Culture, Public Policies, and Smoking in the OECD

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Abstract

Using data from OECD countries, one can investigate the effect of cultural diversity on anti-smoking policies. We use panel data models to test the impact of culture on the effectiveness of anti-smoking policies. It is assumed that two forces are effecting tobacco consumption in a society. These forces can be smoke preventive and smoke encouraging factors. Each of these forces consists of smaller subsets. Preventive policies and the time effects are the main parts of the smoke preventive forces. Culture and its effect on personal capital and social capital can be a part of smoke encouraging or smoke preventive forces. Using different proxies for culture and fixed effect models, this study allows one to investigate the differences in effectiveness of public policies in different OECD countries. The results from empirical investigation indicate that effectiveness of public policies depends on culture, therefore varies across countries. This is important for policymakers who need to avoid imposing uniform policies across a region with cultural diversity without accounting for cultural differences.

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Chapter 1

Introduction

Consumption of tobacco is responsible for more deaths than any other product. For instance, in Canada smoking accounted for approximately 50 percent of premature mortality[1] among smokers in 1996 (Ellison et al 2000). In the U.S. and European Union, smoking related deaths account for more than 14 percent of all deaths (Mokdad et al 2004; ASPECT Consortium 2004). It is clear that public policy to discourage smoking would be beneficial to society. These policies can range from the imposition of taxes to a smoking ban in public places or ban on advertising, and their overall effect maybe to change people's smoking practices. They therefore, enhance social welfare by reducing utilization of smoking related health services and by preventing premature death. However, the net impact of these policies depends on the culture in which the policies are implemented. People in different countries have different cultures. In this analysis the term "culture" is used to describe different ways of life. Each culture has its specific norms and values

[1] "Smoking accounted for 56% and 48% of premature mortality among male and female smokers respectively. Among male smokers, approximately 3.5% of premature deaths were due to suicide, 2.1% to motor vehicle accidents, 1.4% to HIV/AIDS and 0.4% to homicide. Similarly, among female smokers, 1.5% of premature deaths were due to motor vehicle accidents, 1.6% to suicide, 0.3% to homicide, and 0.2% to HIV/AIDS" (Ellison 2000) .

that form behavior and preferences of individuals. Thus different people living in different countries and under different cultures do not have the same taste and preferences. Therefore smoking prevention methods will have different degrees of effectiveness in different countries.

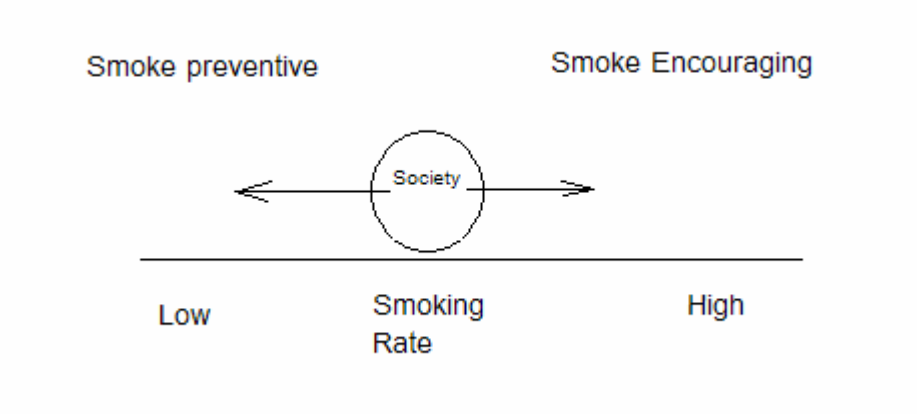
It is important to know the degree of effectiveness these policies have once other factors such as culture have been taken into account. In other words will the same policy in different countries be equally effective despite the differences in culture in those countries? The aim of this research is to examine the impact of culture on the effectiveness of public policies in reducing smoking. In this study a panel data model is used to estimate the impact of culture on smoking behavior. This is done by determining the impact of public policies and economic factors such as price and income on demand under different cultures, and comparing those, using data from OECD countries in the period of 1980 to 2000. The majority of previous studies have concluded that the price elasticity of demand for smoking is centered at -.4 with a small margin of variation. However, they have not included variables from the wider literature regarding what has proven to be effective on smoking prevalence. For example, literature in Medical, Psychology, and Nutrition journals have placed an emphasis on the linkage between cultural-dietary pattern (*foodways*) and smoking (Grano 2004; Martikainen 2003; Osler 1998; Steptoe (2002); and Skuladottir 2004). Therefore the model presented here includes foodways variables to test the effectiveness of tax policies and other bans on smoking for different countries and cultures.

This study uses different proxies for culture. First is the country effect which accounts for the factors that are constant from 1980 to 2000, but different among all countries. This is called constant cultural diversity. The second proxy is *foodways*. Different cultures have different diets, so these are used throughout this work as a mean of distinguishing between different cultures. Public policies against smoking can also have a cultural role. For instance it is not clear that the reduction in cigarette consumption is a product of an anti-smoking policy or a result of the negative sentiments of individuals toward smoking in that society. Negative sentiments toward smoking can force politicians to vote for higher taxes and different bans on smoking. In a society with positive sentiment toward smoking however, politicians will lose the election votes by voting for such policies.

1.1 Theoretical Framework

There are two forces that affect tobacco consumption in a society. They are referred to here as: smoke preventive and smoke encouraging forces. These two forces act against each other and change tobacco consumption in a society. This is illustrated in fig. 1 below.

Fig.1: Smoking Preventive and Encouraging Forces



Each of the above forces consists of smaller forces that act in the same direction. Smoke preventive force, as considered in this model, consist of smoke prevention policies, health-risk information, social capital, personal capital, and culture. Smoke preventive policies could be tax policies, bans on tobacco advertising, and bans on smoking in public places. These are enforced by the government. Health risk information however is acquired through mass media and the educational system. The mass media reports the results from the latest research on smoking hazard as well as shows infomercials on it. Social capital is divided into sentiment toward smoking and peer group pressure. The latter is more effective for young smokers. Sentiment toward smoking is the behavior of people in a society toward smoking and smokers. What the majority of people in a society think about smoking and smokers can be a very strong factor in reducing tobacco consumption. This sentiment also informs the ban laws, since societies with a negative sentiment toward smoking will vote for or encourage higher taxes and more bans on smoking

(Kim and Shanahan 2003). Peer group pressure can be discouraging too, but it is seen more as an encouraging factor rather than a preventive one.

Smoke encouraging force consists of culture, personal capital, and social capital. If sentiment toward smoking in a society is not negative, or in other words if tobacco is widely used and smoking is well accepted in a society, then not only is there no pressure from the society to quit smoking but also it can be an encouraging factor as smoking will become a mean of socializing.

When young people are enticed or socially forced to smoke, peer group pressure is the most effective. If they think by smoking they look more grown up, respected and accepted, or if they believe that smoking is *a cool thing* to do then there is a good chance that they start smoking in teenage years. By smoking they fit in their groups better. This will increase their social capital despite reducing their overall utility. As teenagers turn into adults, their past consumption increases the utility they achieve by smoking in adulthood. Smoking in the past will increase their personal capital of smoking in future (Becker 1996).

