

An Empirical Analysis of Cigarette Smoking Behavior in Pakistan



By

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Dedication

***The Ph.D. Dissertation is dedicated to my late
father Noor Dad Khan***

Declaration

The material and information contained in this thesis is my original work. I have not previously presented any part of this work elsewhere for any other degree.

Assad Ullah Kh

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List of Acronym/abbreviations (alphabetically)

ARDL	Auto Regressive Distributive lag
ADF	Augmented Dickey-Fuller
CPD	Cigarettes per day
FCTC	Framework Convention for Tobacco Control
FED	Federal Excise Duty
FBR	Federal Board of Revenue
GDP	Gross Domestic Product
GST	General Sales Tax
IMF	International Monetary Fund
PTC	Pakistan Tobacco Company
PDHS	Pakistan's Demographic and Health Survey
SPDC	Social Policy and Development Centers
SROs	Statutory Rules and Orders
WHO	World health organization

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All praises to **Almighty Allah**, The Light of Heavens and Earths, The One Who put good thoughts in one's mind, turn them into determinations and then makes the way towards their fulfillments showering all His Blessings throughout the journey.

Best of the praises and Peace be upon all the Sacred Messengers and especially for the Last of them **Hazrat Muhammad (SAWW)** who are the minarets of knowledge for all the mankind.

Assad Ullah Khan

Abstract

To control cigarette smoking, Pakistan, like many other countries, has initiated crucial anti-smoking regulations since the promulgation of Health Warning Ordinance No LXXIV 2002. However, empirical evaluation of such regulations is missing in research. Therefore, this study examines the effects of policy variables (taxation and regulation) on the demand for cigarettes. However, focus of the study is to find influence of non-price preventive measures on cigarette demand. Therefore, this study also investigates whether social, psychological and religious factors influence an individual's decision of smoking initiation and cessation. This thesis consists of three essays on smoking behavior. The first essay, uses time series data (1981 to 2018) and examines whether taxation and regulation (on smoking), real per capita income and education enrollment reduce smoking or not. The study finds that preventive regulations significantly discourage smoking. Second, cigarette price elasticity is less than unity showing that cigarette demand is in-elastic. Increasing cigarette prices by 10 percent, declines cigarette demand by about 5% and 7% in the short and long-run, respectively. Moreover, individual's real per capita income is found negatively associated with cigarette consumption, which attests the wealthy individuals' avoidance of smoking. Finally, the study finds positive association of cigarette demand with educational enrollment revealing the failure of educational institutions for effectively dissemination anti-smoking awareness. For further validating the results, the study conducts cross-sectional analyses to highlight the central factors linked with smoking initiation, and cessation. For smoking initiation, the study randomly collects data from 638 BS students at public sector universities across the country. With the help of binary regression method, the study discovers the impact of demographic characteristics (like age and ethnicity) on smoking onset decision. However, one's residential area is unrelated with smoking initiation. Peer and parental smoking also entice individuals to smoking. In addition, physically and emotionally abused children more likely fall a prey to smoking. Next, religious individuals are found less likely attracted to smoking. Lastly, anti-smoking awareness play an essential role in discouraging smoking trends. Finally, for cessation analysis, the study randomly collects data from 421 respondents in the capital city of Pakistan, Islamabad. The findings demonstrate: commitment, socioeconomic status, absentia of smoking peers, low nicotine dependency, and previous quitting attempts appear

strong elements in smoking cessation for a period of almost six months. Besides, social pressure, religious and public preventive elements push individuals to quitting attempts. The study concludes taxation and public regulation significantly discourage cigarette consumption. However, socio-religious and psychological factors appear instrumental elements in discouraging smoking initiation among adolescents, and encourage quitting among adult smokers.

Chapter 01 Introduction

1.1 The Study's Background and Motivation

Out of 1.3 billion worldwide tobacco users, almost 80% live in low- and middle income countries (WHO, 2020a). Smoking is one of the major causes of preventable diseases and deaths. Empirical evidence demonstrates smoking causes several types of cancer, and cardiovascular and respiratory diseases (Damasceno, 2016; K Fagerström, 2002; WHO, 2020a). Every year, about 8 million people die of tobacco consumption (Dai et al., 2022; Hameed & Malik, 2021a; Jamal et al., 2018; C. Ma et al., 2021a; WHO, 2019e, 2022). A common perception marks cigarette smoking as dangerous for smokers and non-smokers' health. Despite the smoking rules, passive smoking remains a serious challenge for the masses. World Health Organization (WHO) reports that around 1.2 million annually lose their lives to passive smoking including almost 65,000 children. (Öberg et al., 2011; WHO, 2019e). The data reveal smoking prevalence is declining in high income countries, whereas in low- and middle income countries, it is rising (Chaloupka, 1999; Ross & Al-Sadat, 2007a). Traditionally, India, Pakistan, and Bangladesh have remained the most vulnerable countries for tobacco consumption (Sreeramareddy et al., 2014). Pakistan, with more than 25 million tobacco consumers, is counted among the largest smoking populations (Hameed & Malik, 2021b; Masud et al., 2020; Memon et al., 2022; Zaheer et al., 2021). The pattern of tobacco consumption in Pakistan includes cigarette smoking, water pipes (shisha and gutka), and smokeless tobacco (like chewing paan, naswar, etc.) (A. Y. Alam et al., 2008; Iqbal et al., 2015; J. Khan, 2012; Naz et al., 2018).

Pakistan's Demographic and Health Survey (PDHS 2017-18) reports cigarette consumption 22 % men and 3 % women (PDHS, 2017; Zubair et al., 2022). Interestingly, the prevalence of smoking has witnessed a significant decrease since 2005 (when Pakistan became a signatory of the WHO health treaty). For instance, smoking prevalence among adults age 15 or older was 31.9 % in 2005, which declined to 23.60 % in 2015 further dropping to 20.2 % in 2020. Despite population growth, the reduction in smoking may reflect prudent public intervention in the market for tobacco. However, as committed with

WHO FCTC, reducing tobacco smoking by 30 % until 2025, still remained a challenge for national public policy.

Being a risk factor for individuals' health, cigarette smoking is counter-imperative to reducing the overall prevalence of cigarette smoking. For this purpose, nations have made substantial efforts, such as signing the WHO Framework Convention for Tobacco Control (FCTC). The WHO FCTC has set the goal of reducing smoking prevalence by 30% between 2010 to 2025 (WHO, 2015; L. Yang et al., 2022). WHO reported in 2013, that Pakistan bans cigarette advertisements and promotions? However, implementation of tobacco control laws and regulations on smoking appears less satisfactory. Like many other low income countries, tobacco control has remained a serious challenge for the public health policy in Pakistan. To control the growing prevalence of smoking, the government of Pakistan has suggested various regulations on smoking.

In 1979, a public ordinance was made mandatory for the tobacco companies to place health warnings such as “smoking is injurious to health” on cigarette packages, etc. (WHO, 2013). Though, due to the high illiteracy rate, this ordinance was not much noticeable at the time, it paved the way for a chain of more comprehensive legislation on cigarette smoking. In this line, “Health Warning Ordinance No. LXXIV 2002” is worth noting, which restricts smoking in public-and enclosed-places, bans cigarette advertisements, and prohibits cigarette sales to minors (Burki et al., 2013; Nayab et al., 2018). Moreover, in the year 2004, Pakistan signed the WHO FCTC, a health treaty that suggests measures and guidelines for the implementation of excise taxation and public regulations on cigarettes (WHO, 2019c). Unfortunately, the implementations of such laws and regulations to control cigarette smoking is not satisfactory. Additionally, empirical evidence reveals the lack of effectiveness of such regulations on smoking prevalence in Pakistan.

To control tobacco, literature suggests interventions like taxation on cigarettes, health warnings on cigarette packages, smoke-free public and enclosed places, and bans on cigarette advertisements and promotions (Cummings & Proctor, 2014; Le & Jaffri, 2022). However, data attest: taxation on cigarettes is reported to be the most desirable strategy for decreasing the prevalence of smoking, particularly among young and depressed strata of

the society. (Cummings & Proctor, 2014; Golden et al., 2016; Le & Jaffri, 2022; Wallace et al., 2007). Furthermore, taxation reduces the quantity of cigarettes consumed, and encourages quitting. That is, increasing taxation on cigarettes raises cigarette price thereby making it less affordable for individuals, especially in low income countries (Becker & Murphy, 1988; Chandola et al., 2004; Colombo & Galmarini, 2022; Golden et al., 2016; Han et al., 2022; G. B. Kim et al., 2021; Le & Jaffri, 2022). Taxation on cigarettes is initially used as a means of generating revenue and subsequently for discouraging smoking (Becker & Murphy, 1988; Colombo & Galmarini, 2022). However, recent literature shows that taxation coupled with non-price regulations such as broadcasting information that highlight health hazards of smoking, marketing bans, and clean air laws play more significant role in discouraging smoking behavior (Asaria et al., 2007; Colombo & Galmarini, 2022; Hiscock et al., 2018; Jovanović et al., 2022; Marcelino et al., 2022; WHO, 2022).

In the same vein study conducted by (M. U. Ahmed et al., 2022) show that tax-induced cigarette prices reduce cigarette consumption. However, cigarette prices don't influence the decision to start smoking. Therefore, this study also focuses on finding elements that are significantly linked with the initiation and cessation of smoking. Smoking is an addictive behavior that is usually initiated during early adolescence and continues afterwards (Ayatollahi et al., 2005; Joann, 2022; C. Ma et al., 2021b; Paavola et al., 2004). Adolescent smoking is a significant predictor of adulthood smoking (Everett et al., 1999; Fagbamigbe et al., 2020; Mdege et al., 2021; Sabado et al., 2017; Sciences et al., 2019; WHO, 2020a). Young adults, especially those enrolled in colleges or universities, have greater exposure to risky behaviors like smoking. Living a life of boarding, students may find numerous changes in their lives including freedom from family restrictions, interaction with new fellow students, and greater exposure to cigarette smoking or alcohol use (Joo et al., 2020a; Macy et al., 2007; Tucker et al., 2002). Though smoking frequency among adults has decreased in recent years ((CDC, 2003; Jamal et al., 2018; Titus et al., 2021; Kenneth E Warner, 2015), adolescent's smoking is likely a risk element for public health (C. Ma et al., 2021a; Ng et al., 2014). Regardless of health hazards of smoking, adolescents are reported smoking cigarettes at an alarming rate. For example, around 1 million young individuals below the age of 18 step into smoking every year (Alexander et al., 2001;

Bonnie & Lynch, 1994; Johnston et al., 1995). Therefore, it is essential to comprehend factors that significantly influence smoking initiation if the prevalence has to be reduced substantially.

Age, peers and parents smoking behavior, smoking as a show off, unpleasant events in life, religious affiliation, and smoking policy both at home and in public places are affecting smoking initiation (A. Ahsan et al., 2022; Azzahra, 2022; Fagbamigbe et al., 2020; Heris et al., 2020; Jiang et al., 2016; Joann, 2022; W. Kang, 2022; C. Ma et al., 2021b; Parthasarathi et al., 2021; Sci, 2022; Titus et al., 2022; WHO, 2020a; Zhang et al., 2022). For example (Alexander et al., 2001; M. M. Ali et al., 2009; Vitória, Pereira, Muinos, Vries, & Luísa, 2020), find that adolescents are copying peers' and parents' smoking behavior. According to ((Leonardi-Bee et al., 2011) children are expected to initiate smoking, in case one of the parents smoke cigarettes. This probability, however, increases by three times when both parents are smokers. Similarly, the probability of smoking is high for individuals whose friends are involved with smoking (Cheng Wang, 2021; Joo et al., 2020b; Lim et al., 2015; Seo et al., 2011; Vitória, Pereira, Muinos, Vries, & Lima, 2020; Vitória, Pereira, Muinos, Vries, & Luísa, 2020). In addition, childhood victimization has also been reported to be associated with smoking behavior. For example, (H B Nichols, 2004; Joann, 2022; Joannès et al., 2022; L. Lin et al., 2022; Sci, 2022; Tracie et al., 2020), adverse childhood and peer victimization increase the odds for the experimentation of smoking among children. Recently, research has shown more interest in empirically investigating the effect of religious pronouncements on individual's smoking behaviors. Most religions promote human health and do not allow smoking (Garrusi & Nakhaee, 2012).

Although discouraging smoking initiation is an important prevention strategy, encouraging to quit smoking is an equally crucial strategy for reducing the prevalence of smoking. Assuming the possible health advantages of ending smoking, Pakistan, like many other countries of the world, has signed WHO-FCTC health treaty which suggests measures for quitting smoking. Prior research has examined predictors of quitting attempts and factors that are significantly associated with smoking cessation. Literature has analyzed demographic factors, social and environmental, and other psychological factors

to find its significant role in either quit attempts or permanent cessation of smoking. For example, (Holm et al., 2017; Honjo et al., 2010; G. B. Kim et al., 2021), age was significantly associated with smoking cessation. On the contrary (Zhu et al., 1999) age, gender and ethnicity do not distinguish between cessation and quitting attempts. Moreover, low nicotine dependency (Chandola et al., 2004; Grande, 2018; Han et al., 2022), and past quitting attempts (Grande, 2018; Han et al., 2022; G. B. Kim et al., 2021) were attested as vital factors that help in ending of smoking. Additionally, many studies reported that socio-economic status of an individual also influence an individual's decision of ending smoking behaviors. These studies concluded that wealthy individuals give more value to life and therefore avoid risky behavior such as smoking and drinking. Similarly, individuals with higher educational level take smoking an unhealthy behavior. Empirical evidence also indicates that an individual with both high wealth and educational levels is expected making more quit attempts.

Although we find impressive literature in developed countries about the influence of public regulation and other factors (e.g., demographic, social, and psychological factors) on smoking behavior, however, the findings of prior studies cannot be used as a smoking prevention strategy in Pakistan. The varying socio-economic patterns of living, geography, and environmental conditions might be the possible reasons. For example, in Pakistan, smoking is socially unacceptable, and parents do not allow smoking at home. In addition, Islam (the most widely practiced religion in Pakistan) prohibits smoking on account of its harmful effects on an individual's health. Therefore, the need of the hour is to comprehensively analyze smoking behavior in the context of Pakistan. Although, Pakistan has developed crucial anti-tobacco measures to regulate smoking since the notification of Smoking and Health Ordinance No LXXIV in 2002. However, we find very little empirical evidence showing the influence of such public regulations on individual smoking behavior. As researchers have focused mainly on the estimation of cigarette price elasticity, while less attention is paid to public regulation and other social and psychological factors that influence smoking behavior. This study, therefore, differs from prior studies in terms of methodology and content conducted on the area of smoking behavior in Pakistan. First, this study uses a comprehensive framework using both time series and cross sectional data to empirically analyze smoking behavior in detail. Second, the study systematically

examines the process of starting and quitting smoking. Finally, unlike prior studies, which fail to control relevant variables in the econometric equation of cigarette demand, this study attempts to include all the important variables thought to be significantly related with initiation, and cessation of smoking.

1.2 Purpose of the Dissertation

The study empirically examines in detail the effects of public policy variables (taxation and regulation) on cigarette consumption. First, the study develops an aggregate time series study, evaluating that whether cigarette prices (taxation effect), public regulation, real per capita income, and enrollment in educational institutions influence cigarette demand. It is analyzed whether people with different incomes demonstrate varying responses in deciding the number of cigarettes puffed. Whether education properly conveys an anti-smoking message?

Cigarette taxes largely affect the number of cigarettes puffed. There are several other social and psychological factors that affect an individual's decision about smoking initiation and quitting. Therefore, to reduce cigarette demand, discouraging the decision to initiate smoking and encouraging quitting are vital. This requires an understanding of the factors closely linked with smoking initiation and cessation. Therefore, the study conducts cross-sectional analyses for examining the effects of demographic characteristics, social and psychological elements, and religious influence on smoking initiation and cessation behavior.

To achieve these objectives, this study advances to address the following research questions:

- Do public policy variables such as taxation on cigarettes and non-price regulation on smoking limit cigarette demand?
- Do demographic characteristics, socio-economic status, religious affiliation, and environmental and psychological factors discourage smoking initiation and encourage quitting?

1.3 Plan of the Dissertation

The organization of the study is as follows: Chapter 2 presents a brief overview of the government intervention through taxation on cigarettes and regulation on smoking. Additionally, cigarette production and changes in cigarette prices are discussed in this section. Chapter 3 presents a time series study focusing on the link between cigarette prices and regulations with cigarette demand. In addition, this part of the study also examines whether real income of individuals and enrollment in educational institutions are associated with cigarette demand. Chapters 4 and 5 present cross-sectional analyses to find predictors of smoking initiation and cessation, respectively. Finally, chapter 6 discuss the results of the study. This part of the study also suggests policy implications for the study.

Chapter #02

Cigarette Production, Taxation and Public Regulations on Smoking in Pakistan: An Overview

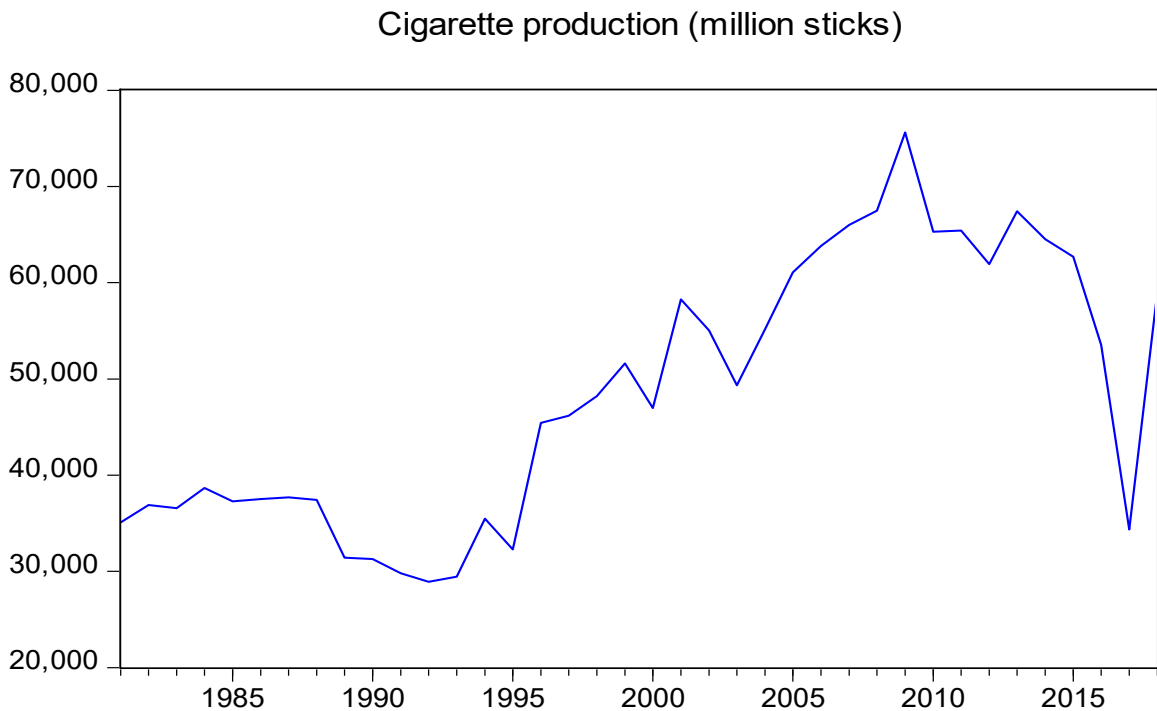
Tobacco use is the central cause of unavoidable diseases like cancer, respiratory problems, cardiovascular disease, and skin problems across the world. Tobacco use has also remained a serious health issue in Pakistan. The trend of tobacco use is increasing, particularly among adults in Pakistan. One estimate shows that nearly 31 million adults use tobacco in one form or another (SPDC Policy Report, 2022). Research findings show that around 163,360 people died in Pakistan during the year 2017 as a result of tobacco consumption (SPDC Policy Report, 2022; WHO, 2019b). Another finding indicates that the total cost of smoking related diseases (including direct health costs and the cost of productivity lost) was PKR 615 billion during the year 2019 (Nayab et al., 2021). Empirical evidence shows that smoking prevalence increases with age. Further evidence indicates that the highest smoking prevalence in Pakistan is found among men between the ages of 45 and 64 (R. Ahmed et al., 2008; A. Y. Alam et al., 2008; S. E. Alam, 1998; Iqbal et al., 2015; Shaikh & Kamal, 2004). During the year 2017-18 Pakistan's Demographic and Health Survey (PDHS) found that 23% of men and 5% of women use tobacco in one form or another. The survey analysis further reports that 22% of men and 3% of women are smoking cigarettes (PDHS, 2017; Zubair et al., 2022). The high prevalence of smoking shows ineffectiveness of smoking regulation. Therefore, this chapter presents a brief overview of cigarette production, taxation, and regulation on smoking in Pakistan.

2.1 Cigarette Production

Tobacco is cultivated in three provinces of Pakistan, however, the Pakistan Tobacco Company (PTC) reports climate conditions and soil fertility of Khyber Pakhtunkhwa (KP) suitable for the growth of tobacco leaves. According to Pakistan Tobacco Board (PTB), tobacco leaf was grown on 50,800 hectares of land, which resulted in the production of 113.6 million kilograms of tobacco during the year 2020. The share of KP in the production of tobacco was 71.38 million kilograms of tobacco from cultivating 28,089 hectares of land (Sajjad et al., 2022).

Below Figure 2.1, show trends in the domestic production of cigarettes from 1981 to 2018. The graph shows that domestic production increased from 35.8 billion sticks in 1980-81 to as high as 75.6 billion sticks in 2008-09. However, from 2009 onwards, cigarette production showed a declining trend until 2016-17, reaching a level as low as 34.3 billion sticks. After the declining trend, the production of cigarettes picked up to 59 billion sticks in 2017-18. This surge in the production of cigarettes was mainly due to the introduction of third tier excise duty for low-priced cigarette brands. The FBR officials and the tobacco industry defended this move by arguing that the third tier excise duty will prove fruitful in curbing the illicit cigarette production. However, in reality, a loss of 36 billion (Pakistani rupees) occurred to the revenue department as a result of the introduction of third tier excise duty on cigarettes. This loss occurred because the cigarette industry in Pakistan shifted from high tax brand cigarettes to low-tax or low-priced brand cigarettes. This brand shifting by the cigarette companies resulted in the reduction of FED on several brands of cigarettes from Rs. 32.98 to Rs. 16 in the fiscal year 2017-18 (Nayab et al., 2018).

Figure 2. 1: Trends in the domestic production of cigarettes from 1981 to 2018.



Below table 3.1 shows the actual trend of cigarette production, the average price of cigarettes, and the tax revenue collected by the government of Pakistan during the period 2015-18.

Table 2.1: Cigarette Consumption, Taxes, and Prices (2015–2018)

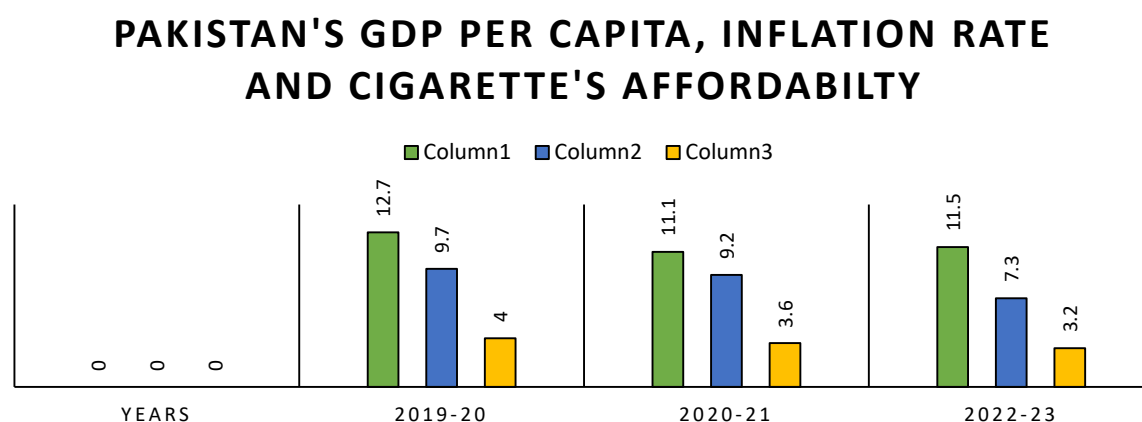
Years	Cig. Consumption (Million sticks)	Taxes (million PKR)	Cig. Price/packet
2015	62687.24	102890	45.85
2016	53545.23	114202	57.75
2017	34350.92	83693	65.44
2018	59065.35	87450	50.86

Source: Pakistan Tobacco Board (PTB)

As evident from the Table 2.1, on average the price of a packet of 10 cigarettes has declined from Rs. 65.44 to Rs. 50.86 during the period 2017–18. However, the volume of cigarette production increased from 34 billion sticks to 59 billion during this period. The government regained its lost revenue, which was nearly equal to PKR 3757 million. However, statistics indicate that contrary to the government’s claim, the three-tier structure failed to generate additional tax revenue even though cigarette production has increased considerably. Furthermore, the International Monetary Fund's (IMF) estimate shows that Pakistan’s nominal GDP per capita grew by 21.7% during 2020–21, while the projected growth rate is expected to exceed 11% for the periods 2021–22 and 2022–23. However, the inflation rate during 2020–21 was 10%, and the target for next year is 9.2%. Moreover, according to the Pakistan Bureau of Statistics, retail prices of cigarettes have remained stable due to an unchanged FED since July 2019. Consequently, cigarette affordability has increased in the years 2020–21 and will further increase in the years 2022–23 if taxation on cigarettes remains unchanged.

