ESTIMATING PRICE AND INCOME ELASTICITY OF THE DEMAND FOR SUGAR SWEETENED BEVERAGES IN PAKISTAN

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CERTIFICATE

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Author's Declaration

I Ghufran Khan hereby state that my MPhil thesis titled ESTIMATING PRICE AND INCOME ELASTICITY OF THE DEMAND FOR SUGAR SWEETENED BEVERAGES IN PAKISTAN is my own work and has not been submitted previously by me for taking any degree from this University Pakistan Institute of Development Economics or anywhere else in the country/world.

At any time if my statement is found to be incorrect even after my Graduation the university has the right to withdraw my MPhil degree.

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Dedication

I dedicate this Research to my beloved parents, have been a great source of inspiration and support; their love encouraged me at every step-in life and particularly during my studies at PIDE. I dedicate my little effort to my brothers and sister whose love, trust, and prayers are unforgettable for me.

(Ghufran Khan)

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ABSTRACT

A huge and expanding body of scientific knowledge prove that sugar- contain drinks are harmful to health. Consumption of sugar-sweetened beverages (SSB) is linked to obesity and type 2 diabetes. Pakistan has one of the highest per capita soft drinks consumption rates in the world, as well as high obesity and diabetes rates. Fiscal measures, such as taxation, have been proposed as a public health policy to reduce Sugar-sweetened beverages consumption. Taxation policies are effective tools for reducing the consumption if these items on which taxes are levied are price elastic. We have estimated a double log model for beverages consumption and calculated the own and cross price elasticities for soft drinks (carbonated drinks) and for all sugar-sweetened beverages (Squash, fresh juice and Packed Juice) in Pakistan. Models were formed by income quintile and over region level in Pakistan. Price elasticity for soft drinks turned out to be -.562 and -.88 in the case of SSB, i.e., a ten percent rise in price from Rs 65 (average price in our sample) to Rs 71 is estimated to result in a 126-liter demand which is reduction in the amount of soft drinks consumed from 134 liters per household annually. Soft drinks price increases are also linked to switching to other beverages, squash, fresh juice and packed juice. For soft drinks, Households in metropolitan regions, those living in more marginalized areas, and those with higher incomes all had higher elasticities. A tax on soft drinks or on all SSB could limit consumption, especially among the poor, and hence lower the incidence of NCDs and the costs associated with them. However, to estimate the potential impact on total calories ingested, substitutes and complementarities with other foods and beverages should be assessed as well.

Keywords: *Price Elasticity, Income Elasticity, Sugar Sweetened Beverages, Taxation*

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List of Acronyms

SSB	Sugar sweetened beverages
NCDs	Non-communicable diseases
TPB	Theory of planned behavior
CDC	Centers of disease control and prevention
WHO	World health organization
CDA	Christian democratic appeal
HIES	Household Integrated Economic Survey
FDI	Foreign direct investment
SDGs	Sustainable development goals
OLS	Ordinary Least squares

CHAPTER 1

INTRODUCTION

The evidence for a link between obesity and sugary beverage intake is growing and becoming stronger (Hu, 2013). Globally, an increasing group of experts argue in favor of the introduction of taxation to disincentives the consumption of unhealthy food and drinks (Roache & Gostin, 2017). In particular, sugar-sweetened beverages (SSBs) drinks sweetened with any form of added sugars, including non-diet soft drinks, flavored juice drinks, sport drinks, sweetened tea, coffee drinks, energy drinks, and electrolyte replacement drinks (Control & Prevention, 2017) are considered as target group for additional taxation. A group of globally operating diabetes specialists urged the G20-countries to impose a tax on SSBs (Adekola, 2020). In addition, The World Health Organization declared that a 20% sugar tax on SSBs will result in lower consumption and thus decrease the likeliness of obesity (WHO Organization, 2016). Various countries have introduced taxation on unhealthy consumption to prevent people from ending up with serious health issues. Mexico, in 2014, has been the first country to implement a so-called sugar tax on SSBs, of which the first results are promising (Briggs, 2016). This tax is exclusively levied on SSBs. Recently, also Great Britain has officially agreed to introduce a sugar tax. More and more countries are considering such a tax. Pakistan is not an outlier. However, because a tax on SSBs does not yet have a parliamentary majority, it is more probable that it will remain on the political table. The question of the sugar-sweetened beverage tax was included in the electoral register agenda of the third main political party, Christian Democratic Appeal (CDA[1]).

[1] CDA is the Christian Democratic Appeal, established in 1980. Currently they possess (19 out of 150) seats in The parliament.

In both the discussion and tax enforcement, the success of the decreased consumption tax is critical. As a result, the focus of this paper is a micro-economic analysis of the so-called beverage tax. Using readily available empirical data, we concentrated on sugar-sweetened beverages that are widely available in Pakistan, according to data from the Household Integrated Economic Survey (HIES 2018-2019[2]). We hope to add to the existing literature some useful, empirical results for better taxation-based policies by measuring the price and income elasticity of demand for sugar-sweetened beverages.

1.1 Sugar sweetened beverages in Pakistan

Pakistan is a developing economy in South Asia with a land size of 796,095 km2 and a population of 220,892,331 million people (United Nations & Social Affairs, 2019). Pakistan is the world's sixth most populated country and the 36th largest country in terms of population, with a diverse cultural, ethnic, and religious background. Pakistan has a growing middle class and is home to the world's sixth largest population. There are over 17 million middle-class households and 102 million middle-class people. Food and beverage trading is Pakistan's second largest industry after textiles, accounting for 27% of value-added production and 16% of manufacturing sector employment. Food processing was examined for FDI from 2012 to 2018, with an average yearly investment of $223.5 million (BOI, 2012-2018). For example, the proposal of a soda tax on soft drinks to reduce consumption and hence the risk of obesity, type 2 diabetes, and other non-communicable diseases such as dental decay, heart disease, kidney disease, and non-alcoholic liver disease is continuously being considered.

In Pakistan, diabetes, cancers and other non-communicable diseases are widespread. Present diabetes prevalence in Pakistan is 17.1 percent (IDF, 2019). Moreover, the overall economic cost of diabetes for the

[2] HIES (House Hold integrated economic survey of Pakistan 2018-2019).

year is 71 billion (Khowaja et al., 2007). Whereas another study found the overweight and obesity prevalence to be 25 percent (Jafar et al., 2006). The economic cost of obesity and overweight is 16,450,154 (Nayab & Khalid, 2015). Last but not least, the study revealed that by 2025, there will be 3.87 million premature deaths due to non-communicable diseases in Pakistan, with significant economic consequences (Alwan, 2011). Pakistan is the signatory body of 17 SDGs Goals and Target 3 is strictly health-related, which is *"Ensuring the safety of all people and supporting their well-being".* Global health players are committed to raising awareness of non-communicable diseases under the SDGs 3.1.4 metric, which is directly linked to premature death prevention. While no clear research has been done on drinks. Which is directly linked to non-communicable diseases (NCDs) most developed countries are focusing on this risk factor but still ignored by Pakistan. In this study, we focus on this risk factor, which leads to premature death and gives to the government the best solution on the basis of my empirical results. The beverage manufacturing of juices, soft drinks, squashes in Pakistan has seen significant rises over the past couple of years (Manan et al., 2017). Clearly, public policy to halt this trend is necessary, as the expense of public health would otherwise rise to unsustainable and undesired levels. Fiscal policies aimed at SSBs may be on the verge of halting this trend. Furthermore, additional government revenue generated by such a fiscal strategy can be used to offset the regressive impact of a tax and encourage healthier soft drink alternatives.

1.2 Research Gap

A comprehensive review of the literature was carried out. However, to our knowledge, no research has been conducted in Pakistan to evaluate the price, cross-price, and income elasticity of demand for sugar-sweetened beverages. Which is a major non-communicable disease risk factor. Adding co-variates like regions and income quintiles to the equation adds more evidence for improved policy creation. These gaps were created using nationally representative data and a careful examination of sugar-sweetened beverage and soft drink consumption at the national level.

1.3 Research Question

This analysis comes up with the following questions, after reviewing the literature and defining the research gap;

1) What is the income and Price Elasticity[3] of sugar sweetened beverages in Pakistan?
2) To what extent the price and income elasticity of demand changes for different co-variates such as income, province and education etc. of sugar sweetened beverages in Pakistan?
3) Simulate potential for a tax rise on soft drinks to determine the decline in SSB consumption and increased government revenues?

1.4 Objective of the study

1) To evaluate self-prices and income elasticity and cross prices for sugar sweetened beverages (soft drinks, squash, fresh juice, and packed juice).
2) To determine if the elasticity estimates vary across different co-variates.
3) Examining the possible impact of a soft drink tax gives evidence for assessing the feasibility of fiscal measures to reduce SSB use.

1.5 Significance of the Study

Communicable and non-communicable diseases are both public health problems affecting both developing and developed nations. Yet literature suggested that most of the developed countries followed different economic policies to prevent communicable and non-communicable diseases. In this research, we focused only on non-communicable diseases, as sugar-sweetened beverages contribute to diseases that cannot be transmitted, and evaluate taxation policy options to reduce its incidence. In Pakistan, the intake of sugary beverages has increased, and non-communicable

[3] Price and Income Elasticity: Price elasticity of demand measures the responsiveness or sensitivity of the quantity demanded due to change in its price and income elasticity demand measures the sensitivity of the quantity demanded due to change in its income.

diseases are also on the rise. If we want to reach the SDGs goal of avoiding premature death by 2025. We have to focus on the non-communicable diseases risk factors. Sugar-sweetened drinks are one of the risk factors that lead to non-communicable diseases, and to the best of our knowledge no research was found in case of Pakistan taking into account both the price and income elasticity of sugar-sweetened beverage demands. Further taxation as policy option is not considered with simulations. Many developing countries have implemented economic policies to control sugar-sweetened beverage consumption through fiscal measures, and their findings are favorable. If we act on this approach, the future health effects would be beneficial.

1.6 Rationale of the study in Pakistan

The use of sugar-sweetened beverages is represented in the current study's beverage expenditures. In economic study, a person's consumption expenditures reveal his or her preference for a certain commodity. One of the major, especially in the form of soft drinks, illustrated health hazards is the consumption of sugar sweetened beverages. It not only causes economic problems, but it also impoverishes our population. This research is significant because it can assist policymakers in becoming more aware of the effects of prices on beverage consumption, as well as the impact of income on expenditures. The current study is additionally significant because no studies on the determinants of beverage consumption expenditures and their elasticities have been undertaken at the national level, encompassing all four provinces. Although a study on elasticities was undertaken, it focused on beverage production rather than beverage consumption.

1.7 Organization of the Study

This study is consisting of Six chapters. The first chapter which introduces the topic, is the introduction. It explains about why it is crucial to estimate price and income elasticity of demand for sugar sweetened beverages. This chapter also covers fiscal approaches to control the demand of sugary beverages through taxation, research gap, objectives of the study, research questions, Significance of the study. The second part includes review of literature on consumption of the beverages linked with non-communicable diseases, the price and income elasticities and tax implication in the world and in the context of Pakistan as well. Data and the methodology which has been used in the analysis of this research is discussed in chapter 3. The next chapter gives the findings of data analysis concerning the goal of the study estimating price and income elasticity of the demand for sugar sweetened beverages in Pakistan and provide household consumption expenditure information by SSB items in different regions and provinces. The fifth chapter focuses on estimation results the price and income elasticities of sugary beverages and the final chapter discusses the conclusion and policy recommendation. References are listed at the end.

CHAPTER 2

LITERATURE REVIEW

The related research paper review has been carried out. But there is no study available regarding the estimation of price and income elasticity of soft drink demand in Pakistan. The price and income demand elasticity for sugar-sweetened drinks were discussed by certain researchers whose work have been reviewed below.