According to Becker (1996) both personal and social capital are dependent on the last periods' personal and social capital.

$$P_{t+i} = X_t + (1 - d_p) P_t \qquad (1)$$

$$S^i_{t+i} = X^i + (1 - d_s) S^i_t \qquad (2)$$

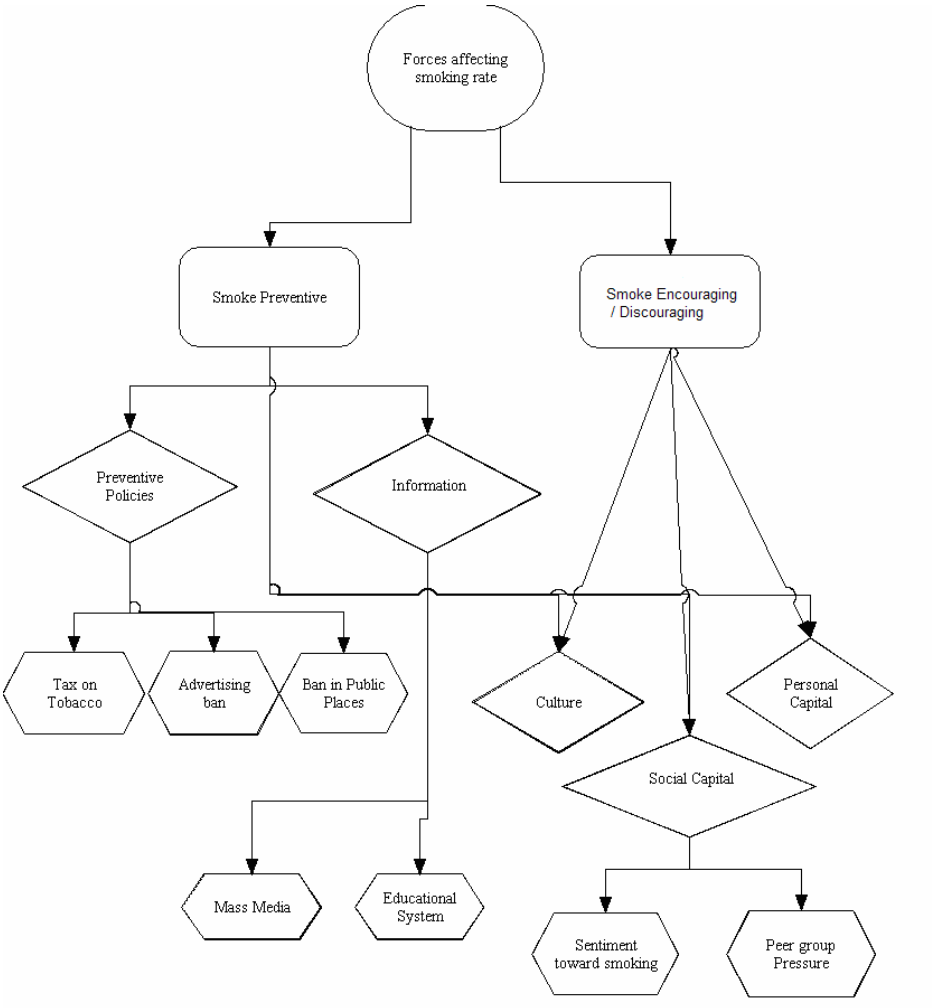
where P is personal capital, S stands for social capital, d is depreciation rate, X is amount pended at capitals, and i is individuals' network of social capital.

Becker's theory implies that, preference to smoke is influenced by past experiences. As shown in equations (1) and (2) above, the P_{t+i} and S^{i}_{t+i} can eventually change over a long period of time.

By Becker's theory, one can show how in different cultures, *ceteris paribus,* the smoking rate can be different. Different countries have different cultures. Sentiments toward smoking and peer group pressure which form social capital are different in each culture. In an extreme example if one has a pro-smoking culture, one way to build on social capital is through smoking. Peer group pressure will start young people to smoke. Smoking at a young age will increase their personal capital by smoking more when they are adults. In this society, sentiment toward smoking is positive, so individuals are under no pressure from the society to quit. The more they smoke the higher their personal capital for smoking will be in the future and thus the harder it is to quit. In such a society, the number of individuals who quit smoking is low and the number of young adults who start smoking is high. Comparing this hypothetical society to a society that has an anti-smoking culture, one can see that negative sentiment toward smoking as well as absence of peer pressure to smoke will result in a much lower smoking rate in that society. This is why culture maybe such an important factor in determining the smoking rate in a society.

Fig 2 summarizes all factors that form smoke preventive and encouraging forces. These two forces will determine the smoking rate in a society. Culture, social capital, and personal capital are included under both preventive and encouraging forces and can work both ways. Since culture influences social and personal capitals and the effectiveness of public policies against smoking, I suspect cultural factor can offset or enforce the affect of other factors.

Fig 2: Forces Effecting Smoking Rate



1.2 Neo-classical Model and the Culture

In this thesis the role of cultural diversity on smoking is tested. Let us consider the following budget equation to illustrate the differences between our model and the neoclassical model of cigarette consumption.

$$I = \sum_{i=2}^{n} P_i X_i + P_1 X_1 \qquad (1)$$

where I is income, P_i is the price of good i, P_1 is the price of cigarette, X_i is goods other than cigarette and services, and X_1 is cigarette.

$$\sum_{i=2}^{n} P_i X_i = I - P_1 X_1 \qquad (2)$$

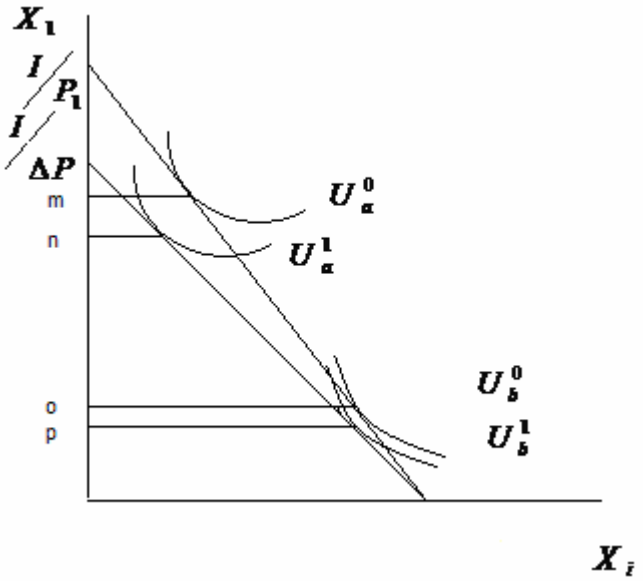
$$\sum_{i=2}^{n} X_i = I/P_i - P_1/P_i \, X_1 \qquad (3)$$

In the above equation P_1/P_i is the relative price of cigarettes compares to all other goods and services.

In neo-classical economics one expects, *ceteris paribus*, a change in price of cigarettes to cause the same magnitude of change in cigarette consumption across all countries. If the neo-classical assumption holds then the utility curves for all countries should be the same. In fig.3 as the price of cigarettes (P_1) increases, the

magnitude of I/P_1 reduces. Therefore, the budget line pivots downwards. As P_1 increases consumers move from U_a^0 to U_a^1, and consume "n" units of cigarette instead of "m" .

Fig.3 Price Change



If the model of effectiveness of cultural diversity holds, individuals in each country will have different preferences and therefore different utility functions. Fig.3 indicates that, keeping income level constant, a change in P_1 results in different magnitude of change in X_1. In fig.3 there are two countries: country "a" and country "b". When P_1 increases, consumers are faced with a higher price of cigarette, but their income stays the same. As a result they have to reduce their consumption of cigarettes. Individuals in the country "a" move from U_a^0 to U_a^1 and

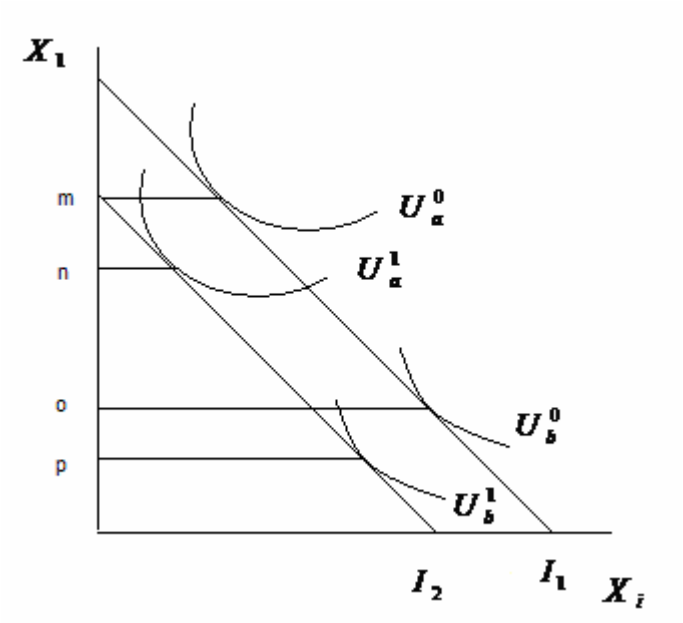
individuals in country "b" move from U_b^0 to U_b^1. These two countries have different cultures, so they have different utility function. As they have different utility functions an increase in P_1 leads to different magnitudes of change in consumption of cigarettes. Consumption of cigarette in country "a" reduces by m-n and consumption in country "b" reduces by o-p. Fig.3 illustrates that m-n is larger than o-p.