Table 2. 2: Projections of Pakistan’s Macroeconomic Variables

Years	Nominal Per Capita Income Growth	Inflation rate	Affordability
2019-20	12.7	9.7	4
2020-21	11.1	9.2	3.6
2022-23	11.5	7.3	3.2

Figure 2. 2: Pakistan's GDP per capita, inflation rate and cigarette's affordability

Source: IMF economic projections, October 2021

In the above graph, cigarettes’ affordability (defined by real income to cigarette’s price ratio) shows the percentage of real per capita income to buy 2000 cigarettes. Based on IMF projection, the Social Policy and Development Centers (SPDC) estimates that it requires nearly 4% per capita GDP to purchase 2000 cigarettes’ sticks in the year 2019-20. However, if cigarette prices remains unchanged, it would decrease to 3.6% and 3.2% during the periods 2020-21 and 2022-23 respectively.

2.2 Cigarette Taxation in Pakistan

World countries generally use taxation on cigarettes production to reduce the prevalence of cigarettes smoking. Pakistan uses two types of indirect taxes on domestically produced cigarettes. These are the General Sales Tax (GST) and the Federal Excise Duty (FED). However, a major share of tobacco revenue (about 80 percent) is collected by FED only. Unfortunately, cigarette taxation system has remained highly complex in Pakistan. In the retail prices of cigarette the excise share is 40.9 percent which is much lower than 70%

benchmark value recommended by WHO FCTC. The main reason behind this lower share is the complex price tiers of cigarette tax system. For example, specific tax is collected on the quantity of lower brands while ad-valorem tax is charged on premium brands as a percentage of retail prices of cigarettes. However, a combination of both ad-valorem and specific taxes are applied on medium brand of cigarettes. Further, the structure of cigarette taxation has been revised several times during last decade. For instance, by abolishing ad-valorem component in the budget 2013-14, the existing three-tier tax system was modified into two tier. However, in 2017-18 again the three-tier tax on cigarette was assumed, resulting in substantial increase of sale for the lower brand cigarettes in the country. Although, the government claimed that the main reason behind the introduction of three-tier tax was to reduce the illicit cigarette production, however, in reality this move of the federal government resulted in substantial loss of the revenue. The revenue loss is evident from FED rate which declined from PKR 1.9 per stick to PKR 1.1 per stick during the period 2016-17 to 2017-18 (Durre Nayab et al., 2018; Iqbal, Muhammad Asif Sabir, 2018). Below Table 2.3, shows various revisions in the FED rate for different price tiers during the period 2013-14 to 2022-23.

Table 2. 3: Price Tiers and FED Rate Various Revisions

Years	Tiers	Price Per 1000 Cig. Sticks	FED Rate
2013-14	First Tier Second Tier	≤ PKR 2286 > PKR 2,286	PKR 880 PKR 2350
2014-15	First Tier Second Tier	≤ PKR 2706 > PKR 2706	PKR 1085 PKR 2632
2015-16	First Tier Second Tier	≤ PKR 3600 > PKR 3600	PKR 1420 PKR 3155
2016-17	First Tier Second Tier	≤ PKR 4000 > PKR 4000	PKR 1536 PKR 3436
2017-18	First Tier Second Tier Third Tier	≤ PKR 2950 > PKR 2,950 ≤ PKR 4,500 > PKR 4500	PKR 800 PKR 1670 PKR 3740
2018-19	First Tier Second Tier Third Tier	≤ PKR 2950 > PKR 2,950 ≤ PKR 4,500 > PKR 4500	PKR 848 PKR 1770 PKR 3964
2019-20	First Tier Second Tier	≤ PKR 5960 > PKR 5960	PKR 1650 PKR 5200
2020-21	First Tier Second Tier	≤ PKR 5960 > PKR 5960	PKR 1650 PKR 5200

Chapter 2

2022-23	First Tier	≤ PKR 6660	PKR 1850
	Second Tier	> PKR 6660	PKR 5900

Source: Federal Board of Revenue (FBR); Finance Acts; SPDC estimates

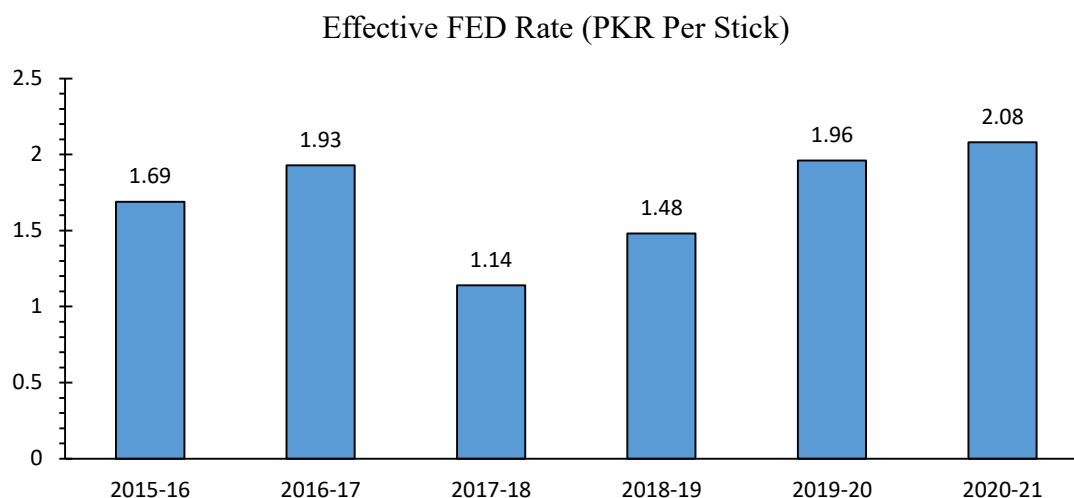
Data for 2021-22 is not available

Currently, cigarettes produced in Pakistan are taxed through lower and higher price tiers by Federal Excise Duty (FED). According to Finance Act 2022, cigarettes are included in lower price tier if retail price of 1000 sticks does not exceed PKR 6660. However cigarette brand will be included in high price tier if the price of 1000 cigarettes exceed the limit of PKR 6660. Taxation on low and high priced cigarettes are Rs. 1850 and Rs. 5900 per one thousand sticks, respectively (Pakistan Tobacco Fact Sheet, 2022).

Below figure 2.3, shows effective FED rate as measured by total revenue collection through taxes divided by total number of cigarettes produced. As evident from the graph, the FED rate drops down during the period 2017-18, when the federal government introduced third tier price for the lower brands of cigarettes. However, it starts increasing again by abolishing the third tier during 2018-19 and reaching as high as PKR 2.08 per stick in the year 2020-21 (SPDC Policy Report, 2022).

Table 2. 4: Effective FED Rate for the selected Years (PKR/Stick)

Years	Effective FED
2015-16	1.69
2016-17	1.93
2017-18	1.14
2018-19	1.48
2019-20	1.96
2020-21	2.08

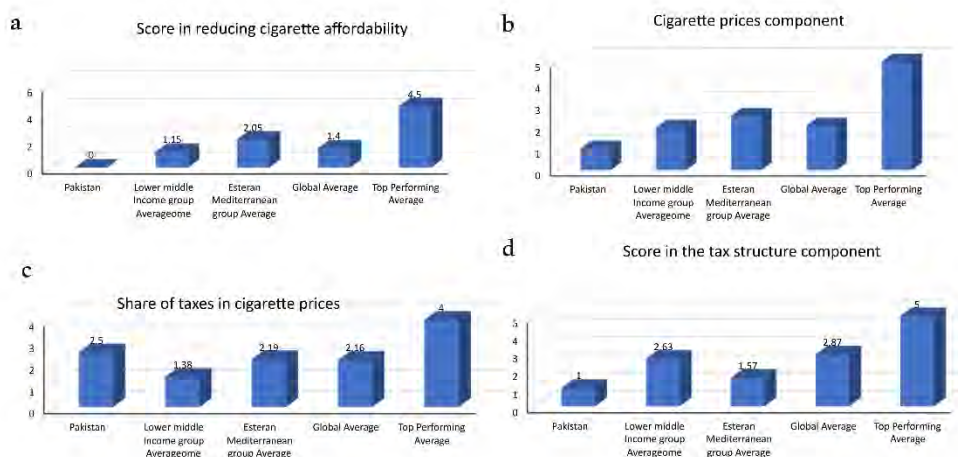
Figure 2. 3: Effective FED rate (PKR/Stick)

Source: Economic Survey of Pakistan 2020-21; FBR; and SPDC estimates

One reason for the growing prevalence of smoking in Pakistan might be the cheap tobacco prices and increasing affordability of cigarettes. The cigarette's affordability in Pakistan, defined by the proportion of the average cigarette pack price to per capita income, was low in the early 1990s as real income was falling more rapidly. This reduction in the affordability of cigarettes contributed to less cigarette consumption during this period. However, a rapid increase in real income and thereby increasing affordability might be a reason for the rise in cigarette consumption during the late 1990s (Burki et al., 2013). To assess the effectiveness of the cigarette tax system in any country, the Tobacconomics Cigarette Tax Scorecard (TCTS) evaluates a country's performance on the basis of five-point scores. This system ranks a country on the basis of scores obtained through increasing cigarette prices, making cigarettes less affordable, the high portion of taxes in the cigarette's prices, and the overall structure of the excise tax system. The average score obtained by a country reflects its performance in discouraging smoking behavior. Pakistan achieved an average score of greater than 2 points during the period 2014–2016. However, the average score dropped substantially in 2018, which improved moderately, reaching 1.13 points in 2020. Among the four components, Pakistan's performance was satisfactory in terms of the terms of the share of taxes in the retail prices of cigarettes, receiving 2.50 points. However, Pakistan received zero points in the component of reducing cigarette affordability during this period. Similarly, its performance was not satisfactory in the

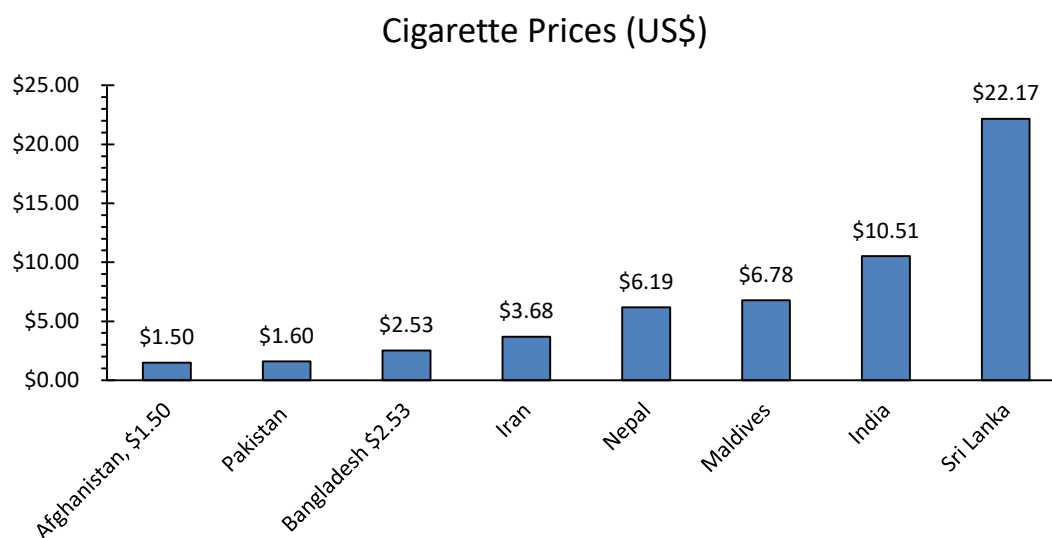
components of tax structure and cigarette prices (Tobacconomics Scorecard, 2022). As shown in the graphs 3.4a to 3.4d, Pakistan’s performance is poor in the South Asian region and globally as well.

Figure 2. 4: Cigarette affordability, prices, and tax on cigarettes



2.3 Cigarette Prices in Pakistan

Average cigarette prices are low in Pakistan in the South Asian region, except in Afghanistan, where cigarette prices are lowest. For example, price of the most widely used pack containing 20 cigarettes was US\$10.51 in India in 2018, while it was only US\$1.60 in Pakistan. Cigarette prices are higher in Sri Lanka compared to both India and Pakistan. As high prices of cigarettes reduce cigarette demand, that is why smoking prevalence is lower in Sri Lanka compared to India, Bangladesh, and Pakistan. The main reason behind low cigarette prices in Pakistan might be low taxes on cigarette production. For example, excise tax is just 41 percent of the selling price of a Capstan’s packet containing 20 cigarettes. However, excise tax is 57.8 percent of the selling price of a pack of Gold Leaf (a high-priced brand) containing 20 cigarettes (SPDC, 2021; WHO, 2019a). Hence, a lower percentage of excise taxes in the selling prices of cigarettes shows that there is still ample space for raising taxes on cigarette production in Pakistan.

Figure 2. 5: Cigarette prices for the selected countries

Source: WHO 2019

2.4 Regulation on Smoking in Pakistan

Aside from taxation, non-price regulations on smoking also play a significant role in decreasing cigarette consumption. These regulations include health warnings, smoking in enclosed places, cigarette advertisements and promotions, cigarette sales near educational institutions, and cigarette sales to minors. Although the legislation on tobacco use in Pakistan can be found back during the introduction of the “Motor Vehicle Ordinance” in 1965 and later Cigarette (Printing of Warning) Ordinance No. LXXIII, 1979. However, due to the low literacy rate in the country, these warning ordinances did not effectively highlight the health risks associated with smoking. Later in 2002, Pakistan issued a comprehensive health ordinance, “Restrict Smoking in Indoor Places, and Health Warning Ordinance No. LXXIV. The ordinance restricts smoking in indoor work places such as schools, hospitals, transport, and all other government buildings and offices. It bans the advertisement and promotion of cigarettes, restricts minors from purchasing cigarettes, and prohibits sales near academic institutions (Burki et al., 2013; Nayab et al., 2018).

In this line, Pakistan signed the WHO FCTC in 2004, which resulted in quite significant improvements in tobacco regulation policies. To fulfill its obligations required by the FCTC, the country issued various Statutory Rules and Orders (SROs) to amend and further regulate the production and consumption of tobacco. For example, the general label

warning of the 1979 ordinance “Warning: Smoking is Injurious to Health” was replaced in 2002 with a more specific and effective health warning that “tobacco causes cancer and heart diseases.” Later, a 2010 SRO called for the size (40% front and back) and circulation of health warnings. More recently, the warning label was further strengthened by SRO 2018, which requires a 50% pictorial warning on both sides of cigarette packages.

Similarly, Health Ordinance No. LXXIV, 2002, prohibits smoking in public places, job places, and passenger vehicles. However, this restriction was relaxed by SRO 2008, which allowed for specifying special smoking rooms at all public and job places except educational institutions and transport services. However, the controversial SRO 2008 was rolled back through another SRO issued in 2009, requiring public spaces to be completely free of cigarette smoking. In the same manner, Ordinance LXXIV 2002 contains some weak restrictions regarding cigarette advertising, promotion, and sponsorship. These restrictions were strengthened by a 2007 SRO that provides guidelines for tobacco product advertising. For example, it further restricts the times during which advertisements are allowed on television. In addition, the SRO restricts billboard advertising and limits the size of tobacco advertisements in print media. Later, SRO 2009 further amended these tobacco advertisement guidelines by restricting tobacco companies from distributing free samples of cigarette packages and other promotional discounts. It also restricts tobacco company sponsorship of events like sports, dramas, and movies.

Empirical evidence from advanced economies indicates that only strong and comprehensive tobacco regulation policies can play a significant role in decreasing tobacco consumption, while weak policies will have no or very little impact on tobacco consumption. However, evidence from developing economies demonstrates that even weak tobacco control policies play a role in reducing tobacco use (Saffer & Chaloupka, 2000). The statistical data of this study shows that since 2009, cigarette consumption in Pakistan has declined from 75 billion sticks to as low as 34 billion sticks in 2017. This demonstrates that in the last two decades, by strengthening its tobacco control policies, cigarette consumption in Pakistan has declined significantly. However, with the introduction of the third-tier excise tax in 2017, which lowered cigarette prices for low-brand cigarettes, cigarette consumption picked up again, reaching 59 billion sticks in 2018. The abolition of the third tier for lower-brand cigarettes (2018–19) and raising FED in the

years 2022–23 is a significant move by Pakistan to decrease smoking prevalence. More recently, the government of Pakistan introduced the Tax Law Ordinance 2022, resulting in raising overall cigarette prices by 24.5 percent. The abolition of the three-tier tax system on cigarette production in 2018–19 and the subsequent rise in cigarette taxes through the Finance Act 2022, are important policy measures that will substantially reduce smoking prevalence in Pakistan.

The need of the hour is to empirically evaluate the dynamic impact of cigarette prices and public regulation on cigarette demand in Pakistan. Therefore, in the next chapter, the study develops an econometric model that is best capable of modeling the effects of policy variables (taxation and regulation on cigarettes) and other socioeconomic determinants of smoking on the demand for cigarette consumption.

Chapter # 03

Do Regulations on Smoking Limit Cigarette Demand? An Empirical Evidence from Pakistan

Abstract

Since Ordinance No LXXIV in 2002, Pakistan initiated a number tobacco control measures. Therefore, this study hypothesizes the significance of cigarette prices and public regulations on cigarette demand. For this purpose, the study employed an auto-regressive distributed lag model (ARDL) for the data series of variables covering the time period 1981- 2018. The results find that a 10 percent rise in the cigarette prices reduces cigarette demand by about 5 percent and 7 percent in the short and long run, respectively. This findings validate that cigarette price elasticity is less than unity in Pakistan. Moreover, the results also confirm the statistically significant and negative effects of public regulations on smoking. Further, the study finds positive association of smoking with university education, showing that academic institutions do not properly highlight the health hazards of smoking. Finally, the negative association of real income indicates that wealthy individuals' avoid risky behaviors like smoking. Compressive regulations should be enacted to effectively reduce smoking in Pakistan.

Keywords: Smoking Regulations; Addiction; Cigarette Demand; Cigarette Price Elasticity; Cigarette advertisement and promotion; Pakistan Tobacco Board (PTB); ARDL; ECM

3.1 Introduction

3.1.1 Study's Background

Cigarette smoking is harmful for the health of all individuals (smokers as well as non-smokers). Every year, cigarette smoking (the most commonly used form of tobacco) causes more than 8 million deaths worldwide due to lung cancer, cardiovascular diseases, and hypertension (WHO, 2020b) .To get rid of the menace of cigarette smoking, the WHO Framework Convention for Tobacco Control (FCTC) advocates high taxes on cigarette production and non-price regulations on smoking, such as restrictions on cigarette

advertisement and promotion, sales to minors, and prominent warnings on packs of cigarettes (WHO, 2015). This report calls upon the government, policymakers, and researchers to design a preventive policy that raises cigarette prices through taxation and restricts cigarette smoking in public places so that demand for cigarettes may be substantially reduced. In addition, restricting cigarette advertisements and promotions and placing health warnings on cigarette packages are also helpful in limiting cigarette demand. Since then, it is now generally believed that cigarette smoking is the single largest preventable cause of premature death. In 2020, 70 percent of those killed by tobacco will be from developing countries (Jha & Chaloupka, 1999).

In most developed countries, the prevalence of smoking is declining over time, as are tobacco-related illnesses and deaths (Cheng Wang, 2021; Sharelike et al., 2018; WHO, 2019d). Unfortunately, in developing countries like Pakistan, the trend of smoking increases gradually (Hana Ross & Al-Sadat, 2007; Jha & Chaloupka, 1999). The World Health Organization (WHO) reported that, in Pakistan, 31.8% male, 5.8% female, and 19.1% adults are consuming tobacco products. And among them, 17.9% male, 1% female, and 9.6% adults are smoking cigarettes (WHO, 2019c).

Given the high prevalence of smoking and the resulting premature death and illness, it becomes imperative for the government of Pakistan to intervene in the market for tobacco. Literature suggests taxation is the most useful strategy for reducing tobacco smoking. Prior studies (see: Chaloupka & Warner, 2000; Graham, 2013; Marzioni et al., 2020; Randell, 2018; Stoklosa et al., 2016; Teixeira, 2018) find that cigarette prices and smoking are inversely related. Moreover, many researchers have also find high cigarette elasticity in low, and middle-income countries. For example, (Van Walbeek, 2005) finds cigarette elasticity for developed countries at around -0.4, while it lies in the range of -0.4 to -0.8 for developing economies. This is supported by (John, 2008) showing that price elasticity estimates of cigarettes, beedi (tobacco rolled in dry leaves), and leaf tobacco in India lie in the range of -0.4 to -0.9. Similarly, evidence from advanced countries shows that cigarette consumption reduces by 2.5% to 5% in response to a 10% increase in price (Chaloupka & Warner, 2000). In addition, we also find varied estimates of cigarette price elasticities from studies conducted in Pakistan. For instance, (Mushtaq et al., 2011) find

the price elasticity of smoking greater than unity (-1.17), while (Burki et al., 2013) find it less than unity (-0.58).

A detailed review of the literature on cigarette consumption suggests the following research gaps with reference to cigarette price elasticity and public regulations on cigarette smoking: First, researchers in Pakistan have estimated price elasticity with reference to taxation or the price of cigarettes only. For example, regressing cigarette consumption on cigarette prices and real income (Mushtaq et al., 2011) finds a cigarette's elasticity greater than unity. Similarly, estimates from the South Asian region show a cigarette's elasticity greater than unity. For example, (Guindon et al., 2011) for India (-1.03); (Nayab et al., 2018) for Pakistan (-1.06); (Hasbun et al., 2018) for Bangladesh (-1.3). These studies have entirely ignored the role of non-price regulations in reducing cigarette demand. We therefore deduce that the estimated cigarette price elasticities owing to the cigarette price alone could be upward biased (overstated).

Second, in Pakistan, the tier system of federal tax on cigarettes is highly complex. The complexity arises when the government increases the tax on high-brand cigarettes and smokers shift to other low-brand or low-priced cigarettes. This results in an increasing volume of cigarette smoking as low-brand cigarettes can be afforded by a large number of people. This high tax may also give rise to illicit cigarette production and increase demand for unreported cigarettes (Nayab et al., 2018; SPDC, 2018). Non-price regulations on smoking, like bans on cigarette advertisement and promotion and placing health warnings on cigarette packets, are generally applicable to all brands of cigarettes. We therefore believe that non-price regulations on smoking along with cigarette taxes will prove highly significant in reducing cigarette smoking.

In this line, one can see a number of developments in Pakistan's tobacco control policies since the promulgation of Ordinance No. LXXIV of 2002. The ordinance includes restrictions on smoking in public places, restrictions on tobacco companies' marketing, and placing the health warnings on cigarette packets (Nayab et al., 2018). Pakistan became a member of the WHO FCTC in 2004, and since then, the government has issued a number of ordinances and SROs (statutory regulatory orders) to regulate cigarette smoking (Burki et al., 2013). However, tobacco control policies in Pakistan are hardly monitored and

poorly implemented. In Pakistan, we find very little evidence on the effectiveness of non-price regulations in cigarette demand models. Literature gives a varying range of assessments of the influence of increasing prices through taxation on cigarette demand. Extensive demand models for cigarettes have been empirically examined in studies from developed and developing countries as well. Beside the price effect, these models of cigarette demand have introduced government regulations on smoking, like restrictions on cigarette smoking in the workplace and in public places, banning cigarette advertising and promotion, health warnings on cigarette packets, and restrictions on selling cigarettes to minors, all of which could influence demand for cigarettes. In Pakistan, one can find very few research studies that have examined the effect of regulations on cigarette smoking. This study attempts to empirically examine the effects of price as well as non-price cigarette regulations on the demand for cigarettes in Pakistan. More specifically, the study tests the hypothesis that non-priced public restrictions on cigarette smoking are helpful (significant) in limiting cigarette demand. To see a more detailed analysis of cigarette demand, sections of the study are given below.

Section 2 of this study provides relevant literature on cigarette demand analysis. In Section 3, we have presented a brief overview of cigarette production, taxation, and regulations on smoking in Pakistan. Section 4 gives an understanding of the econometric model of cigarette demand. This section explains the ARDL estimator, including a dummy variable for smoking regulation. Section 5 presents empirical estimates of the coefficients of variables included in the cigarette demand model. Suggestions and policy implications are reported in the final section.