In economics, few theories take into account of addiction, defined as a high rate of consumption of a substance that is ultimately harmful to the organism. The theories are teleological and behavioral in the sense that the ultimate motivational forces they propose lie in the behavioral context of the environment in the function of economic utility or the behavioral adjustment process rather than in the internal physiological or cognitive mechanism. For example, TBP[4]: The Theory of planned behavior researchers assist to understand how to predict an individual's intention to engage in a behavior at a specific time and place. The theory was intended to explain all behaviors over which people have the ability to exert self-control. The TPB has been used successfully to predict and explain a wide range of health behaviors and intentions.

In the above scenario we have another prominent theory which is "Rational Addiction": by Gary S. Becker and Kevin M. Murphy they were developed a theory of rational addiction in which rationality means a consistent plan to maximize utility over time. Strong addiction to a good requires a big effect of past consumption of the good on current consumption. Consumption rises over time when above unstable steady-state levels, and it falls over time, perhaps until abstention, when below unstable steady states. Not all smokers and heroin users become addicted, but those

[4] Theory of planned behaviour was proposed by Icek Ajzen (1985).

who discount the future heavily are more likely to become addicted. Permanent changes in prices of addictive goods may have a modest. short-run effect on the consumption of addictive goods. Rational persons end strong addictions only with rapid and sometimes discontinuous reductions in consumption. Addiction is a major challenge to the theory of rational behavior. Theory of rational addiction does explain well-known features of addictions (Becker & Murphy, 1988).

Sugar-sweetened beverages are important for the economic and public health benefits of a global health. A strong argument was made for the reduction of consumption in the use of sugar-sweetened beverages (SSBs), with obesity, diabetes and cardiac disease (Brownell et al., 2009). Taxation as a way of reducing consumption and thus minimizing healthcare expenditures and generating cash for public health initiatives was recommended (Nestle & Jacobson, 2000).Soft drinks now have sales taxes in 33 states, but the levies are too small to modify consumption and the money is not targeted at activities relating to health.

The literature developed patterns in consumption of SSB, evidence supporting such drinks to negative health outcomes, and approaches for the implementation of a taxation system which could improve nutrition while helping the nation recover costs related to consumption of SSB. SSB intake has increased over the last few decades globally, with Mexico intake doubling in all ages between 1999 and 2006 (Córdova-Villalobos et al., 2008). From 1977 to 2002, consumption of caloric drinks per capita doubled across the US at all ages (Duffey et al., 2012). According to the most recent data (HIES 2018–2019), Pakistani children and adults drink 134 liter of sugar-sweetened beverages per home yearly. Various cross-sectional, longitudinal and systematic tests examined the relationship between SSB use and body weight (Vartanian et al., 2007). In longitudinal studies as well as for beverage-funded research, a meta-analysis showed greater positive relations between the intake of SSB and body weight than for cross-sectional studies. A

meta-analysis of young research was funded by the beverage industry (Forshee et al., 2008). The meta-analysis was interpreted as demonstrating no indication of an association between SSBs and body weight, but it erroneously gave considerable weight to several small negative studies (Malik et al., 2009). A prospective study conducted by middle school students over the course of two academic years has found that every additional SSB per day increased the risk of obesity by 60% (Ludwig et al., 2001).

Those who increased their SSB consumption by year 4 in an 8- year prospective study in adult women, while those who decreased their SSB consumption in year 4 only increased to 2.8 kg (Schulze et al., 2004).). Short term clinical trials provide the experimental basis for understanding how SSBs can affect adiposity (Tordoff & Alleva, 1990). Found that over a period of three weeks the total energy intake and body weight of individuals in SSBs was increased 530 kcal a day, but decreased in subjects in non-caloric sweetened liquids compared to those in non-caloric drinker areas.

Obese subjects gained weight when given sucrose mostly in the form of SSB for 10 weeks, but lost weight when given non-caloric sweeteners for the same time period, according to (Raben et al., 2002). Three prospective observational studies in US Nurses, Finnish women and men, and Black women have all found positive links between SSB use and risk for diabetes type 2 (Montonen et al., 2007). In the Nurses' Health Study II, which followed 91,249 women for eight years, the incidence of diabetes was nearly doubled for women who consumed one or more servings of SSB per day (Schulze et al., 2004). Almost half of the increased risk was due to a higher body weight. The majority of the increased risk was attributed to Black women's weight.

According to the Nurses' Health Study, which included 88,520 women, the risk of cardiovascular disease risen by 23% for women who consumed one SSB serving per day and by 35% for women

who consumed two or more servings per day (Fung et al., 2009). Increased body weight explained some, but not all, of this link.

Understanding the Relationship Between Sugar-Sweetened Beverages and Poor Health Mechanisms, the associations between SSB consumption and negative health outcomes could be due to a variety of behavioral and physiological mechanisms, with some relationships (e.g., SSB intake and weight gain) being more well established than others. High consumption of refined carbohydrates, such as sugar, has been linked to an increase in triglycerides and blood pressure, as well as a decrease in HDL cholesterol, both of which are associated with an increased risk of heart disease and stroke (Appel et al., 2005). Because of their high glycemic load, SSBs are likely to increase the risk of diabetes by causing insulin resistance and having direct effects on pancreatic islet cells (Ludwig, 2002). According to observational studies, intake of Sugary beverages, but not non-calorically carbonated drinks, has been linked to insulin resistance markers (Yoshida et al., 2007). SSB consumption may result in excessive weight gain due to the apparent lack of satiating characteristics of sugar in liquid state. In fact, calorie compensation for energy consumed in a beverage is less comprehensive than calorie compensation for energy consumed in solid food at subsequent meals (Mourao et al., 2007).). Energy from beverages, for example, contributed to total caloric intake but did not show up to displace other components of calories in a study involving 323 adults and 7-day food diaries (De Castro, 1993). A study of school-age children found that those who consumed 9 ounces or more of SSB per day consumed nearly 200 kcal per day more than non-drinkers (Harnack et al., 1999). Short-term feeding studies lend support to this mechanism. Strong food consumption did not change along all situations in 33 adults who were given identical test lunches on different ways with differing soft drink type (sugar sweetened cola,

non-caloric cola, or water) and quantity (12 vs. 18 oz) (Flood et al., 2006). As a result, when the SSB was served, the total energy consumption increased significantly.

SSBs have the potential to influence other behavioral pathways. Individuals could drink SSBs to quench their thirst or for social reasons in the absence of hunger, but solid food consumption is usually associated with hunger. Long-term exposure to SSBs may have a negative impact on taste preferences and dietary acceptability. Individuals who drink SSBs instead of water may find less sweet but more satiating meals (e.g., vegetables, legumes, and fruits) unpleasant or disagreeable, resulting in poor diet quality.

When it comes to (Park et al., 2012). They discovered that male adolescents are 66 percent more likely than female adolescents to consume 1 or more SSBs per day when they looked at the relationship between gender and SSB consumption. However, upon additional examination, the author discovers that this disparity is not consistent across all types of SSBs consumed. Men are 57% more likely than women to consume regular soda, but their chances of consuming sports and energy drinks increase (99 percent and 117 percent respectively). Adult females are 12% less likely than adult men to consume one or more SSBs each day, according to a study by (Kristal et al., 2015). Even though the two studies involve two very different age groups, high school students and low-income individuals who use public health care, the pattern of male consumption being higher than female consumption remains consistent. It's worth noting, though, that when it comes to SSB consumption, the gender gap isn't paralleled when looking at obesity rates. Adult men have a higher BMI than adult women, according to (Wang & Beydoun, 2007), but this relationship flipped after 1994, when the rise of obesity among adult American women overtook that of their male counterparts. (Wang & Beydoun, 2007) predict that adult men's BMIs will grow by.7 points each year, while adult women's will climb by.8 points per year, based on a linear regression model.

For example, if a man's BMI is 30, it will be 30.7 points the next year. If a woman had the same BMI as a man, her BMI would be 30.8. Both figures show that they are overweight; nevertheless, women's average body mass is increasing at a faster rate than men's. The forecast of (Wang & Beydoun, 2007) is consistent with the findings of another long-term study of New York City inhabitants, (Black & Macinko, 2010) discovered that women are expected than males to be obese in a stratified random sample of 48,506 New York City folks, and that the gender gap is widening. For each year of the study, there is a statistically significant increase in obesity for women of 3.4 percent, but no such increase for men. According to (Wang & Beydoun, 2007). Research, the rise in female obesity accounts for the majority of the city's obesity trend (exact results not provided).

The incidence of obesity, as well as men's and women's SSB consumption patterns, can be broken down further by racial and ethnic groups. In a longitudinal study of American adults,(Han & Powell, 2013) found that African Americans are 89 percent more likely than whites to drink SSBs when utilizing logistic regression. Furthermore, Hispanics are 25% more likely than whites to consume SSBs, but African Americans are less likely. While (Han & Powell, 2013) do not break the study groups into male and female categories, a report published by the state of California in 2014 indicated that African Americans and Hispanics have higher obesity rates in their areas due to their higher consumption patterns. In contrast to (Black & Macinko, 2010; Han & Powell, 2013) incorporate factors based on gender, race, and ethnicity in an obesity study. (Black & Macinko, 2010) utilize the terms white and female to demonstrate that women of all races and ethnicities are more likely to be obese than men.

Obesity is 10% more common among African Americans than among whites, but black females are 67 percent more likely than their male counterparts to be overweight. These studies suggest that SSB consumption has a favorable relationship with obesity prevalence in racial and ethnic

groups when not controlling for gender, but that this positive association decreases when men and women with similar demographics are compared. Age shows a negative link with SSB use, according to all of the data reviewed for this thesis. In a longitudinal study of children and adults in America from 1999 to 2010,(Kit et al., 2013) Age shows a negative link with SSB use, according to all of the data reviewed for this thesis. In a longitudinal study of children and adults in America from 1999 to 2010, (Kit et al., 2013) discovered that consumption of SSBs decreased with age for all demographics, including race, wealth, and gender. Recent government measures to ban SSB consumption, according to the authors, may be too responsible for the reduction in consumption. If this is the case, it may indicate that consumer education is effective in reducing consumption and promoting healthy eating habits.

Younger age groups consume more SSBs than older age groups, according to (Kristal et al., 2015) People aged 30 to 39, for example, are 99 percent more likely than those aged 70 and over to consume one or more servings of any kind of SSB each day. Young people aged 18 to 29 are 193 percent more likely to consume one or more servings each day. The downward trend in consumption continues with each age group after the 18-29 population. Findings from a previous study of adults in New York City were repeated by (Kristal et al., 2015). (Rehm et al., 2008) In this study, 18 to 24 year olds were shown to be 140 percent more likely than 25 to 44 year olds to consume more than 12 ounces of SSB each day.

The increased rise in obesity contrasts with the lower trend in consumption among older age groups. (Black & Macinko, 2010) discovered that obesity rates climb to a point, then reduce in the 65 and older age group in their study of obesity variables in New York City from 2003 to 2007. In addition, when comparing consumption patterns from (Kristal et al., 2015) study, which found that males consume more SSBs than females, women had a higher proclivity than men for having a

BMI of greater than 30. Despite the fact that women consume fewer SSBs, they are more likely to become obese.

Neither study goes into great detail on the causes of this phenomenon, but the Robert Wood Johnson Foundation stated in a 2012 paper that it could be the result of decreasing exercise in older populations mixed with the life-shortening comorbidities that obese people suffer from. Furthermore, if the theory proposed by (Kit et al., 2013) is correct, knowledge gained from public education activities aimed at reducing SSB intake should be transferred to other dietary choices, resulting in weight loss over time. The existence of a relationship between consumption and obesity calls the idea into question.

Socioeconomics, in contrast to static demographics, consists of a number of aspects that can change over the course of a person's life, regardless of fixed qualities like race, ethnicity, gender, or age. While they may not be causal, they do shed light on other aspects including nutritional information, healthier food options, and physical exercise options. People in low-income areas, for example, may not have as easy access to nutritious foods as those in higher-income areas. Furthermore, these low-income neighborhoods may not be safe enough for citizens to feel comfortable passing through.