Bans on smoking in indoor places impose an additional inconvenience on the smoker, for they have to leave the indoor place to be able to smoke. This makes it more time consuming. The cost associated with this inconvenience is called P_t in this study since P_t is larger than zero, $(P_1 + P_t)$ is larger than P_1. Therefore, bans on smoking in indoor places will have the same effect as an increase in the price of cigarettes.

In neo-classical economics one would expect, *ceteris paribus*, the consumption of normal good to decrease when income decreases. In the neo-classical framework it is assumed that utility functions for smoking in all countries are the same. Fig.4 illustrates that as income decreases, since all prices are constant, individuals move from U_a^0 to U_a^1. In this case as income decreases all individuals will reduce their cigarette consumption by an equal amount in all countries.

In fig.4 it is assumed that individuals in different countries have different cultures and therefore they have different utility functions. In fig.4 there are two countries: “a” and ”b”. As income decreases from I_1 to I_2, individuals in country “a”

Fig.4 Income Change



will move from U_a^0 to U_a^1 and individuals in country “b” move from U_b^0 to U_b^1. This decrease in income reduces the cigarette consumption in both countries. Consumption of cigarettes in country “a” reduces by m-n and consumption in country “b” reduces by o-p. Fig.4 illustrates that m-n is larger than o-p.

Chapter 2

Literature review

There have been many studies on the demand for cigarettes. These studies generally have two modeling methods: the conventional demand model and the addictive demand model. The conventional demand model ignores the addictive nature of cigarettes. For each of these models there are three different types of data used: time-series data for a single geographical location, cross sectional time-series data (panel data), and individual level survey data. This research will concentrate on conventional demand models that use aggregate time-series data. Chaloupka and Warner (2000), provide a review of these models revealing that demand usually is a function of price, income, tobacco control policies, and different socioeconomics and demographic factors. These studies generally conclude that the consumption of cigarettes is negatively related to price. Estimated price elasticity varies from -0.14 to -1.23, but mostly between -0.3 to -0.5.

One of the problems with these studies is multicollinearity. Many of the main variables including price are highly correlated, which leads to unstable results.

Among recent studies that have addressed this problem are Seldon and Boyd (1991), Simonich (1991), Flewelling et al. (1992), Sung et al. (1994), Barnett et al (1995), and Keeler et al. (1996). They found the price elasticity of demand in a narrow range centered at -0.4 (Chaloupka 2000).

2.1 Income Effect

A considerable volume of research focuses on the income effect. The majority of studies found that income has a positive effect on smoking and concluded that cigarettes are normal goods. A recent study, Gruber et al. (2003), showed that the sensitivity of smoking to price is much larger among lower income Canadians. Some studies such as Wasserman et al (1991), Keeler et al. (1993), and Yurekli and Zhang (2000) found that income effect is insignificant or has a negative effect on the consumption of cigarettes. These studies mainly used cross-sectional data (Barratt et. al. 2003). Although most of the studies on price elasticity of cigarette demand have been done in developed countries, there are some that discuss the income effect in developing countries as well. Comparison between developing countries and developed ones has been briefly discussed in some of these papers. For example Lance et al. (2004) studied the effect of price elasticity of cigarette consumption in China and Russia. They have found the price elasticity for these

countries to be between 0 to -0.15 which shows a high insensitivity compared to results from developed nations which generally are around -0.4.

2.2 Area Restriction

Another factor in the study of cigarettes is smoking area restrictions. These restrictions increase the cost of smoking. These costs are time and trouble that a smoker has to go through to go out of the office buildings, restaurants, bars, or any other public facility to be able to smoke. These inconveniences it is argued to help reduce smoking prevalence. As reviewed by FAO, in *Issues in the Global Tobacco Economy*, these impacts have been studied by Wasserman et al. (1991), Chaloupka (1992), Chaloupka and Saffer (1992), Keeler et al. (1993), Chaloupka and Grossman (1996), Evans et al. (1996), Chaloupka and Wechsler (1997), Chaloupka and Pacula (1998), Bardsley and Olekalns (1998), Yurekli and Zhang (2000). In general, smoking restrictions have been found to reduce both smoking prevalence and average daily cigarette consumption among smokers. For example, Yurekli and Zhang (2000) estimated that restrictions on smoking reduced cigarette consumption per capita by 4.5 percent in the United States in 1995.

2.3 Advertising

Cigarettes are one of the most heavily advertised products. In the United States in 1996 the industry spent 5.1 billion dollars on advertising and promoting cigarettes. The industry argues that advertising cigarettes does not encourage people to either start smoking or to smoke more; it just changes the share of market among brands. The industry also argues that advertising gives useful information to consumers about nicotine and tar content. Warner (1986) suggests that advertisements and promotions will encourage young people to try smoking which increases the chance of becoming a regular smoker. He also argues that it makes it harder for smokers to quit smoking, and it can increase daily usage of smokers and cause ex-smokers to smoke again. Many studies have been conducted to this date, but the majority concluded that there is no effect or small positive effect of advertisement on cigarette consumption. The majority of these studies have been on UK and United States markets (Chaloupka 2000). Table 1 shows a summary of studies on advertising cigarettes. They are divided into three groups. The first group are the time series studies which show no effect or small positive effect of advertising on smoking. These studies used national annual or quarterly time series data. Saffer and Chaloupka (2000: 1119) stated that "the loss of variance due to aggregation leaves little to correlate with consumption and since the advertising occurs at a level where the marginal effect is small". The second category is panel studies. Saffer and Chaloupka (2000: 1121) argue that there is more variation in these data compared to national level data for many reasons. The relative size of

each area is different; the cost of advertising varies across local areas. There is a relatively larger variation in advertising levels and in consumption in a study that uses monthly or quarterly local level data. When the variation in advertising levels is greater, the possibility of being in an upward sloping portion of the response function increases, as there is more variation in advertising levels. These will have more variance and therefore there is a bigger chance of getting a positive result between advertising and consumption. The third category is the study of bans on different media. Each medium has its advantages and disadvantages, but they are substitutes for each other. Banning advertising in one medium will increase advertising in another, and therefore reduces the marginal product of advertising cigarettes in those media. By reducing the number of media that advertise cigarettes, the average and marginal product of advertising is reduced. By banning advertising cigarettes in more and more media a point is reached where cigarette companies will not gain by spending more money in non-banned media (Saffer and Chaloupka 2000). Hamilton (1975), Laugesen and Meads (1991), Stewart (1993), Saffer and Chaloupka (2000), and Nelson (2003) all used the data from OECD countries. The number of countries they included does vary because of the increase in the number of OECD countries over time as well as the availability of data to the researcher. The data span also varies from 1960 to 1995. All the above papers found no significant positive effect of advertising on consumption of cigarettes with the exception of Saffer and Chaloupka (2000). They examine the effect of tobacco advertisement bans on consumption of tobacco in OECD countries. They used data

from 22 OECD countries for the period of 1972 to 1992. They included four independent variables for tobacco consumption from four different sources, and ran four regressions using different tobacco consumption data each time. The advertising ban variables were created from data on television advertising, radio advertising, print advertising, outdoor advertising, point of purchase advertising, movie advertising, and sponsorship bans. Since the theory suggests that the effect of bans will increase as the number of banned media increases, there is likely to be a non-linear relationship between the number of bans and consumption.

Saffer and Chaloupka (2000) used a set of three dummy variables. The first dummy is defined as Weak Ban and equals one if there is a ban on advertising tobacco on zero, one or two different media. The second dummy, defined as Limited Ban, equals one if there is a ban on tobacco advertisements on three or four different media. The third dummy is defined as Comprehensive Ban, and equals one if there is a ban on tobacco advertising on five, six or seven different media. Their other variables are price, real income, percentage of filtered cigarettes, and unemployment. They found that comprehensive tobacco advertisement bans can reduce consumption. They indicate "a 5.4% reduction in tobacco use and about a 7.4% reduction in cigarette use if all OECD countries had enacted Comprehensive Bans" (Saffer and Chaloupka 2000).