3.2 Literature Review

The empirical findings of the studies that have analyzed cigarette demand give inconclusive results. These studies give varying estimates of cigarette price elasticities owing to differences in data series, econometric models, and estimation methods. For instance, (Kenneth E Warner, 1986) obtained a price elasticity of -0.37 by collecting time series data during the period 1947–1978. Similarly, using ridge regression techniques, (Fuji, 1980) conducted an empirical study to find the numerical values of the coefficients of the cigarette demand equation. The empirical findings of the study show a negative price

elasticity of -0.47 and a positive income elasticity of 0.22. A recent study conducted by (Cetin, 2017a) confirms that regulation of cigarette smoking matters in the estimation of cigarette elasticity. The study applies the OLS estimation method to monthly and quarterly data and observes whether taxation and regulations have affected cigarette demand. The empirical findings of the study confirm that pre- and post-taxation and regulatory elasticities are different.

There seems to be a policy dilemma of the kind where additional taxation on cigarettes is desirable. On the one hand, cigarette consumption is generally considered an evil that causes serious diseases like lung cancer, heart disease, brain strokes, and other skin problems. On the contrary, cigarette production and sale are sources of revenue for the national ex-checquer. To address this issue (Mao et al., 2002) examines the impact of cigarette taxation on cigarette demand. The study suggests additional duties on cigarette smoking to attain good health and economic gain. More specifically, simulations of the results show that when cigarette elasticity is -0.54, cigarette consumption would fall by 4.74 billion packets, a tax increase of 40 percent. This increase in taxation would add an additional 24.74 billion yuan to the revenue and would save the lives of 1.44 to 2.16 million people. In addition, as a result of taxation, the addition to the national exchequer would be greater than the total industrial and farmer's income loss. Similarly, (Ross & Al-Sadat, 2007b) confirm that taxation reduces cigarette consumption as well as tobacco-related deaths. In addition, tobacco taxation is also a source of increasing revenue for the government. Applying the error correction method to the time series data collected during 1990–2004, the study finds a tax elasticity of -0.57 and an income elasticity of 0.08. Simulation of the results indicates that cigarette smoking falls by 3.37% when the cigarette tax is increased by 0.40 ringgit (Malaysian currency) on a packet of cigarettes. This increase in cigarette tax would further add 20.8% to the government's revenue.

Aside from the excise tax on cigarettes (prices), many studies have analyzed the role of non-price government regulation, including restrictions on cigarette advertisement and promotion, health warnings on cigarette packages, information campaigns, and clean indoor air restrictions. For example, it has remained a controversial issue whether or not advertising affects tobacco consumption. Government, health-care officials, and tobacco

control advocates suggest that advertisement and tobacco consumption are positively associated, and banning advertisement can reduce tobacco use substantially. On the contrary, the tobacco industry argues that advertising does not encourage cigarette smoking but only increases the relative importance of a particular brand of cigarette in the market. In this line, literature provides rich empirical evidence to highlight the link between cigarette advertisement and cigarette smoking. For example, (Saffer & Chaloupka, 2000), using data on 22 OECD countries during the period 1984–1992, examine the relationship between restrictions on tobacco advertisement and tobacco use. The study concludes that tobacco advertisement and tobacco consumption vary positively. Moreover, the results of the study show that a complete set of restrictions on tobacco advertising can reduce tobacco use substantially. On the contrary, a limited or weak ban on tobacco advertising will have little or no effect at all. The result further indicates that if all OECD countries had used complete restrictions, it would reduce tobacco use by 5.4% and cigarette use by 7.4%, respectively. Similarly, (C. R. Wasserman et al., 1996) estimate a generalized linear model to empirically estimate the demand for cigarettes among adults and teenagers. The results show that adult and teenage price elasticity are almost equal in magnitude. Adult demand indicates an unstable price elasticity ranging from 0.06 in 1970 to -0.23 in 1985. Furthermore, the study shows that public restrictions on smoking have a statistically significant effect on both demand models for adults and teenagers.

Unlike (Saffer & Chaloupka, 2000), (Nelson, 2003) analysis of tobacco demands finds that restrictions on tobacco advertising have no effect on tobacco use. The study identified that prior studies suffered from two problems. First, these studies ignore the fact that restrictions on tobacco advertising and tobacco use are simultaneously determined. That is, countries legislated advertising bans only when tobacco consumption had fallen substantially. Second, the analysis further indicated that in cross-country, almost all countries suffer from auto-correlation problem. Therefore, the study empirically analyzes simultaneous equations and treats restrictions on tobacco advertisement as endogenous variables.

Furthermore, literature also indicates that cigarette demand is more sensitive to price, income, and non-price smoking restrictions (like health warnings, media bans, and

bans on smoking in public places) in developing countries relative to developed countries in the world. One possible explanation for this could be the larger price elasticity of cigarette demand in developing economies. For example, (Van Walbeek, 2005) confirms this statement by arguing that almost all researchers are of the view that cigarette elasticity for developed countries equals -0.4 while it lies in the range of -0.4 to -0.8 for developing economies. Another reason could be that individuals in developing countries have low education levels, which in turn may be the reason for little or no understanding of the negative health consequences of smoking. Empirical studies from advanced economies indicate that only a comprehensive ban on advertising plays a role in reducing cigarette demand. The reason could be that, in the case of a limited ban, the industry may be able to shift advertisements away from the banned media towards those that are yet free from such bans. However, in developing economies both weak and comprehensive ban matters in influencing cigarette demand. For example, (Blecher, 2008) concludes that in developing countries cigarette demand responds to both weak and comprehensive bans. The analysis examined the influence of advertising ban across countries on cigarette demand. A data set comprising 51 countries (21 developed; 30 developing) during the period 1990–2005 was collected. The empirical result for developing countries of the study shows that a comprehensive and weak ban is effective in reducing cigarette consumption. In addition, the comparative results of comprehensive and weak bans indicate that the former have a far greater negative influence (23.5%) than the latter (13.6%).

Unfortunately, developing economies lack effective implementation of tobacco control policies due to economic benefits in the form of tobacco agriculture, manufacture, and tax revenue. However, these economic benefits to farmers and industry are very low compared to the harms caused by tobacco consumption. Keeping in view the rising social and healthcare costs of tobacco consumption, researchers in Pakistan have attempted to empirically estimate the price elasticity of tobacco demand. For example, (Mushtaq et al., 2011) empirically estimate the price elasticity of cigarette demand in Pakistan. Using ARDL estimation techniques with the annual data from 1981 to 2009, the study finds that increasing cigarette taxation and therefore prices are helpful in limiting cigarette smoking. More specifically, the study result shows that cigarette smoking falls by 4.8% in the short

run and 11.7% in the long run, resulting in a 10% increase in cigarette taxes (cigarette prices).

To examine the effectiveness of the health warnings, (M. Ahsan et al., 2015) conducted a cross-sectional study in Pakistan. For this purpose, a self-structured questionnaire was distributed in Karachi from July to October 2014. The result indicates that out of a total of 1500, 1330 (88.7%) did notice health warnings on cigarette packages. Moreover, the study adds that 730 (54.8%) responded positively to the idea that pictorial warnings are more effective in reducing cigarette consumption. Finally, the study suggests that to reduce cigarette consumption significantly, the government of Pakistan should make the graphical warnings more clear and prominent. A similar study conducted by (Rasool et al., 2011) finds that compliance with anti-smoking regulations by the cigarette industry for showing health warnings is 39%, which is very low than desired. Cigarette-selling shops were observed in Abbottabad with the aim of determining total cigarette brand availability and their compliance with anti-smoking regulations. The results show that a total of 18 cigarette brands are available in Abbottabad city. In addition, the study finds that 38.4% of varieties of cigarette brands carry health warnings on cigarette packets. Most cigarette customers are between 20 and 40 years of age and buy cigarette brands that do not carry health warnings. The study suggests to the Ministry of Health (MoH) that they ensure health warnings on cigarette packages so that smokers are aware of the negative health consequences of smoking.

Literature has identified various social and environmental factors responsible for smoking initiation. These factors include peer pressure, domestic and occupational stress relief, nicotine dependency, parental smoking, media influence, easy availability, and affordability of cigarettes. In this line, (Nizami et al., 2011) distributed a questionnaire among 170 participants with the aim of determining factors contributing to smoking initiation and propagation. The study finds occupational stress relief to be mainly responsible for cigarette smoking, followed by peer pressure. More specifically, the analysis concluded that continuation of smoking is due to addiction or nicotine dependency. However, young individuals start smoking mainly due to peer pressure. In the vein (A. Y. Alam et al., 2008), analyzed the impact of demographic, and socioeconomic

factors on tobacco smoking. Using modified questionnaire, the study collected data in the Rawalpindi, a district of Pakistan.

Further, the study finds that although stress or nicotine dependency appears to be a factor in cigarette smoking in middle age, smoking initiation is mainly due to peer pressure at a young age. Another study conducted by (A. Y. Alam et al., 2008) investigates the socio-economic and demographic determinants of tobacco use from 2004 to 2005. A cross-sectional survey based on a self-structured questionnaire was carried out in the Rawalpindi district of Pakistan. Using multi-stage cluster sampling with rural and urban stratification, a total of 1018 respondents (1038 rural and 980 urban) were interviewed face-to-face. The result of the cross-sectional analysis indicates that 16.5% of the respondents (33% male and 4.7% female) regularly use tobacco. The study also finds cigarette smoking to be the most commonly used form of tobacco (68.5%), followed by oral tobacco (13.5%). As regards the demographic factors, the study finds that rural areas, males, and low educational status all have a positive association with tobacco consumption.

Literature gives mixed and inconclusive results concerning the effect of taxes (cigarette price) and regulations on cigarette smoking (non-price public restrictions) on cigarette demand. Few studies have ignored the effect of non-price regulations on smoking; therefore, their estimated price elasticity is greater than unity. Others have only focused on individual cigarette regulations, like a media ban on cigarette advertisements or placing a warning on a packet of cigarettes. In Pakistan, we find very little empirical evidence that has analyzed the role of non-price regulations on cigarette smoking. Therefore, we address this issue in detail. In this line, we attempt to estimate both the effect of price as well as non-price regulations on cigarette consumption. In the next section, we present a mathematical equation showing how an individual optimizes (maximizes utility) from smoking as well as utilizing a basket of other goods, given his income, a brief history of taxation, and regulations on cigarette smoking in Pakistan, and compare these with the estimates of our model.

3.3 Methodological Framework

3.3.1 Theoretical Model (Myopic Model)

The utility function of our representative smokers is given by

$$U = U(Q, X, E) \quad (3.3.1)$$

Subject to constraint $P_1Q + P_2X = M$ where Q indicates number of cigarettes consumed, X stands for baskets of all other market goods, E shows education level, P_1 indicates cigarette prices and P_2 prices of all other goods, M shows nominal money income (Yuanliang & Zongyi, 2005). Assuming that individual's educational level is constant, then the following Lagrange Function is maximized:

$$\max L = U(Q, X, \bar{E}) + \lambda(M - P_1Q - P_2X) \quad (3.3.2)$$

Taking first partial derivatives with respect to Q , X and λ respectively, we obtain

$$U_Q - P_1 = 0 \quad (3.3.3)$$

$$U_X - P_2 = 0 \quad (3.3.4)$$

$$M - P_1Q - P_2X = 0 \quad (3.3.5)$$

Solving equations (3), (4) and (5) respectively, we get optimal quantity of endogenous variables Q and X given as under

$$\begin{aligned} Q^* &= Q^*(P_1P_2EM) \\ X^* &= X^*(P_2P_1EM) \end{aligned} \quad (3.3.6)$$

Substituting optimal quantities Q^* and X^* into the objective function (1), we obtain

$$U^*(P_1P_2EM) = U(Q^*(P_1P_2EM), X^*(P_1P_2EM)) \quad (3.3.7)$$

Equation (7) is the indirect utility function, showing maximum value of the utility that an individual derives from optimal consumption of cigarettes and all other basket of goods. To know how educational level and cigarette consumption are related, consider the dual objective function given as under:

$$Z(Q, E) = U(Q, E) - U^*(E) \quad (3.3.8)$$

Differentiating equation (8) with respect to ' E ' and solving we get,

$$U_E = U_E^* \quad (3.3.9)$$

Since we know that marginal utility of education is again a function of education, therefore in the manner of equation (7), equation (9) can be written as under:

$$U_E^*(E) = U_E(Q^*(E), E) \quad (3.3.10)$$

In view of the relationship between cigarette consumption and educational level, two hypothesis can be formulated. That is,

- 1) The consumer thinks that education reduces the marginal utility of cigarette consumption and thereby increase his/her total utility
- 2) With the increase of education, cigarette consumption will increase

To derive the former hypothesis, we optimize (maximize) equation (8) as under:

$$\begin{aligned} Z_E &= U_E - U_E^* = 0 \\ Z_{EE} &= U_{EE} - U_{EE}^* < 0 \end{aligned}$$

Therefore,

$$U_{EE} < U_{EE}^* \quad (3.3.11)$$

Now by differentiating both sides of equation (10) with respect to 'E' we get,

$$U_{EE}^* = U_{EQ} \frac{\partial Q}{\partial E} + U_{EE}$$

By utilizing equation (11), the above equation can be written as

$$U_{EQ} \frac{\partial Q}{\partial E} > 0 \quad (3.3.12)$$

We know that with the increase of education, marginal utility of cigarette consumption decreases, hence $U_{EQ} < 0$ and therefore for equation (12) to hold $\frac{\partial Q}{\partial E} < 0$. This clearly indicates that with the increase of educational level cigarette consumption will decrease.

To prove the second hypothesis, we minimize the function given by equation (8) as under:

$$\begin{aligned} Z_E &= U_E - U_E^* = 0 \\ Z_{EE} &= U_{EE} - U_{EE}^* > 0 \end{aligned}$$

Therefore,

$$U_{EE} > U_{EE}^*$$

$$U_{EE}^* = U_{EQ} \frac{\partial Q}{\partial E} + U_{EE}$$

$$U_{EQ} \frac{\partial Q}{\partial E} < 0$$

We know that with the increase of education, marginal utility of cigarette consumption decreases, hence $U_{EQ} < 0$ and therefore for equation (12) to hold $\frac{\partial Q^*}{\partial E} > 0$. This clearly indicates educational level increase cigarette consumption. Theoretical model gives inconclusive result about how educational level is associated with the cigarette consumption. In the next section of the study we therefore, empirically analyze the relationship among cigarette prices, regulation on smoking, educational level and cigarette consumption (Yuanliang & Zongyi, 2005).

3.4 Data and Methodology

3.4.1 Econometric Model

The study follows the framework in (Mushtaq et al., 2011) which examines the effects of price and income on cigarette consumption. However, the fore mentioned study seems to have missed important variables which can significantly affect cigarette demand. It might be the reason for the high cigarette price elasticity (greater than unity) obtained in the study. We, therefore also include regulations on smoking as a controlled variable to accurately measure price elasticity and examine whether, in Pakistan, regulations on smoking play additional role in reducing cigarette smoking. Below, equation (3.4.1) shows that cigarette consumption depends on cigarette price, real income and regulations on cigarette smoking.

$$\mathbf{Cigarette\ Consumption = f(Cig.Prices, Income, Education, Regulations)} \quad (3.4.1)$$

We conduct cigarette demand analysis, using aggregate time series data on macroeconomic variables (cigarette consumption, cigarette prices, real income, enrollment in education institutions, and public relations) from 1981 to 2018. In accordance with the economic theory, cigarette consumption was taken as a function of cigarette prices, real income and regulation on smoking. More specifically, we estimate the following cigarette demand model:

$$\ln Q_t = \beta_0 + \beta_1 \ln P_t + \beta_2 \ln Y_t + \beta_3 \ln E_t + \beta_4 \ln \text{Reg} + \varepsilon_t \quad (3.4.2)$$

Where Q_t is the quantity (millions of cigarette sticks) demand and or consumed in time period (year) t , P_t is the average price of 17 centers of a particular brand of cigarette in time period t , Y_t is GDP per capita in time period t , E_t shows enrollment in university education level ‘Reg’ is a dummy variable, taking 1 value for years 2002 to 2018 and 0 (zero) otherwise. In addition, the cigarette demand equation also examine the effects of all other SROs. Finally, ε_t is random disturbance term?

3.4.2 Data

Data related to cigarette production, prices, gross domestic product (GDP), federal excise taxes and regulations on smoking were obtained from domestic and international institutions. More specifically, data on cigarette production, exports and imports were obtained from Pakistan Tobacco Board (PTB). Cigarette consumption was calculated by subtracting net cigarette exports from cigarette production. Cigarette prices data used in the analysis for each year, were the average prices (average prices of 17 centers of one particular brand of cigarette) of a packets of cigarette having 10 cigarettes. Cigarette prices data were received from Economic Survey of Pakistan 20017-18. Real Gross Domestic Product per Capita (Real GDP per Capita) was defined by dividing real GDP on population (15 years or older). World Development Indicator (WDI) gives data for Real GDP per capita. Government of Pakistan issued an ordinance titled ORDINANCE No LXXIV, 2002. This ordinance suggests restriction cigarette smoking in indoor places, job places and public transport vehicles. The ordinance also prohibits advertising and promotion of cigarette, sale to minor, and distribution of cigarettes near educational institutions. Hence,

to examine the effect of regulations on smoking, the study introduces a dummy variable into the regression equation. The binary variable is taking 1 value for the period 2002 and onwards till 2018 and zero otherwise. In the next step of estimation, we include all the relevant SROs that restrict cigarette smoking. Furthermore, the study includes enrollment in primary school and university education as proxy variables for awareness against smoking behavior.

To produce short-run and long-run cigarette elasticities, the study apply Auto-Regressive Distributive Lag (ARDL) co-integration method. This estimation method is used due to its several advantages. First, ARDL method can be applied even though data series have different order of integration. That is, (M. H. Pesaran & Pesaran, 1997) argued that ARDL method can be used even if various series are integrated of order zero I(0) or one I(1). However, if data series are integrated of order I(2) or above, the estimator thus obtained would not be valid (Ouattara, 2004). In addition, in case of simultaneity, ARDL gives valid estimation of the coefficients. This is most relevant as Nelson (2003) points out that regulation on smoking and cigarette smoking are simultaneously determined. That is, governments suggest restriction on cigarette smoking only when reduction in cigarette demand has already been observed. Moreover, (Pesaran & Shin, 1999) notes in case of small sample like ours (38 annual observations), ARDL estimation method produce true as well as consistent parameters compare to Johansen and Juselius's co integration techniques. Therefore, this study uses ARDL estimation method for cigarette demand analysis. The study specifies ARDL equation as under:

$$\Delta \ln Q_t = \alpha_0 + \alpha_1 \ln Q_{t-1} + \alpha_2 \ln P_t + \alpha_3 \ln Y_t + \alpha_4 \ln E_t + \alpha_4 \text{Reg} + \sum_{i=1}^q \lambda_1 \Delta \ln Q_{t-i} + \sum_{i=0}^p \lambda_2 \Delta \ln P_{t-i} + \sum_{i=1}^p \lambda_3 \ln Y_{t-i} + \sum_{i=0}^R \lambda_4 \Delta \ln E_{t-i} + \varepsilon_t \quad (3.4.3)$$

In equation (3.4.3), α_1 and α_2 show long-run association of variables while λ_1, λ_2 captures immediate or short-run impact of variables on cigarette consumption. In addition, the coefficient α_3 indicates the effect of smoking regulation on cigarette demand. For complete analysis of cigarette demand, using ARDL estimation, following steps are required. First, to see whether co-integration exist, the study applies F-test to the above

equation (3). Our null hypothesis is $H_0 : \alpha_1 = \alpha_2 = \alpha_3 = 0$. This shows that there is no co-integration. On the contrary, our alternative hypothesis is $H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq 0$, showing existence of co-integration. The study then compares the estimated F-statistic with the critical values suggested by (Pesaran et al., 2001). If for example, F-statistic $< I(0)$, we accept the null hypothesis of no co-integration. However, if F-statistic $> I(1)$, in this case we are bound to accept the alternative hypothesis, that is, long-run co-integration exist among the variables. And if estimated F-statistic lies between the suggested critical values of $I(0)$ and $I(1)$, our result will be inconclusive. Second, estimate of long run co efficient is obtained by using Akaike Information Criterion (AIC) and Schwarz Criterion (SBC). To verify convergence towards steady state equilibrium, we estimate short term elasticities by estimating Error- Correction Mechanism (ECM) given as under:

$$\Delta \ln Q_t = \beta_0 + \beta_1 \ln P_t + \beta_2 \ln Y_t + \beta_3 \ln E_t + \beta_4 \text{Re } g + \sum_{i=1}^p \gamma_1 \Delta \ln Q_{t-i} + \sum_{i=1}^p \gamma_2 \Delta \ln P_{t-i} + \sum_{i=1}^p \gamma_3 \Delta \ln Y_{t-i} + \sum_{i=1}^p \gamma_4 \ln E_{t-i} + \phi \text{ECM}_{t-1} + \mu_t \quad (3.4.4)$$

In the above equation (3.4.4), the coefficient of lag ECM shows adjustment factor towards long-run equilibrium when disequilibrium or shock occur in the short-run. Finally, to see over all fitness of the model, the study conduct diagnostic tests. For example, for checking serial correlation, the study uses LM test. Similarly, to check heteroscedasticity, we use Bresh-Pagan- Godfrey test. And for stability of the model, we use Cumulative Sum of Recursive Residuals (CUSUM) line. If CUSUM line lies within the boundaries of 5 % significance level, it would indicate that our model is stable.

3.4.3 Descriptive Statistics of the Study

Table 3. 1: Descriptive Statistics

	ln(Cig Con)	ln(Cig Price)	Ln(Real Income)	ln(Primary Education)	ln(Uni Edu)
Mean	10.75	2.40	10.68	16.37	12.27
Median	10.77	2.21	10.66	16.48	11.55
Max	11.23	4.18	11.03	16.95	14.28
Min	10.27	1.17	10.31	15.52	10.66
Std. Dev	0.29	0.86	0.19	0.42	1.33

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Skew	-0.09	0.48	-0.10	-0.58	0.36
Kurt	1.59	2.27	2.19	2.13	1.45
J-Bera	3.20	2.31	1.10	3.33	4.65
Prob	0.20	0.32	0.58	0.19	0.10
Obs	38	38	38	38	38

Table 3.1 above shows the descriptive statistics of the included variables. All variables are log-transformed. Since the coefficients of log transformation are directly interpreted in percentage, it makes the data more easily interpretable. In addition, the log transformed data produce more stable variances of time series (Kang et al., 2017; Li et al., 2019; Salles et al., 2019). Based on the probability value of Jarque-bera, and the associated values of skewness and kurtosis, we reject the null hypothesis that all included variables are not normally distributed.

3.5 Result and Discussion

Since, all the included variables are normally distributed, the study therefore, formally estimated the ARDL equation (3) to calculate cigarette price elasticities with and without regulation on smoking. However, before estimating elasticities, we apply the Augmented Dickey-Fuller (ADF) test, to see whether the data series are stationary or non-stationary. Below, Table 3.2 shows the results of the ADF test, indicating that none of the variables are stationary at level. However, by taking first difference, all series become stationary. Interestingly, none of the series have integration order (2) or above; therefore, we are justified in using the ARDL estimation method.

Table 3. 2: ADF Unit Root Test

At level (Intercept and Trend)			At First Difference (Intercept and trend)	
Variables	T-statistics	P-value	T-statistics	P-value
Cig. Consumption	-1.2085	0.6601	-7.3369	0.0000
Cig. Price	-0.2641	0.9731	-4.9628	0.0003
Real Income	-0.3422	0.9085	-3.6127	0.0104
Primary Education	-1.9423	0.6134	-4.2038	0.012
University Education	-1.5821	0.7808	-4.7928	0.002

We applied the ARDL long-run bound test procedure and obtained numerical values of the long run coefficients and joint F-statistic estimate. Table 3.3 shows the F static value and critical values at 1%, 5%, and 10%, respectively. The F-statistic value (12.97) is well above the suggested critical values of both the lower bound [I (0)] and the upper bound [I (1)] at all significance levels, indicating that long-run co-integration exists.

Table 3. 3: Bound Testing

F- Test		Null Hypothesis: No Long-run relationship		
Test Statistic	Value	Significance.	I(0)	I(1)
F-statistic	12.97197	10%	3.03	4.06
		5%	3.47	4.57
		1%	4.4	5.72

The study examines long-run and short-run relationships (scenario I and II, respectively) among variables in different models. In the first scenario, we examine whether public ordinance 2002 and various SROs have significantly affected cigarette smoking. In the second scenario, we investigate whether our educational institutions convey an anti-smoking message to students. Using this strategy, we examine nine (9) different cigarette demand models under two different scenarios. The study uses dummy variables to examine the effects of non-price regulations (Ordinance and SROs) on cigarette smoking. Below, Tables (3.4) and (3.5) show the long-run and short-run empirical results of five different models under scenario (I).