Low-income adults aged 35 and higher (135 percent of FPL) consume 89 percent more sugar-sweetened beverages than high-income adults (>300 percent of FPL), according to (Han & Powell, 2013). Han and Powell differentiate between adults and young adults in their analysis, but the spending disparity between the two groups still follows the same trend of higher expenditure for those with lower wages.

(Malik et al., 2010) revealed that bad dietary and health habits cluster together, which could explain the negative association between income level, SSB use, and obesity. When people eat a lot of SSBs, they also eat a lot of high-energy foods and don't exercise very often.

Human metabolism, nutritional consumption, and physical activity all play a key and linked part in the aetiology of overweight and obesity, and are all influenced by social, economic, and architectural contexts, as well as hereditary features. Furthermore, dietary intake and physical activity levels can be influenced by behavioral, environmental, economic, and cultural factors (Goni et al., 2015). The main physiological cause of overweight and obesity is an imbalanced energy intake caused by a combination of overconsumption of energy dense foods, such as SSBs, and insufficient energy expenditure (e.g. due to lack of exercise or other physical activity)(Hill, 2006). Early onset of an unhealthy percentage of body fat accumulation in childhood can have a negative impact on an individual's health in adulthood and predispose them to obesity for the rest of their lives (Juonala et al., 2011). Obesity and overweight are known to be substantial risk factors for a variety of non-communicable diseases, including cardiovascular disease (CVD), type 2 diabetes, cancer, and osteoarthritis (Guh et al., 2009). Obesity and being overweight are linked to severe psychological illnesses(Simon et al., 2006). Furthermore, obesity and overweight may contribute to the loss of social capital in some nations, as fat persons are frequently socially stigmatised, thus leading to social isolation (Puhl & Heuer, 2009). Overweight and obesity, on the other hand, might be considered as socially acceptable in other places, such as some Pacific Island countries (Mavoa & McCabe, 2008).

In overweight and obesity, there are both inter-country and intra-country disparities. In terms of inter-country disparities, morbidity and death rates linked to overweight and obesity are generally greater in middle and high-income countries than in low-income countries (WHO, 2009). When it

comes to within-country disparities, factors such as health disparities and socioeconomic determinants of health have a big impact on the incidence of overweight and obesity. Individual (e.g., socioeconomic status (SES), age, gender, ethnicity, education, and occupation) as well as contextual characteristics are included (e.g. food security, built environment including housing) (Valera et al., 2015). A recent assessment of data in low-income nations found a link between socioeconomic status and obesity: Obesity is more common in people with a higher socioeconomic status (Dinsa et al., 2012). In contrast, the connection between SES and obesity in middle and high-income countries is mixed or negative: obesity is more prevalent in lower SES groups (Wang & Lim, 2012). Overweight and obesity have a significant economic impact on public health systems, both directly (e.g., treatment expenses) and indirectly (e.g., reduced work productivity)(Van Nuys et al., 2014).

According to a recent analysis, direct expenses of obesity account for 0.7 percent to 2.8 percent of national healthcare expenditures in the reporting countries, with the majority of studies coming from high-income countries (Withrow & Alter, 2011). . The direct costs of being overweight were also considered in a review that was limited to studies from the United States. Overweight and obesity expenditures account for 5% to 10% of all healthcare costs in the United States (Tsai 2011). In general, indirect costs of overweight and obesity can far outweigh direct expenses, depending on whether indirect costs are included (Dee et al., 2014).

There is no internationally accepted gold standard for determining overweight or obesity, nor is there a method for predicting the majority of obesity-related health concerns (e.g. type 2 diabetes) (Kodama et al., 2012). The BMI is a proxy measure that is based on a person's weight and height and is one of the most often used to assess total body fat accumulation. However, this metric may give false findings, especially in those with a lot of muscular mass, some ethnic groups, and

youngsters (Javed et al., 2015). Waist circumference is a popular proxy measure for abdominal obesity (WC), waist-to-hip ratio (WHR), and waist-to-height ratio (WHtR) (Ashwell et al., 2012).

More modern measurement techniques, including as bioelectrical impedance analysis (BIA), magnetic resonance imaging (MRI), isotope dilution analysis (IDA), ultrasound, and computed tomography, have been utilized in recent years to assess the level of body fat more precisely (CT),(Kodama et al., 2012).

Economists argue that government intervention in a market is permissible when "market failures" result in less-than-optimal production and consumption (Cawley, 2004). Sugar-sweetened beverages had a number of market failures. To begin with, many people make consumption decisions based on incomplete knowledge, failing to recognize the connections between consumption and health implications. The widespread marketing that can boost the apparent benefits of consuming is likely to distort these judgments even more. A second failure is produced by shifting preferences over time (decisions that provide short-term gratification but long-term harm). This problem is exacerbated in children and teenagers, who priorities instant enjoyment while overlooking long-term implications. . Finally, in the SSB market, there are financial "externalities": consumers do not bear the full cost of their purchases.

Because of the role of SSB consumption in obesity and the health consequences of SSB consumption that are independent of weight, SSB consumption leads to a rise in health-care costs.

Fiscal policies will be forecasted to have the most efficient effects on SSBs. For an effective policy, the categories of beverages which would be taxed, the type of tax (sales vs. excise tax), and the tax rate are all important considerations. On beverages containing any caloric sweetener, we propose a sales tax of 5 to 20 cents per liter.

A particular tax on excise duty per liter or per Gram of added sugar would be preferable to sales tax or ad valorem duty (as a percentage of the price), or ad valorem duty tax (as a percentage of price) and would provide a motivation to reduce sugar in every liter of an SSB. There are three drawbacks to the addition of sales tax as a proportion of retail costs, a) they could just promote the purchase of cheaper brands, (without a reducing calorie) or of big containers with reduced costs, b) they are not noticed by consumers, until after they have made the purchase choice. SSBs in a number of countries are now excluded from sales taxes along with food, apparently as food is a necessity. This anachronism should be eradicated if or not an excise tax is adopted.

Excise levies may be imposed on producers and distributors, most likely in the form of a higher retail price visible at the time of purchase to consumers. Producers and wholesalers are considerably more easily charged than retailers because far fewer firms are required to comply and syrup sugar can be charged for which the high volumes of fountain beverages sold are an important advantage. As with tobacco and alcohol taxes, specific excise charges have a stronger effect on consumption than ad-value excise taxes and may also produce more constant revenue as the price systems in industry are less dependent (Chaloupka et al., 2010). Moreover, tax laws need to be constructed so that specific excise charges are adjusted in accordance with inflation on a regular basis so as to avoid any deterioration in their impact on prices and income over time.

The finding of one study was that the price of a 20-ounce drink would be increased by a one-cent per unit beverage tax by 15–20 percent. Price elasticity research can be used to determine the impact on consumption, including both direct and indirect effects of price changes. All soft drinks are between -0.8 and -1.0 price elasticity (Andreyeva et al., 2011). It is forecast that taxing only SSBs will have a higher price impact because some consumers switch to diet drinks. A one cent per oz excise rate will reduce the caloric intake from sweetened drinks by at least 10 percent or at

least 20 kcal per person per day, based on a moderate estimate, which will replace 25 percent of the reduced caloric consumption with calories from other sources sufficient to reduce weight and risk (Duffey et al., 2010). In higher volumes of consumers, which are likely to be overweight and seem to be more price sensitive, the benefit would be greater (Powell & Chaloupka, 2009). More taxes would be more advantageous. The taxation of non-caloric sweetener beverages is an important subject. While no consistent evidence has been shown of negative health consequences for non-caloric sweeteners, there are concerns that dietary drinks could boost caloric consumption by rationalizing the input of other highly caloric products or by encouraging demand for sweet aromas (Mattes & Popkin, 2009). We are currently proposing to levy a drinks tax.

A tax on sugar-sweetened beverages would raise large funds, which might be used to support child nutrition and obesity prevention programmes, uninsured health care, or general revenue needs. A national SSB tax of 5 cents per liter would earn 3.542 rupees billion in the first year alone. For example, state taxes in Arkansas would yield $139 million, $173 million in Oregon, $221 million in Alabama, $928 million in Florida, $937 million in New York, $1.2 billion in Texas, and $1.8 billion in California. For some countries researchers have calculated the price and income elasticity of demand for SSBs, as shown below.

The Almost Ideal Demand System was developed to calculate the price elasticity of SSB demand in Mexico (AIDS). The Mexican National Income and Household Spending Surveys (MNIHES) offered cross-sectional data on sugary beverage consumption as well as several other variables such as income levels and urban vs. rural living circumstances in 2006, 2008, and 2010. Soft drink elasticity was estimated to be 1.06, compared to 1.16 for other SSBs. They also found that rural households are more flexible and had lower earnings than those with higher incomes (Colchero et al., 2015). Opponents sometimes argue that a sugar tax on SSBs is unfair since it is regressive and

disproportionately affects the poorer population (Colchero et al., 2015). Reject the argument by claiming that the soft drink market is more elastic for lower-income households. As a result, the financial burden of a potential tax will fall disproportionately on those with higher earnings. A similar study was conducted in Chile to determine whether or not the market for SSB is elastic (Guerrero-López et al., 2017). Using a method that is similar to that of (Colchero et al., 2015). They estimated a market structure for drinks using a cross-sectional household survey. They discovered that soft drinks have a price elasticity of -1.37, but other SSBs have a price elasticity of -1.67. There was also a link between money and happiness.(Guerrero-López et al., 2017) found that lower-income consumers consume more SSBs and are more aware of price changes. Predict that: In the medium to long term, only a considerable price rise (10%) will have an economic and health impact. They suggest that more tax income should be spent to mitigate the regressive nature of the tax. This can be accomplished by educational programmes that eliminate asymmetric information dissemination and by making drinking water available to the general public (Andreyeva et al., 2011).

Give an example of a method for calculating SSB excise tax revenues. To compute total tax income, they used statistics on regional beverage consumption in the United States, historical patterns, and SSB's most recent pricing elasticity estimates. They come to the conclusion that the impact of SSB tariffs on public health may be significant. A 20% increase in price will result in a 24% decrease in SSB consumption. Fiscal policy, in particular, may have an impact on consumption among youth and low-income groups. The conclusion is supported by evidence (Powell & Chaloupka, 2009). Those who contend that pricing changes are affecting teenagers, low-income populations, and those most at risk of obesity. They go on to say that spending tax dollars in obesity prevention programs could have a bigger payoff. Ireland is one of the countries

where the SSB tax is a topic of discussion. There have been several proposals for establishing a sugar tax that have been discussed.

A similar study (Briggs, Mytton, Madden, et al., 2013). Looked into the impact of a 10% tax on SSBs on obesity. They used market elasticity estimations to determine the impact of a 10% tax, taking into consideration a 90% customer pass-through rate. The -0.9 price elasticity of SSBs is anticipated to reduce obesity by 1.3 percent and overweight by 0.7 percent. Surprisingly, there are no significant gender or income disparities. They did notice age differences, though. Young adults are more receptive to the tax and, as a result, are more likely to lose weight. In the United Kingdom, similar findings are provided (Briggs, Mytton, Madden, et al., 2013).

In support of the United Kingdom. A 20% SSB tax results in a 1.3 percent and 0.9 percent reduction in obesity for overweight people, respectively. A 10% tax would result in a 0.6 percent reduction in the number of obese people. Ireland and the United Kingdom appear to be comparable countries. A price increase is likely to have a similar effect on SSB use. However, the impact of an SSB tax on lowering the obese population is expected to be different. One probable explanation is that the relative contribution of sugary drink consumption to obesity will vary. A similar SSB tax might result in a different reduction in energy use. Further research is needed to determine why a 20% tax in the UK has the same effect on obese population decrease as a 10% tax in Ireland.