Table 1. Previous Studies on Cigarette Advertising

Study	**Data**	**Conclusion**
Time series studies		
Hamilton (1972)	US 1925–1970	no effect of advertising
Grabowski (1976)	US 1956–1972	no effect of advertising
Schmalensee (1972)	US 1955–1967	no effect of advertising
Schneider et al. (1981)	US 1930–1978	no effect of advertising
Baltagi and Levin (1986)	US 1963–1980	no effect of advertising
Johnson (1986)	Australian 1961–1986	no effect of advertising
Porter (1986)	US 1947–1982	no effect of advertising
Wilcox and Vacker (1992)	US quarterly 1961–1990	no effect of advertising
Duffy (1995)	UK quarterly 1963–1988	no effect of advertising
Bishop and Yoo (1985)	US 1954–1980	small positive effect of advertising
Abernethy and Teel (1986)	US 1949–1981	small positive effect of advertising
Valdes (1993)	Spanish 1964 to 1988	small positive effect of advertising
Chetwynd et al. (1988)	New Zealand quarterly 1973–1985	small positive effect of advertising
McGuinness and Cowling (1975)	UK quarterly 1957–1968	small positive effect of advertising
Seldon and Doroodian(1998)	US 1952–1984	small positive effect of advertising
Panel data studies		
Lewit et al. (1981)	7000 youths 1966–1970	positive effect of advertising
Goel and Morey (1995)	US states 1959–1982	positive effect of advertising
Roberts and Samuelson (1988)	1971–1982 for five firms	positive effect of advertising
Ban studies		
Hamilton (1975)	11 OECD countries	no effect of a ban
Laugesen and Meads (1991)	22 OECD countries 1960–1986	negative effect of a ban
Stewart (1993)	22 OECD countries 1964–1990	no effect of a TV ban
Saffer and Chaloupka (2000)	22 OECD countries 1972-1992	positive effect of media ban
Nelson (2003)	20 OECD countries 1970-1995	no effect of advertising bans

Source: Saffer and Chaloupka (2000); author's modification

Nelson (2003) criticizes previous studies. He argues that there has been structural change in cigarette demand functions, advertising bans are endogenous, and cigarette consumption data are not stationary. He tests for unit roots, and argues that "growth rates of cigarette consumption (log differences) are stationary, but levels data are not". He finds no positive effect of advertising bans on cigarette consumption and argues that the decline in smoking prevalence especially in males changed the political climate against smoking and in favor of bans on cigarette advertising.

2.4 Differences in Culture and Smoking Behavior

A fundamental hypothesis of this thesis is that culture is a very important factor in determining smoking rate. Culture can influence other factors and policies. That is why different results are observed in response to the same preventive policies in different countries.

2.4.1 Why Culture Matters

Each culture has a set of norms and values. These norms and values have enormous impact on behavior and preferences of individuals in that culture. Living under the influence of a culture through family, friend, and educational system forms individuals' cultural capital. "Cultural capital can be defined as the shared

sense of meaning that determines a group's way of life" (Hoult 1969). Values and preferences are passed from one generation to the next. Like other social capitals culture does have a depreciation rate, although it is very low. In other words culture can change, but the change is at a very slow rate. Individuals' control over culture is less than other kinds of social capital. People can not change their race, ethnicity, or family background, and it is only with difficulty that they can change their country or religion. Therefore, an individual's culture is given in her life time (Becker 1996). People in different countries have different cultures, therefore different norms and values. Different norms and values lead to different preferences. This is in violation of the mainstream neoclassical economics' assumption. Using a neoclassical economics framework, Connor (1991) argued under the same income and socio- demographic, same relative prices, and same information consumers will choose the similar baskets of goods and services. He suggested that food expenditure and consumption patterns will converge in high-income industrialized countries due to the influence of globalization of the food industry. If people's preferences converge we should see a convergence in tobacco consumption too.

2.4.1.1 Culture of consumption

Different cultures adopt different dietary patterns. "Culture designates the socially standardized activities of people. Those activities related to food are called *foodways*" (Axelson 1986). Dickens (1965) categorizes the influential determinants

of diet into: culture, social, personal, and situational. Cultural factors are climate, technology, geography, and food availability. This means that people of an area mostly use a kind of food that is widely available in that area because of climate and technological limitation. Social factors are friends, relatives, and family members. Personal factors are age, education, and psychological characteristics. Situational factors are income and employment (Axelson 1986). In anthropology also, many important studies have been done on culture and food consumption. Mary Douglas's Cultural Theory is based on her work on anthropology of consumption. Cultural Theory is one of the many social theories of consumption in which patterns of behavior are discussed in different ways from the mainstream economic paradigm. She argues that items that are bought in a supermarket are linked with value and social meaning. They show the cultural allegiance and social relationships. Further she argues that patterns of consumption are formed between people rather than within them. (Sayfang 2004).

In neoclassical economics it is argued that consumers will choose the similar baskets of goods and services under the same income, socio- demographic, relative prices, and information (Connor 1991). If this is correct, when prices, income and demographic factors converge, the consumption patterns should also converge. However Hermann and Roder (1995) argue that the food consumption pattern in different OECD countries is converging. In other words people in OECD countries are choosing a basket of food that is more alike. Gil et al. (1995) conducted a similar study but they used data from European Union rather than the OECD. They

concluded that convergence is occurring but at a diminishing rate in European Union. They also show that the dietary differences in Western Europe remain. Valli and Trail (2005) argue that one reason the dietary patterns are not expected to completely converge is because of cultural differences. They also argue that culture has proved to be very resistant to pressures from global media, telecommunications and, foreign travelers (Vali and Trail 2005). They stress for example, that even though the fat intake in Mediterranean countries has increased and has become closer to the rest of the Europe, because of the resistant nature of culture, Mediterranean countries' diet is still very different from the rest of the Europe.

2.4.2 Contributions of Other Disciplines

There have been many studies of smoking in other disciplines. They generally examine the effect of other factors on smoking which are not severely included in the economics' literature. Life style factors can be important in the study of smoking. In non-economics' studies, factors such as eating habits, social behaviors, stress, and many others proved to be important. Lenz (2004) and Rigotti (2000) conducted surveys on university students in the United States. Lenz (2004) explored the correlate of tobacco use among 18 and 19 years old students at the University of Minnesota. A sample of 203 randomly selected freshmen completed a survey that included questions about tobacco use, other drug use, mental health issues, eating disorders, stress, smoking environment, and healthy life styles. This

study showed that students with a lifetime diagnosis of depression or treatment for depression were 7 times as likely as other students to use tobacco. Marijuana, alcohol use, and weekend exposure to smoke increased the likelihood of being a tobacco user. Rigotti (2000) also suggests students who use tobacco are more likely to smoke marijuana, binge drink, have lower grades, and spend more time socializing with friends. Compared to non tobacco users, smokers are also less likely to rate athletics and religion as important. He found stress and diet behaviors not to be significantly associated with tobacco use. Another dietary pattern factor is fruits and vegetables intake. Osler (1998), Steptoe (2002), and Skuladottir (2004) examine the relation between smoking and intake of fruits and vegetables. Osler (1998) collected information on food intake and smoking behavior for a 40 to 70 year old suburban Danish population with a sample size of 2656. His results suggest that smokers consume less fruits and vegetables and more beer compared to nonsmokers. Steptoe (2002) carried out a survey of university students from 13 European countries in 1990 and 2000. His sample consists of 4,701 men, 5,729 women in 1990 and 4,604 men, 5,732 women in 2000. They assessed smoking, exercise, fruits and fat intake, beliefs in the impacts of behavior on health, and awareness of the influence of behavior on heart disease risk. Smoking prevalence increased and fruit consumption decreased between 1990 and 2000, while physical exercise and fat intake were more stable. There were large variations between country samples. Health beliefs weakened, with marked decreases in beliefs about smoking and diet. Across country samples, showed that changes in beliefs

correlated with changes in the prevalence of behaviors. Awareness of the effects of smoking and exercise was stable, but knowledge of the role of fat intake increased over the decade. Skuladottir (2004) investigated the previously observed protective effects of high intake of fruit and vegetables on the risk of lung cancer. He believes smoking is a confounder because it is associated with both lung cancer and the intake of plant food. He divided a Danish sample into three groups of Never Smoker, Ex-Smoker, and Current smokers. He found the gram per day consumption of fruits to be 164.9, 148.7, and 109 respectively. For daily intake of vegetables in grams he obtained 169.4, 169.2, and 138 for each group respectively, and also the total plant food daily intake in grams was quoted 522.2, 516.4, and 449.6. He concluded that increasing smoking status category, ordered from never smoker over ex-smoker to current smoker was associated with fewer intakes of fruits, vegetables, and all plant food in general.