In the first scenario, the study finds that cigarette prices, across all equations both in the short run and long run, are negatively and significantly associated with cigarette consumption. More specifically, cigarette price elasticities are higher in the long run (ranging from -0.79 to -0.96) than in the short run (ranging from -0.42 to -0.57). The results indicate that cigarette prices (taxes on cigarettes) are an important determinant of cigarette demand and play a significant role in reducing cigarette smoking in the long run. In the same line, real income has negative and statistically significant effects on cigarette demand across all equations (except a few models) of the first scenario. This shows that wealthy individuals avoid risky behaviors like cigarette smoking.

The results of Table 3.5 show that the Public Ordinance 2002 and all SROs have negative and statistically significant effects on cigarette smoking in the short-run. The estimated values of the effects of non-price regulations on cigarette demand vary in magnitude from -21.62 million sticks to -40.09 million sticks. In the long run, only Ordinance 2002 and SRO 2003 (Restriction on Cigarette Advertising) have negative and statistically significant effects on cigarette smoking (as shown in Table 3.4). This clearly indicates that government non-price anti-smoking policies are more effective in the immediate period. For the long-term dynamic effect of non-priced cigarette regulations, the government of Pakistan will have to pursue and monitor their proper implementation.

In the second scenario, the study tests the hypothesis that national educational institutions in Pakistan properly convey anti-smoking education (awareness) among students. The study uses enrollment in primary and university education as proxy variables for awareness about the dangers of smoking. Models (2) and (3) of scenario II regress cigarette consumption on a primary and university educational level along with price and income variables. However, models (4) and (5) further include the Regulation Ordinance 2002 beside the primary and university educational levels. Empirical results of educational level in both primary schools and universities are shown below in Tables (3.6) and (3.7), under scenario II. Throughout the second scenario and across all models, the study finds very interesting and consistent results. The result obtained shows that both primary and university educational levels are significantly associated with cigarette consumption. Although the primary educational level shows a negative effect on cigarette consumption, on the contrary, the university educational level has a positive effect on cigarette smoking. The result obtained indicates that cigarette smoking increases with the increase in enrollment in Pakistani universities. This further highlights the fact that university education in Pakistan does not properly convey an anti-smoking message to students. The reason for the positive outcome could be that students in university are far away from parental affluence (free from home restrictions on smoking). Second, in university, usually peer pressure (friends and classmates) influences an individual towards risky behaviors like cigarette smoking and alcohol use. This finding of a positive association between university educational level and cigarette smoking is consistent with (Wechsler et al., 1998; Yuanliang & Zongyi, 2005).

Table 3. 4: Long Run ARDL Estimates

Scenario-I					
Variable	Model 1	Model 2	Model 3	Model 4	Model 5
InCig. Price	-0.79***	-0.68**	-0.73***	-0.90**	-0.96*
	(0.206)	(0.267)	(0.242)	(0.454)	(0.563)
InReal Income	-1.96*	-3.88***	-3.30***	-2.10*	-1.89
	(1.032)	(0.925)	(0.726)	(1.198)	(1.469)
Regulations					
Ordinance (2002)		-41.38***			
		(12.902)			
SRO (2003)			-27.27*		
			(13.993)		
SRO (2009)				-50.92	
				(38.39)	
SRO (2010)					-91.35
					(66.162)
Bound Test Critical Values I(0) 3.12 and I(1) 4.25 at 5% Level of Significance					
F-Static	10.62	11.10	11.06	7.00	6.79

Standard error (S.E) are in parenthesis ().

***, **, and * represent coefficient significant at 1%, 5%, and 10% respectively.

Table 3. 5: Short Run ARDL Estimates

Scenario-I					
Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Cons	18.82**	37.26***	36.03***	17.46**	14.07*
	(8.343)	(8.423)	(8.231)	(8.255)	(8.521)
$\Delta \ln(\text{Cig. Price})$	-0.47***	-0.49**	-0.57***	-0.47**	-0.42**
	(0.106)	(0.179)	(0.178)	(0.208)	(0.210)
$\Delta \ln(\text{Real Income})$	-1.17	-2.81***	-2.61***	-1.10	-0.87
	(0.723)	(0.753)	(0.714)	(0.719)	(0.737)
Regulations)					

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Ordinance (2002)		-29.89***			
		(8.392)			
SRO (2003)			-21.62**		
			(10.164)		
SRO (2009)				-26.63*	
				(15.63)	
SRO (2010)					-40.09**
					(18.953)
ECM term(-1)	-0.59***	-0.72***	-0.52***	-0.43***	-0.79***
	(0.102)	(0.080)	(0.075)	(0.063)	(0.089)

Standard error (S.E) are in parenthesis ().

***, **, and * represent coefficient significant at 1%, 5%, and 10% respectively.

Table 3. 6: Long Run ARDL Estimates

Scenario-II				
Variable	Model 1	Model 2	Model 3	Model 4
lnCig. Price	-1.08***	-0.76**	-0.49*	-0.98**
	(0.238)	(0.135)	(0.288)	(0.232)
lnReal Income	-0.97	-1.70**	-3.32***	-3.36***
	(1.02)	(0.701)	(0.988)	(0.827)
lnPrimary Education	-1.00**		-1.03*	
	(0.400)		(0.596)	
lnUniversity Education		0.20***		0.22**
		(0.061)		(0.119)
Regulations				
Ordinance (2002)			-44.78***	-31.24***
			(13.632)	(11.619)
Bound Test Critical Values I(0) 2.87 and I(1) 4.00 at 5% Level of Significance				
F-Static	11.39	11.82	10.97	10.85

Standard error (S.E) are in parenthesis ().

***, **, and * represent coefficient significant at 1%, 5%, and 10% respectively.

Table 3. 7: Short Run ARDL Estimates

Scenario-II				
Variables	Model 1	Model 2	Model 3	Model 4
Cons	23.32***	21.65***	41.49***	34.62***
	(7.789)	(7.599)	(8.336)	(8.201)
Δ ln(Cig. Price)	-0.67***	-0.62***	-0.33*	-0.47**
	(0.122)	(0.109)	(0.199)	(0.181)
Δln(Real Income)	-0.61	-1.38**	-2.44***	-2.71***
	(0.692)	(0.697)	(0.776)	(0.724)
Δ ln(Primary Edu)	-0.62**		-0.69*	
	(0.230)		(0.358)	
Δ ln(University Edu)		0.16***		0.22*
		(0.059)		(0.119)
Regulations)				
Ordinance (2002)			-30.22***	-25.19***
			(8.018)	(8.446)
ECM term(-1)	-0.66***	-0.80***	-0.67***	-0.80***
	(0.067)	(0.112)	(0.069)	(0.083)

Standard error (S.E) are in parenthesis ().

***, **, and * represent coefficient significant at 1%, 5%, and 10% respectively

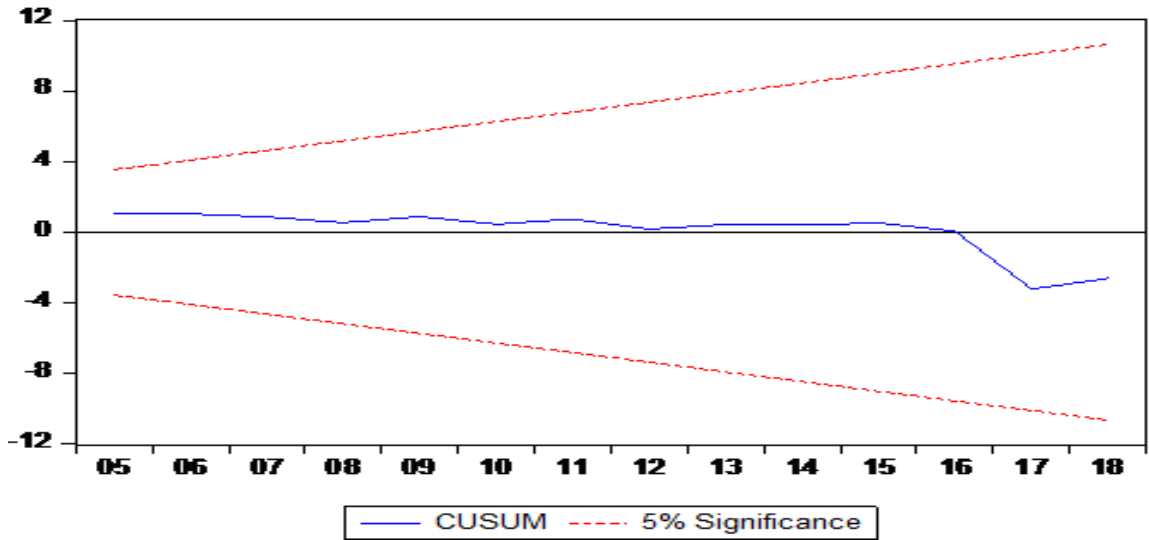
We conduct several diagnostic tests and report the results below in Table 6. More specifically, we conduct LM test to check whether errors are serially correlated. The study also checked whether errors had a normal distribution and constant variance. The statistics obtained indicated that errors have a normal distribution and have no serial correlation. Furthermore, the result indicated no evidence of heteroscedasticity, that is, errors have constant variances.

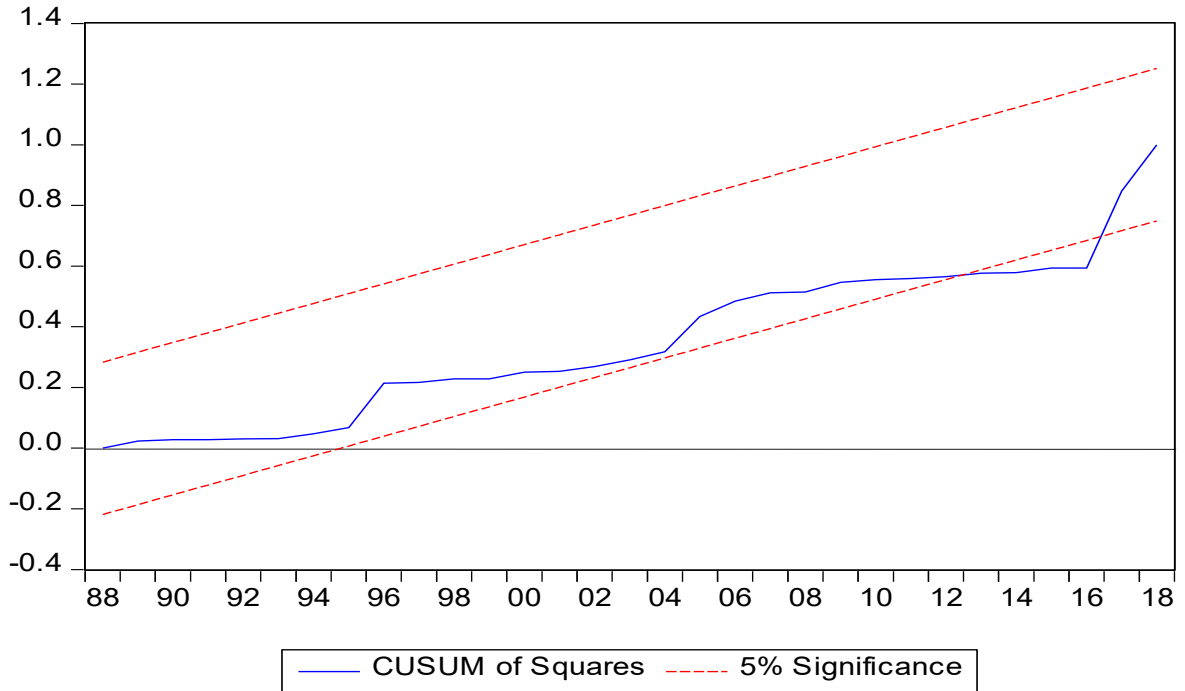
Table 3. 8: Model Diagnostic Tests

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.655597	Prob. F	0.2098
Obs*R-squared	4.041878	Prob. Chi-Square	0.1325
<i>Heteroscedasticity Test: Breusch-Pagan-Godfrey</i>			
F-statistic	1.445588	Prob. F	0.2257
Obs*R-squared	9.570956	Prob. Chi-Square	0.2142

In addition to the diagnostic tests, the study checked whether the model's parameters were stable. To observe this, the study examines Cumulative Sum of Recursive Residuals (CUSUM) lines. The graphs show that the CUSUM and CUSUMSQ lines are inside 5% significance boundaries, indicating that the model's parameters are stable.

Figure 3.1 & 3.2 Plot of Cumulative Sum of Recursive Residuals





3.6 Endogenous Cigarette Prices

Few authors critically examine the demand side analysis of cigarette smoking. For example, (Jackson & Ekelund, 1989; McAuliffe, 1988) argue that both demand and supply-side factors matter in deciding cigarette prices. However, empirical studies (Franke, 1994; Kao & Tremblay, 1988) provide justification for demand side analysis, on the basis of tobacco market concentration and ambiguous supply functions. Although much of the literature exists on the demand-side factors of cigarettes, it is imperative to analyze whether cigarette prices are endogenous in nature. Therefore, the study attempts to re-estimate cigarette demand by using the two-stage least squares method. The empirical results of the estimated demand elasticities are given as follows:

3.11 Cigarette Demand Elasticities (Method: 2SLS)

Variables	Model 1		Model 2		Model 3	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Cig.Price	-0.337225	0.0029	-0.451117	0.0002	-0.455240	0.0003
Real Income	0.757849	0.0000	0.377634	0.0224	0.363643	0.0432
University Enrollment	0.282213	0.0006	0.659705	0.0002	0.673576	0.0005
Regulation 2002	-----	-----	-0.497993	0.0369	-0.513734	0.0430
SROs 2009	-----	-----	-----	-----	-0.034598	0.8404
SROs 2010	-----	-----	-0.307580	0.0192	-0.285115	0.0991

Table 3.11 shows empirical estimates of cigarette demand elasticities, implying a two-stage least squares method across the three models. In each model, taxes on cigarettes have been used as a proxy variable for cigarette prices. More specifically, the results show that cigarette prices have a negative and statistically significant association with cigarette demand. The cigarette price elasticities have similar signs (negative); however, they are less in magnitude when compared to ARDL estimators. Second, unlike ARDL estimators, real income shows a positive influence on cigarette demand. This indicates that by increasing cigarette affordability (increasing income while controlling for cigarette prices), individuals increase demand for cigarette consumption. In addition, enrollment in university education consistently shows a positive and significant influence on cigarette consumption. This indicates the failure of academic institutions to convey anti-smoking warnings to the educated youth of the country. Finally, public regulation and the associated Statutory Regulatory Orders (SROs) show a negative and statistically significant influence on cigarette demand. Although individually non-price public regulation has a smaller influence, combining it with taxation may play a more effective role in discouraging cigarette consumption.

3.7 Rational Behavior (dynamic cigarette demand model)

In the beginning, economists assumed the consumption of addictive substances (cigarette smoking, drug and alcohol use) as irrational behavior and thus did not obey the standard economic “law of demand.” However, recent empirical models assume consumption of addictive substances as rational behavior. The distinguishing feature of the addictive model is that current consumption of addictive substances depends on past consumption and considers the concepts of tolerance and reinforcement. Reinforcement shows that past consumption of cigarettes increases the desire for current smoking. On the other hand, tolerance shows that the utility derived is lower from a greater past smoking. This section of the study follows (Becker & Murphy, 1988) for a theoretical and empirical evaluation of the cigarette demand model, which accounts for the addictive behavior of smoking.

3.7.1 Theoretical Model

Following (Becker & Murphy, 1988), the study derives the cigarette demand model, which accounts for the rational behavior of an individual while consuming an addictive good like cigarette smoking. At any point in time, assuming an individual’s utility depends on health $h(t)$, the relaxation or release of tension $R(t)$ derived from the consumption of an addictive good, and the consumption of a composite good $X(t)$. Assuming concave utility functions in the arguments, the relationship is given as follows:

$$U(t) = u[h(t), R(t), X(t)] \quad (3.7.1)$$

Health responds to two arguments: consumption of market goods $m(t)$ and cumulative stock of past cigarette smoking $A(t)$. That is,

$$h(t) = h[m(t), A(t)], \quad \text{Where} \quad (3.7.2)$$

$$h_m > 0, h_{mm} < 0 \quad \text{And} \quad h_A < 0, h_{AA} < 0$$

The consumption of addictive goods and the addictive stock both influence ‘relaxation’ in the manner given below.

$$R(t) = R[c(t), A(t)], \quad \text{Where} \quad (R)_c > 0, (R)_{cc} < 0, (R)_A < 0, (R)_{AA} < 0, (R)_{cA} > 0 \quad (3.7.3)$$

The composite good $X(t)$ depends on inputs $S(t)$ which uses market goods (including medical care, individual’s own time etc.). The relationship is given below:

$$X(t) = X[S(t)], \text{ where } X_S > 0, X_{SS} < 0 \quad (3.7.4)$$

Using this information, the instantaneous utility function is given by

$$U(t) = u[c(t), A(t), Y(t)], \text{ where} \quad (3.7.5)$$

$Y(t)$ is a vector incorporating inputs $S(t)$ into the market goods $m(t)$ and health $h(t)$. At any moment, the following relationship holds:

$$U_c = u_R R_c > 0 \quad (3.7.6)$$

$$U_A = u_R R_A + U_h h_A < 0 \quad (3.7.7)$$

$$U_Y = u_h h_Y + u_X X_Y > 0 \quad (3.7.8)$$

$$U_{cA} = u_{RR} R_c R_A + u_R R_{cA} > 0 \quad (3.7.9)$$

The above equations 3.7.6 to 3.7.9 describe withdrawal, tolerance, and reinforcement of addictive substances like cigarette smoking. For example, equation 3.7.6 shows withdrawal, that is, utility falls when cigarette smoking is reduced. Equation 3.7.7 describes tolerance, indicating negative marginal utility for increasing stocks of addictive goods. Equation 3.7.8 shows the positive marginal utility of composite goods. Finally, equation 3.7.9 shows reinforcement, that is, past smoking reinforces current smoking.

Assuming an additive utility function and constant preferences, the utility function for lifetime is given below:

$$U = \int_0^{\infty} e^{-\alpha t} U[c(t), A(t), Y(t)] dt, \text{ and} \quad (3.7.10)$$

The budget constraint to maximize the utility function is given by

$$\int_0^{\infty} e^{-\alpha t} [Y(t) + P_c c(t)] dt \leq 0R(0), \text{ where} \quad (3.7.11)$$

‘ P_c ’ is the price of cigarettes, including the money price and the inconveniences associated with buying cigarettes due to public regulation on smoking. Cigarette prices reflect both price (taxation on cigarettes) and non-price (regulations on smoking) public intervention in the market for tobacco. $R(0)$ is today value of individual lifetime assets discounted at a constant market interest rate.

Maximizing the above utility function subject to the given budget constraints, the following first order equations are obtained:

$$U_Y(t) = ue^{-(\sigma-r)t}, \text{ and} \quad (3.7.12)$$

$$U_c(t) = u\pi_c(t), \text{ where} \quad (3.7.13)$$

$$\pi_c(t) = P_c(t)e^{-(\sigma-r)t} - \int_t^\infty e^{-(\sigma+\delta)(\tau-t)} U_A(\tau) d\tau \quad (3.7.14)$$

The $\pi_c(t)$ term shows the full price of addictive consumption, consisting of the discounted money price, the inconveniences associated with buying cigarettes due to public regulations on smoking, and the discounted utility cost of the stock of addictive goods.

3.7.2 Empirical Model

Assuming that an individual's time preference rate equals the market interest rate ($\sigma = r$), the quadratic utility function in Y, C, and A is given by

$$U(t) = b_Y Y(t) + b_c c(t) + b_A A(t) + 1/2 U_{YY} Y(t)^2 + 1/2 U_{cc} c(t)^2 + 1/2 U_{AA} A(t)^2 + U_{YA} Y(t)A(t) + U_{cA} c(t)A(t) + U_{Yc} Y(t)c(t) \quad (3.7.2.1)$$

Maximizing the above utility function with $Y(t)$ and utilizing the first-order conditions for $c(t)$ and $A(t)$, the following cigarette demand function is derived:

$$C_t = \beta_0 + \beta_1 P_{cig}(t) + \beta_2 P_{cig}(t+1) + \beta_3 C(t-1) + \beta_4 C(t+1) + \varepsilon_t \quad (3.7.2.2)$$

The above equation (3.7.2.2) indicates that current smoking is a function of the one-year lag, the one-year lead of smoking, and the current and one-year lead of cigarette prices. To empirically estimate equation (2), the analysis needs smoking in three consecutive periods, however, data on future consumption is not available. Therefore, the study considers current smoking ' C_t ' as smoking in the future $C(t+1)$, and lagged smoking $C(t-1)$ is considered current smoking; ' C_t ' consequently, the resultant cigarette demand is given as follows:

$$C_{t-1} = \beta_0 + \beta_1 P_{cig}(t) + \beta_2 P_{cig}(t-1) + \beta_3 C(t) + \beta_4 C(t-2) + \varepsilon_t \quad (3.7.2.3)$$

The analysis uses current and lagged values of taxes as a proxy for cigarette prices. Further, an endogeneity problem may arise as a result of a possible correlation between lagged ' $C(t-2)$ ' and lead ' C_t ' cigarette smoking. Therefore, the analysis has used the current and second lags of cigarette production as proxy variables. Implying the two-stage least squares method (2SLS), the empirical result of the estimated model is given as follows:

Dynamic Cigarette Demand Model

Variables	Coefficient	Std.Error	t-Statistic	Probability
Future consumption	0.44	0.120	3.673	.0009
Past Consumption	0.56	0.123	4.570	.0001
Future Cig.Prices	0.55	0.239	2.281	.0293
Current Cigarette Prices	-0.58	0.239	-2.411	.0218

The empirical result shows that both past ' $C(t-2)$ ' and future ' C_t ' smoking significantly increase current cigarette smoking $C(t-1)$. The past cigarette consumption is significant even at the 1 percent level, showing that cigarettes are addictive goods. Future consumption significantly increases current cigarette smoking. The result shows that future smoking is significant at the 1 percent level, indicating that addicts do not behave myopically. Although both past and future consumption positively affect cigarette demand, the coefficient on past consumption is larger in magnitude. Further, as expected, current cigarette prices significantly reduce current smoking. However, future prices of cigarettes are positively associated with current smoking. The findings of the study are consistent with economic theory, as high cigarette prices in the future make today's prices relatively cheap, which in turn increases cigarette smoking today. Furthermore, this analysis finds consistent results with studies (Franke, 1994; Iannaccone, 1984; Jackson & Ekelund, 1989; Stigler & Becker, 1977) indicating that addicted smokers consider the interdependence of current, past, and future consumption when making decisions about current smoking. On the other hand, the findings of this study are inconsistent with other studies (Houthakker & Taylor, 1970; Mullahy, 1985; Spinnewyn, 1981) showing that addicted individuals consider the dependence of past consumption only and ignore future consumption effects on current and past consumption.

3.8 Conclusion and Recommendations

3.8.1 Conclusion

3.8.2 Recommendations

From the estimated model of the study, we conclude that, besides cigarette taxation, regulations on smoking play a significant role in reducing cigarette consumption. However, in Pakistan, research concerning the effects of smoking regulation on cigarette demand is lacking. Therefore, this study is an attempt to examine whether non-price regulations on smoking in Pakistan are helpful in reducing cigarette demand over the period 1981–2018. The findings of this study confirm the hypothesis that regulations on smoking are playing a highly significant and quite effective role in limiting cigarette demand. Furthermore, the estimated price elasticities are about 0.5% and 0.7% in the short run and long run, respectively. This result shows that smoking demand in Pakistan is inelastic. Furthermore, enrollment in universities has a positive effect on cigarette demand. That is, cigarette smoking increases with the increase in enrollment in university education. This is alarming and shows that education at the university level does not educate students about the dangers of smoking. Based on the findings of the study, the following policy suggestions are recommended:

First, the empirical findings of this study are evident in the fact that regulations on cigarette smoking have a negative but highly significant impact on the demand for cigarette consumption. Regulations on smoking are a more effective policy, as they are generally applicable to all brands of cigarettes. Therefore, to reduce cigarette consumption, Pakistan will have to introduce stronger, more comprehensive, and better enforced regulations on cigarette smoking.

Second, although current cigarette prices are negatively associated with cigarette consumption, increasing real income is positively associated with cigarette demand, signaling the rising affordability of smoking. Therefore, to further discourage smoking, the study suggests that the government should further increase tobacco taxes to make cigarettes less affordable.

Third, university education is positively associated with cigarette consumption. This means that national educational policies do not convey the message that smoking causes negative health consequences. Therefore, the study recommends that seminars be

arranged at the university level to disseminate information about the negative effects of smoking on health.

