and found that 10 of these reported significant negative coefficients indicating that the bans of advertising were associated with decreased smoking or consumption. Bletcher (2008) evaluated the impact of bans on tobacco advertising in developing countries and concluded that both partial and complete advertising restrictions are effective in reducing tobacco consumption, with complete bans being more effective. A few studies have concluded that there is no evidence that advertising bans affect consumption or prevalence of smoking among youth (Lancaster and Lancaster, 2003; Nelson 2003). However, the studies that find no effect of advertising bans on smoking behavior have been questioned on methodological grounds (Surgeon General, 2012). This gives credence to the previous line of research which finds significant effects of tobacco advertising bans (see Saffer and Chaloupka, 2000; Lewit et al, 1981; Bletcher, 2008; Lovat et al., 2003; Difranza et al., 2006; Goldberg, 2008; NCI, 2008; Surgeon General, 2012).

The Surgeon General Report (2012) finds that spending on cigarette marketing is 48% higher than in 1998, the year of the Master Settlement Agreement. The evidence is sufficient to conclude that there is a causal relationship between advertising of tobacco products and initiation and progression of tobacco use among youth.

2.3.9. Counter-Advertising Campaigns

Mass media campaigns are another tool employed to reduce smoking among youth. These campaigns focus on highlighting the short-term and long-term effects of smoking. The aim of counter-advertising interventions is to change social norms about smoking and second hand smoke, to highlight to manipulative targeting of youth by tobacco companies, and to emphasize the adverse health consequences of smoking.

Reviews of current studies document the effectiveness of media interventions in reducing smoking among youth. Flynn et al. (1992) examined the effect of media plus school interventions and found that these interventional had significantly lowered smoking among youth. Similarly evidence by Farrelly et al. (2003), Wakefield et al. (2003), and the Task Force on Community Services (2005) all concluded that mass media campaign have the potential to curb smoking and tend to be more effective when combined with school level interventions (Surgeon General, 2012).

Evidence from longitudinal studies and cross-sectional studies finds similar results. Lewit et al. (1981) found a reduction of 3-3.4 percentage points due to antismoking advertising during the Fairness Doctrine Period compared to the period prior. Of sixteen studies reviewed among cross-sectional studies, fourteen showed evidence that smoking was reduced among youth due to exposure to antismoking advertising. Similarly, Niederdeppe et al. (2008) found that the there was an upward trend in smoking after the recall of Florida's "truth" campaign.

According to the Surgeon General Report (2012) the evidence is sufficient to infer a causal relationship between adequately funded antismoking campaigns and reduced prevalence of smoking among youth. Further studies suggest that ads evoking strong negative emotions

show greater recall and are related to higher intention not to smoke. Finally, evidence suggests that even those messages intended for adult populations, decrease the prevalence among youth.

2.3.10. Youth Access Restrictions

A variety of strategies seek to restrict commercial access to cigarettes among youth. Jurisdictions often require licensure of tobacco retailers. Licensure can be revoked if the vendor is found to sell tobacco products to minors. Additionally bans on self-service sales of tobacco further reduce the availability of cigarettes for youth (Woollery et al., 2000). Some local governments have sought to penalize youth for possession, purchase and use of tobacco products, and most require that sale is in compliance with age-of-sale legislation. Age-of-sale restrictions are quite prevalent among developed countries, but less so among middle and low income countries. They are intended to limit the availability of tobacco from commercial sources to minors.

The existing evidence provides mixed findings on the effectiveness of youth access restrictions on reducing youth smoking. Wasserman et al. (1991) found that state laws that restrict sale to minors reduced a teen's probability of smoking but did not affect consumption. Similarly, Chaloupka and Grossman (1996) found little impact of minimum age-of-sale policies. They interpreted the findings to imply weak enforcement of the law by retailers. Chaloupka and Pacula (1998) find that licensing requirements do not have a significant impact on youth smoking. Wakefield and Giovino (2003) reviewed the empirical evidence of possession, use and purchase (PUP) and found that these laws are associated with reduction in smoking among youth only for those youth who were unlikely to initiate smoking. More recently, DiFranza et al. (2009) examined the association between the compliance of merchants with youth access laws

and current daily smoking. They found that the odds of daily smoking were reduced by 2 percent for each 1 percent increase in merchant compliance.

2.4. Data Sources

The Global Youth Cigarette Survey (GYTS) is a school-based survey that examines youth cigarette use, knowledge and attitudes among children aged 13-15. The survey has been conducted in 140 income countries from six World Health Organization (WHO) participating regions (Africa, Europe, East Mediterranean, Americas, Southeast Asia and the Pacific). The data are pooled cross sections and the survey is administered over two or three waves in each country beginning in 1999 through 2008. The GYTS sampling procedure produces a representative sample of individuals aged 13-15 in the schools but the actual sample includes youth aged 11 to 19. The final data set includes 593,588 individuals from 38 countries.

Price data are obtained from the Economist Intelligence Unit's World Cost of living Survey (EIU), which collects retail price data for a range of consumer goods on a bi-annual basis for multiple cities worldwide. Cigarette prices are available for local brand and foreign brand cigarettes. While smokers in the GYTS report cigarette prices, self-reported prices are likely endogenous as smokers are more likely to shop around for cheaper cigarette. Country level price measures do away with the endogeneity of self-reported prices. Because the effect of prices is identified by using within country variation over time, this limits the analysis to only those countries that conducted the survey over multiple waves. Of 140 countries surveyed, 49 were excluded because the countries only conducted one wave of the GYTS. An additional 31 countries were dropped because they were missing the proxy for income variable used in the analysis. Finally, since EIU does not survey all countries in the GYTS and additional 22 countries were dropped due to lack of price data. I am able to conduct the

analysis among 38 countries where price data were available[14]. Data are generally reported from individual cities, if multiple cities are surveyed, the average of the prices is merged in. Where I can link EIU prices to cities in the GYTS survey, the city price is merged instead of the country average. I only employ the local-brand prices for the analysis. Local-brand prices are used because they are typically less expensive and more likely to be purchased when the average youth decides to consume cigarettes. All prices are expresses in real 2005 US dollars using the PPP adjustment factors from the Penn World Tables.

Two measures of youth smoking are employed to conduct the current analysis. To measure youth smoking participation a dichotomous variable is constructed which takes a value of 1 if the student smoked at least one cigarette in the last month the survey was conducted, and 0 otherwise. Smoking intensity (consumption) is based on the average number of days that smoking occurred in the past month multiplied by the average number of cigarettes smoked daily. Consumption ranges from 0.75 to 600 cigarettes a month[15]. Table 9.1 summarizes variable constructions and definitions and table 9.2 provide summary statistics of the analysis variables.

The all sample smoking prevalence is 9.9 percent. Smoking prevalence is lower among low and middle income countries. The average smoker in the sample consumed 49 cigarettes a month, or

[14] The analysis is conducted on GYTS waves 1999 through 2008 for the following countries: Argentina, Bangladesh, Brazil, Chile, China, Colombia, Czech Republic, Ecuador, Egypt, Guatemala, Hungary, India, Indonesia, Iran, Jordan, Kenya, Kuwait, Mexico, Morocco, Nigeria, Pakistan, Panama, Peru, Philippines, Poland, Qatar, Russia, Saudi Arabia, Senegal, Slovakia, South Africa, South Korea, Syria, Uruguay, United Arab Emirates, Venezuela, Vietnam, and Zambia

[15] The consumption variable is defined at the days a youth smoked times the number of cigarettes smoked per day. Some students reported smoking 1 to 2 days a month, and on the days they smoked they consumed less than 1 cigarette per day. I use the midpoints of the intervals. This gives me 0.5 cigarettes per day times 1.5 days per month, which equals 0.75 cigarettes per month. The upper bound is of students who smoked all 30 days of the month and who consumed 20 cigarettes a day.

the equivalent of two packs and a half. Fewer females are smokers, and if they smoke they consume fewer cigarettes.