The link between an unhealthy lifestyle can be important in the study of smoking. Martikainen (2003) and Grano (2004) studied this effect. Martikainen (2003) aimed to identify common dietary patterns, study socioeconomic differences in these dietary patterns, and assess whether they contribute to socioeconomic differences in biological risk factors. The data came from the Whitehall II study of London civil servants, who participated in the third phase (1991–1993) and were 39–63 years old (N = 8004). Food frequency and socioeconomic background information was obtained from questionnaires, and biological risk factors from medical screening. This study found that unhealthy diets also tend to go together

with other unhealthy behaviors of smoking and little exercise among both men and women. Grano (2004) used data collected by two questionnaires within a two-year period from workers of 12 Finnish hospitals. He examined the relationships between impulsivity, smoking and alcohol in a large non-clinical sample of 601 men and 4832 women. At baseline, he mentions impulsivity was associated with smoking and alcohol use. After controlling for baseline smoking, impulsivity predicted increased number of cigarettes smoked per day in women ($p = 0.08$), but not in men. After controlling for alcohol use at the baseline, impulsivity predicted increased alcohol consumption similarly in both genders ($p < 0.01$). Higher impulsivity was also associated with increased likelihood of taking up smoking or becoming a heavy drinker ($p < 0.05$). This evidence suggests that impulsivity contributes to increasing health risk behaviors.

In policy making it can be important to examine the existence of links between the patterns of health related behavior. The above literature illustrates that people who exercise more or people who consume more fruits and vegetables smoke less. The crucial point in policy making is, to determine if encouraging people to exercise or consume more fruits and vegetables will reduce smoking, and if reducing the alcohol intake will affect the smoking rate. In other words, will encouraging people to pick a healthy life style behavior, or drop an unhealthy behavior prevent them from other unhealthy habits? It is important to test if findings in these studies will hold once we compare different individuals with different cultures. For instance will people of two countries with the same intake of

fruit and vegetables, *ceteris paribus,* have the same utility curve for cigarette consumption.

Chapter 3

Data and Methodology

The purpose of this chapter is to identify the data source for each variable. This chapter will also describe how and in which cases it was necessary to create a new set of data from the raw data or information. In addition the range, source, mean and standard deviation for each variable is presented. Methodology of statistical analysis and econometrics techniques are also explained.

3.1 Data Sources and Variables

The variable "consumption" is cigarettes consumed per capita per year. Data for cigarette consumption were retrieved from the United States Department of Agriculture (USDA 2004) online database. The original consumption data were in millions of cigarettes consumed in a year in a country. To convert into annual per capita consumption, it is divided by the total population of each country.

The variable "price" is retail price of the most consumed brand of cigarettes in each country in Year 2000 US dollars. Data for the price of cigarettes are from

Tobacco Manufacturers Association (TMA 2005) in the United Kingdom. TMA does not have any data on prices of cigarettes in Canada and United States. The price data for Canada were obtained from Statcanada (2005) and the price data for the United States were obtained from Centers for Disease Control and Prevention (CDC 2004). The original data from these sources are in nominal currency of each corresponding country. In order to convert these prices to year 2000 US dollars, two steps were taken. First, price is expressed in real terms. This is done by taking the CPI index of year 2000 as the base and multiplied each CPI index by 100 and divided it by the CPI index of year 2000 of that country. CPI indices are from Euro stat (2004) online data base.

In the second step, in order to convert the Real $price_{2000}$ from national currency to year 2000 US dollars, the result of the step one is divided by the exchange rate of each currency to US dollars in year 2000. The exchange rate data are from Eurostat (2004) online database.

Prices in year 2000 US dollars = Real $price_{2000}$ in national currency/ exchange rate of national currency to US dollars in year 2000.

The variable "GDP" is real gross domestic product per capita adjusted for purchasing power parity. This data is from WHO-HFA-DB off-line version (WHO 2004a).

The variables "weakban, limitedban, and strongban" are dummy variables created from information on bans of advertising tobacco from the World Health Organization Tobacco online Database (WHO 2004b). The information in that

database is divided into eight categories: ban of direct advertising of tobacco on national TV, ban of direct advertising of tobacco on cable TV, ban of direct advertising of tobacco on national radio, ban of direct advertising of tobacco in local magazines and newspapers, ban of direct advertising of tobacco in international magazines and newspapers, ban of direct advertising of tobacco on billboard and outdoor walls, ban of direct advertising of tobacco in points of sale and kiosks, and ban of direct advertising of tobacco in cinema. Primarily eight groups of dummy variables were created from the information on the database, and then from these eight groups three other dummy variables of weakban, limitedban, and strongban were created. Weakban variable takes the value of one, when there is no ban, up to where two bans are in effect in any of the eight media. Limitedban variable takes the value of one when there is an advertising ban on three to four of the media. Strongban variable takes the value of one when there is an advertising ban on five to seven of the media.

The variable "totalarea" is ban on smoking in indoor places created from the information on World Health Organization Tobacco online Database (WHO 2004b). Seven dummy variables were created for bans on health care facilities, educational facilities, governmental working places, restaurants, pubs and bars, indoor working places, and theatres and cinemas. Then the sum of all these is used to make the "totalarea" variable. Since in the United States each State is responsible for implementing such laws the data from American Lung Association (2005) is used to create the same seven dummy variables as above for each State. Then the sum of

these variables was multiplied by the population of that State and divided by the total population of the United States. Then the data from each year of these States is summed to make a series of data for the United States from 1980 to 2000.

The variable "alcohol" is alcohol intake in liters per capita per year. The data were obtained from the WHO-HFA-DB off-line version (WHO 2004a) and online alcohol database of World Health Organization (WHO 2004c). The variable "calories" is the calorie intake per capita per day. The variable "fruit" is the intake of fruits and vegetables in kilos per capita per year. The variable "butter" is the consumption of butter in kilos per capita per year. The variable "sugar" is consumption of sugar in kilos per capita per year. The data for these four variables were obtained from OECD HEALTH 2004 Database.

The variable "Divorcerate" is the divorce rate and was obtained from Euro Stat for European countries, Statcanada (2004) for Canada, and Census U.S. (2003) for the United States. All data were obtained for Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom, and the United States. Table 2 below lists the major variables with their definitions, basic statistics, and the source.

Table 2: Variable Definitions and Basics Statistics

Variable	**Definition**	**Mean**	**S.D**	**Source**
Consumption	Total consumption of manufactured tobacco – pieces per capita per year	1800.51	497.33	USDA (2004)
Price	Retail real price for a pack of cigarette (US $ in 2000)	2.39	1.23	TMA (2005) Statcanada (2004) CDC (2004)
GDP	Real gross domestic product, PPP$ per capita	19184.03	4370.46	WHO (2004a)
Policy variables				
Weakban	Ban of direct advertising of tobacco on up to 2 media	0.48	0.50	WHO (2004b)
Limitedban	Ban of direct advertising of tobacco on 3 to 4 media	0.19	0.40	WHO (2004b)
Strongban	Ban of direct advertising of tobacco on 5 to 7 media	0.33	0.47	WHO (2004b)
Totalarea	The law of smoke free indoor places	2.29	2.36	WHO (2004b) American Lung Association (2005)
foodways				
Alcohol	Pure alcohol consumption, litters per capita per year	9.45	1.92	WHO (2004a) WHO (2004c)
Calories	Total calories intake - calories /capita/day	3383.97	189.16	OECD Health (2004)
Fruit	Fruits and vegetables - kilos /capita/year	239.76	78.43	OECD Health (2004)
Butter	Butter consumption-kilos/capita/year	3.79	2.71	OECD Health (2004)
Sugar	Sugar consumption-kilos/capita/year	33.34	6.17	OECD Health (2004)
Stress Variables				
Unemprate	Unemployment rate (%)	8.94	4.11	WHO (2004a) OECD Health (2004)
Divorcerate	Divorce rate (%)	.21	.12	EuroStat (2004) Statcanada (2005) U.S. census (2003)
Education				
Tertiary	Tertiary education enrolment (%)	44.51	15.70	UNESCO (2004)

Table 3 below shows per capita consumption of manufactured tobacco in pieces per capita per year. Countries are divided into three groups, low, medium, and high, depending on their consumption of tobacco. This table shows that Sweden and Finland have the smallest per capita cigarette consumption. Canada, France, United Kingdom, Belgium, Italy, Denmark, Portugal, Netherlands, Ireland, Germany, and Austria fall in medium per capita cigarette consumption. The United States, Spain, and Greece have the highest per capita of cigarette consumption.