Although this study analyzes important determinants that play a significant role in reducing cigarette demand, there are some limitations to this study as well. First, tobacco companies usually manipulate the actual data. For example, the tax on cigarettes is an important determinant of cigarette demand; however, to minimize the influence of cigarette taxation, tobacco companies use the tactics of illicit cigarette production. Unfortunately, this study cannot empirically evaluate the phenomenon of illicit cigarette production due to the non-availability of illicit cigarette production data.

Second, in Pakistan, a large number of cigarette sales are unreported; therefore, the calculated cigarette price elasticity in this study may be overstated. When the price of taxable cigarettes increases, individuals might shift to unreported or non-custom (smuggling cigarette) cigarette consumption. Therefore, it is possible that the estimated price elasticity may not have reflected the actual decline in cigarette consumption. Again, this study is limited by the availability of unreported or illegal cigarette consumption data. However, unlike other studies conducted in Pakistan, this study, aside from cigarette prices, has analyzed the role of non-price regulations on smoking. Since regulations on smoking are generally applicable to all types of cigarettes (reported or unreported), we have therefore made efforts to actually show the decline in cigarette smoking as a result of both cigarette prices and regulations on smoking. Third, the study is limited by analyzing the role of religion in reducing cigarette consumption. Pakistan is a majority Muslim-populated country, and the religion Islam promotes the good health of human beings. Islam forbids every addiction and social bad, like the use of alcohol and cigarette smoking. However, the study is limited by the lack of data to empirically examine the role of religion in cigarette smoking.

In the next chapters, the study empirically evaluates the hypothesis that the demographic characteristics of an individual, environmental and psychological factors, and one's religious affiliation influence the decision of smoking initiation or cessation.

Chapter #04

Predictors of Smoking Initiation: An Empirical Evidence from Pakistan

Abstract

Understanding factors that significantly influence smoking initiation will be a meaningful contribution to designing a public health strategy. Therefore, this study focuses on finding determinants of smoking initiation among university students. Primary data, consisting of 638 respondents, were used to analyze the phenomenon of smoking initiation among randomly selected male students enrolled in the BS program of study in the public sector universities of Pakistan. Using a questionnaire, the study collects information about the demographic characteristics and smoking history of an individual. In addition, the study asks questions about environmental and psychological factors that are closely linked with an individual's smoking decision. To assess the effect of religion on smoking initiation, the study asks several questions related to an individual's religious affiliation. Finally, to know how an individual responds to public laws and regulations, a few questions related to the individual's attitude toward the public anti-smoking campaign are asked. Employing the binary logistic regression method, the study finds that individuals' religious affiliation, smoke-free homes, and public awareness negatively influence the decision of smoking initiation among adult students. However, age, ethnicity, peer pressure, depression or unusual habits, and adverse childhood experiences induce smoking habits among students of public sector universities. Public prevention strategies that involve parents, monitoring children's behaviors, ensuring smoke-free homes, and the inclusion of religious pronouncements against smoking will prove useful in limiting smoking.

Key Words: Smoking initiation, religious pronouncements, anti-smoking messages, adverse childhood experiences, peer smoking pressure

4.1 Introduction

4.1.1 Background of the Study

The World Health Organization (WHO) consistently reports smoking as detrimental to the health conditions of smokers and non-smokers. Smoking is thought to be a chief source of preventable disease and death in the world (WHO, 2013, 2015). Among

substance use, cigarette smoking is most commonly used by adolescents. Adolescence's smoking increases the risk of nicotine dependency as well as the chances of alcohol consumption later in adulthood. Approximately 1.3 billion smokers live in the entire world, and among these, around 80% are from low-and middle-income economies. Moreover, about 5 million deaths occur every year from tobacco consumption, and is expected to reach nearly 10 million in 2025. The World Health Organization (WHO) reports that around 47 percent of men and 12 percent of women smoke cigarettes (Bartecchi, 1995; Guindon & Boisclair, 2003; Martiniuk et al., 2006). In this line, the Pakistan Demographic and Health Survey (PDHS) reported that in the years 2017-18, 22 percent of men and 3 percent of women were regularly smoking. Moreover, (Mukhtiar et al., 2002; Shaikh & Kamal, 2004) reported that among students enrolled in Pakistan's universities, the prevalence of cigarette smoking is about 15 percent, with the majority being male students. Furthermore, in Pakistan, around 86 billion cigarette sticks (both registered and illicit) are consumed every year (Chatha, 2018; Hameed & Malik, 2021). Empirical evidence shows that smoking prevalence among adults in Pakistan is not only high but increasing (Ahsan et al., 2015; Alam, 1998; Burki et al., 2013; Hameed & Malik, 2021b; Khan & Shah, 2020; Nasir & Rehan, 2001; Saqib et al., 2018a; WHO, 2019c). Therefore, noticing factors that entice adults toward smoking is indispensable.

Prior studies have highlighted elements that are significantly associated with smoking initiation. For instance, (Darling & Reeder, 2003; Healey et al., 2015) report that secondhand smoking exposure increases the chances of a youth's smoking initiation. Similarly, parents' anti-smoking behavior is negatively related to children's initiation of smoking (Kim & Chun, 2016; Kong et al., 2012). However, (Anda et al., 2015) argue that negative childhood experiences at home increase the odds of an adolescent's smoking initiation. Moreover, (Pierce et al., 2012; Pinilla & Abásolo, 2017) identify that public intervention in the tobacco market plays a significantly negative role in reducing youth smoking behavior. In Pakistan, despite public regulation on smoking, (Barolia et al., 2022; Saqib et al., 2018c), 48.3% of individuals are exposed to second hand smoking (SHS) at home, while 69.1% are at work.

Although, we find vast literature on the prevalence and determinants of smoking initiation in both developed and developing countries around the world, however, due to cultural and geographical differences, empirical evidence from foreign countries cannot be used effectively in designing policies to intervene in the market for tobacco in Pakistan. In Pakistan, we find very little research that has analyzed the impact of social and environmental factors on the smoking behavior of individuals. Past studies conducted, in Pakistan, have focused mainly on the estimation of cigarette price elasticity. These studies are limited in exploring predictors that are associated with an individual's decision to initiate smoking. We therefore, conducted a cross-sectional analysis to differentiate smokers and non-smokers behaviors of adults enrolled in public sector universities in Pakistan. For this purpose, the study hypothesizes that individuals who have experienced more adverse childhood; who are depressed; who have no smoking policy at home; and individuals whose best friends are smokers, are more likely to initiate smoking? On the other hand, individuals who have more religious affiliation; and those who acknowledge public preventive measures, are less likely to start cigarette smoking.

To empirically evaluate these hypotheses, the study is organized as follows: Below, Section 2 presents literature that is relevant to this study. The methodology of the study is discussed in Section 3. Section 4 presents regression results and discusses both statistical and economic relationships among dependent and independent variables of the model. Finally, Section 5 concludes and makes comparisons with relevant literature. This section also gives recommendations and suggestions for policy purposes.

4.2 Literature Review

Studies have identified that social support from family members promotes healthy behavior among adolescents. Moreover, parental support acts as a protective shield and lowers the chance for children to engage in risky behaviors like smoking. For example, it is generally believed that children are less likely to initiate smoking when parents are closely attached to them (Chassin et al., 1986; Wills et al., 1992; Wills & Cleary, 1996). On the contrary, the smoking behavior of peers and older siblings has been considered a prime factor in the initial experimentation with cigarette smoking. Research findings show that young individuals with smoker friends, are more likely to initiate cigarette smoking

than those who have no smoker friends (Defoe et al., 2016; Kobus, 2003; Simons-Morton, 2002; Vitória et al., 2020; Wills & Cleary, 1996). In this regard, secondhand smoking exposure (SHS) is also thought to be an important determinant of cigarette smoking experimentation (Andreeva et al., 2007; Becklake et al., 2005; Glover et al., 2011; Homish et al., 2012). Prior studies have identified that peer and parental smoking behavior play a positive role in the smoking initiation of adolescents (Tyas & Pederson, 1998).

Although parental support promotes healthy behavior among children, on the contrary, adolescents' adverse childhood experiences (ACEs) mostly result in substance use like cigarette smoking, drug and alcohol use in the adulthood (Afifi et al., 2017; Brown & Shillington, 2017; Crouch et al., 2019; Dube et al., 2006; Forster et al., 2018). ACEs refer to child maltreatment in the form of physical, emotional, and sexual abuse, parental divorce or separation, violent treatment with a wife in the presence of children, living with drug addiction, or the presence of a lunatic, insane, and mentally ill person at home (Arruda & Arruda, 2014; Dube et al., 2003). In this line, (Anda et al., 2015) report that adolescents with adverse childhood experiences are more likely to initiate cigarette smoking compared to those who do not have such adverse experiences. Similarly, (Afifi et al., 2020) added that all individuals with ACEs (physical, emotional, or sexual abuse, etc.) increase the odds of smoking initiation. The study further adds that the cumulative effect of ACEs and peer victimization significantly increases the odds of initiating smoking (Nichols, 2004; Huang et al., 2016; Jiang et al., 2016; Moore et al., 2017; Niemelä et al., 2011; Tracie et al., 2020; Vieno et al., 2011). Adding to the above, cigarette smoking has been reported to be related with stress, and personality measures like hostility, emotions, etc. For example (Loon et al., 2005) finds current cigarette smokers as more hostile, emotionally unstable and depressed in life. In addition, literature shows religious activities may also affect cigarette smoking behaviors. That is, evidence indicates that individuals who attend and/or offer more religious services are less likely to engage in risky behavior like cigarette smoking (Byron et al., 2015a; Garrusi & Nakhaee, 2012; Koenig et al., 1998a; Sharma et al., 2011). The Quran (the primary source of Muslim law) says: "Do not, with your own hands, cast yourself to destruction; and do not be wasteful: they ask you what has been allowed for them. Say; all things pure and good have been allowed for you. On account of financial burden, it has been reported of the Prophet Muhammad (SAW) that He prohibited the

squandering of money.” In light of these mentioned verses from the Quran and Hadith, many religious leaders label cigarette smoking either “Haram” (prohibited) or “Makrhu” (reprehensible). In 1995, the Malaysian government issued a “Fatwa,” which declares smoking as haram (Byron et al., 2015a; Garrusi & Nakhaee, 2012; J. et al., 2003; L. Li et al., 2010; Manuscript & Muslims, 2010; Muha, 2016; Region & Islam, 2002; Sciences et al., 2019; Whooley et al., 2002). Similarly, according to the Council of Islamic Ideology of Pakistan, smoking is un-Islamic and forbidden on account of the health risks that it imposes on individual smokers and society as a whole (Dawn, 2000). However, despite these religious rulings against smoking, many Muslims are still smoking. Therefore, this study makes an attempt to model the effect of an individual’s religious affiliation on the decision of smoking initiation.

Finally, literature has identified that the public’s circulation of information about the health hazards of smoking significantly discourages smoking initiation (A. Ahsan et al., 2020; Andreeva et al., 2007; Byron et al., 2015a; Colombo & Galmarini, 2022; Lim et al., 2015; Luke et al., 2011; Memon et al., 2022; PDHS, 2017; Pierce, White, Emery, et al., 2012; Titus et al., 2021; WHO, 2019a; Zaheer et al., 2021). For example, (Andreeva et al., 2007) examine the influence of a ban on smoking at home and school, cigarette advertisements and information on youth’s smoking initiation. The analysis finds women receiving promotional information about tobacco, either from magazines or outdoor advertisements are more likely initiate cigarette smoking. In the same line of reasoning, (Ross & Chaloupka, 2003) find no significant public policy effects on the age of smoking initiation. However, the analysis concludes that the significant influence of time and trend might show long term public policy effects. In addition, evidence shows that comprehensive public restriction on cigarette advertisement discourages smoking behavior. For example, (Catalano & Gilleskie, 2021) finds complete ban reduces smoking prevalence, but has no significant influence on smoking intensity. Governments and organizations spend millions of dollars to discourage smoking initiation and encourage quitting. In this line, (Farrelly et al., 2009) examine the influence of public anti-smoking policy on youth smoking initiation. The analysis reveals that public prevention campaigns significantly reduces the risk of youth’s experimenting with cigarettes.

4.3 Data and Methodology

4.3.1 Data and Sampling Technique

This study involves the economic analysis of smoking behavior through cross sectional data (638 observations) collected across the public sector universities of Pakistan, during the academic year 2022. The study uses a two-stage stratified design, for the collection of primary data. In the first stage, three public sector universities were randomly selected from each province, including the capital city of Pakistan, Islamabad. In the second stage, 30 percent of departments were selected based on the total number of departments in any particular university. A questionnaire was distributed among male students present at the time of the survey. Females are more likely to hide their smoking history, as female-smoking is not socially acceptable in the traditional society of Pakistan. Therefore, to avoid any bias in the data, the study excludes females and focuses on male students for the analysis of smoking behavior.

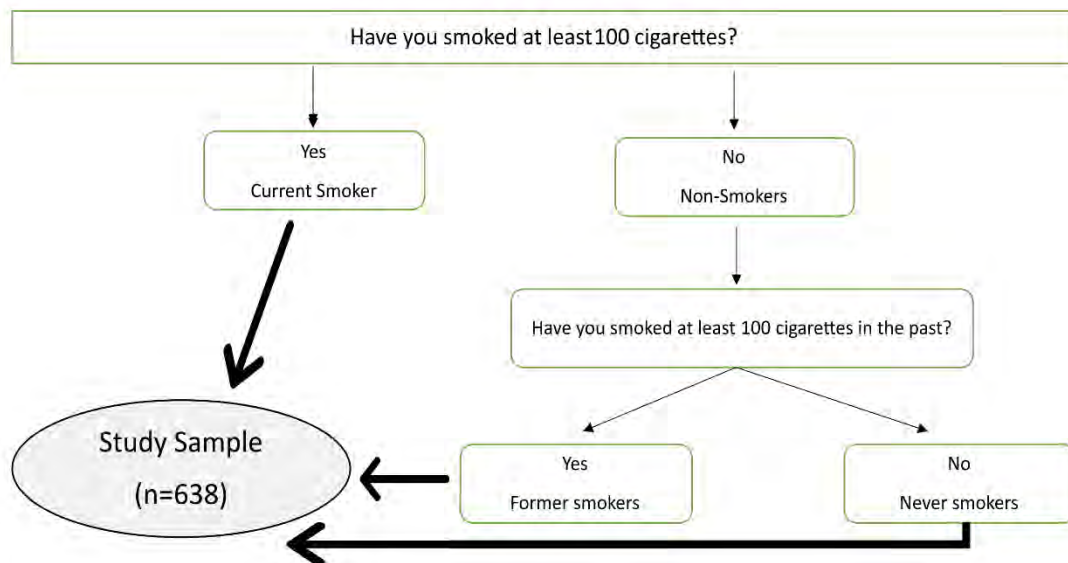
A modified questionnaire, retrieved from literature and standard surveys including the Global Youth Tobacco Survey (GYTS) and WHO-Global Adult Tobacco Survey (GATS), was used for collecting information on the selected variables of the model. Data were collected on variables including demographic, socioeconomic status, smoking history of an individual, and other social and environmental variables that could possibly affect smoking behavior. In addition, information was collected on adverse childhood experiences, depression, or stressful incidents that occurred in an individual's life. Moreover, individuals' perception of smoking regulation and their personal affiliation with religion were assessed by asking standard questions. The overall response rate for the sample was 91.14%. The study employs the binary logistic regression method for the estimation of the association between dependent and independent variables. The dependent variable, 'smoking initiation' was dichotomized to distinguish the behavior of smokers and never smokers. Independent variables which have been identified in prior research as most relevant to the phenomenon of smoking behavior, were included in the analysis. The characteristics of items have been shown as numbers and percentages. Moreover, the analysis uses a chi-square test statistic to differentiate and analyze the behavior of smokers and never smokers. Finally, statistical significance of the smoking analysis was assessed

by analysis of variance with a less than 5 percent probability level. The study uses SPSS version 25.0 for the analysis of smoking behavior.

4.3.2 Outcome Measure

The outcome measured (a dependent variable) in this study is smoking initiation of respondents. More specifically, the study dichotomizes the cigarette smoking status of respondents as smokers and never-smokers. To accomplish this task, participants were asked, “Have you smoked at least 100 cigarettes in your entire life?” Respondents who replied “yes” were defined as ‘current smokers’ while those who replied “no” were called non-smokers. Current non-smokers were further investigated by asking, “Have you smoked cigarettes in the past?” Respondents who confirmed that they have smoked in the past were called ‘former smokers’, and others who denied smoking 100 cigarettes in life were called ‘never smokers’. Hence, current and former smokers were categorized as those who have initiated or experimented with cigarette smoking. In addition, the respondent was asked, what was your age when you first smoked a whole cigarette? In addition to age, other demographic variables like race or ethnicity, residence, parental income, and education are examined in the study. Parental education and monthly income are used as proxy variables to measure socioeconomic status (SES) of the respondent.

Figure 4.1 the sample screened process



4.3.3 Core Independent Variables

4.3.3.1 Adverse Childhood Experiences:

The study examines childhood physical maltreatment by asking respondents, “During your childhood, did your parent, uncle, or any other family member have ever pushed, slapped, hit you, or thrown something at you? Similarly, emotional abuse was measured by inquiring that, “During your childhood, did anyone from your family, including your parents, call you stupid, lazy, or ugly. Furthermore, verbal abuse was measured by asking respondents, “During your childhood, did anyone in your family insult you, scream at you, and threaten to hit or slap you. The Conflict Tactics Scale (CTC) measures physical, verbal, and emotional abuse using the response categories of never, once or twice, sometimes, often and/or very often (Straus, 2013, 2017; Straus et al., 1996).

In the same line of reasoning, peer victimization in childhood is reported to result mostly in substance use, later in adulthood (H B Nichols, 2004; Sci, 2022; Tracie et al., 2020; Vieno, Alessio, Gianluca Gini, 2011). To measure peer victimization, respondents were asked, “During your study, how often have your friends, classmates or any other persons not related to you, physically hit you, pushed you, or thrown something at you?” Similarly, peer emotional abuse was measured by asking participants, “During your childhood, how often have your friends, classmates made fun of you, insulted you by calling with bad names, threaten or blackmailed you directly through texting or by posting something against you on social media, made fun of your body shape, skin color, your clothes, your physical appearance, your family background, and or said something bad about your race or ethnicity. Finally, the study asks respondents, “Overall, what is your opinion, have you been physically or emotionally offended during childhood, either at home or in school? All these items related to childhood adverse experiences were measured using a five point’s response category that varies from never to very often.

4.3.3.2 Social and Environmental Factors

To introduce the effects of ‘environmental variable’ on the smoking initiation of adults, the study investigates smoking restriction at home, parental and peer smoking status. That is, the study examines whether parent and peer smoking behaviors are significantly associated with adult initiation of cigarette smoking. For this purpose, the

study asks the respondent, “Is smoking allowed inside your home? And did your father, uncle, or any other adult living in your home, smoke cigarettes? To measure the self-efficacy (strength of self-control) of the respondents, the study investigated, “Do you think that smoke from other people’s cigarette smoking is harmful to you? How many of your close friends smoke cigarettes: Do any of your close friends or classmates smoke cigarettes: And if one of your best friends offered you a cigarette, would you smoke it?”

4.3.3.3 Religious involvement and cigarette smoking among young adults

To model the role of religion in the prevention of smoking initiation among adults, the study asks respondents, “What is your religion? Does your religion discourage cigarette smoking?” To see whether individuals have knowledge of the Fatwa (Islamic ruling) about smoking and their perceived behaviors towards the ruling, the study asks participants, “Do you have knowledge that the Council of Islamic Ideology (CCI) labels smoking un-Islamic and haram: and whether they support the Fatwa?” Furthermore, to test the hypothesis that religious persons avoid unhealthy and wasteful behavior such as smoking, the study asks participants, “How many times do you offer prayers in a day: and how often do you attend religious meetings or services such as listening to a religious leader: visiting religious ceremonies: and frequency of watching or listening to a religious program on television or radio? All these items were measured on a four point scale, ranging from never to daily a week. In addition, to measure the perceptions of respondents about the effect of religion on cigarette smoking behavior, the study asks, “Does religion (Islam) affects one’s decision to smoke or not? People who indulge in religious practices have less tendency towards smoking; smoking shows an act of rebelliousness and disobedience towards Islam; faith is beneficial for health as it helps people to avoid risky and unhealthy behavior; religion should play a role in prohibiting smoking as it is detrimental to health: All these were measured using a five-point scale ranging from strongly disagree to strongly agree.

4.3.3.4 Depression or Unusual Habits

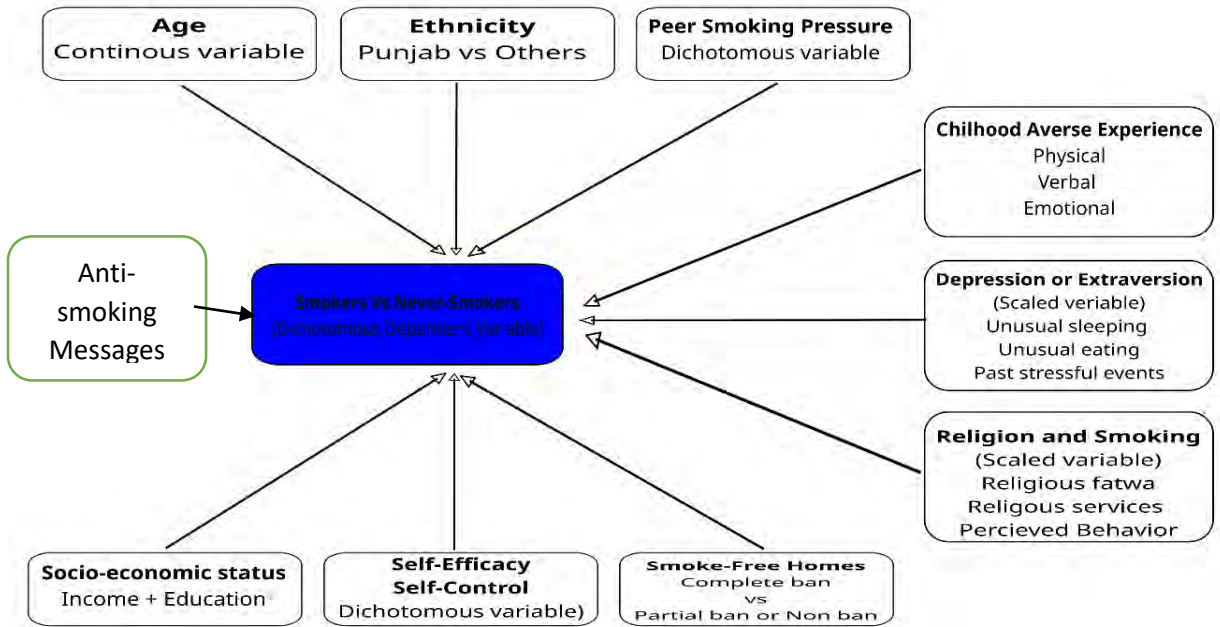
Furthermore, a composite variable, “Depressive Symptoms,” was constructed using a modified 5-item scale to analyze the level of distress among students. Students were asked, How often, were you sad, unhappy, or in a bad mood; felt hopeless about the future; got angry while recalling past incidents; felt like not eating or eating more than usual; and

slept less than usual hours of sleep? Each question has five response options: never, seldom, sometimes, often and very often. Coding 1, 2, 3, 4, and 5 were assigned according to their relationship with the dependent variable. A total score ranging from 5 to 25 was then averaged and regressed on smoking initiation. The internal consistency of the modified scale was 0.72, as measured by Cronbach's alpha statistic.

4.3.3.5 Public Messages and Promotional Advertisements

In this line, the analysis attempts to evaluate the effectiveness of public prevention. Campaign on youth's initiation of smoking. To this end, the study asks respondents, "During the last 30 days, have you seen anti-smoking messages highlighting the dangers of smoking on print or electronic media? During your study, were you taught in any of your classes about the dangers of cigarette smoking? Have you seen a "No Smoking" sign board in your school, college, or university? When you watch TV or use social media, how often do you see actors smoking cigarettes? When you are using the Internet, social media, or watching TV, how often do you see ads for tobacco products? Each item was measured using five different options ranging from 'Never' to 'Always'. Codes 1, 2, 3, 4 and 5 were assigned according to the relationship of each item with smoking initiation. Codes for promotional items were reversed purposely to convey an anti-smoking message.