Individual level explanatory variables include age, gender, parental smoking, and the amount of pocket cash. The average age for the sample is 14 years. Parental smoking is a binary variable equal to 1 if the individual's parents smoke and 0 otherwise. Forty percent of students report having at least one parent that smokes. On average students receive $6.68 of pocket money each month. The amount of pocket cash is expressed in 2005 real dollars using the PPP adjustment from the Penn World Tables.

Several variables are included to control for local environment. Exposure to anti-smoking media is defined as the percentage of students in the school who report recent exposure to anti-smoking media messages and it is intended to capture local efforts to reduce smoking. Exposure to cigarette advertising is the percentage of students in the school who report recent exposure to advertising in newspapers, and billboards. Eighty percent of youth report being exposed to both cigarette advertising and anti-smoking media.

For the current analysis I include a proxy for anti-smoking sentiment. This is clearly not the same as smoke-free air laws. Unfortunately, smoke-free-air laws are generally non-existent in less developed countries[16]. This implies that even if few countries out of the sample employed had instituted smoke-free air laws, I would not have sufficient variation to estimate the effect of such policies over time. Instead I include a variable at the school level which measures anti-smoking sentiment. This variable does not have the same impact as smoke-free air laws, which when fully enforced significantly increase the cost of smoking in public places. However, the local level sentiment may provide an approximation of the potential impact of smoke-free air law

[16] Few GYTS countries have restriction on smoking in public places. The IARC (2009) review summarizes the countries and discusses enforcement issues.

policies when they are implemented. The sentiment variable is defined as the percentage of non-smokers who support a public ban on smoking. Because smokers are less likely to support a ban than non-smokers, this definition of the sentiment variable, where only non-smokers are included, is plausibly less endogenous relative to one including smokers. A majority of youth surveyed supported a public ban on smoking.

I include a control for access to commercial cigarettes. Youth were asked if they had been denied sale of cigarettes by local vendors because of their age in the month prior to the survey. Reduced access to commercial cigarettes is the percentage of students in the school who report having been denied cigarette sale due to age[17]. Exposure to cigarette advertising and anti-smoking media, and limits on access to commercial cigarettes at the local level do not capture the effect of tobacco control policies such as tobacco advertising bans or age-of-sale restrictions. However, if interpreted with caution, they may provide an idea of what the impact of tobacco control programs may be among these countries.

Country and year fixed effects are used to account for unobservable variation that arises within country over time. Missing data were imputed for the right hand side variables only (age, sex, pocket cash, parental smoking).

[17] Reduced access to commercial cigarettes includes every student who responded to the question. While smokers were more likely to respond to the question "Have you been denied sale of cigarettes due to your age in the past 30 days?", some non-smokers also responded to the question.

Table 9.1: Definition of Analysis Variables

Variables	Definitions
Smoking Participation	1= Reported smoking cigarettes in the last 30 days, 0 = otherwise
Conditional Demand	Number of cigarettes smoked in the past month
Age	Respondent's age in years
Male	1 = male, 0 = female
Pocket cash	Monthly amount of allowance or pocket money that students receive, measure in 2005 PPP dollars
Parental Smoking	1= if at least one parent smokes, 0 = otherwise
Anti-Smoking Sentiment	Percent of non-smokers who support a public ban of smoking
Exposure to Cigarette Advertising	Percent of survey participants who report recent exposure to cigarette advertising in print media
Exposure to Anti-Smoking Media	Percent of survey participants who report recent exposure to anti-smoking media messages
Reduced Access to Commercial Cigarettes	Percent of survey participants who report being denied cigarette sales due to age in the month the prior to the survey
Price- local brand	Real price of local brand cigarettes, PPP-adjusted, constant 2005 dollars

Table 9.2: Summary Statistics of Analysis Variables

Variable Name	Full Sample	Less Developed
Individual Level		
Current Smoker	0.099	0.095
	(0.298)	(0.294)
Cigarette Demand	49.40	43.14
	(113.62)	(105.85)
Age	14.060	14.070
	(1.360)	(1.372)
Male	0.537	0.538
	(0.499)	(0.499)
Pocket Money	6.680	4.770
	(14.970)	(11.270)
Parental Smoking	0.411	0.407
	(0.492)	(0.491)
Site Level		
Anti-Smoking Sentiment	0.775	0.772
	(0.182)	(0.187)
Exposure to Cigarette Advertising	0.794	0.814
	(0.224)	(0.211)
Exposure to Anti-Tobacco Media	0.796	0.798
	(0.120)	(0.121)
Reduced Access to Commercial Cigarettes	0.442	0.437
	(0.317)	(0.317)
Country Level		
Price (local)	2.643	2.655
	(0.952)	(0.964)

Standard Deviation in parentheses.

Table 9.2 Continued: Summary Statistics of Prevalence and Conditional Demand by Gender

.	Full Sample	Less Developed
	Incidence - Males	
	0.123	0.120
	(0.329)	(0.325)
	Conditional Demand - Males	
Mean	50.3	44.15
Min	0.75	0.75
25%	0.75	0.75
Median	4	4
75%	30	26.25
90%	116	105
99%	600	600
Max	600	600
	Incidence - Females	
	0.072	0.067
	(0.258)	(0.251)
	Conditional Demand - Females	
Mean	47.62	41.1
Min	0.75	0.75
25%	0.75	0.75
Median	4	2
75%	26.25	24.5
90%	105	105
99%	600	600
Max	600	600

Standard Deviation in parentheses.

2.5. Empirical Specification

A two part model is developed. In the first part I model smoking participation for all students. In the second part, conditional on smoking I estimate cigarette consumption among smokers.

2.5.1. Smoking Participation

S_{isc} is a dichotomous variable indicating smoking participation.

$$S_{isc} = \beta_0 + \beta_1 P_{ct} + \beta_3 X_{ics} + \beta_4 F_{isc} + \beta_5 G_{cs} + S_i + v_t + \varepsilon_{ics}$$

P_{ct} is a measure of cigarette price in country c, in time t. X_{ics} is the vector of personal characteristics (age, sex, pocket money). F_{isc} includes information on parental smoking. G_s includes local anti-smoking sentiment, exposure to cigarette advertising and counter-advertising exposure, and reduced access to commercial cigarettes Country dummies are indicated by S_i, and year dummies are v_t. Year dummies control for trends which might exist in cigarette prevalence over time. Country dummies are intended to capture time invariant factors that are unobserved at the country level affecting cigarette smoking. I use a logit model to estimate the effect of right hand side variables on smoking participation.

2.5.2. Conditional Demand

A conditional demand equation is estimated among students who report having smoked in the last month. Smoking intensity (consumption) is based on the average number of days that smoking occurred in the past month multiplied by the average number of cigarettes smoked daily and it is denoted by the variable D_{isc} in the equation below. All right hand side variables are defined as above.

$$D_{isc} = \beta_0 + \beta_1 P_{ct} + \beta_3 X_{ics} + \beta_4 F_{isc} + \beta_5 G_s + \beta_6 C_{tcs} + S_i + \nu_t + + \varepsilon_{ics}$$

Standard estimation procedures generally log transform the dependent variable. This transformation is conducted in an attempt to stabilize non-constant error variances. Box-Cox transformation tests determined the consumption and prices needed to be log transformed. The equation was then estimated using Generalized Linear Models (GLM) (Manning and Mullahy, 2001, Tauras 2005).

The distribution of conditional demand is continuous and often right skewed. Naïve OLS model where the depended variable is retransformed from log scale to its original scale omit the mean of the error term. If the error is constant than OLS estimates and GLM estimates look similar to one another. But if the error is heteroskedastic, OLS estimates will be biased (Manning and Mullahy, 2001). Tauras (2005) estimates that the bias using OLS instead of GLM in the estimation of conditional cigarette demand produces estimates that overstates the negative impact of price on conditional demand (Tauras, 2005). A Park test was conducted to determine the appropriate variance function (distribution) for the particular model. The distribution function was Gamma.