Table 4 shows the average consumption of fruits and vegetables, calories, alcohol, and also price per pack of cigarettes for countries in the low, medium, and high cigarette consumption categories. This table shows that on average, calorie intake, and consumption of fruits and vegetables are higher in countries with higher cigarette consumption, and cigarettes on average are cheaper in countries with high consumption of cigarettes. This result seems contradictory to prior expectation about the relationship between cigarette consumption and healthy life style. However, descriptive statistics do not control the other factors in cigarette consumption. Therefore, multivariate statistical analysis will be used to test the prior expectation about the smoking behavior.

Table 3. Consumption of manufactured tobacco (pieces per capita per year).

	Countries	Mean	S.D
Low Mean			
	Sweden	784.38	134.28
	Finland	1014.54	15.80
Medium Mean			
	Netherlands	1553.36	430.03
	Belgium	1595.69	251.29
	United Kingdom	1607.92	109.71
	Portugal	1608.76	118.86
	Canada	1611.67	11.06
	Denmark	1621.01	55.53
	France	1623.66	103.42
	Italy	1713.43	138.73
	Germany	1784.24	101.94
High Mean			
	Spain	2076.06	108.05
	United States	2242.49	383.87
	Greece	2875.89	92.61
Average	All Countries	1800.513	497.32.99

Table 4. Comparing Smoking with Other Factors

Variables	Consumption of cigarette in Countries		
	Low	Medium	High
Fruit and vegetables	159	221	315
Calories	3096	3366	3426
Alcohol	6.81	9.85	8.78
Price	3.84	2.80	1.43

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3.2 Methodology

Descriptive statistics are presented in order to show the importance of price, income, policies, stress variables, education, and dietary pattern on smoking in countries with different culture. Regression analysis based on the data described in the previous section is used to isolate influences.

Let consumption be a function of price, policy variables, *foodways*, stress, education, and other variables as controls. The empirical model is defined as follows:

$$\text{Consumption} = \alpha + \beta_1 \text{price}_{it} + \beta_2 \text{income}_{it} + \beta_3 \text{policy}_{it} + \beta_4 \textit{foodways}_{it} + \beta_5 \text{stress}_{it} + \beta_6 \text{education}_{it} + \varepsilon_{it}$$

where income is GDP per capita. Policy is a matrix of policy variables such as weakban, limitedban, strongban, and totalarea; *foodways* stands for cultural-dietary patterns and habits; stress stands for unemployment and divorce rate; education stands for rate of attending post secondary institute; i is an indicator for different countries and t is the year.

The model above will be estimated using panel data techniques. Panel data are used as there are many unmeasured variables that affect the dependent variable. Influence of these variables gives rise to different intercepts. Therefore Ordinary Least Square will be biased. By using panel data this problem can be solved. Both fixed and random effect models will be employed. In fixed effect the above problem can be solved by including dummy variables to allow for different intercepts. Fixed effects always give consistent results, yet may not be the most efficient model to run, since by incorporating dummy variables it reduces the degree of freedom. Random effect allows for different intercepts by viewing the intercept as being drawn from a bowl of possible intercepts, and treat them as if they were a part of the error term. Random effects are more efficient estimators and give better p-values (Kennedy 2003).

By using the Hausman test it can be determined which method is more suitable for this analysis (DSS 2005). Here both the fixed and random effect have been used. The results of fixed and random effect can be found in appendix 1.

Hausman test result of 35.15 indicates that fixed effect is a more appropriate method for this model as compared with random effect. To test for heteroscedasticity in fixed effect, the Breusch-Pagan LM test of independence and Modified Wald test for groupwise heteroscedasticity in fixed effect regression model are used. The results are 163.78 and 4033.92 for the above tests respectively. These results indicate that heteroscedasticity should be accounted for in regressions for this model.

Total of four regressions are estimated: OLS, fixed effect with time effect, fixed effect with country effect and fixed effect with both time and country effect. The first regression is an ordinary least square estimation. The second regression is time effect corrected for heteroscedasticity. Time effect is used to test whether for a reason, apart from the included variables, the consumption function is changing over time. It is provided that the availability of information is causing such change. This can be examined by using time effect technique. Media are reflecting the results of health risks associated with smoking. Today they publish and broadcast more health warning advertisements than before. Because of change in technology more and more individuals have access to media (e.g. internet), and therefore people are better educated and more informed about the health risks that are associated with smoking. A change in tobacco consumption function is possible because of the broader availability of information. The next regression is country effect, corrected for heteroscedasticity. Country effect assumes that there is a factor that stays the same over time, but it is different for each country. One suspects that culture can

have this characteristic. Individuals' control over culture is less than other kinds of social capital. People can not change their race, ethnicity, or family background, and it is only with difficulty that they can change their country or religion. An individual's culture is given in her life time (Becker 1996). Results of this regression will determine the effectiveness of variables under the influence of culture. The fourth regression includes both time and country effect. This is the most comprehensive regression in this study. This regression includes the force of constant cultural diversity under the condition that consumption function is changing because of the increasing availability of information. This is the ultimate test to detect the influence of different policies, *foodways* variables, monetary factors etc. when culture and information are both incorporated.

Chapter 4

Estimation Results and interpretation

4.1 Estimation Results

The impact of public policy and cultural factors on smoking in OECD countries are estimated; table 5 provides the results from regression analyses. The first column is the Ordinary Least Square estimator. The second column is a fixed effect regression corrected for heteroscedasticity which allows for time effect. The third column is a fixed effect regression corrected for heteroscedasticity which allows for country effect. The fourth column is a fixed effect regression corrected for heteroscedasticity which allows for time effect and country effect. The complete table of results that includes all the country effect variables can be found in Appendix 2.

Table 5. Results

	Model (1)	Model (2)	Model (3)	Model (4)
logprice	-0.116	0.037	-0.106	-0.083
	(2.51)**	(0.99)	(2.18)**	(1.70)*
logrgdp	-0.304	0.159	0.515	0.970
	(1.80)*	(1.01)	(1.87)*	(2.53)**
limitedban	0.166	0.091	0.159	0.088
	(2.82)***	(2.92)***	(2.21)**	(1.10)
strongban	-0.186	-0.130	0.116	0.081
	(3.16)***	(2.70)***	(1.71)*	(1.16)
totalarea	0.006	-0.001	0.015	0.021
	(0.45)	(0.09)	(1.02)	(1.44)
alcohol		0.043	0.115	0.081
		(4.08)***	(5.48)***	(2.95)***
calories		-3.39×10^{-5}	-2.07×10^{-5}	-1.34×10^{-4}
		(0.26)	(1.32)	(0.77)
fruit		0.003	0.001	0.001
		(6.97)***	(1.53)	(1.73)*
butter		-0.017	0.012	0.004
		(3.27)***	(1.30)	(0.40)
sugar		-0.000	-0.007	-0.010
		(0.12)	(1.62)	(2.44)**
unemprate	0.002	0.001	0.021	0.026
	(0.33)	(0.12)	(3.75)***	(4.11)***
divorcerate	0.130	1.063	1.366	1.003
	(0.57)	(4.31)***	(2.40)**	(1.51)
tertiary	0.001	-0.005	-0.001	2.95 x10-^{4}
	(0.49)	(2.68)***	(0.91)	(0.17)
Constant	10.464	4.870	1.486	-3.028
	(6.50)***	(3.52)***	(0.57)	(0.82)
Observations	182	181	181	181
R-squared	0.38	0.77	0.88	0.90
Adjusted R-squared	0.35	0.72	0.86	0.86

Note: Absolute value of t statistics in parentheses. *significant at 10%; ** significant at 5%; *** significant at 1%. Dependent variable is Log (consumption).