Figure 4. 1: Association between Dependent and Independent Variables



4.4 Result and Discussion

Table 4.1 shows the main findings of the binary logistic regression analysis. The result indicates that age (a continuous variable) is positively and significantly associated with smoking initiation at the 0.001 probability level of significance. As we move up in age by 1 unit (year), the odds of smoking initiation increase by 1.13 times. Alternatively, older individuals are 13% more likely to initiate smoking. This indicates that older individuals are at higher risk of smoking initiation compared to younger individuals. Consistent results have been found in prior research (Fagbamigbe et al., 2020; Heris et al., 2020; Id et al., 2021; Parthasarathi et al., 2021; Sciences et al., 2019). However, (Loughlin et al., 2009) find that age reduces the risk of smoking initiation. Similarly, the probability of smoking initiation is 93 % higher for those individuals who reside in the province of Punjab compared to those living in other provinces of Pakistan. Past studies have found consistent results, concluding that smoking behavior varies across racial and ethnic groups. For instance, (Lawrence et al., 2014) finds whites smoke more heavily than blacks and Hispanics; however, later in adulthood, blacks and Hispanics converge with whites in their smoking behavior. Similarly, other studies (Phan et al., 2022; Thomson et al., 2022; Titus et al., 2022; Tuthill, 2022; Woo, 2022) find that race and ethnicity significantly matter in

smoking prevalence. Past evidence from Pakistan has also found consistent findings. For example, (Nasir & Rehan, 2001) find that highest smoking prevalence in the province of Sindh, followed by Khyber Pakhtunkhwa. Moreover, smoking initiation was found to be unrelated to household monthly income and residential area (Gilani & Leon, 2013).

Prior research indicates that peers and parents both influence adolescents' smoking behavior (Cheng Wang, 2021; Eisenberg & Forster, 2003; W. Kang, 2022; Powell et al., 2005; Vitória, Pereira, Muinos, Vries, & Luísa, 2020). That is, an individual who has more smoking friends is expected to take the risk of smoking initiation. Consistent with prior studies, this study finds individuals who spend time with smoking peers are 4.053 times as likely to initiate smoking as individuals who do not have smoking friends. Alternatively, the finding indicates the chance of smoking initiation is low for individuals who avoid the company of smokers. Other studies have shown that peer smoking status is associated with smoking initiation among teenagers (Alexander et al., 2001; Joo et al., 2020b; Kobus, 2003; Simons-Morton, 2002; Vitória, Pereira, Muinos, Vries, & Lima, 2020). In addition, the result shows that the probability of smoking is low for individuals where smoking is completely banned at home. That is, individuals whose family members are not smoking and where smoking is not allowed even in one's personal room, are 37% less likely to start cigarette smoking compared to those where no such smoke-free home policy exists. Consistent with our result (Farkas et al., 2000a), finds that smoke-free homes discourage smoking among teenagers.

Moreover, the study examines the significance of a scaled variable 'depression' on the likelihood of smoking initiation. Depression, is a composite variable that comprises unusual habits of sleeping, eating, and other things in life. The result finds individuals with unusual sleeping, eating habits, as well as those having stressful events in their lives, are 1.41 times more likely to start smoking compared to those who have a normal routine in their lives. Similarly, the study has constructed a composite variable 'adverse childhood experiences' consisting of several items related to adverse events that happened in one's childhood. The result shows individuals who had experienced more adverse childhood have a 74% higher probability of initiating smoking compared to those who had led a stable and balanced childhood. That is, individuals who experienced physical and

emotional abuse in their childhood are highly expected to be smokers at adulthood. In line with our findings, (Anda et al., 2015) find that depression symptoms are more common among smokers, and conclude that smoking onset is associated with adverse experiences during childhood. In addition, other studies (Dube et al., 2003, 2006) find that ACEs are strongly associated with mental health problems and thereby subsequent use of drugs and alcohol.

Furthermore, empirical evidence shows that public regulation on smoking in the form of restricting cigarette advertisements and promotions plays a vibrant role in discouraging smoking (Cetin, 2017b; Hameed & Malik, 2021a; A. U. Khan & Shah, 2020; Lim et al., 2015; Luke et al., 2011; Pierce, White, Emery, et al., 2012; Saqib et al., 2018b; J. Wasserman et al., 1991). Therefore, this study constructs a scaled variable ‘Anti-Smoking message’ consisting of several items related to public awareness against smoking behavior. The result finds that with increasing public awareness, the chances of adult smoking initiation decrease by 34 percent compared to the situation where such public awareness programs are missing. Finally, the study examines the hypothesis that individuals’ attachment to religious activities significantly affects their smoking behavior. To empirically evaluate this hypothesis, the study constructed a composite variable, “Religion’s influence,” consisting of items related to daily prayers, listening to religious programs, and individuals’ knowledge and perceptions about religious decrees against smoking. The result finds that religion plays a highly significant role (at the 0.001 % significance level) in discouraging smoking initiation. More specifically, individuals who have knowledge of and a firm belief in religious rulings, are 57% less likely to be smokers than individuals who have no such belief in religion. A consistent result has been found by (Muha, 2016), indicating that Islamic beliefs and teachings have a positive influence on the non-smoking behavior of individuals. Moreover, (Whooley et al., 2002) conclude that young adults who practice more religious services are less likely to initiate cigarette smoking. However, (Byron et al., 2015b) find that religious pronouncements have a small effect on the decision to maintain non-smoking status.

Table 4.1: Multivariate analysis of smoking behavior (Main findings)

Variables	B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Age	0.121	0.026	20.877	1	0	1.128	1.071	1.188
Ethnicity	0.65	0.227	8.416	1	0.004	1.932	1.238	3.016
Peer Pressure	1.39	0.408	11.777	1	0.001	4.053	1.822	9.014
Restriction on smoking at home	0.45	0.208	4.875	1	0.027	0.632	0.421	0.95
Depression or Extraversion	0.344	0.157	4.785	1	0.029	1.411	1.036	1.92
Adverse Childhood Experience	0.554	0.145	14.573	1	0	1.74	1.309	2.312
Anti-smoking public messages	-0.41	0.145	8.341	1	0.004	0.658	0.496	0.874
Religion influence	-0.83	0.211	15.702	1	0	0.434	0.287	0.656
Constant	-4.18	1.103	14.406	1	0	0.015		

4.4 Conclusion and Policy Suggestions

4.4.1 Conclusion

This study attempts to explore determinants of smoking by differentiating smokers and non-smokers' behaviors. The study collects behavioral information through a questionnaire from 638 randomly selected students enrolled in public sector universities in Pakistan. The outcome variable measured is a dichotomous smoking status, that is, smoker versus never smoker. Employing the binary logistic regression method, the analysis assesses the influence of demographic, social, and environmental factors on the smoking behavior of individuals. Moreover, the analysis also examines whether individuals offering more religious services avoid unhealthy behaviors like smoking. In addition, the study hypothesized the influence of an individual's perceived behavior through religious information on smoking initiation decisions. Finally, the study examines

whether public regulation in the form of anti-smoking messages negatively influences individuals' behavior about smoking initiation. The result reveals that age and ethnicity positively and significantly influence smoking initiation. That is, individuals who belong to the province of Punjab as well as those of older age are more likely to initiate smoking. Moreover, the study finds that adverse childhood experiences in the form of physical, emotional, and verbal abuse significantly influence the smoking behavior of an individual. In addition, individuals who live in smoke-free homes, avoid spending time with smoker peers, and whose parents are not smokers have a lower probability of initiating smoking. Religious services and pronouncements against smoking negatively influence individuals' smoking behavior. Public anti-smoking messages in the form of restricting cigarette advertisements and promotions are helpful in limiting smoking initiation.

The major strength of this study is that it randomly collects information from students enrolled in public sector universities across Pakistan. The analysis is unique in that it covers many possible determinants of smoking, including socio-demographic, religious influence, and public regulation of smoking. However, excluding groups of individuals like military personnel, truck drivers, and medical doctors from the analysis indicates a limitation of the study. Moreover, women smoking is socially not accepted in the traditional male-dominant society of Pakistan. It is possible that women may not report their smoking behavior. Hence, the study has only focused on male students enrolled in the BS study program. In addition, the analysis focuses only on cigarette smoking behavior and lacks information about other tobacco products like smokeless tobacco, paan, and shisha. Therefore, the study suggests that future research should focus on all possible respondents, including women and other special groups of individuals like medical doctors and military personnel who are thought to be heavy smokers. The analysis has important implication for smoking prevention program.

4.4.2 Policy Suggestions

The analysis has important implications for the smoking prevention program. The findings suggest that religious pronouncements against smoking, parent role in monitoring children's behavior, and smoke-free homes are vital elements that add to public policy in discouraging smoking initiation.

Chapter #05

Predictors of Quitting Smoking Behavior: Evidence from Pakistan

Abstract

This study attempts to identify factors that significantly encourage the cessation of smoking in the context of Pakistan. The study distributes a modified questionnaire among 421 respondents (current as well as former smokers) in the capital city of Pakistan, Islamabad. The Binary regression method was employed to data analyze the predictors of quit attempts and successful smoking cessation. The results indicate that respondents with strong intentions to quit, high socioeconomic status, low nicotine dependency, past quit attempts, and no-smoking friends are more likely to quit cigarette smoking successfully. On the other hand, factors like social pressure to quit smoking, religious information against smoking, the intention to quit smoking, and public regulation on smoking are more likely to encourage smokers to make quit attempts. The study calls for community-and school-wide smoking cessation campaigns involving officials, peers, parents, religious leaders, and other influential individuals to inform people about the dangers of smoking. In addition, religious leaders should be encouraged to issue rulings against smoking, especially during “Friday Prayer.” Furthermore, the government should pronounce more strict and comprehensive regulations on smoking by properly monitoring its implementation to encourage the cessation of cigarette smoking.

Keywords: smoking cessation, smoking relapse, smoking behavior, regulation on smoking, quit attempt

5.1 Introduction

5.1.1 Background of the Study

Smoking causes chronic diseases like lung cancer, breathlessness, cardiovascular problems and skin diseases (A. U. Khan & Shah, 2020; Koczkodaj et al., 2022; WHO, 2020b). Therefore, world countries need to prioritize the cessation of smoking in drafting health policies. To encourage quitting, factors that are thought to be closely associated with smoking behavior must be identified. Literature identifies that demographic factors

(age, gender, and marital status) and socioeconomic factors (income and education) are closely associated with smoking behavior. For instance, (Derby et al., 1994) found that men of old age and women living with non-smoking partners are more likely to quit smoking successfully. In the same line, (Hymowitz et al., 1997) concluded that male gender, old age, and high income are predictors of successful quitting. Similarly, those with a high educational degree and those who belong to the age groups of 17 to 24 and 65 years or older are more successful in quitting smoking (Haziandreu et al., 1990). (Monsó et al., 2001) add that age, gender, and housing conditions significantly play a great role in smoking cessation. In addition, income and education are also thought to be associated with smoking behavior. For example, (Adler et al., 2023; Gilman et al., 2008; Reid et al., 2010) find smokers with low socioeconomic status (SES) are making fewer quit attempts and are less likely to be successful quitters. Moreover, (De Walque, 2004; Gilman et al., 2008) conclude that high education increases the chances of cessation, while (Agrawal et al., 2008; Barbeau et al., 2004) find that high income induces individuals to quit smoking. In addition, (Madureira et al., 2020) find that individuals with lower educational degrees are less likely to quit smoking successfully. However, (A Hyland, Borland, Li, Yong, McNeill, et al., 2006) find that education predicts smoking cessation, while past quit attempts are significantly associated with smoking relapse. On the contrary, (L. Hu et al., 2020; Vangeli et al., 2011) conclude that age, gender, and educational degree do not predict quit attempts or smoking cessation. . A few other studies show mixed results. For example, studies like (Fagan et al., 2007; Hymowitz et al., 1997) indicate that income but not education is significantly associated with smoking cessation. On the contrary, (Lillard et al., 2007) argue that only education matters in a quit decision.

Literature identifies social and environmental conditions that significantly influence smoking behavior (Homish et al., 2012; Kalkhoran et al., 2013; Kashigar et al., 2013; Manzoli et al., 2005; Okoli & Khara, 2014; Wang et al., 2012). For instance, (Farrelly et al., 1999; M., 2005) are of the view that a smoke-free home policy is associated with making quit attempts, however, (Gilpin et al., 1999; Shiffman et al., 2008) conclude that it is associated with successful cessation. A few other studies (Adler et al., 2023; Bar-Zeev et al., 2021; Cardozo et al., 2019; Lee et al., 2022; Liu et al., 2021; Mingyu et al., 2022; Mullahy, 1985; Reyes-Guzman et al., 2023; Richmond et al., 1993a) find that living in a

company of smokers reduces the likelihood of successful cessation. In this line of reasoning, (Putte et al., 2005) find that social norms (acceptance or unacceptance of smoking in a society) are an important determinant of smoking behavior. Studies have found that it is less likely to quit smoking, if one's partner smokes cigarettes (Chandola et al., 2004; Manchón Walsh et al., 2007), and others conclude that quitting smoking with one's life partner increases the likelihood of smoking cessation (Coppotelli & Orleans, 1985). Further, smoking prevalence is lower among individuals working in a smoking ban policy (Farkas et al., 2000b; Flor et al., 2021; Hao-xiang Lin et al., 2020; Haoxiang Lin et al., 2021).

In addition, smoking is hard to change for individuals who are more heavily dependent on it. For instance, past studies have identified that 'Time to the First Cigarette after Waking (TTF)' and 'Total Cigarettes Smoked Per Day (CPD)' are good predictors of quitting smoking (Branstetter et al., 2020; Higgins et al., 2020; Kabat & Wynder, 1987; Kozlowski, 1981; Sharapova et al., 2018). Moreover, information and knowledge about the harmful health effects of smoking are likely to induce individuals to quit smoking (Abdulateef et al., 2016; AlQahtani, 2017; Blanton et al., 2014; Cheng et al., 2015; Grassi et al., 2014; Haddad et al., 2020; Lim et al., 2015; G. X. Ma et al., 2003; Nasser et al., 2018; Park et al., 2018; Xu et al., 2015). Similarly, (Sansone et al., 2012; Thi et al., 2013) find that smokers are lacking in knowledge about the health risks of smoking compared to non-smokers.

Public non-price regulations like banning public place smoking, restricting cigarette advertisements and promotions, and placing health warnings on cigarette packages, are effective smoking control measures (Bhatia et al., 2022; Chugh et al., 2022; DeCicca et al., 2018; Djutaharta et al., 2021; Flor et al., 2021; Goel & Nelson, 2006; Y. Hu et al., 2017; H. Kim et al., 2023; Leung et al., 2009; Haoxiang Lin et al., 2021; Palali & van Ours, 2019). In this regard, empirical studies from Pakistan (Ahmad et al., 2020; Masud & Oyebode, 2018; Saqib et al., 2018a; Siddiqi et al., 2020) find that regulations on smoking limit cigarette demand.

Furthermore, empirical evidence shows that individuals who offer more religious services are less likely to engage in risky behaviors like cigarette smoking (Byron et al., 2015a; Garrusi & Nakhaee, 2012; Koenig et al., 1998a; Sharma et al., 2011). The Quran

(the primary source of Muslim law) says, “Do not with your own hands, cast yourself to destruction: and do not be wasteful.” In light of these mentioned verses of the Quran, many religious leaders label cigarette smoking either “Haram” (prohibited) and or “Makrouh” (reprehensible). However, despite religious ruling against smoking, the fact is that many individuals are still smoking. Therefore, this study makes an attempt to model individuals’ knowledge and understanding about the role of religion in the prevention of smoking behavior in the context of Pakistan.

Finally, some studies, (e.g., Borland et al., 1991; Dijkstra et al., 1996; Hansen et al., 1985) conclude that predictors of quit attempts and maintenance of smoking cessation are different. For example, studies have shown that nicotine dependency, self-efficacy, longer duration of previous quit attempts, and demographic factors like male and old age are predictors of successful cessation (Ron Borland et al., 1991; Cummings et al., 2006; Dijkstra et al., 1996). On the other hand, negative health consequences of smoking, the number of quit attempts, young age, and high educational status are predictors of making quit attempts (Ron Borland et al., 1991; Hellman et al., 1991; A Hyland, Borland, Li, Yong, McNeill, et al., 2006; Vanasse et al., 2004; West et al., 2001)

Although we find rich empirical evidence highlighting predictors of quit attempts and maintenance of smoking cessation in developed economies around the world (Chezhian et al., 2015; Dijkstra et al., 1996; Hansen et al., 1985; Hellman et al., 1991; A Hyland, Borland, Li, Yong, McNeill, et al., 2006; Nelson, 2003; Patton et al., 1998; K. E. Warner, 1981). However, these predictors may not accurately reflect smoking behaviors in developing countries, like Pakistan. The reason could be that studies in developed countries of the world, show characteristics of a limited population and, therefore, cannot be generalized and extended to developing countries. Second, behavioral characteristics, and other social and environmental conditions vary across countries around the world. For instance, smoking is not acceptable in the traditional society of Pakistan. However, other tobacco products like smokeless tobacco, paan, and gutka are most commonly used. In addition, since 2002, the government of Pakistan has initiated comprehensive smoking control measures; however, one can find very little evidence about the influence of smoking regulation. Therefore, the purpose of this study is to examine and find behavioral,

social, and environmental factors that affect individuals' decisions to make quit attempts or maintain non-smoking status in the context of Pakistan. Thus, predictors that are significantly associated with successful cessation help policymakers design and arrange smoking control measures that effectively influence smoking behaviors in Pakistan. In the next section, the study shows methods of measuring or constructing variables necessary for the analysis of smoking cessation behavior.

5.2 Data and Methodology

The study conducted a survey to identify smokers (current as well as ex-smokers) in the randomly selected locality of Islamabad, Pakistan. The advantage of distributing questionnaires in the capital city is that a definite proportion of each ethnic group is lives in Islamabad, therefore, the sample is an excellent representative of all ethnic groups living in Islamabad. The majority of questions in the survey were taken from standard surveys on smoking behavior, such as the Global Youth Tobacco Survey (GYTS) and the Global Adult Tobacco Survey (GATS). The sample for the analysis has been drawn in two stages. There are nine (9) different sectors in Islamabad. In the first stage, four (4) sectors were randomly selected, including E (E8, E11), G (G6, G7, G9), H (H9, H10), and I (I9, I10). In the second stage, smokers were identified at a tea stall located in these sectors. Finally, using the snowball method of sample collection, smokers were interviewed through a modified questionnaire. Further, smokers were asked to identify current or former smokers in their friend or relative zone. This way, the target sample was approached and interviewed about their smoking history and other relevant information.

The study sample consists of 421 male respondents identified as either current or former smokers by the pretest questionnaire. Later, a questionnaire was filled out by respondents covering their smoking history, socioeconomic status, attitudes about smoking, and other social and environmental factors to assess their impact on quitting behavior. Behavioral items include both current and past smoking practices and the age of smoking initiation. Additionally, socio-economic factors like income and education were assessed to determine whether these characteristics are significantly associated with quitting smoking. A few questions showing the religious involvement of an individual were included in the survey to assess their impact on smoking behavior. Finally, government

regulation on smoking and its impact on quitting smoking, were assessed by asking questions about public place restrictions, restrictions on advertisement and promotion, sales to minors, and placing health warnings. This study makes an effort to know and model an individual's attitude toward public laws and smoking regulations. More interestingly, the study examines whether public regulations are effective enough to encourage and pursue individuals to quit cigarette smoking.

5.2.1 Outcome Measures

The three dependent variables that this study examines are: First, whether or not participants have made any attempt to quit cigarette smoking. Second, whether or not respondents (including all participants, whether they attempted to quit or not) have successfully quit smoking for a period of longer than 6 months. Third, the analysis measures successful cessation among 264 participants who attempted to quit (excluding 157 participants who had not made at least one attempt to quit) and whether they have achieved abstinence from smoking for a period of longer than 6 months. The study defines longer than 6 months of abstinence from smoking as a cut-off point between smoking cessation and relapse, as suggested by other relevant studies (Alboksmaty et al., 2019; Hellman et al., 1991; A Hyland, Borland, Li, Yong, Mcneill, et al., 2006).

5.2.1.1 Dependent Variable 1 (Quit Attempt versus No Attempt at All)

In model 1, the study regresses the choice of respondent's making quit attempt(s) on demographic variables (age, ethnicity, income, education), social and environmental factors (including peer's smoking pressure, smoking-free home policy, acceptability of smoking in society), psychological factors (nicotine dependency), and individuals perceptions about smoking health hazards. In addition, the study also examines the effect of an individual's religious affiliation on the choice of making a quit attempt. Finally, the study examines whether public regulations on smoking (health warnings, banning cigarette advertisements and promotions etc.) persuade an individual to make a quit attempt.

To measure an individual's choice of making a quit attempt, the study asks the respondent: How many times, in your whole life, have you made an attempt to quit smoking? The choice options vary from 'not at all' to 'many quit attempts'. Subsequently, the choices were reduced to a dichotomous variable, that is, quit attempt(s) versus no attempt at all.

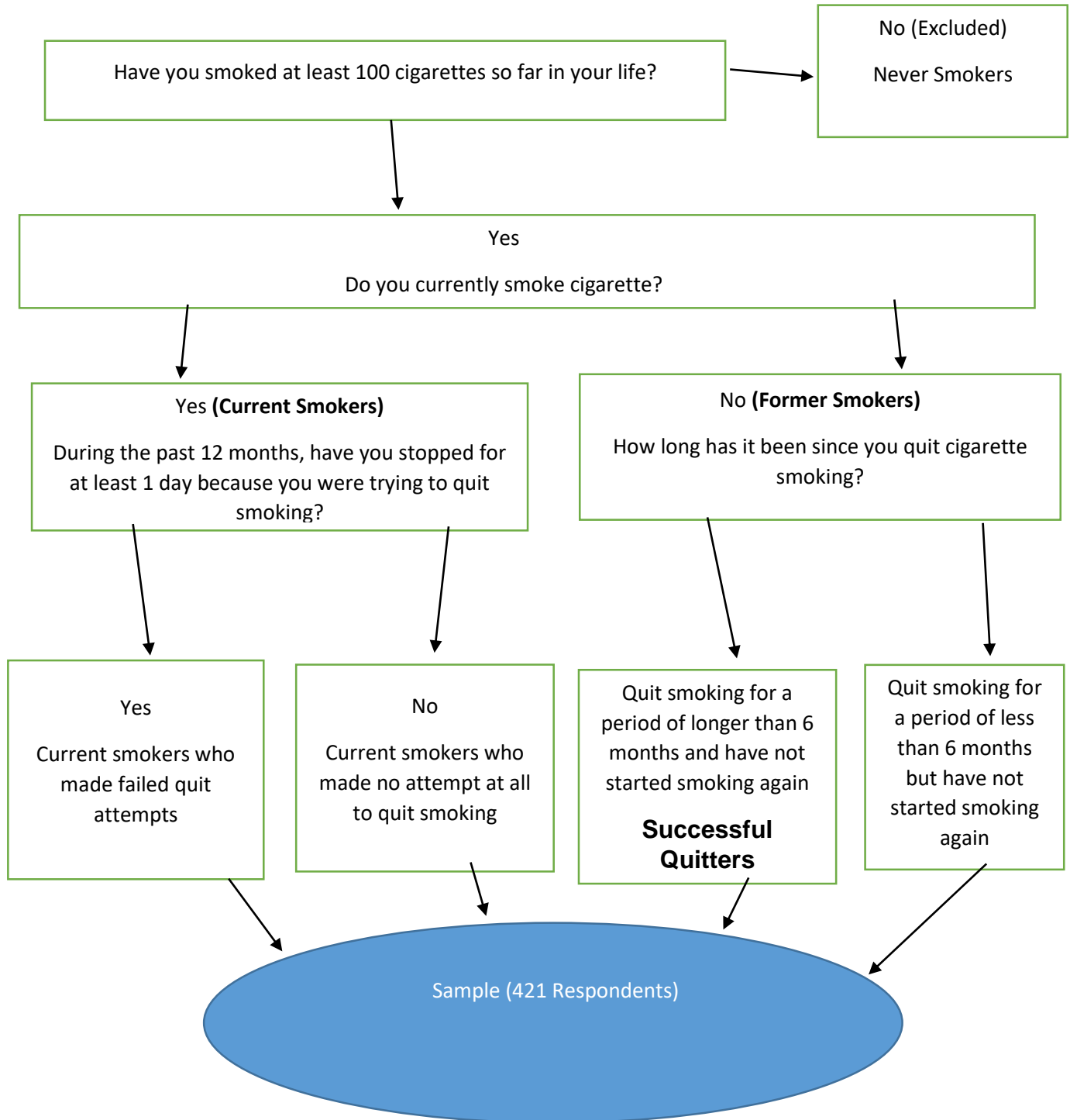
5.2.1.2 Dependent Variable 2 (Successful Cessation versus Failed Quit Attempts, entire sample)

In model 2, the study measures and compares successful cessation of smoking (former smokers who quit and do not relapse for longer than six months) with those who made unsuccessful quit attempts (current smokers who made failed quit attempts). Therefore, participants who replied “yes” to the question, Have you smoked at least 100 cigarettes in your entire life? “Not at all” to the question, Do you currently smoke cigarettes? And “at least six (6) months” to the question, How long has it been since you quit smoking cigarettes? Were called successful quitters. Conversely, respondents who replied “yes” to the question, Have you smoked 100 or more cigarettes in your life? “Every day or some days” to the question, currently, do you smoke cigarettes? And “yes” to the question, have you stopped smoking for some time because you were trying to quit smoking, were called current smokers with failed quit attempts. Finally, the study assigns 1 value to successful smoking cessation and 0 to failed quit attempts.