2.6. Results – Smoking Participation

Table 9.3 presents results of smoking prevalence as a function of the local price. I show several specifications. The baseline specification includes the price, age, sex, and country and year fixed effects without controlling for sentiment, exposure to cigarette advertising and anti-

smoking media, reduced access to commercial cigarettes[18] or parental smoking. The second specification includes a full set of controls including exposure to advertising and counter-advertising, and reduced access to commercial cigarettes. The third specification includes local sentiment. In the fourth specification I include parental smoking.

In the baseline specification the estimated elasticity of smoking prevalence is -0.565 suggesting that a 10 percent increase in price will reduce smoking participation among youth by 5.56 percent. Smoking participation is higher among males. Receiving pocket cash increases the probability of youth smoking. The inclusion of exposure to tobacco advertising, anti-smoking media and reduced access to commercial cigarettes lowers the estimated price elasticity from -0.565 to -0.322, but only the variable of reduced access to commercial cigarettes appears to be significant. The third specification is the one that is most important for the purposes of the analysis because it controls for sentiment which may be correlated with the price variable. The estimated price elasticity of prevalence in the third specification is -0.562. A 10 percent price increase reduces the probability of smoking by 5.62 percent. Sentiment is a significant predictor of smoking participation. A 10 percent increase in the share of students who support a ban of smoking in public places reduces prevalence by half a percentage point. A 10 percent increase in cigarette advertising increases the probability a youth smokes by 0.3 percentage points. Reduced access to commercial cigarettes lowers smoking participation among youth. If vendors were to deny sale to all minors, moving from a mean of 44 percent to 100 percent, youth smoking participation rates would fall by 1.35 percentage points (a 13.6 percent effect of the mean of 0.099). In the last specification I include parental influences. Smoking by parents

[18] This variable is constructed by students who reported having been denied sale of commercial cigarettes by local vendors due to age. It is not the same as legal age restrictions which are mandated at the country level.

increases the probability a youth will smoke by 4.3 percentage points. Theoretically some of the effect of prices should be running indirectly through parental smoking, suggesting that the price effect should become smaller from the inclusion of parental influences. However, the point estimates of the effect of prices on smoking participation do not change much because of the inclusion of parental smoking.

Evidence from studies conducted among U.S. youth suggests that males are more price responsive to changes in tobacco prices than females (Lewit and Coate, 1982; Chaloupka, 1990; Farrelly and Bray, 1998; Chaloupka and Pacula, 1999). On the other hand, estimates form the United Kingdom imply that females may be more responsive to changes in prices (Townsend, Roderick, and Cooper, 1994). I test for gender differences in price responsiveness for the current analysis. The estimates by gender suggest that male prevalence may be more responsive to cigarette price changes. Table 9.4 summarizes the results for boys. The estimated prevalence elasticity is -0.686. A 10 percent increase in local cigarette prices reduces male smoking prevalence by 7 percent. These effects do not change much by the inclusion of parental influences. Table 9.5 summarizes the findings for girls. The results for females are insignificant even though the coefficients are of the right sign. Males are not only more likely to respond to changes in cigarette prices, but they appear to respond more to other interventions at the local level. The effect of reduced access to commercial cigarettes is larger for males than females. Similarly, sentiment is associated with a larger effect on smoking participation among boys than girls. The estimated coefficient on sentiment suggest that a 10 percent increase in the share of students who support a ban on smoking is associated with a reduction in the probability of smoking by 7.5 and 2 percentage points for boys and girls. Parental influences are larger for boys than girls.

The above analysis suggests that higher cigarette prices will reduce smoking prevalence among youth, however, it appears that this result is driven primarily by the effect of prices on the smoking prevalence of boys. Reduced access to commercial cigarettes is associated with a lower probability of smoking, as is sentiment. However exposure to tobacco advertising is only significantly associated with increases in smoking prevalence among girls.

The previous analysis is conducted among primarily low and middle income countries. However, some countries are categorized from the World Bank as high income countries (Poland, Hungary, Czech Republic, Slovakia, Qatar, United Arab Emirates, Kuwait, Saudi Arabia, and South Korea). Youth from low and middle income countries should be more responsive to cigarette prices because they tend to be poorer. According to theory excluding the high income countries from the sample and conducting the analysis among low and middle income countries should increase the estimated price elasticities in absolute value. However, the evidence to date on the price responsiveness among the poor in low and middle is mixed.

To test this hypothesis I conduct the analysis among less developed countries. Excluding high income countries leaves me with 29 countries from the original 38. The middle and low income countries are: Argentina, Bangladesh, Brazil, Chile, China, Colombia, Ecuador, Egypt, Guatemala, India, Indonesia, Iran, Jordan, Kenya, Mexico, Morocco, Nigeria, Pakistan, Panama, Peru, Philippines, Russia, Senegal, South Africa, Syria, Uruguay, Venezuela, Vietnam, and Zambia. The results are presented in Tables 9.6 through 9.8. The price elasticity of smoking prevalence among low and middle income countries it is -0.589. This estimate is not statistically different from the full sample, where high income counties were included. The analysis by gender finds similar price elasticities between the set of full countries and the sample constrained to less developed countries. I only find a significant effect of price on smoking participation

among boys. Among low and middle income countries the price elasticity for boys is -0.633, which is smaller than the price elasticity estimated for the full sample that contained the high income countries. However, the two estimates are not statistically different from each other. Given that price elasticities of participation do not differ, this result implies that poorer youth do not respond differently to price changes when making decisions whether to smoke or not.

TABLE 9.3 - Logit Model of Smoking Prevalence - Coefficients are Marginal Effects
Pooled Sample- All Observations

	1	2	3	4
Price- Local	-0.042**	-0.024	-0.041*	-0.040*
	(0.02)	(0.02)	(0.02)	(0.02)
Age	-0.099***	-0.103***	-0.099***	-0.098***
	(0.01)	(0.01)	(0.01)	(0.01)
Age Squared	0.004***	0.004***	0.004***	0.004***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Male	0.048***	0.048***	0.048***	0.046***
	(0.003)	(0.002)	(0.003)	(0.002)
Pocket Cash	0.001***	0.001***	0.001***	0.001***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Reduced Access		-0.023**	-0.024**	-0.024***
		(0.007)	(0.007)	(0.007)
Exposure to Anti-Smoking Ads		0.015	0.033	0.03
		(0.017)	(0.018)	(0.018)
Exposure to Cigarette Ads		0.024	0.028*	0.025
		(0.013)	(0.013)	(0.013)
Anti-Smoking Sentiment			-0.046***	-0.045***
			(0.010)	(0.009)
Parental Smoking				0.043***
				(0.002)
N	593,588	593,588	593,588	593,588
Elasticity	-0.565	-0.322	-0.562	-0.570

~ Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 9.4 - Logit Model of Smoking Prevalence - Coefficients are Marginal Effects
Pooled Sample - Male

	1	2	3	4
Price- Local	-0.055*	-0.044	-0.068*	-0.065*
	(0.022)	(0.027)	(0.028)	(0.027)
Age	-0.127***	-0.130***	-0.124***	-0.125***
	(0.013)	(0.013)	(0.013)	(0.013)
Age Squared	0.005***	0.005***	0.005***	0.005***
	0.000	0.000	0.000	0.000
Pocket Cash	0.001***	0.001***	0.001***	0.001***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Reduced Access		-0.029*	-0.030**	-0.030**
		(0.012)	(0.012)	(0.011)
Exposure to Anti-Smoking Ads		0.034	0.064*	0.060*
		(0.027)	(0.028)	(0.027)
Exposure to Cigarette Ads		0.005	0.009	0.007
		(0.021)	(0.021)	(0.021)
Anti-Smoking Sentiment			-0.077***	-0.075***
			(0.016)	(0.015)
Parental Smoking				0.054***
				(0.004)
N	296,618	296,618	296,618	296,618
Elasticity	-0.551	-0.441	-0.686	-0.673

~ Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 9.5 - Logit Model of Smoking Prevalence - Coefficients are Marginal Effects
Pooled Sample - Female