4.2 Discussion of Results

Comparing price, income, policies, *foodways*, stress variables, and education across the three fixed effect regressions, yields different results, when one allows for time effect, country effect, and combined time and country effect. An overall examination of the results reveals that most variables are significant at 5 percent level in some regressions and not significant in the others. Some change sign moving from OLS to time effect, country effect, and time and country effect. This supports the previous argument, for as time passes information is more widely available and the consumption function tends to change. On the other hand culture can work for or against this change. Under these two forces other variables should show a small to no effect on amount of cigarette consumption. In the following section, the results of model (4) which includes both time and culture are discussed.

In economics it is widely accepted that as price increases consumption of ordinary goods decreases. The coefficient of log of price in model (4) is -0.083. This confirms the above theory. One percent change in price of cigarettes causes -0.083 percent change in cigarette consumption. One can also conclude that the demand for cigarettes is inelastic. The result for real GDP per capita in regression (4) shows a significant positive relationship between income and cigarette consumption. Income elasticity of cigarettes is 0.97(<1), which implies that cigarettes are normal goods. One percent change in real GDP per capita causes .097 percent change in

cigarette consumption. In the economics literature most studies confirm that cigarettes are normal goods, but Wasserman et al (1991), Keeler et al. (1993), and Yurekli and Zhang (2000) found that income effect is insignificant or has a negative effect on the consumption of cigarettes. These three studies have used cross-sectional data.

Anti-smoking policies have been used in all OECD countries. This indicates that it is believed that policy variables are expected to be effective in smoking prevalence. What follows is a discussion of the findings of the effect of bans on advertising tobacco and bans on smoking in indoor places, on cigarette consumption. Once one account for time effect and cultural differences, coefficients for limited and strong bans are not significant at 5 percent level. The coefficients in model (4) are .088 and .081 for limitedban and strongban respectively. Looking at the literature as described in section 2.4, it is possible to divide the panel studies on ban on advertising into two groups: Studies done on a single country and studies from OECD countries. Studies from Lewit et al. (1981), Goel and Morey (1995), and Robert and Samuelson (1988) were all done in the United States, but between different youths, States, and firms. Since all these studies were carried out on a single country they do not contain culture effect. These studies are on effect of product advertising by tobacco companies and not advertising bans. The second group is studies about advertising ban in OECD countries. Results from

this paper confirm findings by Hamilton (1975), Stewart (1993), and Nelson (2003), who all reported no effect on advertising ban.

As mentioned in section 2.3, bans on indoor places could be effective since it causes an inconvenience to smokers, as they have to leave the working area and go outside to smoke. This is inconvenient for smokers, as they may not be able to leave their work to smoke whenever desired. The results from this study however do not support this theory as the coefficient for this variable is .021 and not significant at 5 percent level. As mentioned in section 2.3, studies by Wasserman *et al*. (1991), Chaloupka (1992), Chaloupka and Saffer (1992), Keeler *et al*. (1993), Chaloupka and Grossman (1996), Evans *et al*. (1996), Chaloupka and Wechsler (1997), Chaloupka and Pacula (1998), and Yurekli and Zhang (2000) all have reported the effectiveness of bans on smoking in working places. These studies have all been done in the United States and the majority of them were based on surveys. The only non U.S study is Bardsley and Olekalns (1998) which was done in Australia. The reason that the findings of this study differ from those above is cultural similarity in their studies and cultural diversity in this study.

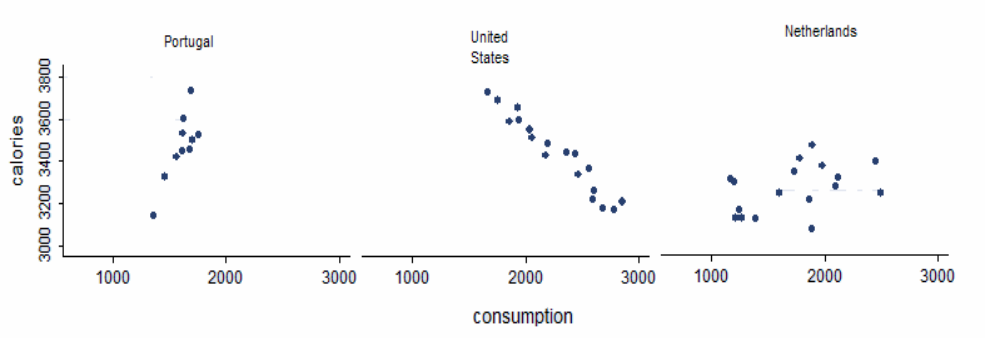
Axelson (1986) distinguishes between different patterns of eating in different cultures and calls it *foodways*. These variables are also proven to be important in studies of other disciplines. Martikainen (2003) found that unhealthy diets tend to go together with other unhealthy behavior such as smoking. Since the

high consumption of alcohol, calories, butter, and sugar are generally considered to be a part of unhealthy diet; they are included in this study. So the expectation from the literature is a positive relationship between consumption of alcohol, calories, butter, and sugar with the consumption of cigarettes, and negative relationship of consumption of fruits and vegetables with consumption of cigarettes. High alcohol consumption is a health hazard, and the same is true for smoking. As mentioned in the literature review, these two variables are reported to be related. Smokers tend to smoke more when they are drinking. The coefficient for alcohol is .081 and it is significant in model (4). One unit (litter/capita/year) change in consumption of alcohol causes an 8.1 % change in the consumption of cigarette. For instance in 1990, per capita alcohol consumption in Greece is 1.4 liter higher than that of USA. Holding all other factors constant, this implies that expected tobacco consumption would be 11.7 percent higher in Greece compared to the US.

The results of this study show no significant relationship between consumption of calories and cigarette consumption. The coefficient is -1.34×10^{-4} and is not significant at 5 percent level. One expects that health aware individuals in the same culture will consume less calories and tobacco. As we are comparing individuals across different cultures, this expectation may not be observed here. Different cultures have different *foodways*. It is very likely that health aware individuals in one country consume more calories, but smoke less than individuals

who are not health aware in another country. The following graph shows the relationship between calorie and cigarette consumption in Portugal, the United States and Netherlands. One can see that in Portugal calorie and cigarette consumptions have a positive correlation. This correlation conversely, is negative for the United States, while in the Netherlands there is no correlation between calorie and cigarette consumption.

Graph. 1 Calories Consumption vs. Cigarette Consumption



The coefficient for butter consumption is 0.004 and not significant at 5 percent level. Once country effects are accounted for, the consumption of butter in different cultures does not show any relation to cigarette consumption. High consumption of sugar is another indicator of unhealthy eating habits; however the coefficient of sugar consumption in model (4) is -0.010 and is significant at 5 percent level. One unit (kilos/capita/year) change in consumption of sugar causes a -1.0 % change in the consumption of cigarette. This can be explained by different

foodways across different cultures. Some cultures contain more sugar in their diet than the others. When comparing individuals across different cultures, sugar consumption can not be a good measure of health awareness anymore.

High consumption of fruits and vegetables is an indicator of a healthy diet. People who consume large amounts of fruits and vegetables are health aware, and one can assume that health aware people do not smoke or at least smoke less. The coefficient is 0.001 and is significant at 10 percent level, which indicated that one unit change (kilos/capita/year) in consumption of fruit causes a .1 % Change in the consumption of cigarette. The expectation from the previous studies is that there should be a negative relationship between the consumption of fruit and vegetables and consumption of cigarettes, however one can see that such expectation when comparing individual in different countries may not hold.

In this study unemployment rate and divorce are included as a measure for stress level across years in each country. The coefficient for the unemployment rate is .026 and it is significant at 5 percent level. This supports the theory that higher levels of stress will increase the cigarette consumption. One can conclude, therefore, that regardless of cultural differences, as unemployment increases the cigarette consumption increases. One percent change in unemployment rate will cause 2.6 % change in the consumption of cigarette. The coefficient of divorce rate is 1.003. This will confirm the theory of linkage between stress and cigarette consumption, but this

coefficient is not significant at 5 percent level. Once constant cultural diversity in different countries is accounted for, the effect of stress caused by divorce is not a significant cause of cigarette consumption.

One can expect people with a higher level of education to be more logical, knowledgeable, and better informed of health hazards associated with smoking. Therefore the expectation of theory is to observe a negative relationship between the level of attendance in higher education and cigarette consumption. In model (4) the coefficient is 2.95×10^{-4} and not significant. It can be concluded that as one accounts for constant cultural differences between countries the education level does not have the preventive effect expected from the above theory.