In comparison to the projected pricing elasticities in the US, Ireland, and the UK, there is a significant variance. According to (Andreyeva et al., 2011). A 20% increase in the price of SSBs results in a 24% drop in consumption. Sugary drink taxes are a successful intervention for lowering sugar consumption (NCDs, 2017). According to evidence, implementing a 20% charge on sugary drinks could result in a 20% reduction in consumption, reducing obesity and diabetes (Powell et al., 2013). In Ireland and the United Kingdom, a similar price increase reduces SSB consumption

by roughly 15%. (Briggs, Mytton, Kehlbacher, et al., 2013). Price differences for replacements and different tastes are two possible explanations for this gap. Furthermore,(Andreyeva et al., 2011). Concentrates on the impact of an excise tax, but (Briggs, Mytton, Kehlbacher, et al., 2013) do not concentrate directly on excise duties.

Research Gap

These findings suggest that the potential efficacy of a soft drink tax varies from nation to country. There is widespread academic agreement on the link between SSB costs and consumption. However, in order to provide policy suggestions, a deeper understanding of pricing elasticity estimates in Pakistan is required. Hence my research focuses on the relationship between soft drink prices and demand. Price elasticity estimates add valuable empirical evidence to the available literature. Our research utilizes HIES House Hold Survey results. That allows me to reflect on the impact of Pakistan's beverage tax. Moreover, the data facilitates the details required for calculating differential effects about gender, age, education. In a nutshell, the goal of my study is to calculate the price and income elasticity of demand in Pakistan for sweetened sugar beverages. As a result, look at the effectiveness of the soft drink tax. The findings of this study could be used to persuade governments to undertake further fiscal policies to reduce soft drink consumption. It could also add to existing public policy evaluations by providing important information.

CHAPTER 3
DATA AND METHODOLOGY

This studied incorporated a well-balanced approached for achieving the researched target along while identifying various channels by which sugar beverages were consumed, and then generating more discussion on end outcome which was the fiscal measures simulations. Taxation had a separate political economy, with different effects on each organization participating in the valued chain of an economic commodity. To captured some of this, ideally the whole valued chain of sugar-sweetened drinks needed have been understood so that the structure and administration of SSB taxation and its effect on curbing its used of SSB in Pakistan could been evaluated. However, given time and resource constraint we had only focused on the final consumption data reported in the HIES and from there demanded behavior was analyzed.

3.1 Data Source

In this study, the data were obtained from the 2018-19 household integrated economic surveyed (HIES). The bureau of statistics of Pakistan was conducted under a special survey, the household integrated income and consumption surveyed (HIICS), specifically developed through the merging household integrated economic surveyed (HIES) (FBS). Survey PSLM/HIICS 2018/19 provides cross-sectional information, among other foodstuffs of different sugar-sweetened beverage products, about spending and quantity consumed by households.

3.2 Ethical Approval

The secondary data taken from HIES was being used in this research. No ethical approval was needed at this stage as the HIES (2018-19) data was already been approved by the government of Pakistan.

3.3 Price and Income Elasticity Estimation

To analyze the impact of the tax increases on the consumption of SSBs, sugar-sweetened beverages, and household revenue elasticity were necessary. In combining family budgets surveyed and household income and integrated reporting we estimate the price and income elasticity of the 2018-19 integrated household income and consumption surveyed (HIICS) from the federal statistical bureau (HIES). The lack of data on the price of sucrose beverages and proxies was an important difficulty when cross-sectional surveys were used to assess the price elasticity of the demanded for sugary drinks. While PSLM/ HIICS surveys gave transversal information on household expenditure and consumption of various sugar beverage products, there was no direct price information accessible for such products. This problem could have been addressed in numerous ways. The used of regional price data was one technique to created consumer price indexes. However, this method for this analysis was not feasible, as the data prices of sugary drinks for all geographical locations were not available. The used of unit values (expenditure/quantity) as a representation of prices was a feasible alternative.

while measurement errors and variance in quality may contaminate the unit valued, it still contains essential price information which could been used to estimate price elasticity. Log-linear, dual log, or constant elasticity models were quite beneficial to utilize because it gave the ability to estimate exact price elasticity by used the unit values spatially derived from surveys. We may then calculate the price and income elasticity estimates of the ordinary lowered squares (OLS) on the assumption, that there could been no market price difference for a specific commodity for a certain timeframe. The studied controlled numerous crucial variables disregarded by earlier studied in Pakistan in addition to consumption by the SSBs, pricing, and household income. These include the size of the household, the overall household education, education and gender of the head of the

household, the number of adults in the household, the number of male members in the household, the average age of the household, the worked of household members, the area of residence and others. We would calculate the tax effect on consumption simulations by means of this set of estimates in handed.

3.4 Methodology for estimating the SSBs demand elasticities

Any inquiry into the effects of taxing and consuming SSBs involves estimating the price elasticity of SSBs. The current studied goal was to calculate price elasticity with small data from the federal bureau of statistics (HIICS) 2018-2019. The lack of price data for SSBs goods was a disadvantage of used cross-sectional surveys to estimate demanded elasticity of demanded for SSBs. Although HIICS gave cross-sectional data on household spending and the quantity consumed of various SSBs goods, direct price information was not accessible. Among the approaches to this problem was the used of regional price data to generate consumer price indexes. However, due to the lack of data on sugary drinks cost at all locations, this method was regarded as inapplicable in the current scenario. Another option would have been to price used unit values (expenditure/quantity). However, there was a chance that the unit valued had been affected by calculation errors and inconsistencies. Nonetheless, it contains valuable price details that could been used to estimate price elasticity. As a result, the current studied employs the double log model to calculate corrected price elasticity under the premise that the market price of a specific ssb product in a cluster (or primary sample unit) did not fluctuate during the studied period.

the double log model was briefly explained in the following discussion. To estimate the sugar-sweetened beverages price elasticity, we started with a basic double log model:

$$Q_{i=}\beta_1 p_i^{\beta 2} \qquad (1)$$

Where Q = per capita SSB demand in litters, P = price of SSB and β_1 is a constant.

This model was nonlinear in the parameters and to estimate it as it stands requires nonlinear estimation techniques. However, if we took the logarithm of this function, we obtain

$$\ln Q_i = \ln \beta_1 + \beta 2 \ln p_i \qquad (2)$$

Where ln denotes natural logarithm.

Writing ln $\beta_1 = A$, we can write eq (2) as:

$$\ln Q_i = A + \beta 2 \ln p_i \qquad (3)$$

Equation (3) is linear in the parameters A and $\beta 2$ is therefore a linear equation, although it is nonlinear in the variables $Q \; and \; P$.

Adding the random error μ_i to equation (3), we obtain the following LRM:

$$\ln Q_i = A + \beta 2 \ln p_i + \mu_i \qquad (4)$$

Equation (4) is known as a log-log, double-log, log- linear, or constant elasticity model, because both the regressand and regressors are in the log form.

An interesting feature of the log-linear model was that the slope coefficient could been interpreted as elasticities. Specifically, β2 was the (partial) elasticity of output with respect to the price of SSB, holding all others variables constant. That was, it gave the percentage changed in quantity demanded for a percentage changed in the price of SSBs, ceteris paribus.

Since these elasticities are constant over the range of observations, the double-log model is also known as constant elasticity model. An advantage of elasticities is that they are *pure* numbers, that is, devoid of units in which the variables are measured, such as rupees, person-quantity consumed liters, or SSB-liters, because they are ratios of percentage changes.

Before presenting a concrete analysis, it should be noted that in a log-linear regression model involving several variables, the slope coefficient of each regressor gives the partial elasticity of the dependent variable with respect to that variable, holding all other variables constant.

Tax simulation had been done on four tire of tax first tire was 5% second tire was 10% third tire of tax was 15% and last tire of tax had been 20% of tax on SSBs. the formula for tax simulation on different rates was followed.

$$Pn = (1 + taxrate)Po \qquad (5)$$

Where Pn = new price of commodity and Po is = old price of commodity for example:

$$Pn = (1 + .05)Po \qquad (6)$$

$$Pn = (1 + .05)65 \qquad (7)$$

$$Pn = 68 \qquad (8)$$

The new price had been 68 only when 5% tax imposed on SSBs. The same method was following for consumption quantity.

$$Cn = (1 - elasticity)Co \qquad (9)$$

Where Cn = New Consumption and Co= Old consumption of the products.

CHAPTER 4

DESCRIPTIVE STATISTICS

This chapter present the findings of data analysis concerning the goal of the study estimating price and income elasticity of the demand for sugar sweetened beverages in Pakistan and provide household consumption expenditure information by SSB items in different regions and provinces.

The cross-sectional data as collected by PBS does not provide data on prices; however, we have estimated unit prices using Deaton (1990) methodology where unit values are estimated by dividing each item expenditures are by their respective quantities consumed.

4.1 Household consumption expenditure on SSBs items per year

In this part we estimate the household beverages expenditure annually. SSB includes soft drinks, squash/Sharbat, fresh juice/sugarcane juice, packed juice.

Table 1: Household expenditure on SSB

Nationally	**Mean**
SSB expenditure	Rs = 11296.74

Source: PSLM 2018-19 (HIICS) data authors' calculations.

The above table (01) shows that the average household expenditure on SSB items in Pakistan the average expenditure is 11296 rupees per year.

Table 2: Household expenditure on SSB over region in Pakistan

SSB Exp	**Mean**
National Rural	Rs = 10136.53
National Urban	Rs = 12615.5

Source: PSLM 2018-19 (HIICS) data authors' calculations.

The above table (02) shows that the average household expenditure on SSB consumption it depicts that the people are living in national urban region are more spending on Sugar sweetened beverages than national rural region. National urban region spends 12615 rupees per year and National rural region inhabitants spend 10136 rupees per annum. Which is two thousand less than urban inhabitants.

Table 3: Household expenditure on SSB over provinces

SSB Exp	**Mean**
Kpk	Rs = 10954.95
Punjab	Rs = 11644.02
Sindh	Rs = 11118.29
Balochistan	Rs = 9936.118

Source: PSLM 2018-19 (HIICS) data authors' calculations.

According to the above table (03) shows that the average household expenditure on SSB over provinces in Pakistan. Punjab is the slightly more spends on Sugar sweetened beverages than other provinces and Balochistan is less spends on Sugar sweetened beverages items which is 9936 rupees annually.

Table 4: Household expenditure on SSB over provinces and region

SSB Exp	Mean
kpk rural	Rs = 10071.85
kpk urban	Rs = 12122.74
Punjab rural	Rs = 10565.9
Punjab urban	Rs = 13280.12
Sindh rural	Rs = 8926.161
Sindh urban	Rs = 12436.32
Balochistan rural	Rs = 10238.47
Balochistan urban	Rs = 9513.4

Source: PSLM 2018-19 (HIICS) data authors' calculations.

The results of the above table (04) shows that the average household expenditure on SSB over provinces regions in Pakistan. Punjab urban region is slightly more spends on SSB than other provinces regions which is 13280 rupees per year and Balochistan urban region inhabitants spend less than other provinces regions which is 9513 rupees only per annum.

Table 5: Percentage of SSB of total food expenditure

SSB expenditure	Mean
Pakistan	4.1%

Source: PSLM 2018-19 (HIICS) data authors' calculations.

The above table (05) shows that the average household expenditure on SSB is 4.1% in overall food expenditure in Pakistan.

Table 6: Percentage of SSB of total food expenditure over regions

SSB expenditure	Mean
National Rural	4.6%
National Urban	3.5%

Source: PSLM 2018-19 (HIICS) data authors' calculations.

The above table (06) shows the average household expenditure on SSB over regions in Pakistan the result depicts that the household living in national rural are spend more than national urban region which is 4.6% of the total food expenditure annually.