	1	2	3	4
Price- Local	-0.019	0.003	-0.006	-0.007
	(0.013)	(0.015)	(0.015)	(0.014)
Age	-0.065***	-0.068***	-0.067***	-0.065***
	(0.009)	(0.009)	(0.009)	(0.009)
Age Squared	0.002***	0.002***	0.002***	0.002***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Pocket Cash	0.001***	0.001***	0.001***	0.001***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Reduced Access		-0.014*	-0.014*	-0.014*
		(0.006)	(0.006)	(0.006)
Exposure to Anti-Smoking Ads		-0.004	0.003	0.002
		(0.017)	(0.019)	(0.017)
Exposure to Cigarette Ads		0.038***	0.040***	0.036***
		(0.010)	(0.010)	(0.009)
Anti-Smoking Sentiment			-0.018*	-0.018*
			(0.008)	(0.008)
Parental Smoking				0.029***
				(0.003)
N	296,970	296,970	296,970	296,970
Elasticity	-0.414	0.071	-0.132	-0.174

~ Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 9.6 - Logit Model of Smoking Prevalence - Coefficients are Marginal Effects
Less Developed Countries - All Observations

	1	2	3	4
Price- Local	-0.041*	-0.023	-0.041*	-0.039*
	(0.02)	(0.02)	(0.02)	(0.02)
Age	-0.093***	-0.096***	-0.092***	-0.092***
	(0.01)	(0.01)	(0.01)	(0.01)
Age Squared	0.004***	0.004***	0.004***	0.004***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Male	0.050***	0.049***	0.049***	0.048***
	(0.003)	(0.003)	(0.003)	(0.003)
Pocket Cash	0.001***	0.001***	0.001***	0.001***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Reduced Access		-0.024**	-0.025**	-0.024***
		(0.008)	(0.008)	(0.007)
Exposure to Anti-Smoking Ads		0.017	0.033	0.031
		(0.019)	(0.020)	(0.019)
Exposure to Cigarette Ads		0.021	0.025	0.021
		(0.013)	(0.013)	(0.013)
Anti-Smoking Sentiment			-0.044***	-0.042***
			(0.010)	(0.009)
Parental Smoking				0.042***
				(0.003)
N	518,009	518,009	518,009	518,009
Elasticity	-0.582	-0.333	-0.589	-0.577

~ Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 9.7 - Logit Model of Smoking Prevalence- Coefficients are Marginal Effects
Less Developed Countries - Male

	1	2	3	4
Price- Local	-0.053*	-0.037	-0.061*	-0.057*
	(0.024)	(0.028)	(0.028)	(0.028)
Age	-0.121***	-0.125***	-0.118***	-0.120***
	(0.013)	(0.013)	(0.013)	(0.013)
Age Squared	0.005***	0.005***	0.005***	0.005***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Pocket Cash	0.001***	0.001***	0.001***	0.001***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Reduced Access		-0.031**	-0.032**	-0.031**
		(0.012)	(0.012)	(0.012)
Exposure to Anti-Smoking Ads		0.039	0.067*	0.064*
		(0.029)	(0.030)	(0.029)
Exposure to Cigarette Ads		0.000	0.005	0.002
		(0.021)	(0.021)	(0.021)
Anti-Smoking Sentiment			-0.074***	-0.072***
			(0.016)	(0.015)
Parental Smoking				0.054***
				(0.004)
N	258,124	258,124	258,124	258,124
Elasticity	-0.542	-0.380	-0.633	-0.609

~ Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 9.8 - Logit Model of Smoking Prevalence - Coefficients are Marginal Effects
Less Developed Countries - Female

	1	2	3	4
Price- Local	-0.019	-0.004	-0.013	-0.012
	(0.014)	(0.016)	(0.016)	(0.015)
Age	-0.060***	-0.063***	-0.062***	-0.060***
	(0.009)	(0.009)	(0.009)	(0.009)
Age Squared	0.002***	0.002***	0.002***	0.002***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Pocket Cash	0.001***	0.000***	0.000***	0.000***
	(<0.000)	(<0.000)	(<0.000)	(<0.000)
Reduced Access		-0.014*	-0.014*	-0.014*
		(0.006)	(0.006)	(0.006)
Exposure to Anti-Smoking Ads		-0.006	0.000	0.000
		(0.019)	(0.020)	(0.018)
Exposure to Cigarette Ads		0.038***	0.040***	0.034***
		(0.010)	(0.010)	(0.010)
Anti-Smoking Sentiment			-0.016*	-0.016*
			(0.008)	(0.008)
Parental Smoking				0.027***
				(0.003)
N	259,885	259,885	259,885	259,885
Elasticity	-0.457	-0.089	-0.311	-0.309

~ Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

2.7. Results - Conditional Demand

Results on conditional demand for the full sample are outlined in Tables 9.9 through 9.11. The baseline specification implies that a 10 percent increase in price will reduce average consumption by 11 percent. The inclusion of reduced access to cigarettes, exposure to anti-smoking advertising, exposure to cigarette advertising, and local sentiment reduces the estimate effect of price slightly. The price elasticity estimates suggest that a 10 percent increase in price will reduce average consumption by 9.4 percent for local brand cigarettes. Parental smoking appears to exert no effect on average consumption. Reduced access to commercial cigarettes is associated with a lower level of average consumption, plausibly because it makes the purchase of cigarettes more difficult. Exposure to anti-smoking media is associated with a decrease in consumption. Exposure to cigarette advertising and sentiment do not appear to affect average consumption, once a youth has already made the decision to smoke.

Decomposing the effect by gender I find that boys' consumption is more responsive to price than girls' consumption. A 10 percent increase in price reduces conditional demand by 13 percent for boys by 8 percent for girls. While reduced access to commercial cigarettes and exposure to anti-smoking advertising lowers average consumption for both boys and girls, sentiment is associated with a reduction in consumption only for girls. Similarly, exposure to cigarette advertising is associated with increased cigarette consumption among boys, but this effect is only significant at the 10 percent level.

Tables 9.12 through 9.14 summarize the effects for less developed countries. A 10 percent increase in price reduces consumption by 16 percent. The inclusion of controls at the local level increases the estimated price elasticities. Males and females elasticities are -1.793

and -1.783 for the third specification which includes all additional controls with the exception of parental smoking. Comparing these results to the results from the full sample, suggests that consumption among relatively poorer youth is more price responsive. Prevalence elasticities were not different between the full sample and the sample of less developed countries. One way to interpret this finding would be that while prevalence price elasticities do not differ, the higher elasticity for conditional demand would suggest that cigarette prices have a higher impact on reducing consumption among youth in less developed countries because these youth are poorer and cigarettes would take up a larger share of their monthly allowance.

The inclusion of local level variables such as reduced access to commercial cigarettes, exposure to cigarette advertising and anti-smoking media and local sentiment, make the estimates larger. Both reduced access to cigarettes and exposure to anti-smoking media appear to lower cigarette consumption, while exposure to tobacco adverting is associated with an increase in consumption only among boys. While sentiment does not affect the average consumption among males, it is associated with a reduction in cigarette consumption among females.