Chapter 5

Discussion and Conclusion

The purpose of this research is to show the impact of different policies on smoking prevalence in different cultures. This is important since policy makers need to know if they should account for different cultures within the area where they impose these policies. The argument of this study is that there are two forces that affect the smoking rate in a society. These forces are called smoke preventive and encouraging. There are three main variables in both of these forces. These are smoke preventing policies, time effect, and cultural variables. From the results of model (4), one can see how the impact of different variables changes once culture and time effect are taken into account. First this study looked at price elasticity and income elasticity. The effects reported were as expected and calculated by the relevant literature; however the effect of price was not significant at 5 percent level. This shows that the cultural effect is masking the effect of price increase on smoke prevalence. In other words, increase in price does not have the same magnitude of effectiveness in all the countries in this study. The other policy variable is bans on the advertising of cigarettes. The coefficients for limited and strong bans were not significant at 5 percent levels. The coefficients for this variable in model (1) and

model (2) are negative and significant at 5 percent level. These two models did not include the country effect. By comparing these models to model (3) and model (4), where country effect is incorporated, one can see that coefficient for strong bans is not significant in the 5 percent interval anymore. This shows that bans on advertising do not have the same effect across different cultures. The last policy is bans on smoking in indoor areas. The coefficient for this variable also was not significant at 5 percent level. The study of a ban on smoking in indoor area is important because it has two applications. One is to reduce the risk of being subjected to second hand smoking and the other is to reduce smoking rate by making smoking more time consuming and in some situations impossible. The result of this study shows that ban on smoking in indoor places is not an effective way to reduce cigarette consumption. Therefore the only effective application of this ban is to reduce the risk of being exposed to second hand smoking. From this one can conclude that bans on smoking in indoor places is only reasonable where non-smokers are exposed to second hand smoke.

Another group of variables in this study are *foodways*. These are consumption of alcohol, sugar, butter, calories, and fruits and vegetables. These variables are important for two reasons. One is that they distinguish between different cultures and the other, is that they have been used by other disciplines in studies on smoking. With the exception of alcohol, no other *foodways'* variable was used in the relevant literature. Using *foodways'* variables one can account for cultural diversities among different countries, as they all have their specific cultural-

diet. Model (3) and (4) include other aspects of cultural diversities. The results from the model (4) show that once one accounts for constant cultural diversity, all the related coefficients are not significant at 5 percent level. This is true for all *foodways'* variables except sugar.

Next group of variables are stress variables. Included here are unemployment rate and divorce rate. In this study the coefficient for unemployment rate shows a positive correlation with smoking. This was expected according to stress theory. The coefficient for divorce rate shows the same positive relation between stress and cigarette consumption, however the coefficient is not significant at 5 percent level.

The last variable is the effect of higher education on the consumption of cigarettes. This was investigated by including a variable called tertiary which is the rate of attendance to post secondary education. This coefficient for this variable is not significant at 5 percent level once cultural effect is accounted for. This shows the importance of accounting for culture as the norms and values can be very different.

In comparing models (2), (3), and (4) it is clear that culture plays a significant rule on cigarette consumption. The coefficient for strong bans on advertising cigarettes is significant and negative when one does not account for constant cultural diversity. It seems like this ban is effective in reducing cigarette consumption but once culture is accounted for this variable becomes irrelevant. This is important as policy makers in the European Union for example, have a time line

for synchronizing their anti-smoking policies across the Union (EPHA 2005). From this study one can expect that there is a high probability that they will not achieve their goal once their policies are implemented. On the other hand policies such as tax on tobacco which increases the price of cigarettes seem to be effective if time effect is not taken into account. Once one accounts for time effect the price increase becomes irrelevant. It can therefore be concluded that from 1980 to 2000 there is a good chance that the cigarette consumption function has changed, and success is achieved by reducing the cigarette consumption is as a result of that. Information on smoking hazards are more widely available and people's knowledge of this hazard is significantly higher. Smoking is a less socially acceptable fact in most countries. Smoking is no longer a sign of being an intellectual; politicians do not carry their pipe with them every where like Winston Churchill and Joseph Stalin once did. Detectives do not smoke like Sherlock Holmes and Lieutenant Columbo any more. More credit has probably been given to anti smoking policies than they really deserve.

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Appendix 1: Fixed Effect and Random Effect

	Fixed Effect	Random Effect
logprice	-0.106	0.038
	(2.33)*	(1.09)
logrgdp	0.515	0.050
	(2.21)*	(0.33)
limitedban	0.159	0.119
	(2.38)*	(2.74)**
strongban	0.116	-0.094
	(2.10)*	(2.08)*
totalarea	0.015	-0.007
	(1.35)	(0.61)
alcohol	0.115	0.047
	(6.71)**	(4.03)**
calories	-0.000	-0.000
	(1.36)	(0.68)
fruit	0.001	0.003
	(2.08)*	(7.88)**
butter	0.012	-0.017
	(1.00)	(2.47)*
sugar	-0.007	-0.001
	(1.99)*	(0.19)
unemprate	2.054	0.039
	(3.69)**	(0.10)
divorcerate	136.566	126.938
	(3.12)**	(6.86)**
tertiary	-0.001	-0.005
	(0.62)	(3.25)**
Constant	1.460	6.030
	(0.70)	(4.69)**
Observations	181	181
Number of countries	14	14
R-squared	0.40	-

Notes: Absolute value of t statistics in parentheses. * significant at 5%; ** significant at 1%. Dependent variable is log (consumption). Country effects are included.

Appendix 2: Results

	Model (1)	Model (2)	Model (3)	Model (4)
logprice	-0.116	0.037	-0.106	-0.083
	(2.51)**	(0.99)	(2.18)**	(1.70)*
logrgdp	-0.304	0.159	0.515	0.970
	(1.80)*	(1.01)	(1.87)*	(2.53)**
limitedban	0.166	0.091	0.159	0.088
	(2.82)***	(2.92)***	(2.21)**	(1.10)
strongban	-0.186	-0.130	0.116	0.081
	(3.16)***	(2.70)***	(1.71)*	(1.16)
totalarea	0.006	-0.001	0.015	0.021
	(0.45)	(0.09)	(1.02)	(1.44)
alcohol		0.043	0.115	0.081
		(4.08)***	(5.48)***	(2.95)***
calories		-3.39×10^{-5}	-2.07×10^{-5}	-1.34×10^{-4}
		(0.26)	(1.32)	(0.77)
fruit		0.003	0.001	0.001
		(6.97)***	(1.53)	(1.73)*
butter		-0.017	0.012	0.004
		(3.27)***	(1.30)	(0.40)
sugar		-0.000	-0.007	-0.010
		(0.12)	(1.62)	(2.44)**
unemprate	0.002	0.001	0.021	0.026
	(0.33)	(0.12)	(3.75)***	(4.11)***
divorcerate	0.130	1.063	1.366	1.003
	(0.57)	(4.31)***	(2.40)**	(1.51)
tertiary	0.001	-0.005	-0.001	2.95 x10-^{4}
	(0.49)	(2.68)***	(0.91)	(0.17)
Denmark			-0.083	0.078
			(0.54)	(0.41)
Finland			-0.548	-0.390
			(3.53)***	(1.90)*
Sweden			-0.391	-0.237
			(1.99)**	(1.03)
U.K.			0.168	0.367
			(1.09)	(1.82)
Netherlands			0.134	0.329
			(0.64)	(1.44)

France			-0.517	-0.224
			(2.83)***	(0.85)
Belgium			-0.175	0.015
			(1.03)	(0.07)
Germany			-0.312	0.046
			(1.93)	(0.19)
Greece			0.790	1.000
			(2.24)**	(2.66)***
Portugal			-0.489	-0.147
			(2.01)**	(0.44)
Spain			0.157	0.473
			(0.62)	(1.56)
Italy			-0.063	0.018
			(0.25)	(0.07)
Canada			0.310	0.318
			(1.54)	(1.47)
Constant	10.464	4.870	1.486	-3.028
	(6.50)***	(3.52)***	(0.57)	(0.82)
Observations	182	181	181	181
R-squared	0.38	0.77	0.88	0.90
Adjusted R-squared	0.35	0.72	0.86	0.86

Notes: Absolute value of t statistics in parentheses. *significant at 10%; ** significant at 5%; *** significant at 1%. Dependent variable is log (consumption).