Table 7: Percentage of SSB of total food expenditure over province

SSB expenditure	Mean
KP	3.6%
Punjab	4.7%
Sindh	3.4%
Balochistan	3.4%

Source: PSLM 2018-19 (HIICS) data authors' calculations.

As per the above table (07) shows that the average household expenditure on sugar sweetened beverages over province in Pakistan the highest expenditure in the province of Punjab which is 4.7 % and the lowest expenditure in the province of KP is 3.6% out of total food expenditure per annum.

Table 8: Percentage of SSB of total food expenditure over province region.

SSB expenditure	Mean
Kpk rural	3.8%
Kpk urban	3.4%
Punjab rural	5.2%
Punjab urban	3.9%
Sindh rural	3.7%
Sindh urban	3.2%
Balochistan rural	3.9%
Balochistan urban	2.7%

Source: PSLM 2018-19 (HIICS) data authors' calculations.

The above table (08) depicts that the average expenditure of the SSB over province region the highest expenditure in the Punjab rural region which is 5.2 % out of overall food expenditure and the lowest expenditure on the SSB in the province of Balochistan urban region which is 2.7% out of total food expenditure annually.

4.2 Unit value of SSB in Pakistan

It is necessary to describe the unit values (expenses divided by quantity) of SSB products before elaborating on the estimate (Table 09). The SSB average price in case of Pakistan turns out to be PKR 96.87 per Liter.

Table 9: Unit value of SSB Pakistan

Unit value	Mean
National price	Rs = 96.

Source: PSLM 2018-19 (HIICS) data authors' calculations.

Table 10: Unit value of SSB over National Region Pakistan

Unit value	Mean
National Rural	Rs = 94.
National Urban	Rs = 99.

Source: PSLM 2018-19 (HIICS) data authors' calculations.

The above (Table no 10) shows that the average prices of SSB are higher in national urban region in Pakistan as compare to national rural region in Pakistan.

Table 11: Unit value of SSB over Provinces

Unit Value	Mean
KP	Rs = 102.
Punjab	Rs = 85.
Sindh	Rs = 112.
Balochistan	Rs = 107.

Source: PSLM 2018-19 (HIICS) data authors' calculations.

As per the above table (11) the price of SSB in KPK is PKR102. / L Punjab is PKR85. /L, Sindh is PKR112. /L and Balochistan PKR107. /L if the unit values are viewed as Price. The SSB in Sindh is higher than other provinces and lower in Punjab province which is PKR85. /L.

Table 12: Unit value of SSB over Regions

Unit value	Mean
KP Rural	Rs = 103.
KP Urban	Rs = 101.
Punjab Rural	Rs = 82.
Punjab Urban	Rs = 89.
Sindh Rural	Rs = 113.
Sindh Urban	Rs = 111.
Balochistan Rural	Rs = 112.
Balochistan Urban	Rs = 100.

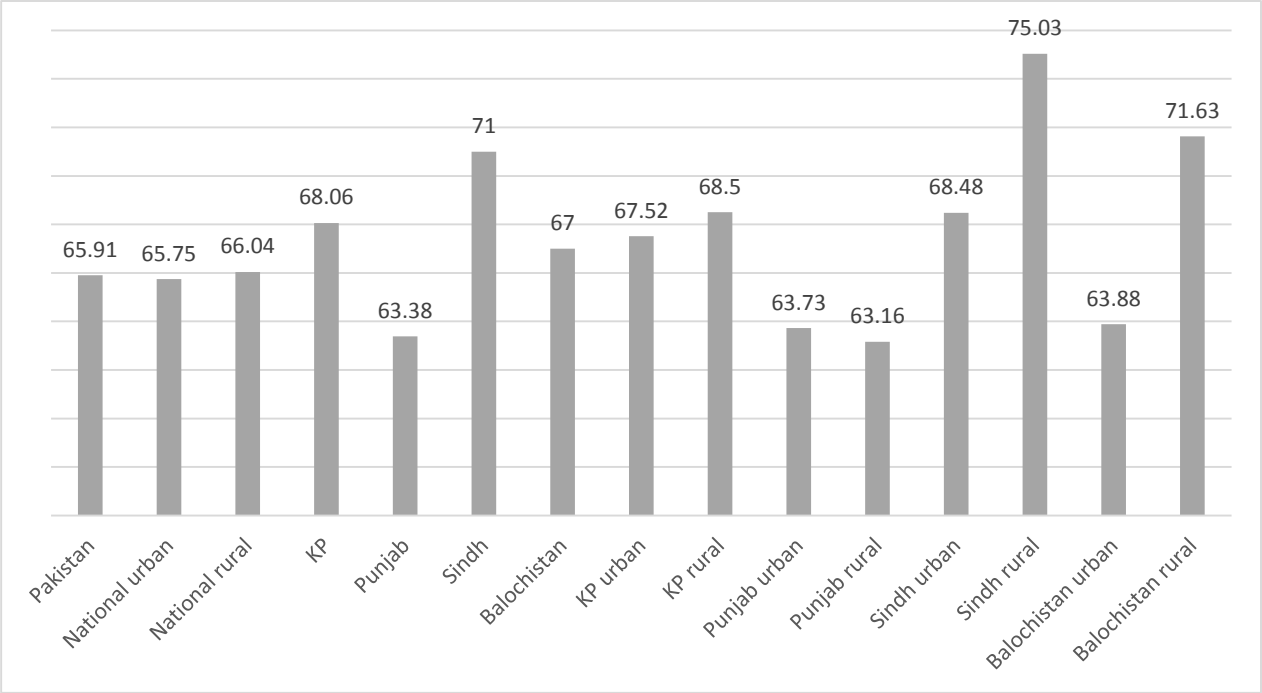
Source: PSLM 2018-19 (HIICS) data authors' calculations.

The above (Table 12) shows that the price of SSB in Sindh rural is very high with other provinces regions and very low in Punjab Rural. The highest price is 103. And the lowest price is 82. The difference between the highest price and lowest price is RS 21 which means that Sindh rural people pay more than other provinces regions for consuming the SSB.

4.3 Unit values of soft drinks in Pakistan

Now we will estimate the unit value for product individually The Soft drinks average price in case of Pakistan turns out to be PKR 65. / L. The below (Figure no 01) shows that the price of soft drinks is higher in rural region in Pakistan as compare to urban region in Pakistan. The price of a Soft drinks in KPK is PKR68. / L Punjab is PKR63. / L, Sindh is PKR71. /L and Balochistan PKR67. / L if the unit values are viewed as Price. The Soft drinks in Sindh is higher than other provinces and lower in Punjab province which is PKR63. /L. The below (Figure 01) depicts that the price of Soft drinks in Sindh rural is very high with other provinces regions and very low in Punjab Rural. The highest price is 75. And the lowest price is 63. /L the difference between the

highest price and lowest price is PKR 11 its means that Sindh rural people pay more than other provinces regions. The price of soft drinks is low in Punjab the fact behind this the manufacturing factory of soft drinks is in Punjab.



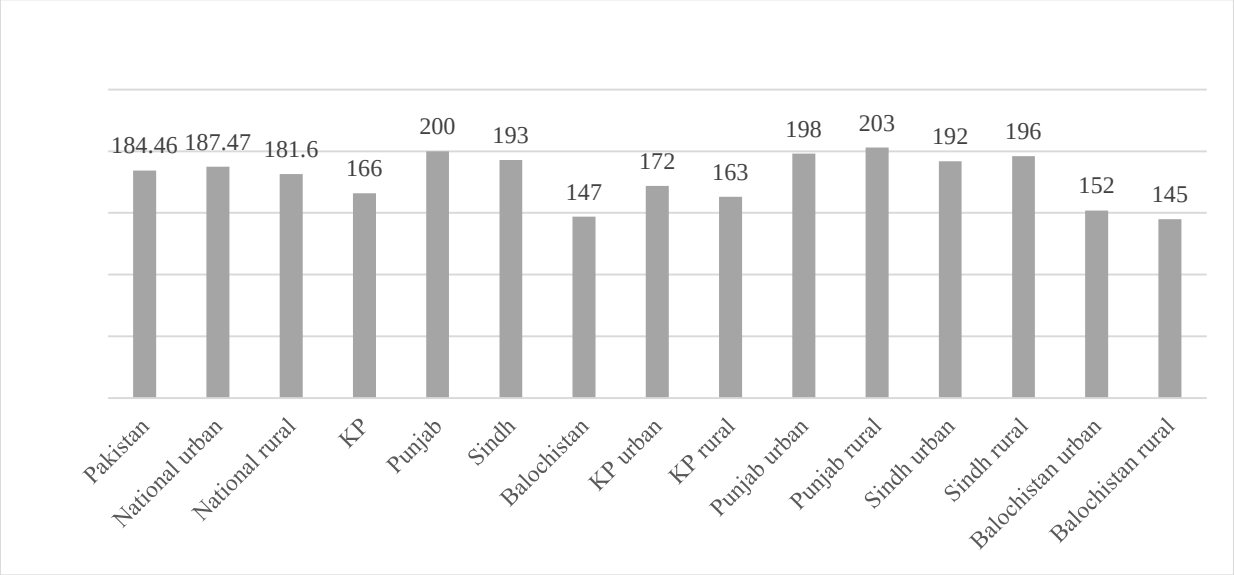
Source: PSLM 2018-19 (HIICS) data authors' calculations

Figure 1: Prices of soft drinks in Pakistan

4.4 Unit values of Squash/Sharbat in Pakistan

The price of squash is also missing in data now to estimate the price of squash in overall Pakistan the average price of squash in Pakistan is 184/L. The price of squash is high in national urban region which is PKR 187/L and the price of squash is different in provinces and also it's in its regions highest price in the province of Punjab is PKR 200 and lowest price in Balochistan is PKR 147/L. The Squash/Sharbat average price in case of Pakistan turns out to be PKR 184/L. The below (Figure no 02) shows that the price of Squash/Sharbat is higher in urban region in Pakistan as compare to rural region in Pakistan. The price of Squash/Sharbat in KPK is PKR 166/L Punjab is PKR 200/L, Sindh is PKR 193/L and Balochistan PKR 147/L if the unit values are viewed as Price. The Squash/Sharbat in Punjab is higher than other provinces and lower in Balochistan which is

PKR 147/L. (Figure 02). Shows that the price of Squash/Sharbat in Punjab Rural is PKR 203/L which higher than other provinces regions and the lowest price of squash in the region of Balochistan rural which is PKR 145/L.



Source: PSLM 2018-19 (HIICS) data authors' calculations.

Figure 2: Prices of Squash in Pakistan

4.5 Unit values for fresh juice/ sugarcane juice Pakistan

The consumption of fresh juice in Pakistan is also in peak level same as the above methods now we are estimated individually unit price for fresh juice/ sugarcane juice in Pakistan is PKR 133.41/ L. higher price find in national rural region which is PKR137/L The Fresh juice average price in case of Pakistan turns out to be PKR 133.41/ L. The below (Figure no 03) shows that the price of Fresh juice is higher in rural region in Pakistan as compare to urban region in Pakistan. The below Figure shows that the price of a fresh juice in KPK is PKR132.14/ L Punjab is PKR139.88/ L, Sindh is PKR129.70/L and Balochistan PKR127.39/ L if the unit values are viewed as Price. The fresh Juice in Punjab is higher than other provinces. The below table results show that the price of

a fresh juice in Punjab rural is PKR148/L which higher than other provinces region. The Price of fresh juice is very cheap in Balochistan Rural which is PKR116.36/ L.

Source: PSLM 2018-19 (HIICS) data authors' calculations.