TABLE 9.9 - GLM Model of Conditional Demand
Pooled Sample - All

	1	2	3	4
Price - Local	-1.119***	-0.887**	-0.939**	-0.938**
	(0.314)	(0.322)	(0.336)	(0.335)
Age	-1.883***	-2.030***	-2.023***	-2.023***
	(0.228)	(0.257)	(0.258)	(0.259)
Age Squared	0.0687***	0.0736***	0.0733***	0.0733***
	(0.008)	(0.009)	(0.009)	(0.009)
Male	0.169**	0.189***	0.190***	0.190***
	(0.056)	(0.054)	(0.054)	(0.054)
Pocket Cash	0.0154***	0.0151***	0.0152***	0.0152***
	(0.001)	(0.001)	(0.001)	(0.001)
Reduced Access		-0.643***	-0.651***	-0.651***
		(0.169)	(0.171)	(0.171)
Exposure to Anti-Smoking Ads		-1.227***	-1.187***	-1.187***
		(0.304)	(0.316)	(0.316)
Exposure to Cigarette Ads		0.271	0.295	0.295
		(0.199)	(0.189)	(0.188)
Anti-Smoking Sentiment			-0.168	-0.168
			(0.189)	(0.189)
Parental Smoking				0.003
				(0.054)
N	78,683	78,683	78,683	78,683
Elasticity	-1.119	-0.887	-0.939	-0.938

~ Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 9.10 - GLM Model of Conditional Demand
Pooled Sample - Male

	1	2	3	4
Price - Local	-1.520***	-1.269***	-1.271***	-1.275***
	(0.364)	(0.366)	(0.376)	(0.375)
Age	-1.545***	-1.732***	-1.732***	-1.730***
	(0.309)	(0.358)	(0.360)	(0.359)
Age Squared	0.0572***	0.0634***	0.0634***	0.0634***
	(0.011)	(0.012)	(0.012)	(0.012)
Pocket Cash	0.0160***	0.0156***	0.0156***	0.0156***
	(0.002)	(0.002)	(0.002)	(0.002)
Reduced Access		-0.605**	-0.605**	-0.608**
		(0.205)	(0.205)	(0.203)
Exposure to Anti-Smoking Ads		-1.208***	-1.206***	-1.208***
		(0.352)	(0.361)	(0.360)
Exposure to Cigarette Ads		0.392	0.393+	0.391+
		(0.242)	(0.232)	(0.231)
Anti-Smoking Sentiment			-0.008	-0.008
			(0.215)	(0.215)
Parental Smoking				-0.020
				(0.067)
N	46,661	46,661	46,661	46,661
Elasticity	-1.52	-1.269	-1.271	-1.275

~Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 9.11 - GLM Model of Conditional Demand
Pooled Sample - Female

	1	2	3	4
Price - Local	-0.528	-0.514	-0.813+	-0.795+
	(0.423)	(0.440)	(0.455)	(0.453)
Age	-2.411***	-2.499***	-2.468***	-2.474***
	(0.317)	(0.312)	(0.315)	(0.319)
Age Squared	0.0865***	0.0895***	0.0883***	0.0885***
	(0.011)	(0.011)	(0.011)	(0.011)
Pocket Cash	0.0137***	0.0135***	0.0137***	0.0136***
	(0.002)	(0.002)	(0.002)	(0.002)
Reduced Access		-0.814**	-0.887***	-0.889***
		(0.252)	(0.255)	(0.255)
Exposure to Anti-Smoking Ads		-1.385*	-1.184*	-1.194*
		(0.579)	(0.588)	(0.592)
Exposure to Cigarette Ads		-0.064	-0.011	-0.013
		(0.262)	(0.258)	(0.258)
Anti-Smoking Sentiment			-0.611*	-0.603*
			(0.277)	(0.278)
Parental Smoking				0.047
				(0.092)
N	32,022	32,022	32,022	32,022
Elasticity	-0.528	-0.514	-0.813	-0.795

~Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 9.12 - GLM Model of Conditional Demand
Less Developed Countries - All

	1	2	3	4
Price - Local	-1.389***	-1.514***	-1.607***	-1.618***
	(0.350)	(0.361)	(0.379)	(0.378)
Age	-1.929***	-2.125***	-2.117***	-2.113***
	(0.241)	(0.273)	(0.274)	(0.273)
Age Squared	0.0701***	0.0767***	0.0764***	0.0763***
	(0.008)	(0.009)	(0.009)	(0.009)
Male	0.163**	0.188**	0.190**	0.189**
	(0.062)	(0.059)	(0.060)	(0.060)
Pocket Cash	0.0164***	0.0161***	0.0162***	0.0163***
	(0.001)	(0.001)	(0.001)	(0.001)
Reduced Access		-0.675***	-0.685***	-0.687***
		(0.173)	(0.175)	(0.174)
Exposure to Anti-Smoking Ads		-1.635***	-1.594***	-1.594***
		(0.354)	(0.363)	(0.362)
Exposure to Cigarette Ads		0.408+	0.443*	0.443*
		(0.211)	(0.199)	(0.199)
Anti-Smoking Sentiment			-0.218	-0.220
			(0.194)	(0.193)
Parental Smoking				(0.031)
				(0.058)
N	66,622	66,622	66,622	66,622
Elasticity	-1.389***	-1.514***	-1.607***	-1.618***

~Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 9.13 - GLM Model of Conditional Demand
Less Developed Countries - Male

	1	2	3	4
Price - Local	-1.711***	-1.776***	-1.793***	-1.807***
	(0.432)	(0.435)	(0.450)	(0.448)
Age	-1.591***	-1.824***	-1.822***	-1.816***
	(0.329)	(0.382)	(0.385)	(0.381)
Age Squared	0.0587***	0.0665***	0.0664***	0.0662***
	(0.011)	(0.013)	(0.013)	(0.013)
Pocket Cash	0.0176***	0.0171***	0.0172***	0.0172***
	(0.002)	(0.002)	(0.002)	(0.002)
Reduced Access		-0.634**	-0.634**	-0.641**
		(0.213)	(0.214)	(0.210)
Exposure to Anti-Smoking Ads		-1.551***	-1.544***	-1.551***
		(0.394)	(0.400)	(0.399)
Exposure to Cigarette Ads		0.491+	0.499*	0.496*
		(0.257)	(0.244)	(0.243)
Anti-Smoking Sentiment			-0.048	-0.049
			(0.222)	(0.220)
Parental Smoking				-0.051
				(0.072)
N	39,530	39,530	39,530	39,530
Elasticity	-1.711	-1.776	-1.793	-1.807

~Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

TABLE 9.14 - GLM Model of Conditional Demand
Less Developed Countries - Female

	1	2	3	4
Price - Local	-0.921+	-1.297*	-1.783**	-1.782**
	(0.555)	(0.586)	(0.597)	(0.593)
Age	-2.469***	-2.614***	-2.585***	-2.586***
	(0.345)	(0.340)	(0.343)	(0.345)
Age Squared	0.0882***	0.0932***	0.0920***	0.0920***
	(0.012)	(0.012)	(0.012)	(0.012)
Pocket Cash	0.0133***	0.0132***	0.0135***	0.0135***
	(0.002)	(0.002)	(0.002)	(0.002)
Reduced Access		-0.858**	-0.954***	-0.954***
		(0.272)	(0.275)	(0.275)
Exposure to Anti-Smoking Ads		-1.918*	-1.721*	-1.721*
		(0.746)	(0.749)	(0.750)
Exposure to Cigarette Ads		0.164	0.245	0.245
		(0.310)	(0.306)	(0.306)
Anti-Smoking Sentiment			-0.727*	-0.727*
			(0.291)	(0.293)
Parental Smoking				0.001
				(0.102)
N	27,092	27,092	27,092	27,092
Elasticity	-0.921	-1.297	-1.783	-1.782

~Errors clusters at the school level; All specifications include country and year fixed effects; +implies p < 0.10, * implies p < 0.05, ** implies p < 0.01 and *** implies p < 0.001

2.8. Sensitivity Analyses

The price variables used in the analysis are country level or city level averages. They tend to be highly correlated with time and country dummies that are used to control for country level unobservables. High levels of correlation between variables would tend to increase the variance; standard errors would be too large, rendering the estimates insignificant. In extreme cases, multicollinearity may produce parameter estimates which are wrong signed and of implausible magnitude. Furthermore small changes in the data, produce wide swings in the parameter estimates (Green 2003).

The general response to multicollinearity is to, (1) remove some of the problem variables, which would produce omitted variable bias, (2) get more data which is not possible for the current analysis, or (3) address the high degree of correlation among variables through variable manipulation or statistical techniques.

The variance inflation factor (VIF) for local brand cigarettes is 17.89 which suggest that collinearity is a problem if the cut-off of VIF less than 10 is applied for consistent errors. These findings clearly suggest that estimates may be insignificant due to the high degree of collinearlity. One way to address the high degree of correlation among variables is to use residualization. Residualization in this case uses the time and country dummies to predict prices, and collects the residuals. This zeroes correlations between the time and country dummies and the residuals from the regression of prices on two way fixed effects. Then the residuals are used instead of the price variable, to see if the portion of price which is unexplained by two way fixed effects matters in explaining cigarette use among youth. This technique reduces the VIF to 1 for local brand cigarettes. Using residualization the estimated effects of the

residuals and other variables on cigarettes use are identical to the results of the actual prices, suggesting that the high level of collinearity in the variables is not an issue of concern.