5.2.1.3 Dependent Variable 3 (Successful Cessation versus Failed Quit Attempts)

In model 3, the study measures successful quitting against unsuccessful quit attempts among the sample of respondents who made at least one attempt to quit. Model 2 and Model 3 both use the same methods (questions asked of the respondents) for measuring the outcome and independent variables. However, the two models of estimation vary by the number of observations. Model 2 uses an entire sample of 421 respondents (whether they attempted to quit smoking or not), whereas Model 3 decides the outcomes of the dependent variable, only among those who attempted to quit smoking (264 respondents). Here, the analysis excludes 157 respondents who had made no attempt to quit smoking.

The survey screening process is shown below in Figure 1.



5.2.2 Independent Variables

More formally, the study assesses the effects of demographic characteristics like age, ethnicity, education, and income on the quitting behavior of respondents. At the time of the survey, the respondents were asked a question: “What is your age?” Age was classified as less than 18, 18-24, 25-39, 40-55, and older than 55. Educational level was categorized as low (less than matriculation), medium (intermediate and graduation) and high (Master, MPhil, and PhD). On the basis of monthly household income earnings, respondents were classified as “low” (less than Rs. 30, 000), “moderate” (Rs. 30,000-Rs. 100,000), and “high” (more than Rs. 100,000). Following (Licht et al., 2011), the study combines education and income to form a composite variable, socio-economic status (SES). Accordingly, respondents with low education and low income were categorized as having lower SES, and those with both high education and high income were called respondents with high SES. All other possible combinations of education and income were categorized as moderate SES.

5.2.3 Addiction Level (a measure of the heaviness of smoking)

Furthermore, evidence shows that addiction is mainly responsible for the continuation of smoking behavior (F. R. M. Ali et al., 2020; Aoike et al., 2023; Branstetter et al., 2020; Breslau & Johnson, 2000; Fagerstrom & Schneider, 1989; Karl Fagerström et al., 2012; Grassi et al., 2014; Harris et al., 2022; Heatherton et al., 1991; C. Huang et al., 2008; Okoli et al., 2008; Parthasarathi et al., 2021; Pinto et al., 1987; Prokhorov et al., 2001; Rojas et al., 1998). Therefore, to measure addiction level, the study constructs a composite variable, “heaviness of smoking index or nicotine dependency,” by adding scores from three (3) items. That is, the questionnaire asks respondents, “Currently, how frequently do you smoke cigarettes?” To measure this item, the study uses three point responses, not at all, a few days in a week, and every day. In the same line, the respondent is asked, “On average, how many cigarettes did you smoke per day?” This question is measured on a four point scale, starting with one cigarette per day (1CPD) and ending with more than twenty cigarettes per day (20CPD). To know the time to the first cigarette (TFC), the study further asks, “How soon after waking do you smoke your first cigarette of the day?” Response options for this item vary from less than ten minutes (10 minutes) to one hour or more (60 minutes or more). Following (Heatherton et al., 1989, 1991) a composite

variable showing “nicotine dependency” was rescaled by taking the average of the scores derived from the above three items.

5.2.4 Social and Environmental Factors

In addition, the study assesses whether social and environmental restrictions on smoking encourage quitting. For the influence of social variables, the study constructed a composite variable from the mean score of three items. That is, the study models one’s personal social interaction on quit decision (descriptive quitting norm) by asking respondents, “How many of the smokers who you regularly see (important to you) have attempted to quit smoking in the last year?” It is measured on a four-point scale, with no body to all of them. In the same vein, an injunctive norm measures social pressure against a certain behavior (smoking) in society. For example, to know how the respondents react when they see someone smoking in a restricted environment, three different questions were asked. That is, “How acceptable is it for you if someone smokes in the presence of children? In public places? Or work places?” All these situations are measured using a five-point scale, which starts with strongly disapprove and ends with strongly approve. Moreover, subjective norm is measured by asking, “Suppose you quit smoking, how people (relatives & friends) who are close to you react to your quitting behavior?” It is measured on a 5-point scale, ranging from strongly disapprove to strongly approve. Finally, the degree of control that one believes to they have over the smoking behavior is measured by asking, “How confident are you that you will be able to quit smoking in the future?” A 4-point scale is used to measure perceived behavior, with end points ranging from not at all confident to absolutely confident.

Similarly, for modeling the effects of environmental factors, the study analyzes the effects of smoking policies/restrictions at home and work on the quitting behavior of respondents. That is, the study assesses whether smoking policies at work and at home, are significantly associated with either making quit attempts or successful cessation of smoking. In addition, the study examines the role of peer and parental pressure in the continuation of smoking behavior among respondents. To model the influence of environmental factors on smoking cessation, the study asks seven questions related to smoking policies at home, work places, and peers’ smoking status. For example, the study

asks of respondents, “Is smoking allowed inside your home? Did your father or any other adult member of your family smoke cigarettes? Similarly, for introducing restrictions on smoking in the workplace, the study asks questions about the smoke-free policy in the workplace. To measure peer pressure and the self-efficacy (strength of self-control) of the respondent, the study investigates: “How many of your close friends’ smoke? If one of your best friends offered you a cigarette, you would smoke it?”

5.2.5 Knowledge about the health consequences of smoking and an individual’s perceived behavior

Although we find rich empirical evidence on the relationship between smoking cessation and knowledge about the health hazards of smoking (AlQahtani, 2017; Cheng et al., 2015; Haddad et al., 2020; Park et al., 2018; Sansone et al., 2012; Xu et al., 2015). However, in Pakistan, very few studies have established empirical link between quitting behavior and health problems caused by smoking (M. Ahsan et al., 2015; Hameed & Malik, 2021a, 2021b; Saqib et al., 2018b). Therefore, this study assesses the effectiveness of knowledge of smoking hazards on smoking cessation behavior. To accomplish the task, the study asks respondents several questions related to their knowledge about the harmful effects of smoking and their perceptions of cigarette smoking. For example, smokers are investigated: “Do you think that breathing other people smoke causes illness in non-smokers?” “Smoking damages lungs and causes cancer,” and “Smoking causes bad breath, an unpleasant smell and yellow teeth.” All these items related to the negative health consequences of smoking were measured on a 5-point Likert scale, with end points ranging from strongly disagree to strongly agree. Similarly, three items related to a positive attitude about cigarette smoking were asked, and these include, “smoking reduces stress,” “controlling body weight,” and “smoking makes one look cool and attractive.” Each of these items was measured using a 5 point scale ranging from strongly disagreeing to strongly agreeing.

5.2.6 Smoking Control Interventions

Finally, the study examines the regulation on smoking and its impact on the quitting behavior of smokers. The study divides the regulation variable into three categories: health warnings, banning cigarette advertisement and promotion, and public places’ smoking

restrictions. In this line, the study asks the respondent, “During the past 30 days, have you noticed any health warnings on cigarette packages. To measure smokers’ perceptions of health warnings, the study asked respondents three questions: To what extent, if at all, the warning labels had stopped you from smoking a cigarette when you were about to smoke one; made you think about the health risks of smoking; led you to think about quitting smoking? The study uses a 4-point response scale varying from “never” to “very often.” Similarly, to know the extent of restrictions on cigarette advertisement and promotion, the study asked respondents, “Do you support tobacco product advertisement and promotion on print and electronic media? How often do you see ads and promotions on media? And how many times have you seen actors smoking cigarettes in dramas or movies? Restriction on smoking inside transport vehicles has been assessed by inquiring, “In the past 12 months, have you seen smoking inside transport vehicles? Moreover, restrictions on smoking in public and enclosed places have been assessed: “Do you support the smoking ban in public places, and in the past 12 months, have you seen anyone smoking in enclosed places like cinemas, restaurants and shopping malls?

5.2.7 Religious involvement and cigarette smoking among young adults

In this section, the study tests the hypothesis that an individual’s religious affiliation makes them more likely to make quit attempts or successfully quit smoking. Moreover, it examines whether individuals have knowledge of religious rulings against smoking. That is, the study examines the role of religion in pursuing individuals to quit cigarette smoking. The perceived effects are examined by asking questions like, “What is your religion? Does your religion discourage cigarette smoking? Do you have knowledge that the Council of Islamic Ideology (CCI) declared smoking un-Islamic and haram? How often have you listened to a religious leader discouraging smoking? What do you think the holy month of Ramadan provides the best opportunity to avoid cigarette smoking or encourage cessation?

5.3 Data Collection

The study conducted a survey to identify smokers (current as well as ex-smokers) in the targeted locality of Islamabad, Pakistan. Data analysis was restricted to male smokers residing in the capital city, Islamabad. The reason for the exclusion of women from the analysis is that social stigma is attached to women smoking in the traditional conservative

society of Pakistan. It is possible that females may conceal the actual status of smoking. Second, the advantage of distributing questionnaires in the capital city is that a definite proportion of each ethnic group lives in Islamabad; therefore, the sample will be representative of all ethnic groups living in Islamabad. The majority of questions in the survey were taken from standard surveys on smoking behavior, such as the Global Youth Tobacco Survey (GYTS) and the Global Adult Tobacco Survey (GATS). The study uses SPSS version 25.0 software for the analysis.

Binary logistic regression models were fitted to find factors that are significantly associated with (1) quit attempts and (2) successful cessation of cigarette smoking. The study uses two binary dependent variables, which are quit attempts and smoking abstinence for a period of more than six (6) months, for all regression models. As we find in the literature, there are various durations for smoking cessation and relapse; however, this study focuses on longer than 6 months as a cutoff point for smoking abstinence. Independent variables identified in the literature as most relevant to the quitting behavior are included in the regression analysis. In addition, the characteristics of the sample have been indicated as numbers and percentages for categorical variables. The study uses a chi-square test to compare characteristics between quit attempts vs. no quit attempts and successful quitters' vs. current smokers with failed quit attempts. Finally, the study tests the statistical significance of the variables at a 5% probability level.

5.4 Results and Discussions

5.4.1 Descriptive analysis

This study was conducted to distinguish the characteristics of current smokers and former smokers. That is, to find whether the behavioral characteristics of successful quitters differ from those of unsuccessful quitters. Moreover, the study assesses the role of religion in discouraging smoking as well as models individuals' attitudes toward smoking regulation. For this purpose, the study distributed a questionnaire among 510 smokers (current as well as ex-smokers) to assess which factors are significantly associated with smoking cessation. However, only 421 respondents were included for descriptive and logistic regression analyses. The remaining 89 participants were excluded on account of

either being unwilling to participate or providing incomplete information as required for the analysis. The overall response rate was 82.55 percent.

Descriptive statistics of the study show that among 421 participants who completed the study questionnaire, 157 respondents (37.3%) have made no attempt at all to quit smoking. However, the majority of the participants, that is, 264 respondents (62.7%), have made at least one attempt to quit smoking. Moreover, among those who attempted to quit (264 respondents), only 81 participants (19.2% of the total sample) successfully quit smoking for a period of more than 6 months. The remaining 183 respondents are those who either made failed quit attempts (quit smoking for a period of less than 6 months and relapsed back to smoking) or those who quit smoking for a period of less than six months. The summary statistics arranged by demographics are shown below in Table 1.

Characteristic of Respondents by Smoking Quit Attempts, Unsuccessful and successful Cessation (N=264)

Characteristics	Smoking Quit Attempt N (%)	Unsuccessful Cessation N (%)	Successful Cessation N (%)
Age			
Below 18	26 (9.85)	23 (8.7)	3 (1.1)
18-30	156 (59.09)	123 (46.6)	33 (12.5)
31-50	70 (26.51)	51 (19.3)	19 (7.2)
50 plus	12 (4.54)	10 (3.8)	2 (0.8)
Ethnicity			
Punjab	156 (59.1)	115 (43.6)	31 (11.7)
KPK	74 (28.0)	42 (15.9)	19 (7.2)
Sindh	17 (6.4)	13 (4.9)	4 (1.5)
Baluchistan	17 (6.4)	14 (5.3)	3 (1.1)
Education			
illiterate and Matric	56(21.2)	49 (18.6)	7 (2.7)
FA/BA/BSc.	93 (35.2)	80 (30.3)	13 (4.9)
BS/MSc/MPhil/PhD	115 (43.6)	78 (29.5)	37 (14.0)
Income			
Below 25,000	77 (29.2)	68 (25.8)	9 (3.4)
25,000-60,000	88 (33.3)	67 (25.4)	21 (8.0)
60,000 & above	99 (37.5)	72 (27.3)	27 (10.2)
Cigarette Per Day (CPD)			
1 CPD	50 (18.9)	35 (13.3)	15 (5.7)
2-10 CPD	123 (46.6)	100 (37.9)	23 (8.7)
11-20CPD	63 (23.9)	51 (19.3)	12 (4.5)
More than 20 CPD	28 (10.6)	21 (8.0)	7 (2.7)

Table 1 shows that among 264 respondents who made at least one quit attempt(s), the highest number who successfully quit fall in the age group 18 to 30 years (12.5%). The majority (156) of respondents were from the province of Punjab and made quit attempts or successfully quit smoking (11.7%). About 14.0% were graduates or higher, and 10.2% with incomes of \$60,000 or above successfully quit smoking. Moreover, 8.7% of respondents who successfully quit were smoking 2–10 CPD, followed by 1 CPD (5.7%).

5.4.2 Multivariate Analysis

To better understand factors that are significantly associated with smoking quit attempts or successful smoking cessation, the study uses binary logistic regression to find predictors of each outcome. First, the result obtained in this paper confirms the findings of prior studies that smoking quit attempts and cessation are two separate phenomena, and that, predictors of each outcome are different. (Ron Borland et al., 1991; Hellman et al., 1991; A Hyland, Borland, Li, Yong, McNeill, et al., 2006; Vanasse et al., 2004; West et al., 2001). As shown below in Table 5.2, religious information, private restrictions on smoking (including social pressure, smoke-free home, and work places), as well as public regulation on smoking, are statistically significant predictors of quit attempts. On the other hand, predictors for successful cessation (the entire sample) include self-efficacy, addiction level, socio-economic status, and past quitting attempts. However, variables like, “attitude about smoking” and “age of smokers” are both statistically insignificant in each model of smoking-behavior. The odds ratio with 95% confidence intervals for making quit attempts is shown below in Table 5.2. More specifically, the result indicates that regulation on smoking is positively and significantly associated with making quit attempts. The odds for regulation on smoking is greater than 1, indicating that in cases of strict public-regulation on smoking, smokers are 2.29 times more likely to make quit attempts than in cases where no public warnings are available. Similarly, the variable “religious information” is positively associated with making quit attempts. The odds for religious information show that individuals with more firm beliefs about religious rulings against smoking, are 1.7 times more likely to make quit attempts than those who are less affiliated with religious affairs. Furthermore, the study has constructed a composite variable, “Social and Environmental factors,” by combining three different items, which are, smoke-free home,

a no-smoking policy at work, and the acceptability of smoking in the traditional society of Pakistan. The odds ratio shows that individuals who have smoke-free homes and or working in places where smoking is strictly prohibited, are 1.68 times more likely to quit than those living or working in places where smoking is allowed.

Similarly, statistically significant predictors of successful cessation are shown below in Table 5.3. The result shows that variables like socioeconomic status and past quitting attempts are positively associated with successful smoking cessation. On the other hand, addiction intensity and low self-efficacy have a negative relationship with the dependent variable (smoking cessation). More specifically, the results indicate that the odds of successful smoking cessation increase 2 times for individuals with high SES as compare to those with low SES. Concerning past behavior, the study finds that the chances of smoking cessation is high by 47 percent for individuals who have attempted to quit smoking as compare to those who have not attempted at least once to quit cigarette smoking. On the contrary, the odds of successful cessation decrease with the severity of addiction. That is, individuals who are more heavily dependent on smoking (as measured by cigarettes per day and time to first cigarette of the day) are 51% less likely to quit smoking than those who are not heavily dependent on smoking. Similarly, individuals with low self-efficacy or self-control are 46% less likely to quit smoking than those with strong self-control. Contrary to the above findings, a person's age, attitude about smoking, religious information, and smoking regulations are not significantly associated with successful smoking cessation. The statistical significance of all these variables is reported in Appendix 5B.

Figure 5.2: Predictors of Smoking Quit Attempts and Smoking Cessation

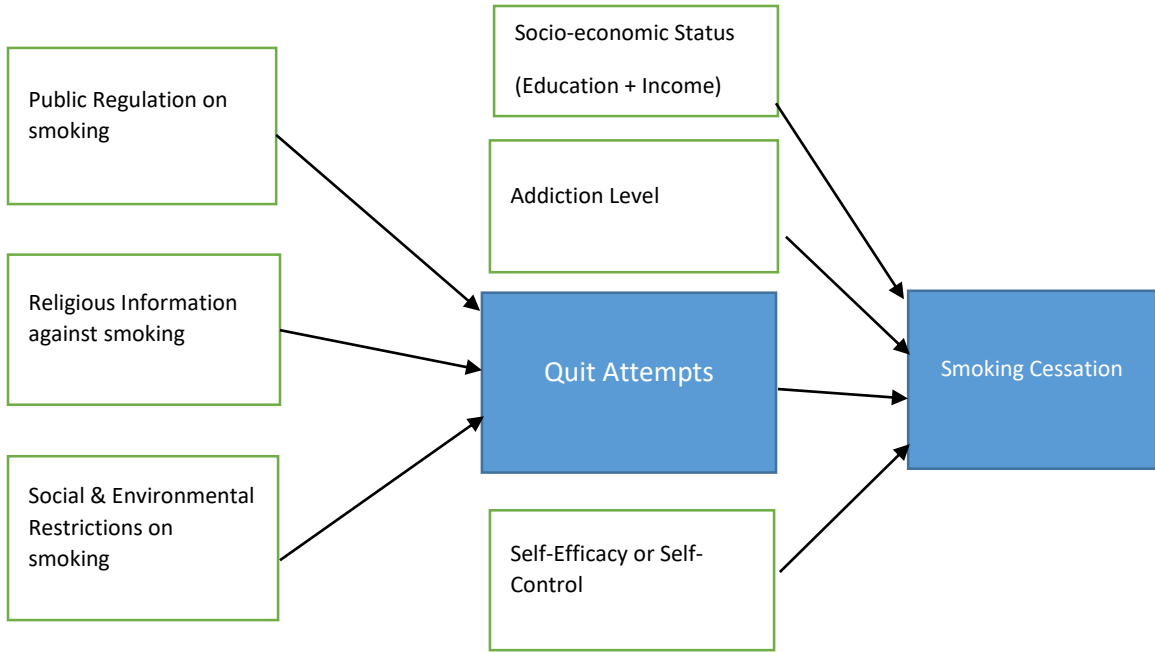


Table 5. 1: Predictors of Quit Attempts

Variables in the Equation	B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Religious Information	0.535	0.231	5.346	1	0.021	1.707	1.085	2.686
Public Regulation on Smoking	0.828	0.315	6.927	1	0.008	2.290	1.236	4.243
Social & Environmental Restrictions	0.511	0.193	7.028	1	0.008	1.667	1.142	2.431
Constant	-2.690	0.697	14.903	1	0.000	0.068		

Dependent Variable: Quit Attempt Vs No Quit Attempt

Table 5. 2: Predictors of Smoking Cessation

Variables in the Equation	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Socio-Economic Status (SES)	.696	.271	6.615	1	.010	2.006	1.180	3.410
Addiction Level	-.868	.226	14.791	1	.000	.420	.270	.653
Past Quit Attempts	.390	.136	8.175	1	.004	1.477	1.131	1.930
Self-Efficacy	-.676	.194	12.143	1	.000	.508	.348	.744
Constant	.893	.618	2.091	1	.148	2.442		

Dependent Variable: Successful Cessation VS Unsuccessful Quit Attempts (entire sample)

Below in Table 5.4, the study examines predictors of successful smoking cessation among those who had attempted to quit smoking in the past. The result shows that socio-economic status, addiction, and self-efficacy are significantly associated with successful quitting of cigarette smoking. More specifically, Model 1 shows that among those who have attempted to quit in the past, the odds of successful cessation increase for individuals with high socio-economic status in comparison to those with lower SES (Odds Ratio = 2.11, P = 0.005). However, the odds of successful quitting decrease for individuals who are highly addicted (odds ratio = 0.508, P = 0.013) and those with more smoking peers (odds ratio = 0.865, P = 0.016). Similarly, Model 2 indicates that the odds of permanent smoking cessation increase for individuals with high SES (Odds Ratio = 1.960, P = 0.011). However, the odds for smoking cessation decrease with high addiction levels (odds ratio = 0.549, P = 0.029). Moreover, the study finds that regulation on smoking, social factors that encourage smoking, smoker’s age, and past quitting attempts have no significant relation with successful smoking cessation among those who had made quit attempts in the past.

Table 5. 3: Smoking Cessation among those who had attempted to quit smoking in the past.

Variables	Model 1		Model 2		Model 3	
	Significance	Odds Ratio	Significance	Odds Ratio	Significance	Odds Ratio
Socioeconomic Status	0.005	2.115	0.011	1.960	0.008	2.029
Addiction Level	0.013	0.508	0.029	0.549	0.083	0.614
Self-Efficacy	0.016	0.563	-----	-----	0.081	0.645

Dependent Variable: Successful cessation Vs those who made failed quit attempts

5.5 Discussion

The study distributed a questionnaire in the capital city of Pakistan (Islamabad) to find factors that are significantly associated with either making quit attempts or successful smoking cessation. The study finds that regulations on smoking, religious information against smoking, and social factors are significantly associated with making quit attempts. On the other hand, addiction level, self-efficacy, socioeconomic status, and past quitting attempts are significantly associated with successful smoking cessation for a period of

more than six months. More specifically, the study finds one very interesting result: public regulations on smoking motivate individuals to make quit attempts but play no role in successful cessation of smoking. This means that regulations on smoking only motivate individuals to make quit attempts but do not guarantee successful cessation until proper planning is executed for achieving the final target in the form of successful cessation. This finding is consistent with (Barbeau et al., 2004; Ron Borland et al., 1991; Burki et al., 2013; Farrelly et al., 1999; Hellman et al., 1991; Joo et al., 2020b; A. U. Khan & Shah, 2020; Richmond et al., 1993b; T. Yang et al., 2011; Y. Yang et al., 2010), showing that non-price regulation on smoking, like warning labels on cigarette packages, restrictions on smoking at public places, banning cigarette advertisements and promotions, significantly reduces smoking in the immediate period only.

Similarly, the study finds that religious services and information are useful in motivating individuals to quit cigarette smoking. Several other studies have obtained similar findings, for example, (Koenig et al., 1998b; Whooley et al., 2002) conclude that individuals who attend frequent religious service are less likely to smoke cigarettes. In the same vein, (Sharma et al., 2011) conclude that highly addicted individuals are not more involved in religious affairs. In addition, (Divsalar et al., 2010) find that smoking is forbidden as Islamic rulings declare it an unhealthy behavior for individuals as well as society. However, on the contrary, (Byron et al., 2015b) find that religion discourages smoking but does not completely ban it. The study has constructed a composite variable “social and environmental factor” consisting of ‘home-smoking’ and ‘smoking acceptability’ in society. The results indicate that the odds of making quit attempts increase for the composite variable. Similar findings were obtained by (Haardörfer et al., 2018), showing that current smokers who are living in a smoke-free-home (SFH), reduce the number of cigarettes per day (CPD) and make more frequent quit attempts compared to those who are living with other smokers at home. Moreover, (Nabi-Burza et al., 2021) finds that no-smoking at home and car policies are significantly associated with spontaneous quitting. In addition, (Klabunde et al., 2017) finds that a smoke-free workplaces policies protect non-smokers as well as encourage passive smokers to quit or to reduce cigarettes smoking. Similarly, (R Borland et al., 2006) indicates that a smoke-free policy at home and in public places is associated with more quit attempts and successful cessation among those

who attempted to quit. In the same line of reasoning, (Seo et al., 2011) find that intervention in the form of a smoke-free-campus is an effective policy to decrease cigarette smoking among adults. On the contrary, (Mdege et al., 2021) finds that a smoke-free-home intervention policy does not produce a desirable outcome for smoking cessation.

For a successful cessation model, the study finds that individuals with high socioeconomic status (SES) are more likely to quit smoking than those with low SES. This is consistent with other studies (Hiscock et al., 2012, 2015) showing that lower SES individuals are less likely to be successful quitters than those with improved living standards. Similarly (Corsi et al., 2014; Hennrikus et al., 1995; Rose et al., 1996), find that higher education is a significant predictor of successful smoking cessation. Similar to our findings, other studies (Chen et al., 2001; Collins et al., 1990; Dijk et al., 2007; Royce et al., 1997) concluded that peers' smoking status is the most important and statistically significant predictor of smoking behavior. Consistent with our analysis (Abdullah et al., 2015), find that past quitting attempts are significant predictors of successful cessation. However, unlike our findings (R Borland et al., 2006; Zhou et al., 2009), find that failed quit attempts are significant predictors of relapse, however, they are not significant predictors of successful cessation. Consistent with past studies (Breslau & Johnson, 2000; A Hyland, Borland, Li, Yong, McNeill, et al., 2006; Andrew Hyland et al., 2004) this study finds that nicotine dependency has a negative but statistically significant association with successful cessation of cigarette smoking. Additionally, (Karl Fagerström et al., 2012) concluded that smoking abstinence rates decrease with increasing scores for smoking dependence.