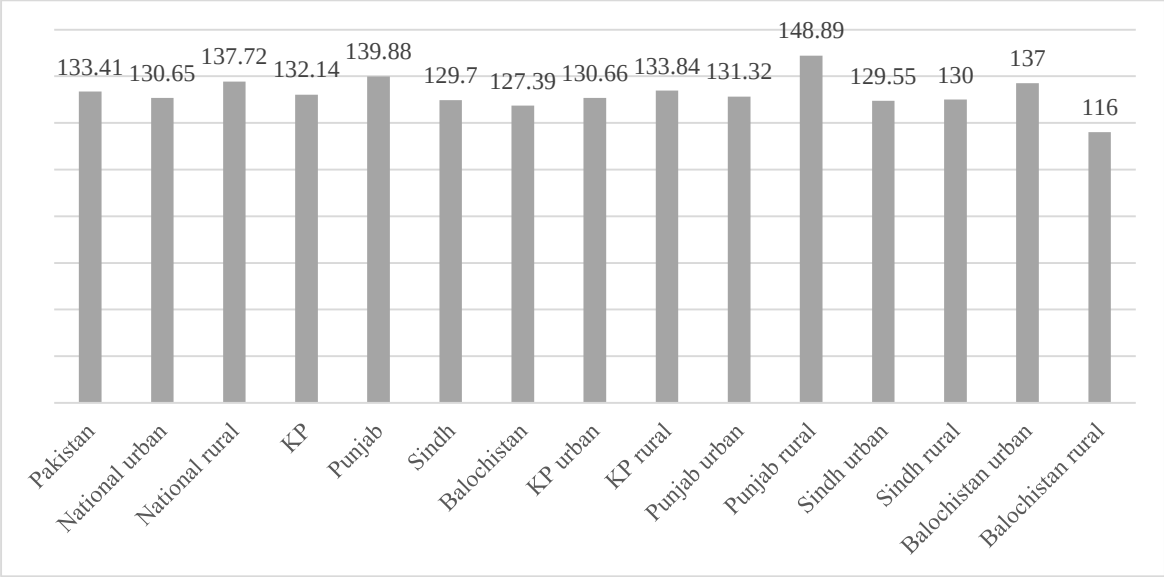
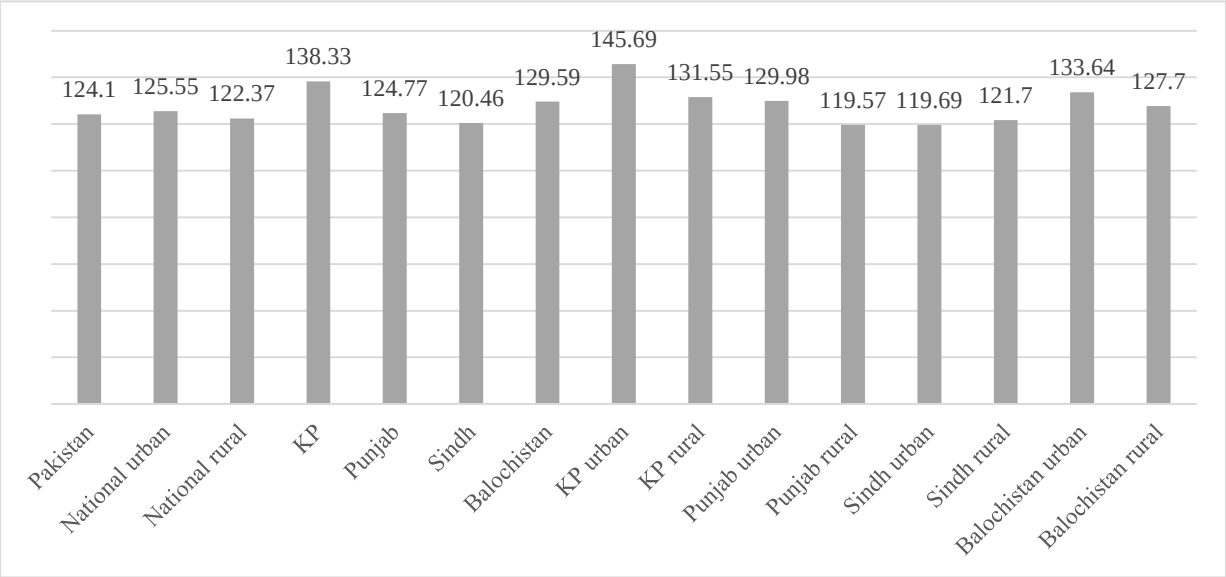


Figure 3: Prices of fresh Juice in Pakistan

4.6 Unit values of packed juice in Pakistan

The consumption of the packed juice in Pakistan is very high in every province and its region the results of (Figure 04). Shows The Packed juice average price in case of Pakistan turns out to be PKR 124.10/ L. The below table 08 shows that the price of Packed juice is higher in urban region in Pakistan as compare to rural region in Pakistan. Also Shows the price of a packed juice over provinces and its region in KPK is PKR138.33/ L Punjab is PKR124.77/ L, Sindh is PKR120.46/L and Balochistan PKR129.59/ L if the unit values are viewed as Price. The fresh Juice in KPK is higher than other provinces. The price of a fruit juice packed in KPK Urban is PKR145.69/L which

higher than other provinces regions and lowest price in the region of Punjab rural which is PKR 119.57. Most of the manufacturing companies in Punjab.



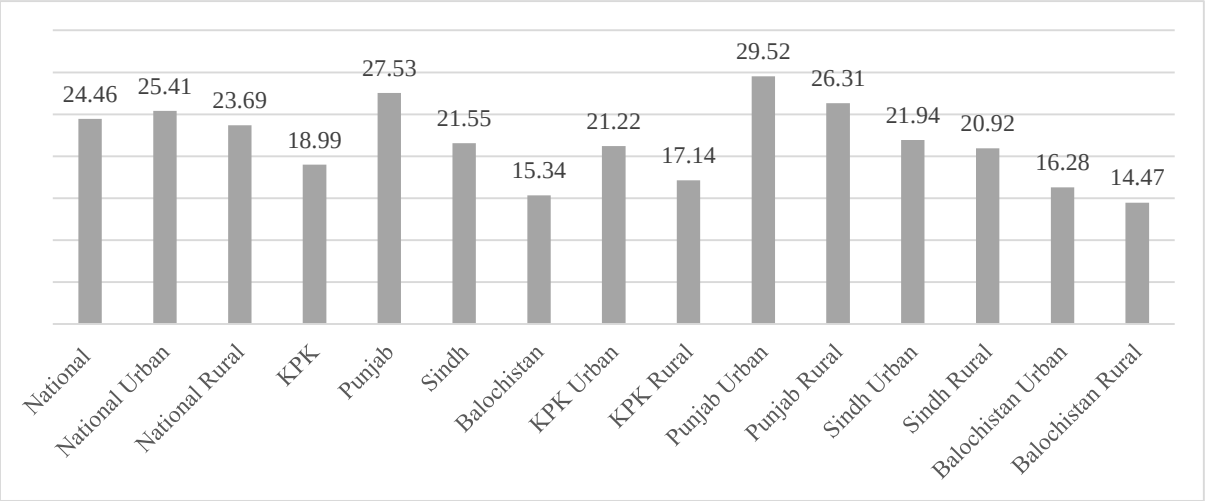
Source: PSLM 2018-19 (HIICS) data authors' calculations.

Figure 4: Prices of Packed juice in Pakistan

4.7 Per capita House Hold Consumption of soft drinks per year

In this section we discuss per capita consumption of the soft drinks in household level the below Figure no 5 shows the average consumption of individual at household level in Pakistan. The below (Figure 05) shows that national per capita household consumption of soft drinks per year is 24.46 liter and also shows the national per capita household consumption of soft drinks per year in national rural region is 23.66/liter and national urban is 25.41/liter. The per capita of soft drinks at household level over provinces. The highest per capita consumption of soft drinks in Punjab province is 27.53/liter and lowest per capita is in Balochistan province is 15.34/liter. Its means that in Punjab province the house hold individual more consumed soft drinks with other provinces. the per capita of soft drinks at household level over provinces regions is the highest per capita of soft drinks in Punjab urban region is 29.52/liter and lowest per capita in Balochistan urban region is

16.28/liter its shows that the consumption of soft drinks is very high in Punjab compare to other provinces regions.



Source: PSLM 2018-19 (HIICS) data authors' calculations.

Figure 5: Per capita consumption of Soft drinks over Pakistan

CHAPTER 5

ESTIMATION RESULTS

After describing the unit values now, we have presented the results of our estimations. The price elasticity of demand (PED) is measured for the responsiveness of the quantity demanded of a beverage to a change in its price. This will help understand how households responds to price signals. Further as there are possibilities of switching to alternatives in the broader category of soft drinks which is measured through the cross-price elasticities.

Table 13: Price Elasticity for SSB in Pakistan dependent variable logssbquantity

Variables	Coef.	St. Err.	t-value	p-value
Logssbprice	-.88	.01	-90.91	0.000
Mean dependent var	0.480	SD dependent var		0.705
R-squared	0.346	Number of obs		14665.000
F-test	8265.182	Prob > F		0.000
Akaike crit. (AIC)	25136.767	Bayesian crit. (BIC)		25151.954

**** p<.01, ** p<.05, * p<.1*

The above table (13) shows the own price elasticity of SSB. We have regressed simple OLS in log-log form to calculate elasticities using the HICS 2018-19. Unit prices were estimated using the Deaton methodology and described in the earlier section. The own price elasticity for SSB is -.88 and results are significant. It means that the price elasticity for SSB is less elastic but true as per law of demand. If the price of SSB increases, there will be decrease in the demand for but it will not be at the same rate at which price is increased. Results are significant Hence that the consumers being relatively insensitive to changes in price: a 1% increase in SSB price will lead to drop in SSB quantity demanded of less than 1%.

Table 14: Price Elasticity for Soft drinks in Pakistan and dependent variable Lsofquantity

Variables	Coef.	St. Err.	t-value	p-value
Lsofprice	-.562	.026	-21.64	0.000
Mean dependent var	0.781	SD dependent var		0.559
R-squared	0.341	Number of obs		9624.000
F-test	468.115	Prob > F		0.000
Akaike crit. (AIC)	15705.526	Bayesian crit. (BIC)		15719.870

*** p<.01, ** p<.05, * p<.1*

After calculating the price elasticity of overall demand for SSB now we have calculated the price elasticity of soft drinks demand. The above tables (14) shows the own price elasticity for soft drinks is -.562 and result are significant. If we compare the elasticity of overall SSB and soft drinks. The soft drinks elasticity is less than SSB elasticity its means that soft drinks is less elastic than SSB. If the price of soft drinks is increased there will be decrease in the demand for soft drinks but it will not be at the same rate at which price is increased. Same like the price elasticity for overall SSB the price elasticity of soft drinks is less elastic.

Table 15: Price Elasticity for Squash/Sharbat in Pakistan and dependent variable lsquashquantity

Variables	Coef.	St. Err.	t-value	p-value
Lsquprice	-.556	.018	-30.15	0.000
Mean dependent var	-0.149	SD dependent var		0.534
R-squared	0.325	Number of obs		6803.000
F-test	909.160	Prob > F		0.000
Akaike crit. (AIC)	9858.669	Bayesian crit. (BIC)		9872.319

*** p<.01, ** p<.05, * p<.1*

We calculate elasticity for each product the above table (15) shows the own elasticity of squash/ Sharbat. The coefficient of the squash elasticity is -.556 which is less than 0ne its means inelastic.

Hence the result of squash is more less elastic than SSB elasticity its means if we increase the price of squash the reduction of the squash demand is decrease but not at the same price changes. So the elasticity of the squash shows us the consumption of the squash will be decrease if we increase the price of squash and it's also helps to increase the government revenue because if we impose a tax on all SSB group the people demand for SSB are not decrease at high level our estimation result shows that the elasticity of all SSB is Inelastic.