2.9. The Effect of Sentiment, Reduced Access to Commercial Cigarettes, Exposure to Cigarette Advertising, and Exposure to Anti-Smoking Media

Assessing the impact of the other control variables suggest that the reduced access to commercial cigarettes and sentiment lower smoking prevalence, whereas sentiment affects cigarette consumption only among girls. Exposure to cigarette advertising increases cigarette consumption, and exposure to counter-advertising messages reduces it, but these two variables do not affect prevalence. Two issues arise when interpreting these results. First, these estimates are plausibly correlated with one another as they are defined at the school level. The correlation coefficients among these variables are below 0.2 in absolute value, which would imply that correlation among variables is not a problem in the current analysis. Secondly, these variables are more likely endogenous suggesting that we are overstating/understating their effect on cigarette use. Kostova and Bletcher (2012) find that once the endogeneity of tobacco advertising is addressed by the use of instrumental variables the effect of advertising disappears, suggesting that the large effect of advertising on smoking can be explained by the higher propensity of smokers to notice cigarette advertising. The estimated effects of local control variables should be interpreted as simply associations between the local variables and youth smoking.

2.10. The Effect of Parental Smoking on Youth Cigarette Use

Ex ante one expects that cigarette use by parents should increase both prevalence and conditional demand if youth have access to cigarettes at home. Secondly, parents model appropriate behavior for children and the social stigma of smoking may be lessened when

parents smoke (Chaloupka and Powell, 2005). It is possible that parental influence runs the other way. Second hand smoke is unpleasant and if youth are exposed to high levels of second hand smoke at home, they may choose to move away from the behavior. Further, if parents are experiencing observable adverse health outcomes due to their smoking, youth may have a better understanding of the impact of smoking on health. Therefore, they may be less likely to smoke. If smoking by parents lowers the shadow price of cigarette use, youth should be more likely to smoke. On the other hand if youth find smoking by parents repulsive, parental smoking will lower smoking prevalence and consumption among youth. Since I have no way of separating the two effects, the effect of parental smoking on youth smoking represents a combination of the two effects.

The findings suggest that parental smoking increases smoking prevalence for youth. These estimates should be interpreted as mere associations as parental smoking may be correlated with other unobservables that increase smoking for the individual. Parental smoking is associated with a 4 percentage point increase in smoking prevalence. In the full sample I do not find an effect of parental smoking on youth cigarette consumption. The null effect of parental smoking on consumption would imply that parental smoking may impact youth smoking primarily through the modeling effect. If parental smoking increased access to cigarettes, we would expect a positive and significant effect of parental smoking on average consumption. Since, I find no effect on average consumption; it appears that most of the effect runs through parental smoking modeling appropriate behavior.

2.11. Discussion

This chapter estimates the effect of cigarette prices on youth smoking prevalence and cigarette consumption among 38 GYTS participating countries. The findings support the importance of higher cigarette prices in reducing smoking prevalence and cigarette consumption among youth. Conducting the analysis for a group of developed and less developed countries I find a total price elasticity of -1.5. A 10 percent price increase in cigarette prices reduces smoking prevalence by 5. 6 percent and conditional cigarette demand by 9.4 percent. Estimated cigarette price elasticities are larger when the analysis is constrained to a sample of low and middle income countries. A 10 percent increase in cigarette price reduces cigarette use by 22 percent. Most of this effect runs through conditional demand, where a 10 percent increase in price reduces average consumption by 16 percent. This evidence suggests that youth smoking is more responsive to changes in cigarette prices than smoking among adults[19]. Further, consistent with theoretical models, I find that poorer youth are more sensitive to cigarette price changes than youth from higher income countries. I find no difference in the impact of cigarette price on youth smoking prevalence between high income and low and middle income countries. However, youth from low and middle income countries, have higher conditional demand elasticities in absolute value. One way to interpret this finding would be that while prevalence price elasticities do not differ, the higher elasticity for conditional demand would suggest that cigarette prices have a higher impact on reducing consumption among youth in less developed countries because these youth are poorer and cigarettes would take up a larger share of their monthly allowance. Another implication of the analysis is that higher prices on cigarettes that

[19] A few studies estimate price elasticities for cigarettes among adults in low and middle income countries. These suggest that most price elasticities in low and middle income countries fall in the range from -0.5 to -1.0. For higher income countries the price elasticities fall in the range from -0.25 to -0.5 (IARC, 2011)

arise because of higher taxation of such products, may reduce the regressivity of taxes because the poor will respond by reducing their cigarette consumption by more than higher income individuals.

I find gender differences in the price responsiveness of cigarette use. Males tend to be more price responsive than females. Among males, a 10 percent increase in price would reduce smoking prevalence by 6.9 percent and average consumption among smokers by 13 percent. For females, I do not find an effect of price on smoking prevalence, but conditional demand is reduced. A 10 percent increase in price would reduce cigarette consumption by 8 percent among girls. The results for low and middle income countries produce larger impacts of price on cigarette use. The total price elasticity among males in low and middle income countries is -2.43, whereas for females the total price elasticity is -1.783. For males the effect is split between prevalence and consumption, while the effect for females is driven by changes in average consumption. The analysis implies that while price increases are a strong instrument in reducing cigarette use among youth, the effect of price increases will be larger for males than females. For females, the effect of price will reduce cigarette use primarily through decreasing cigarette consumption, whereas for males the higher prices will reduce both smoking prevalence and average consumption. Given that in less developed countries there is a large gap between male and female smoking prevalence and consumption, higher prices should reduce disparities in health outcomes which arise from smoking because males will be more responsive to changes in prices.

The estimated price elasticities in the analysis are on the larger end of estimates of price elasticity in the literature, but they are comparable to the findings of Kosotva et al (2012) who find that a 10 percent increase in price reduces cigarette smoking by 22 percent. As highlighted

in Kostova et al. (2012), several reasons may explain the large sensitivity of youth in less developed to cigarette prices. These youth tend to be poorer, and face a higher opportunity cost of smoking. The findings of this paper and those of Kostova et al. (2012) are consistent with theoretical models which suggest that the poor will be more responsive to increases in cigarette prices. Finally, since the sample of youth under investigation tends to be relatively younger than in other studies who have estimated price elasticities for youth; it should not be surprising that the estimated price elasticities are larger.

Assessing the impact of the other control variables implies that reduced access to commercial cigarettes and sentiment are associated with lower smoking prevalence among all youth, whereas sentiment affects cigarette consumption only for girls. Exposure to cigarette advertising may increases cigarette consumption, and exposure to counter-advertising may reduce it, but these two variables do not affect initiation. Parental smoking is associated with increases in smoking prevalence, but it does not affect average consumption. The effect of parents is larger for boys than girls.

The contribution of this chapter is that it provides additional insight into the determinants of cigarette consumption among youth in developing countries. The paper controls for an array of environmental factors that affect smoking among youth, including tobacco advertising, anti-tobacco media, and youth access restrictions. In addition to confirming the effect of prices on youth smoking, I find that the inclusion of anti-smoking sentiment does not reduce the effectiveness of price in curbing smoking among youth. Finally, the use of two way fixed effects in this methodology does away with any unobserved heterogeneity that is time invariant and could bias the price elasticity estimates. To the extent that sentiment toward smoking within countries did not change by much during the period under investigation, the inclusion of country

fixed effects in the model eliminates the possibility of an omitted variable bias in the price estimates and these estimates can be interpreted as the causal effects of prices on smoking behavior. In light of these results, the implications of the study are that higher taxes and prices on cigarettes will reduce both smoking prevalence and cigarette consumption among youth. Moreover, because of differences in responsiveness by gender group, higher prices will be able to narrow the gap in both current health behaviors and health outcomes into the future between population groups.