The study examined assumptions of multi-collinearity among independent variables and the existence of outliers in the data set. "Appendix C" of this paper show results about multi-collinearity among independent variables of Model 1 and Model 2, respectively. Table 1 shows that a tolerance value (T) lies in the range of 0.94 to 0.96 and the associated variance inflation factor (VIF) lies in the range of 1.03 to 1.06. Similarly, in the case of Model 2, we find tolerance values lying in the range of 0.83 and 0.95, while VIF values range from 1.05 to 1.18. Hence, the result shows the existence of no-collinearity among the independent variables of both models. Besides, the study examined standardized

residual values (*Z* Resid) and found that there is no outlier in the data set. Overall, the model was statistically significant, $\chi^2(2, N = 421) = 28.56, P = 0.003$, suggesting that Model 1 could distinguish well between those who made quit attempts and those who did not attempt at all to quit cigarette smoking (reported in appendix 5E).

The study has a few interesting implications for public health policy. First, the statistically significant impact of “religious information” on quit attempts shows that religious intervention against smoking is helpful in the smoking prevention policy. However, the effect of religious information about smoking on successful cessation is statistically insignificant, indicating that only having knowledge or information of a religious ruling against smoking did not produce the desirable outcome of permanent smoking cessation. Therefore, this study suggests that advocates of public health policy should recruit influential religious leaders who could mobilize the masses against smoking behavior. Moreover, during religious ceremonies (especially Friday-Prayers) religious scholars (Mufti) should issue Fatwa (religious rulings), focusing on highlighting the negative health effects and economic costs of smoking. Besides, social influence is positively associated with smoking cessation, while peer pressure is negatively associated with smoking cessation. This suggests that parents should voice and warn their children to avoid the company of smokers. That is, a-religion backed and socially enforced quitting strategy would produce the desirable outcome of smoking cessation. Similarly, public regulations on smoking have an immediate and significant role in motivating smoker to make quit attempts. However, none of the individual strategies, in the form of placing health warnings on cigarette packs or banning cigarette advertisements and promotions, is helpful in maintaining non-smoking status. Summing up, the study suggests that to reduce smoking prevalence, a-religion backed and socially enforced quitting strategy would produce the desirable outcome. Furthermore, the study suggests the government should call for comprehensive, multi-dimensional, coordinated, and properly monitored cessation strategies by combining mass-media campaigns with community and school based awareness programs, which could effectively ensure smoke-free Pakistan.

Chapter #06

Conclusion and Policy Implications

6.1 Conclusion

Smoking causes serious health problems, and therefore, it is imperative for the world's countries to discourage smoking initiation and encourage quitting. The WHO FCTC has suggested useful measures to control smoking and the use of other tobacco products. Like many other countries in the world, Pakistan has also suggested a number of regulations to combat the increasing trend of smoking, particularly among adults. However, we find very little empirical evidence about the influence of these regulations on the smoking behavior of individuals. Therefore, this dissertation is an effort to find the influence of policy variables (taxation and regulation on smoking) as well as explore other social, psychological, and religious factors that are significantly associated with smoking initiation and cessation. This dissertation comprises a time-series study and two cross sectional analyses to empirically evaluate smoking behavior in Pakistan. The empirical results of this dissertation are summarized below.

Using the ARDL estimation method on the data covering the period 1981-2018, the study regressed cigarette demand on policy variables (taxation and regulation on smoking), real income, and educational enrollment. The time series analysis finds cigarette price elasticity less than unity, showing that individuals are less responsive to changes in tax-induced cigarette prices. More specifically, the result indicates that a 10 % increase in cigarette prices reduces demand for cigarettes by about 5% and 6.9% in the short run and long run, respectively. Additionally, public regulations like restriction on cigarette advertisements and promotions, public anti-smoking messages, and placing health warnings on cigarette packages all such public intervention negatively influence cigarette consumption. Moreover, real income is negatively associated with cigarette demand, indicating that wealthy individuals are health conscious and therefore avoid risky behaviors like smoking. Further, university education is positively associated with cigarette consumption. The reason may be that students at the university are far away from parent

affluence. Moreover, in university life, students usually become victims of peer pressure for the initiation of smoking and other risky behaviors.

Furthermore, this dissertation makes an effort to find predictors that influence smoking initiation. For this purpose, a questionnaire was distributed randomly among 638 male students enrolled in public sector universities of Pakistan. The study hypothesized that demographic characteristics, social and psychological factors influence smoking initiation. Additionally, whether religious affiliation and public anti-smoking awareness discourage smoking initiation. The empirical results show that age and ethnicity are positively associated with the smoking initiation. That is, individuals of older age and those who belong to the province of Punjab are at high risk of smoking initiation. Moreover, a smoke-free home is negatively associated with smoking initiation of respondents. However, an individual's low self-control may result in the adoption of a smoking habit. Additionally, respondents who experienced miserable childhoods in the form of physical or emotional abuse are more likely to engage in risky behavior like smoking. Further, public awareness campaigns that highlight the harmful effects of smoking and convey anti-smoking messages, restrict cigarette advertisements and promotions significantly discourage smoking initiation. Finally, the study finds that religion discourages smoking, and individuals who are more involved in religious services are less likely to initiate cigarette smoking.

Finally, this study conducted a cross sectional analysis to find factors that encourage smoking cessation. In the first stage, the study randomly selected 4 sectors (out of a total 9 sectors) in Islamabad, the capital city of Pakistan. In the second stage, a questionnaire, covering smoking history and other social and psychological behaviors, was distributed randomly among 421 respondents. Using the binary logistic regression method, the study attempts to find factors that are significantly associated with making quit attempts and successful smoking cessation. The result shows addiction, socioeconomic status, absence of smoking peer(s), and past quit attempts are predictors that are significantly associated with successful smoking cessation for a period of more than 6 months. However, social pressure, public regulation on smoking, and individual's perceived religious affiliation are factors that significantly motivate individuals to make quit attempts.

In a nutshell, the author summarized the findings of this study as follows:

- Although taxation on cigarettes is an important factor that negatively influences smoking, however, the empirical results of this study show that the tax elasticity of cigarettes is less than unity, indicating that individuals are proportionately less responsive to changes in the tax-induced price of cigarettes. Moreover, it is possible that high taxation on cigarettes may give rise to problems of border smuggling and underreporting of cigarette production. We therefore cannot rely only on the taxation of cigarettes as a sole prevention tool.
- Non-priced public regulations on smoking, like placing health warnings on cigarette packages, banning cigarette advertisements and promotions, restrictions on smoking in public and enclosed places, etc. affect cigarette demand in the immediate period. Additionally, these regulations not only discourage smoking initiation but also encourage individuals to make quit attempts. However, the long-term influence of such regulation in the form of successful cessation of smoking is ineffective.
- Psychological factors such as addiction level, adverse childhood experiences, stress, and other unusual habits influence smoking behavior.
- Social and environmental factors such as peer and parental smoking status, smoke-free home policy, and acceptability of smoking in society significantly influence individuals smoking behavior.
- Finally, religious pronouncements against smoking and an individual's religious services have a negative influence on smoking initiation as well as encourage smokers to make quit attempts. However, it does not influence an individual for a long period of time to successfully quit smoking.

The major strength of the study is that it collects separate data for each cross-sectional analysis, including smoking initiation and cessation. Data for analyzing the phenomenon of smoking initiation has been collected from students enrolled in BS programs in public sector universities across Pakistan. However, data for the analysis of smoking cessation has been collected across the capital territory, Islamabad, which is a melting pot of all national ethnic groups. Moreover, it is the first empirical study conducted

in Pakistan that examines comprehensively the predictors of smoking behavior. The study uses demographic, behavioral, religious information, as well as social and public restrictions on smoking, as independent variables in the model. However, aside from its strengths, the study has a few limitations. First, the study excludes special groups from the analysis, for instance, truck or car drivers, military or police personnel who are thought to be heavy smokers. Second, the findings of the study have been based on the information provided by individuals themselves. In such a case, there is a chance of bias because it is possible that respondents may have decided to give more socially desirable answers. Third, the study focuses only on males, while females have been excluded from the analysis. The reason is that women smoking is socially not acceptable in the traditional society of Pakistan. It was expected that women may not report their smoking history. Therefore, to avoid bias in the form of underreporting the actual smoking status, the study has only focused on male smoking behavior. Finally, the study calls those individuals' successful quitters who had quit for longer than six months; however, it is possible for some smokers to relapse even after a year. Therefore, in such a case the analysis may have included some individuals as successful quitters who do not have actually quit smoking successfully.

6.2 Policy Implications

Based on empirical results, this dissertation presents few important policy implications for enacting a better anti-smoking policy.

- Since non-price public regulation influences smoking demand, this implies that any prevention strategy that relies only on cigarette taxation will not produce the desirable outcome of discouraging smoking to a large extent. A comprehensive prevention policy that includes taxation on cigarettes as well as better enforced non-price regulations on smoking will be more effective in discouraging smoking behavior.
- This dissertation recommends that advocates of public health policy must recruit religious scholars, and other influential speakers to disseminate knowledge about the harmful effects of smoking among the masses at a large level. In this regard, religious leaders (Mufti) play a significant role by issuing Fatwa (religious rulings) which could highlight the negative health effects and the associated cost of

smoking. Similarly, community leaders, households, and parents should closely monitor children's behaviors to avoid their engaging in any risky behaviors like smoking. That is, a-religion backed and socially enforced quitting strategy would produce the desirable outcome of discouraging smoking.

In a nutshell, this dissertation suggests the government to call for comprehensive, multi-dimensional, coordinated, and properly monitored cessation strategies by combining mass media campaigns with households, communities, and above all, school based awareness programs to be initiated to effectively reduce smoking prevalence and thereby ensure smoke-free Pakistan.

6.3 Suggestions for Future Research

Smoking behavior is a complex phenomenon influenced by various factors, including demographic characteristics, socio-economic factors, and public laws and regulations. Despite progress in the area of tobacco research, challenges still persist in the form of the health costs of tobacco use. To overcome these challenges, considerably more has to be done to understand the factors behind smoking initiation, quit attempts, relapse, successful cessation of smoking, and maintenance of smoking abstinence. Therefore, this dissertation recommends a few important suggestions for future research in the area of tobacco consumption, as follows:

- First, we must extend our data on smoking behavior to include all subgroups of the population. For instance, we need information about the smoking histories of medical doctors, security personnel, and drivers who are thought to be chain smokers. In addition, information about women's smoking is also crucial to understanding the trends and causes of gender differences in smoking behavior.
- Second, we need longitudinal analysis to understand different stages of smoking behavior. For this purpose, we must routinely collect information on the smoking status of individuals and the associated social and psychological factors that are thought to be influencing smoking behavior.
- Third, aside from cigarette smoking, individuals also use various other tobacco products. For example, smokeless tobacco is more common in the Khyber Pakhtunkhwa and Baluchistan provinces of Pakistan. However, paan and gutka are

more commonly used in the Punjab and Sindh provinces of Pakistan. In this line, a disaggregate analysis of each tobacco product will add important insight into the analysis of tobacco consumption. Moreover, there is an increasing trend toward using electronic cigarettes (e-cigarette) as a substitute for conventional cigarette smoking. This requires empirical analysis to find out whether e-cigarettes and smokeless tobacco are safer than conventional cigarettes that uses tobacco leaves.

- Fourth, it will be more useful to conduct a cost-benefit analysis of tobacco production and consumption. On one hand, tobacco production is a source of earnings for farmers and the associated cigarette manufacturing companies. Moreover, the government also generates revenue through taxation on tobacco products. However, on the contrary, tobacco consumption incurs a huge burden in the form of diseases and deaths.
- Finally, it is crucial to understand whether smoking during adolescence leads to the use of other drugs like alcohol, marijuana, ice, or crystal in adulthood.

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Appendices

Appendices

Appendix 3A RDL Short Run Estimates (All SROs)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Cig.Prices	-0.604931	0.139855	-4.325417	0.0002
Real Income	-2.222692	0.789035	-2.816976	0.0090
Regulation 2002	-0.280766	0.186181	-1.508027	0.1432
SROs 2003	0.171077	0.127847	1.338139	0.1920
SROs 2009	0.064298	0.119364	0.538669	0.5945
SROs 2010	-0.148300	0.138100	-1.073856	0.2924
University Education	0.251740	0.179692	1.400950	0.1726
C	30.08352	9.224072	3.261414	0.0030
@TREND	0.078474	0.017886	4.387399	0.0002
R-squared				
	0.912345	Mean dependent var		10.75438
Adjusted R-squared				
	0.883127	S.D. dependent var		0.293124
S.E. of regression				
	0.100209	Akaike info criterion		-1.537649
Sum squared resid				
	0.271132	Schwarz criterion		-1.102266
Log likelihood				
	38.44651	Hannan-Quinn criter.		-1.384156
F-statistic				
	31.22509	Durbin-Watson stat		2.378682
Prob(F-statistic)				
	0.000000			

Appendix 3B ARDL Long Run Form and Bounds Test

Dependent Variable: D(LNCIGPERCAPITA CONSUMPTION)				
Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.46950	5.106088	3.029620	0.0051
@TREND	0.072248	0.014235	5.075484	0.0000
LNCIGPERCAPITA CONSUMPTION (-1)*	-0.749010	0.132792	-5.640492	0.0000
LP**	-0.537236	0.191717	-2.802227	0.0089
LNGDPPERCAPITA**	-3.150380	0.858429	-3.669935	0.0010
REG2002**	-21.56014	5.553697	-3.882124	0.0006
LNREALCIGPRICEXREG2002**	-0.280670	0.198683	-1.412651	0.1684

Appendices

PCGDPXREG02**	3.227803	0.859145	3.756994	0.0008
* P-value incompatible with t-Bounds distribution.				
** Variable interpreted as $Z = Z(-1) + D(Z)$.				
Levels Equation				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Cig. Price	-0.717261	0.261990	-2.737744	0.0105
GDP PER CAPITA	-4.206057	0.965007	-4.358578	0.0001
REG2002	-28.78484	8.368526	-3.439654	0.0018
REALCIGPRICEXREG2002	-0.374721	0.278220	-1.346855	0.1885
PCGDPXREG02	4.309424	1.288984	3.343272	0.0023
EC = LNCIGPERCAPITACONSUMPTION - (-0.7173*LP -4.2061				
EG2002 + 4.3094*PCGDPXREG02)				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Sig..	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	10.49402	10%	2.75	3.79
K	5	5%	3.12	4.25
		2.5%	3.49	4.67
		1%	3.93	5.23

The appendix 3A, shows estimates of per capita cigarette consumption. It is possible that growing population over time might explain variation in cigarette consumption. Hence, to mitigate the effect of population, we divided total cigarette consumption by total population ages 15 or above. The result found indicates that estimates of almost all parameters are stable.

Appendix 4A Effect of all Independent Variables on Smoking Initiation

Variables in the Equation	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Age	0.118	0.027	19.430	1	0.000	1.125	1.068	1.185
Ethnicity	0.665	0.228	8.493	1	0.004	1.944	1.243	3.040
Peer Pressure	1.391	0.410	11.497	1	0.001	4.017	1.798	8.973
Restriction on smoking at home	-0.485	0.209	5.394	1	0.020	0.616	0.409	0.927

Appendices

Religion influence on smoking	-0.858	0.212	16.308	1	0.000	0.424	0.280	0.643
Residence	-0.269	0.207	1.692	1	0.193	0.764	0.509	1.146
Depression	0.337	0.158	4.539	1	0.033	1.401	1.027	1.911
Socioeconomic status	-0.192	0.208	0.848	1	0.357	0.825	0.549	1.242
Public Anti-smoking messages	-0.435	0.146	8.869	1	0.003	0.647	0.486	0.862
Adverse childhood experiences (ACEs)	0.562	0.146	14.864	1	0.000	1.755	1.319	2.336
Constant	-3.766	1.135	11.005	1	0.001	0.023		

Appendix shows multivariate analysis of all possible determinants of smoking initiation. The findings indicates that residential area and socioeconomic status of an individual do not influence an individual's decision of smoking initiation. However, all other variables as mentioned earlier significantly influence onset of smoking.

Appendix 4B Smoking Initiation

Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
ACE	.489	.118	17.244	1	.000	1.630	1.294	2.053
Religious Influence	-.826	.202	16.806	1	.000	.438	.295	.650
Age	.127	.026	23.971	1	.000	1.135	1.079	1.194
Ethnicity	-.706	.223	10.056	1	.002	.494	.319	.764
Restriction on Smoking at home	.551	.203	7.391	1	.007	1.735	1.166	2.580
Depression	.495	.149	11.056	1	.001	1.640	1.225	2.196
Anti-Smoking Messages	-.293	.111	6.989	1	.008	.746	.601	.927
Constant	-3.644	.967	14.190	1	.000	.026		

Appendix 4B shows factors affecting the smoking choice of respondents. The study has excluded peer influence from the smoking behavior of respondents. As peer's behavior is expected endogenous in the smoking initiation choice of respondents. Therefore, to avoid biasedness, the analysis has excluded the endogenous peer's influence.

Appendices

Appendix 5A Successful Smoking Cessation

Variables in the Equation	B	S.E.	Wald	D F	Sig.	Exp.(B)	95% C.I. for EXP(B)	
							Lower	Upper
Socio-economic status (SES)	0.596	0.278	4.606	1	0.032	1.815	1.053	3.128
Addiction Level	-0.816	0.236	11.982	1	0.001	0.442	0.279	0.702
Self-Efficacy	-0.674	0.202	11.192	1	0.001	0.510	0.343	0.756
Past Quit Attempts	0.346	0.144	5.815	1	0.016	1.414	1.067	1.873
Social Pressure to Quit Smoking	0.506	0.284	3.183	1	0.074	1.658	0.951	2.891
Religious Information against Smoking	-0.106	0.301	0.124	1	0.725	0.900	0.499	1.621
Public Regulation on Smoking	-0.236	0.425	0.309	1	0.578	0.790	0.343	1.817
Perceived behavior through health effect of smoking	0.054	0.306	0.031	1	0.861	1.055	0.579	1.922
Smoker' Age			3.925	3	0.270			
Smoker's Age (1)	-0.387	0.883	0.192	1	0.661	0.679	0.120	3.832
Smoker's Age (2)	0.213	0.699	0.092	1	0.761	1.237	0.314	4.870
Smoker's Age (3)	0.663	0.708	0.875	1	0.349	1.940	0.484	7.779
Constant	-0.259	1.658	0.024	1	0.876	0.772		

Dependent Variable: Successful smoking cessation Vs Unsuccessful

Appendix (5A) shows effects of nine independent predictors on successful smoking cessation. The result indicates that “religious information against smoking” and “public regulation on smoking” may motivate an individual for making quit attempts, however their role in maintenance of smoking abstinence is statistically insignificant. This further explain that pictorial health warning on cigarette packages and other public regulations on smoking may motivate an individual to take prompt action of quitting cigarette smoking. Similarly, when an individual get to know that smoking is “Haram or Makrhu” in Islam, he may immediately decide to stop smoking. That is, religious information against smoking and strict public regulation on smoking may motivate an individual for making quit attempt. However, only motivation to stop smoking is not sufficient for maintaining non-smoking status. A multi-component smoking cessation strategy in the form of ensuring smoke-free homes as well social and environmental pressure against smoking will produce the desirable outcome of smoking abstinence.

Appendices

Further, the result obtained show that individual perception about smoking and individual's age have no significant relation with smoking cessation.

Finally, comparing results of appendix A and appendix B, confirms that predictors of quit attempts and successful cessation of smoking differ from one another. For example, variables like public regulation and religious affiliation an individual are significantly associated with quit attempts but having no role in permanent cessation of smoking. On the other hand, socioeconomic status matters only cessation of smoking.

Appendix 5B Quit Attempt Vs No Quit Attempt

Variables in the Equation	B	S.E.	Wald	D F	Sig.	Exp.(B)	95% C.I. for EXP(B)	
							Lower	Upper
Religious Information against Smoking	0.535	0.235	5.189	1	0.023	1.708	1.078	2.707
Public Regulation on Smoking	0.836	0.322	6.727	1	0.009	2.307	1.227	4.340
Nicotine Dependency	-0.102	0.163	0.395	1	0.530	0.903	0.656	1.242
Socio-economic Status (SES)	-0.081	0.215	0.142	1	0.707	0.922	0.605	1.406
Individual's Perception about Smoking	0.100	0.229	0.190	1	0.663	1.105	0.706	1.731
Smoker's Age			3.887	3	0.274			
Smoker's Age (1)	0.968	0.536	3.267	1	0.071	2.633	0.922	7.521
Smoker's Age (2)	0.750	0.426	3.096	1	0.079	2.117	0.918	4.881
Smoker's Age (3)	0.778	0.444	3.067	1	0.080	2.178	0.911	5.204
Constant	-2.282	1.104	4.270	1	0.039	0.102		

Result find in the “Appendix 5B” shows religious information against smoking and public regulation on smoking have significant effect on motivating individuals to quit smoking. However, socioeconomic status of an individual, heavy dependence on smoking and individual perception about smoking are unrelated with smoking quit attempt. Similarly, age is a categorical variable and is not significantly associated with smoking quit attempt. However, as shown below in (5C) “age” variable show statistically significance sign in parsimonious model of smoking quit attempts.

Appendices

Appendix 5C Quit Attempt Vs No Quit Attempt

Variables in the Equation	B	S.E.	Wald	D F	Sig.	Exp.(B)	95% C.I. for EXP(B)	
							Lower	Upper
Public Regulation on smoking	0.957	0.309	9.581	1	0.002	2.603	1.420	4.771
Smoker's Age			5.092	3	0.165			
Smoker's Age (1)	1.091	0.525	4.323	1	0.038	2.979	1.065	8.334
Smoker's Age (2)	0.852	0.410	4.319	1	0.038	2.344	1.050	5.233
Smoker's Age (3)	0.796	0.436	3.329	1	0.068	2.216	0.943	5.209
Constant	-1.322	0.513	6.631	1	0.010	0.267		

Dependent Variable: Quit Attempt Vs No Quit Attempt

Appendix 5D Smoking Cessation

Variables in the Equation	B	S.E.	Wald	D F	Sig.	Exp.(B)	95% C.I. for EXP(B)	
							Lower	Upper
Past quit attempts	.400	.137	8.490	1	.004	1.492	1.140	1.952
Social & Environmental Factor	.714	.353	4.083	1	.043	2.041	1.022	4.078
Socioeconomic status	.531	.260	4.162	1	.041	1.700	1.021	2.830
Religious Affiliation	-.194	.288	.457	1	.499	.823	.469	1.446
Public regulations on smoking	.069	.652	.011	1	.916	1.072	.298	3.849
knowledge about negative health effect	.083	.221	.142	1	.706	1.087	.705	1.676
Age	.194	.192	1.021	1	.312	1.214	.834	1.767
Constant	-4.501	1.123	16.056	1	.000	.011		

Appendix 5D shows logistic regression result of smoking cessation model. In this case, the analysis has excluded variables like “nicotine dependency” and “peer pressure” which are thought to be endogenous in models of smoking behavior. The result finds no change in the overall significance of the model. However, only magnitude of the coefficient of variables has changed.

Appendices

Appendix 5E

Model 1 Multi-Collinearity

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-0.178	0.154		-1.158	0.248		
Motivational Factors	0.057	0.026	0.105	2.147	0.032	0.940	1.064
Regulation on smoking	0.160	0.069	0.112	2.317	0.021	0.960	1.042
Religion & Smoking	0.107	0.050	0.102	2.128	0.034	0.969	1.032
Social & Environmental Restrictions	0.099	0.043	0.112	2.288	0.023	0.945	1.058

Dependent Variable: Smoking Quit Attempt Vs No Attempt

Model 2 Multi-Collinearity

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.198	0.145		1.367	0.172		
Motivational Factors	0.048	0.022	0.108	2.173	0.030	0.832	1.202
Peer Pressure	-0.087	0.027	-0.158	-3.254	0.001	0.878	1.138
Social Factors	0.071	0.034	0.096	2.050	0.041	0.932	1.072
Quit Attempts	0.039	0.018	0.102	2.179	0.030	0.938	1.066
Nicotine Dependency	-0.089	0.030	-0.150	-3.023	0.003	0.844	1.184
Socio-Economic Status	0.091	0.037	0.114	2.449	0.015	0.951	1.051

Dependent Variable: Successful cessation Vs Failed quit attempts.