5.1 Price Elasticity for Fresh juice/ Sugarcane in Pakistan

Now we are estimating elasticity for fresh juice/ sugarcane in double log form which give us a direct elasticity coefficient of the fresh juice / sugarcane juice. We are estimating elasticity is it elastic or inelastic. After the estimating elasticity we are able to say what should we do for the price of the fresh juice and also recommend a policy for government on the basis of the estimated results.

Table 16: Price Elasticity for Fresh Juice in Pakistan and dependent lfeshjuquantity

Variables	Coef.	St. Err.	t-value	p-value
Lfreshjprice	-.686	.096	-7.16	0.000
Mean dependent var	-0.160		SD dependent var	0.650
R-squared	0.371		Number of obs	847.000
F-test	51.289		Prob > F	0.000
Akaike crit. (AIC)	1613.959		Bayesian crit. (BIC)	1623.443

**** p<.01, ** p<.05, * p<.1*

As per the above table (16) depicts the own elasticity of the fresh juice the result of the coefficient is -.686 which means less elastic if we increase the price of the fresh juice the people demand for the fresh juice is less but not same at the price level. After the price increase of the fresh juice people still demanded for fresh juice.

Table 17: Price Elasticity for Packed juice in Pakistan and dependent variables lpackedjuquantity

Variables	Coef.	St. Err.	T-value	p-value
Lpackjprice	-.115	.037	-3.07	.002
Mean dependent var	0.025	SD dependent var		0.616
R-squared	0.302	Number of obs		5516.000
F-test	9.445	Prob > F		0.002
Akaike crit. (AIC)	10298.597	Bayesian crit. (BIC)		10311.828

*** p<.01, ** p<.05, * p<.1

According to the above table (17) shows the elasticity of the packed juice the coefficient of the elasticity is -.115 which means more less elastic same as for all SSB products which we estimated in earlier table. The result is significant its means when we increase the price of the packed juice in market the demand for packed juiced is less but not at same proportion of the price changes. So, we estimated all products individually and in one SSB group but the result of all product is less elastic.

Table 18: Cross Price Elasticity for Soft drinks and Squash in Pakistan and dependent variable Lsofq

Variables	Coef.	St. Err.	t-value	p-value
Lsofp	-.289	.083	-3.47	.001
Lsqup	.094	.044	2.12	.035
Mean dependent var	0.878	SD dependent var		0.569
R-squared	0.312	Number of obs		1428.000
F-test	9.375	Prob > F		0.000
Akaike crit. (AIC)	2428.921	Bayesian crit. (BIC)		2444.713

*** p<.01, ** p<.05, * p<.1

The results of the above table (18) shows the cross-price elasticity of soft drinks with respect to Squash. We regressed simple OLS in log-log form to calculate cross price elasticities for soft

drinks and squash. The coefficient of cross price elasticity is .094 and results are significant. The coefficient shows it is inelastic and both are substitutes. In this case the consumer seems being very less sensitive in terms of consumption of soft drinks to change in price of squash although these appear to be substitutes: When the price of the squash is increased the demand for soft drinks will be increased but 1% price increase in squash will lead to a less than 1% increase for soft drinks.

Table 19: Cross Price Elasticity for Soft drinks and Fresh Juice in Pakistan and dependent variable Lsofq

Variables	**Coef.**	**St. Err.**	**t-value**	**p-value**
Lsofp	-.311	.193	-1.62	.106
lfreshjp	.249	.114	2.18	.030
Mean dependent var	0.871	SD dependent var		0.552
R-squared	0.324	Number of obs		478.000
F-test	3.101	Prob > F		0.046
Akaike crit. (AIC)	781.864	Bayesian crit. (BIC)		794.373

**** p<.01, ** p<.05, * p<.1*

The above table (19) shows that the own and cross price elasticity for soft drinks and fresh juice. The Cross-price elasticity for fresh juice elasticity coefficient is .249 which is less elastic but appears that both are substitutes but results are insignificant. Hence it appears consumers don't regard the prices/availability of fresh juices as a replacement of soft drinks.

Table 20: Cross Price Elasticity for Soft drinks and Packed Juice in Pakistan and dependent variables Lsofq

Variables	Coef.	St. Err.	t-value	p-value
Lsofp	-.697	.103	-6.75	0.000
Lpackjp	.462	.064	7.21	0.000
Mean dependent var	0.935	SD dependent var		0.607
R-squared	0.389	Number of obs		1084.000
F-test	51.031	Prob > F		0.000
Akaike crit. (AIC)	1897.934	Bayesian crit. (BIC)		1912.899

**** p<.01, ** p<.05, * p<.1*

The above table (20) shows that the cross-price elasticity for soft drinks and packed juice. The coefficient of the Cross price elasticity for Packed juice elasticity coefficient is .462 which shows there is substitution for soft drinks when the price of packed juice increased the demand for soft drinks is increased Our results are significant hence if price of packed juice is increased by 1% increased the demand for soft drinks will be increased but by less than 1%.

Table 21: Parameters Estimates of Sugar Sweetened Beverages

Elasticity	P soft drinks	P squash	P fresh juice	P packed juice
Soft drinks	-.562 *** (0.000)	.094 *** (.035)	.249 ** (.03)	.462 *** (0.000)

*** p<0.01, **p<0.05, *p<0.1 Significant value in parentheses.

The above table (21) shows summary table for the own and cross price elasticity for sugar sweetened beverages. Own price elasticity is less elastic and consumers do not substitute in case of price changes with other options that much. Relatively packed juices appeared to be among the better substitute for soft drinks.

5.2 Soft drinks demand elasticities with different co-variates

The price and income elasticity of demand changes for different co-variates such as income, province and education etc. of soft drinks in Pakistan.

Table 22: Elasticities of Demand for soft drinks among individual up to matriculation dependent variable Lsofq:

Variables	Coef.	St. Err.	t-value	p-value
Lsofprice	-.56	.016	-35.31	0.000
Matric Edu	-.01	.007	-1.41	.160
Constant	3.144	.066	47.46	0.000
Mean dependent var	0.806	SD dependent var		0.559
R-squared	0.342	Number of obs		25230.000
F-test	624.377	Prob > F		0.000
Akaike crit. (AIC)	41132.354	Bayesian crit. (BIC)		41156.762

*** p<.01, ** p<.05, * p<.1*

The above table (22) shows the demand for sugar sweetened beverages with education. The relationship of soft drinks demand with up to matric education is negative the coefficient is -.01 its means that if the education is below or up to matric the demand for soft drinks is less elastic.

Table 23: Elasticities of Demand for soft drinks among individual above Matriculation and dependent variables Lsofq

Variables	Coef.	St. Err.	t-value	p-value
Lsofp	-.567	.016	-35.89	0.000
Abmatricedu	.126	.009	14.16	0.000
Mean dependent var	0.806	SD dependent var		0.559
R-squared	0.349	Number of obs		25230.000
F-test	734.338	Prob > F		0.000
Akaike crit. (AIC)	40945.325	Bayesian crit. (BIC)		40969.732

*** p<.01, ** p<.05, * p<.1*

As per the above table (23) shows the demand for sugar sweetened beverages with education higher than matric level. The relationship of soft drinks demand with above matric education is positive the coefficient is .126 which means that if the education is above matric the demand for

soft drinks is elastic. Its shows more educated people are consumed less when the price of soft drinks increased.

Table 24: First quantile of Income estimates and dependent variable log Soft drinks Quantity

Variables	Coef.	St. Err.	t-value	p-value
Log Soft drinks Price	-.563	.016	-35.55	0.000
firstqt	-.092	.009	-10.64	0.000
Mean dependent var	0.806	SD dependent var		0.559
R-squared	0.346	Number of obs		25230.000
F-test	687.274	Prob > F		0.000
Akaike crit. (AIC)	41025.355	Bayesian crit. (BIC)		41049.763

**** p<.01, ** p<.05, * p<.1*

According to the above table (24) we estimate elasticities by income quantile we make five quantile of the household income each quantile is equal 20 percent. First quantile is the lowest income quantile and the last fifth quantile is highest income quantile based on average household income level per annum. The above table results mean that if the house hold are in first income quantile the demand for soft drinks is less elastic the coefficient is -.092 its means that if the house hold income increases the demand will be decreased for soft drinks.

Table 25: Second quantile of Income estimates and dependent variable Soft drinks Quantity

Variables	Coef.	St. Err.	t-value	p-value
Log Soft drinks Price	-.558	.016	-35.25	0.000
Secndqt	-.052	.005	-10.99	0.000
Constant	3.148	.066	47.65	0.000
Mean dependent var	0.806	SD dependent var		0.559
R-squared	0.346	Number of obs		25230.000
F-test	688.743	Prob > F		0.000
Akaike crit. (AIC)	41019.427	Bayesian crit. (BIC)		41043.835

*** p<.01, ** p<.05, * p<.1*

The above table shows that if the household are in second income quantile the demand for soft drinks is less elastic its means that if the house hold income increases the demand will be decreased for soft drinks and increased for another substitute.

Table 26: Third quantile of Income estimates and dependent variable Soft drinks Quantity

Variables	Coef.	St. Err.	t-value	p-value
Log Soft drinks Price	-.564	.016	-35.53	0.000
thirdqt	-.036	.003	-13.48	0.000
Mean dependent var	0.806	SD dependent var		0.559
R-squared	0.348	Number of obs		25230.000
F-test	712.870	Prob > F		0.000
Akaike crit. (AIC)	40964.130	Bayesian crit. (BIC)		40988.537

*** p<.01, ** p<.05, * p<.1*

The above table shows that if the house hold are in third quantile the demand for soft drinks is more less than first and second quantile its means that income is change the demand of soft drinks to another substitute.

Table 27: Fourth quantile of Income estimates and dependent variable Soft drinks Quantity

Variables	Coef.	St. Err.	t-value	p-value
Log Soft drinks Price	-.56	.016	-35.33	0.000
fourthqt	0	.002	-0.05	.957
Mean dependent var	0.806	SD dependent var		0.559
R-squared	0.342	Number of obs		25230.000
F-test	624.012	Prob > F		0.000
Akaike crit. (AIC)	41134.333	Bayesian crit. (BIC)		41158.740

*** p<.01, ** p<.05, * p<.1*

The above table shows that the household are in fourth quantile of the income are not change the demand of the soft drinks if the price is increase the demand of the soft drinks is remaining same its means that zero % change in quantity demanded.

Table 28: Fifth quantile of Income estimates dependent variable Soft drinks Quantity

Variables	Coef.	St. Err.	t-value	p-value
Log Soft drinks Price	-.573	.016	-36.45	0.000
fifthqt	.047	.002	29.91	0.000
Mean dependent var	0.806	SD dependent var		0.559
R-squared	0.376	Number of obs		25230.000
F-test	1088.258	Prob > F		0.000
Akaike crit. (AIC)	40220.174	Bayesian crit. (BIC)		40244.582

*** p<.01, ** p<.05, * p<.1*

The above table shows that when the household are in fifth quantile of the income the demand of the house hold for soft drinks is less elastic. Its means that if the price of the soft drinks increased the demand of the soft drinks will be decrease very less.

Table 29: Parameters Estimates of income quantile

Soft drinks quantity	1st Quantile	2nd Quantile	3rd quantile	4th quantile	5th quantile
Soft drinks price	-.092	-.052	-.036	0	.047

The above table shows that the household of the first quantile demand for soft drinks in higher than other house hold income quantile. It means that the people which income is less they are more demanded soft drinks form other higher income quantiles. Its shows the poor people are demand more than higher income levels.

5.3 Tax Simulations

Four tiers of taxes were simulated to show the impact of changes in SSB consumption. First estimation is based on 5% tax increment, 2nd simulation is based on 10% increase in taxes while 3rd and 4th simulation is 15% and 20% to see the impact of tax increase in SSB consumption. This tax simulation is being applied on soft drinks, squash, fresh juice and packed juices to see the Impact of decrease in consumption. The decrease in consumption will lead to a decline in NCDs benefitting the health sector and there will be less burden on public exchequer to support the health sector activities. According to WHO guidelines 20% tax must be imposed on SSBs to discourage consumption of SSBs which are posing serious threats to human health and make them vulnerable to NCDs.Tax imposition will support the great cause of WHO to control the increase in NCDs caused by the usage of SSBs.