2.12. References

Adioetomo S, Djutaharta R, Hendratno. (2005). "Cigarette Consumption, Taxation, and Household Income: Indonesia Case Study". HNP Discussion Paper Series, Economics of Tobacco Control Paper No. 26. Washington D.C., The World Bank.

Aloui O. (2003). "Analysis of the Economics of Tobacco in Morocco". HNP Discussion Paper Series, Economics of Tobacco Control Paper No. 7. Washington D.C., The World Bank.

Becker GS, Murphy KM. (1988). "A Theory of Rational Addiction". Journal of Political Economy, 96:675-700.

Becker, G. and Murphy K., Social Economics: Market Behavior in Social Environment. Harvard University Press: Cambridge, 2000. Print.

Bletcher, E. (2008). "The Impact of Tobacco Advertising Bans on Consumption in Developing Countries". Journal of Health Economics. 27:932-942.

Camerer C, and Loewenstein G. (2002). "Behavioral Economics: Past, Present, and Future." Division of Humanities and Social Sciences, Caltech, Pasadena; Department of Socal and Decisions Sciences, Carnegie-Mellon University, Pittsburg.

Carpenter C, Cook P. (2008). "Cigarette Taxes and Youth Smoking; New Evidence from National, State, and Local Youth Risk Behavior Surveys." Journal of Health Economics 27; 287-299.

Centers for Disease Control and Prevention (CDC) (1998). Response to Increases in Cigarette Prices by Race, Ethnicity, Income and Age Groups in the United States. MMWR Morbidity and Mortality Weekly Report, 47:605-609.

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

Chaloupka FJ, Grossman M. (1996). **"**Price, Cigarette Control Policies and Youth Smoking". National Bureau of Economic Research Working Paper No. 5740.

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

Chaloupka, FJ, Wechsler,H. (1997). "Price, tobacco control policies and smoking among young adults," Journal of Health Economics, Elsevier, 16: 359-373.

Chaloupka F, Pacula R. (1999) "Sex and Race Differences in Young People's Responsiveness to Price and Tobacco Control Policies". Tobacco Control. 8:373-377.

Chaloupka, F. J., and Warner, K. E. (2000). "The Economics of Smoking." In *Handbook of Health Economics,* eds. A. J. Culyer and J. P. Newhouse. Amsterdam: Elsevier Science.

Chaloupka (forthcoming). "The Effects of Pricing and Tax Policy on Youth Cigarette Use", Geneva: World Health Organization.

Chen J, **Millar WJ**. "Age of smoking initiation: implications for quitting". Health Reports 1998, 9:39–46

Decicca P, Kenkel D, Mathios A, Shin Y, Lim J. "Youth Smoking, Cigarette Prices, and Anti-Smoking Sentiment". Health Economics 2008; 17(6); 733-749.

Decicca P, Kenkel D, Mathios A. "Putting Out the Fires; Will Higher Taxes Reduce the Onset of Youth Smoking?" Journal of Political Economy 2002; 110(1); 144-169.

DiFranza JR, Wellman RJ, Sargent JD et al. (2006). "Tobacco Promotion and the Initiation of Tobacco Use: Assessing the Evidence for Causality". Pediatrics 117:1237–1248.

Efroymson D, Ahmed S, Townsend J et al. (2001). "Hungry for Tobacco: An Analysis of the Economic Impact of Tobacco Consumption on the Poor in Bangladesh". Tobacco Control, 10:212-217.

Farrelly MC, Niederdeppe J, Yarsevich J. (2003) "Youth Tobacco Prevention Mass Media Campaigns: Past, Present, and Future Directions". Tobacco Control 12(Suppl 1):i35–i47.

Farrelly M, Englen M. (2008). "Cigarette Prices, Smoking and the Poor, Revisited". American Journal of Public Health. 98:582-583.

Fletcher, JM. "Social Interactions and Smoking; Evidence Using Multiple Student Cohorts, Instrumental Variables, and School Fixed Effects". Health Economics 19, 2010: 466-484.

Flynn BS, Worden JK, Secker-Walker RH et al. (1992) "Prevention of Cigarette Smoking Through Mass Media Intervention and School Programs". American Journal of Public Health 82:827–34.

Franks P, Jerant A, Leigh J et al. (2007). "Cigarette Prices, Smoking and the Poor: Implications of Recent Trends". American Journal of Public Health. 98:1873-1877.

Goldberg M. (2008). "Assessing the Relationship Between Tobacco Advertising and Promotion and Adolescent Smoking Behavior: Convergent Evidence". In: Haugtvedt CP, Herr PM, Kardes FR, editors. Handbook of Consumer Psychology. New York: Taylor & Francis Group, 2008: 933–57.

Gospodinov N, Irvine I. (2009). "Tobacco Taxes and Regressivity". Journal of Health Economics. 28:375-384.

Grossman, M., and Chaloupka, F. J. (1997). "Cigarette Taxes: The Straw to Break the Camel's Back." *Public Health Reports* 112:291-297.

Gruber J, Zinman J. (2001). "Youth Smoking in the United States: Evidence and Implications. In Risky Behaviors Among Youths: An Economic Analysis". Chicago. University of Chicago Press. 69-120.

Gruber J, Koszegi B. (2002). "A Theory of Government Regulation of Addictive Bads: Optimal Tax Levels and Tax Incidence for Cigarette Excise Taxation". NBER Working Paper Series, Working Paper 8777. Cambridge, MA, National Bureau of Economic Research.

Gruber J, Koszegi B. (2008). "A Modern Economic View of Tobacco Taxation". Paris. International Union Against Tuberculosis and Lung Disease.

Gruber J, Sen A, Stabile M. (2003). "Estimating Price Elasticities when there is Smuggling: The Sensitivity of Smoking to Price in Canada". Journal of Health Economics, 22:821-842.

International Agency for Research on Cancer (IARC). (2009). IARC Handbooks of Cancer Prevention, Tobacco Control, Vol.13. Evaluating the Effectiveness of Smoke Free Policies. Lyon, France.

International Agency for Research on Cancer (IARC). (2011). IARC Handbooks of Cancer Prevention, Tobacco Control, Vol.14. the Effectiveness of Tax and Price Policies for Tobacco Control. Lyon, France.

Jha P, Chaloupka FJ, Moore J, Gajalakshmi V, Gupta PC, Peck R, Asma S, Zatonski W. "Cigarette Addiction," in Disease Control Priorities in Developing Countries, 2nd Edition, edited by DT Jamison, JG Breman, AR Measham, G Alleyne, M Claeson, DB Evans, P Jha, A Mills, and PR Musgrove. Washington DC: The International Bank for Reconstruction and Development, The World Bank, and Oxford University Press, pages 869-885, 2006. on-line at: http://files.dcp2.org/pdf/DCP/DCP46.pdf

Joseph, R. (2010) The Economics of Youth Tobacco Use in India. Chicago. University of Illinois.

Karki Y, Pant K, Pande B. (2003) "A Study on the Economics of Tobacco in Nepal". HNP Discussion Paper Series, Economics of Tobacco Control Paper No. 13. Washington D.C., The World Bank.

Kinh H, Ross H, Levy D et al. (2006). "The Effect of Imposing a Higher, Uniform Tobacco Tax in Vietnam". Health Research Policy and Systems, 26:4-6.

Kostova, D, Ross H, Blecher E, Markowitz S. (2010). "Prices and Cigarette Demand: Evidence from Youth Cigarette Use in Developing Countries", NBER Working Paper 15781.

Kostova, D, Ross H, Blecher E, Markowitz S, "Is Youth Smoking Responsive to Cigarette Prices" Evidence from Low and Middle Income Countries", Cigarette Control, 2011; 20(6); 419-424.

Kostova, D., and Blecher, E. "Does Advertising Matter? Estimating the Impact of Cigarette Advertising on Smoking Among Youth in Developing Countries". Contemporary Economic Policy, 2012.

Krasovsky K, Andreeva T, Krisanov D et al. (2002) Economics of Tobacco Control in Ukraine from the Public Health Perspective. Kiev: Alcohol and Drug Information Center.