Table 30: Tax Simulation on 5% Increment on Consumption and Prices of SSBs

Type	Average N Price	Average old Consumption (Ltrs.)	Elasticity	Tax Increment	Average New Price	New Consumption (avg ltrs perhh/ annually)	Govt Revenue
Soft drinks	65	134	-.56	5%	68	130	390
Squash	184	50	-.55	5%	193	48	432
Fresh juice	133	52	-.68	5%	139	50	300
Packed juice	124	52	-.11	5%	130	51	306

Source: Authors' Calculations from PSLM 2018-19 (HIICS) data.

The above table shows that after a 5% tax increase, the current average price for soft drinks rises from PKR 65 to PKR 68, resulting in a decline in soft drinks consumption from 134 Ltrs. The volume has been reduced to 130 liters once a year. Squash has followed the same pattern, with a price increase from PKR 184 to PKR 193 and a decrease in volume from 50 Ltrs to 48 Ltrs/HH annually. Fresh juice prices increased from PKR 133 to 139, while annual consumption fell from 52 Ltrs to a new low of 50 Ltrs. Packed juices follow the same patterns as fresh juices, but consumption is much lower, dropping from 52 Ltrs to a new low of 51 Ltrs. Government revenue yearly generate from 5% tax is RS 7,592,676 Million.

Table 31: Tax Simulation on 10% Increment on Consumption and Prices of SSBs

Type	Average N Price	Average N Consumption (Ltrs.)	Elasticity	Tax Increment	Average New Price	Average New Consumption	Govt Revenue
Soft drinks	65	134	-.56	10%	71	126	756
Squash	184	50	-.55	10%	202	47	846
Fresh juice	133	52	-.68	10%	146	48	624
Packed juice	124	52	-.11	10%	136	51	612

Source: Authors' Calculations from PSLM 2018-19 (HIICS) data.

The above table depicts that after 10% increase in tax the resultant new average price for soft drinks rises from PKR 65 to 71 with the decrease in consumption of soft drinks from 134 Ltrs. Down to 126 Ltrs annually. Same trend is obvious for squash with the price increment from PKR 184 to PKR 202 with the decline of these drinks from 50 Ltrs to 47 Ltrs annually. Price increase for Fresh juices from PKR 133 to 146 accompanied with the decreased annual consumption from 52 Ltrs to a new low level of 48 Ltrs. Packed juices show the identical trends like fresh juices but the consumption is very less decrease from 52 Ltrs to a new low level of 51Ltrs. Total government revenue from 10 % increment is RS 70,407,942 million.

Table 32: Tax Simulation on 15% Increment on Consumption and Prices of SSBs

Type	Average N Price	Average N Consumption (Ltrs.)	Elasticity	Tax Increment	Average New Price	Average New Consumption (Ltrs)	Govt Revenue
Soft drinks	65	134	-.56	15%	74	122	1098
Squash	184	50	-.55	15%	211	45	1215
Fresh juice	133	52	-.68	15%	152	46	874
Packed juice	124	52	-.11	15%	142	51	918

According to the above table, after a 15% tax increase, the current average price for soft drinks rises from PKR 65 to PKR 74, resulting in a drop in soft drinks consumption from 134 to 122 liters per year. Squash has followed a similar trend, with a price rise from PKR 184 to PKR 211 and a volume reduction from 50 Ltrs to 45 Ltrs per year. The price of fresh juice increased from PKR 133 to 152, while annual consumption decreased from 52 to 46 liters. Packed juices meet the same trends as fresh juices, but consumption is significantly lower, falling from 52 liters to a new low of 51 liters. Annually government revenue from 15% tax is Rs 101,840,945.

Table 33: Tax Simulation on 20% Increment on Consumption and Prices of SSBs

Type	Average N Price	Average N Consumption (Ltrs.)	Elasticity	Tax Increment	Average New Price	Average New Consumption (Ltrs)	Govt Revenue
Soft drinks	65	134	-.56	20%	78	118	1534
Squash	184	50	-.55	20%	220	44	1584
Fresh juice	133	52	-.68	20%	159	44	1144
Packed juice	124	52	-.11	20%	148	50	1200

As per the above table, after a 20% tax increase, the current average price for soft drinks rises from PKR 65 to PKR 78, resulting in a decrease in annual soft drinks consumption from 134 to 118 liters. Squash has followed a similar pattern, with a price increase from PKR 184 to PKR 220 and a decrease in volume from 50 to 44 liters per year. The price of fresh juice increased from PKR 133 to 159, while annual consumption decreased from 52 to 44 liters. Packed juices meet the same trends as fresh juices, but consumption is significantly lower, falling from 52 liters to a new low of 50 liters. Annually Govt revenue from 20% tax is Rs 135,506,758 million.

CHAPTER 6
CONCLUSION AND RECOMMENDATION

Most countries priorities revenue generating, and Pakistan is no exception. Different tax regimes have been implemented in the country at various times, some under the pressure of health advocates and others under the influence of the beverage lobby. The same analysis applies to this study since there is active lobbying, and the FBR is unable to withstand the lobbying of beverage businesses.

For Pakistan, the own-price elasticities of sugar-sweetened beverage products were found to be negative and significant. The price elasticity was shown to be negative and significant for lower-income households, but inelastic for higher-income households, according to the study. This gap is understandable given that the average income in urban areas was clearly higher than in rural areas. Because the majority of urban consumers are from a higher income group and beverages account for a minor portion of their budget, a rise in beverage prices may have a negligible impact on demand. Regional and cross price elasticities differences are also found the overall SSB own price elasticities found -.88 negative and less elastic for Pakistan. Cross price elasticities for soft drinks and squash the coefficient of cross price elasticity is .094 and results are significant. The coefficient shows it is inelastic and both are substitutes. In this case the consumer seems being very less sensitive in terms of consumption of soft drinks to change in price of squash although these appear to be substitutes: When the price of the squash is increased the demand for soft drinks will be increased but 1% price increase in squash will lead to a less than 1% increase for soft drinks. The Cross-price elasticity for fresh juice elasticity coefficient is .249 which is less elastic but appears that both are substitutes but results are insignificant. Hence it appears consumers don't regard the prices/availability of fresh juices as a replacement of soft drinks. The coefficient of the

Cross price elasticity for Packed juice elasticity coefficient is .462 which shows there is substitution for soft drinks when the price of packed juice increased the demand for soft drinks is increased Our results are significant hence if price of packed juice is increased by 1% increased the demand for soft drinks will be increased but by less than 1%. Own price elasticity is less elastic and consumers do not substitute in case of price changes with other options that much. Relatively packed juices appeared to be among the better substitute for soft drinks.

The simulation activity is carried out in four predictions, with a partial overall effect, projecting scenarios to increase tax income and public health results by reducing drink consumption. On the basis of finding the overall estimated elasticities of SSBs found negative and less elastic for Pakistan if the government of Pakistan imposed 20% tax on SSBs it will directly decreased the household consumption of SSBs from 288 liters to 256 liters annually and generate revenue from beverages is total Rs 135,506,758 million. The decision is mostly based on the significance of the outcomes for tax collection and public health.

Based on the findings of this study, the following policy recommendations can be made:

- The government have relied on the beverage business for tax collection due to its limited fiscal space, and it cannot afford to squeeze it too hard. However, if enforcement were to improve generally, the government would be in a stronger position to recognize that a FED on beverages is not a VAT and that its principal objective is to discourage the consumption of sugar-sweetened beverages rather than to generate income.
- However, until that reality is realized, a number of other reforms must be implemented. These include launching technologically-assisted monitoring, enforcement, and compliance procedures. In addition, strategies should be designed to disrupt the political support for the beverage business and to build a social compliance system, which includes opposing tax evasion and a public demand for tax invoices.
- Beverage revenue should be proportional to the health costs incurred as a result of beverage usage. Any revenue produced will be countered if increasing beverage consumption leads to rising health costs.

Scope for the Future Research:

- The present study estimated price and income elasticity of the demand for sugar sweetened beverages and determines the elasticity estimate with different co-variates at household level in Pakistan but it should be carried out with an individual perspective, which will be covered by the analysis on all individuals in the households.
- The study could be further enhanced to determine the impact of beverages with non-communicable diseases. How many non-communicable diseases prevent to reduced consumption of SSB.
- Additionally, the research deals with different co-variates but neglected the SSBs related diseases, so there should some effort in reporting the diseases, which are caused by beverages consumption in Pakistan Particularly household and individual level.
- Along with the diseases concern, the study should be focused on the health care costs in terms of beverages consumption expenditures: it will improve the magnificence of the research in the area of health economics.

CHAPTER 7
DISCUSSION

We estimated a demand system and tax simulation for sugar sweetened beverages and derived the income, own and cross price elasticity of the demand for soft drinks, squash, fresh juice and packed juice. We found that the price elasticity of the demand for soft drinks is -.562 and higher for SSB (-.88). The demand for soft drinks and SSB is more elastic among households living in rural areas and those with lower income.

Our price elasticity of the demand for soft drinks and for SSB is in the range of similar estimates for Mexico (Colchero et al., 2015) of -1.06 and (-1.16) were higher than our estimates for soft drinks but contrast to SSB because they included natural and mineral water, milk candies, snacks, traditional snacks that have not estimated in our findings. More recent estimates compared to (Barquera et al., 2008) our estimates for soft drinks are less similar to their elasticity of -1.0 in 2006, but more similar than their 1989 and 2002 estimates of -0.6 and -0.8, respectively. The differences could be due to the model used in each study (Barquera applied a two-part model in which each beverage group is estimated independently).

To our knowledge, this is the first work that estimates price and income elasticities of the demand for sugar sweetened beverages in Pakistan. Our findings are similar to other studies. Cabrera found an average price-elasticity of SSB of -1.29 in several countries (Hofman et al., 2013). Our estimate for soft drinks is also in the range of other Latin American countries, such as Mexico or Ecuador (-1.06 and -1.20, respectively) (Paraje, 2016). The variability could be due to different definitions of SSB, different statistical models and also by the particular nature of demand in each country. Regarding income level, the studies (Colchero et al., 2015) and (Paraje, 2016) agree that population in lower income groups are more responsive to changes in price, as we found in the

Pakistan case. Cross price-elasticities allow us to classify the rest of categories as substitutes and complements. Since their cross price-elasticity of soft drinks w.r.t squash. The coefficient of cross price elasticity is.094 positive and result are significant. The coefficient shows it is inelastic and both are substitutes. In this case the consumers seem being very less sensitive in terms of consumption of cold drinks to change in price of squash although that appears to be substitutes: when the price of squash is increased the demand for soft drinks will be increased but 1% price increase in squash will lead to less than 1% increase for soft drinks demand.

Since their cross price-elasticity is positive, our study suggests that squash, fresh juice, packed juice shows a substitute behavior towards soft drinks. Own price elasticity is less elastic and consumers do not substitute in case of price changes with other options that much. Relatively packed juices appeared to be among the better substitute for cold drinks.

We acknowledge several limitations in our study, which come primarily from the data. First, we were not able to split the category of soft drinks into non-diet or diet soft drinks, which would have been valuable in order to isolate the possible effect of a tax on soft drinks with added sugar from drinks without calories. The prices of sugar sweetened beverages is not available in (HIICS 2018-19). Since our data is cross-sectional, it is also likely that purchases of food and beverages included in our analysis are under-reported, because it excludes expenditures for consumption outside the household and does not consider purchases of all the households' members. The study is also lacking the health concern regarding the diseases which are related to the use of SSB products which needs to be taken into the account for the future research.

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