Kyaing N. (2003). "Tobacco Economics in Myanmar". HNP Discussion Paper Series, Economics of Tobacco Control Paper No. 14. Washington D.C., The World Bank.

Kyaning N, Perucic A, Rahman K. (2005). "Study on Poverty Alleviation and Tobacco Control in Myanmar". HNP Discussion Paper Series, Economics of Tobacco Control Paper No. 31. Washington D.C., The World Bank.

Lance P, Akin J, Dow W, Loh C. (2004). "Is Cigarette Smoking in Poorer Nations Highly Sensitive to Price? Evidence from Russia and China". Journal of Health Economics, 23:173-189.

Lancaster AR, Lancaster KM. (2003). "The Economics of Tobacco Advertising: Spending, Demand, and the Effects of Bans". International Journal of Advertising 22:41–65.

Lee J. (2008). "Effect of a Large Increase in Cigarette Tax in Cigarette Consumption: An Empirical Analysis of Cross-Sectional Data". Public Health. 13:1191-1201.

Lewit E, Coate D, Gorssman M. (1981). "The Effect of Government Regulation on Teenage Smoking". Journal of Law and Economics, 24:545-549.

Lewit E, Coate D. (1982). "The Potential for Using Excise Taxes to Reduce Smoking". Journal of Health Economics, 1:121-145.

Lovato C, Linn G, Stead LF, Best A. (2003). "Impact of Tobacco Advertising and Promotion on Increasing Adolescent Smoking Behaviors". Cochrane Database of Systematic Reviews 2003, Issue 3.

Lundborg P. 2006. Having the wrong friends? Peer effects in adolescent substance use. Journal of Health Economics 25: 214-233.

Manning, W. G., and Mullahy, J. "Estimating Log Models: To Transform or Not to Transform". Journal of Health Economics, July 2001.

National Cancer Institute. (2008). "The Role of the Media in Promoting and Reducing Tobacco Use". Tobacco Control Monograph No. 19. Bethesda (MD): U.S. Department of Health and

Human Services, National Institutes of Health, National Cancer Institute. NIH Publication No. 07-6242.

Nelson J. (2003). "Youth Smoking Prevalence in Developing Countries; Effect of Advertising Bans". Applied Economics Letters 10: 805-811

Niederdeppe J, Farrelly MC, Hersey JC, Davis KC. (2008). "Consequences of Dramatic Reductions in State Tobacco Control Funds: Florida, 1998–2000". Tobacco Control 17:205–10.

Onder Z. (2002). "The Economics of Tobacco In Turkey: New Evidence and Demand Estimates". HNP Discussion Paper Series, Economics of Tobacco Control Paper No. 2. Washington D.C., The World Bank.

Powell, LM., Tauras JA, and Ross H., "The Importance of Peer Effects, Cigarette Prices and Cigarette Control Policies for Youth Smoking Behavior". Journal of Health Economics, 24(5), 2005: 950-968.

Ross H. (2004a). "Ukraine (Kiev), 1999 Global Youth Tobacco Survey: Economic Aspects". HNP Discussion Paper Series, Economics of Tobacco Control Paper No. 20. Washington D.C., The World Bank.

Powell, Lisa, and Frank J. Chaloupka . "Parents, Public Policy, and Youth Smoking". Journal of Policy Analysis and Management 24(1) 2005: 93--112.

Ross H. (2004b). "Russia (Moscow), 1999 Global Youth Tobacco Survey: Economic Aspects". HNP Discussion Paper Series, Economics of Tobacco Control Paper No. 23. Washington D.C., The World Bank.

Ross H, Chaloupka F. (2004). "The Effect of Public Policies and Prices on Youth Smoking". Southern Economic Journal, 70:796-815.

Sayginsoy O, Yurekli A, De Beyer J. (2002). "Cigarette Demand, Taxation, and the Poor: A Case Study of Bulgaria". HNP Discussion Paper Series, Economics of Tobacco Control Paper No. 4. Washington D.C., The World Bank.

Saffer H, Chaloupka F. (2000). "The effect of tobacco advertising bans on tobacco consumption". Journal of Health Economics.19:1117–37.

Schaap M, Kunst A, Leinsaly M et al. (2008). "Effect of Nationwide Tobacco Control Policies in High and Low Educated Groups in 18 European Counties". Tobacco Control. 17:248-255.

Schelling T. (1978). "Egonomics, or the Art of Self-Management". American Economic Review. 68:290-294.

Schnohr C, Kreiner S, Rasmussen M et al. (2008). "The Role of National Policies Intended to Regulate Adolescent Smoking in Explaining the Prevalence of Daily Smoking: A Study of Adolescents from 27 European Countries". Addiction, 103: 824-831.

Siahpush M, Wakefield M, Spittal M et al. (2009). "Taxation Reduces Social Disparities in Adult Smoking Prevalence". American Journal of Preventative Medicine. 36:285-291.

Task Force on Community Preventive Services. Tobacco. In: Zaza S, Briss PA, Harris KW, editors. Preventive Services: What Works to Promote Health? New York: Oxford University Press, 2005:3–79. http://www.thecommunityguide.org/tobacco/Tobacco.pdf

Tauras J. (2005). "Can Public Policy Deter Smoking Escalation Among Young Adults?". Journal of Political Analysis and Management. 24:771-784.

Tauras, J. (2005). "An Empirical Analysis of adult cigarette demand" *Eastern Economic Journal* 31:361-375.

Tauras J, Chaloupka F. (1999). "Price, Clean Indoor Laws, and Cigarette Smoking: Evidence from Longitudinal Data for Young Adults". NBER Working Paper Series. Working Paper 6937. Cambridge, MA. National Bureau of Economic Research.

Townsend J, Roderick P, Cooper J. (1994). "Cigarette Smoking by Socioeconomic Group, Sex, and Age: Effects of Price, Income and Health Publicity". BMJ, 309:923-927.

U.S. Surgeon General Report, (2012). Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General.

van Walbeek C. (2005). "Do Tax Increases on Tobacco Hurt the Poor? In Economics of Tobacco Control in South Africa". University of Cape Town.

Wakefield M, Giovino G. (2003). "Teen Penalties for Tobacco Possession, Use, and Purchase: Evidence and Issues". Tobacco Control. 12(Suppl 1):6–13.

Wang H, Sindelar L, Busch S. (2006). "The Impact of Tobacco Expenditures on Household Consumption patterns in Rural China". Social Sciences and Medicine. 62:1414-1426.

Wasserman J, Manning W, Newhouse J, Winkler J. (1991). "The Effect of Excise Taxes and Regulations on Cigarette Smoking". Journal of Health Economics. 10:43-64.

Woolery T, Asma S, Sharp D. (2000). "Clean Indoor Air Laws and Youth Access Restrictions". In Tobacco Control in Developing Countries. Available at: http://go.worldbank.org/HWHXKJJ050. Accessed on July 12th, 2012.

World Health Organization, WHO Report on the Global Cigarette Epidemic, 2009. Geneva: World Health Organization. On line at: http://www.who.int/cigarette/mpower/2009/en/index.html

VITA

NAME:	Silda Nikaj
EDUCATION:	B.A., Economics, Grand Valley State University, August 2006
	B.S., Mathematics, Grand Valley State University, August 2006
	M.A., Economics, University of Illinois at Chicago, December 2007
FIELDS OF INTEREST:	Health Economics, Labor Economics, Demography
EXPERIENCE:	Instructor, Department of Economics, University of Illinois at Chicago, 2007 to 2012
	Adjunct Faculty, Department of Economics, Loyola University Chicago, 2009 to 2011
HONORS AND AWARDS:	Winifred Geldard Memorial Award, University of Illinois at Chicago, 2011.
	Chancellor's Award Fellowship, University of Illinois at Chicago, 2010-2011.
	Kenneth R. Vanderbush Award, Grand Valley State University, 2006.
	Award of Excellence, Grand Valley State University, 2001-2006.
PROFESSIONAL MEMBERSHIPS:	American Economic Association, Illinois Economic Association