

THE EFFECTS OF RELATIVE DEPRIVATION  
ON  
SMOKING STATUS

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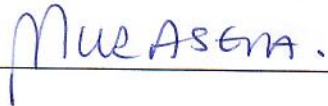
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## ABSTRACT

### THE EFFECTS OF RELATIVE DEPRIVATION ON SMOKING STATUS

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This research study examines the association between relative deprivation and smoking habits. Dividing individuals into different reference groups, this study measures relative deprivation in terms of different levels of income and education inequality within those reference groups. The reference groups are based on gender, region, age group and the combinations of the three. Data for this research study are taken from the ‘Health Research Survey’ conducted by the Turkish Statistical Institute (TurkStat) in 2012. The sample consists of people aged between 25 and 64. Separate logistic regressions are used to undermine the relationship between the smoking status of individuals and the two relative deprivation variables. The regressions control for marital status and job status of individuals.

Results of this research study show that the probability of smoking increases with rising income relative deprivation and education relative deprivation. Among men, the probability of smoking increases with relative deprivation; among women, on the other hand, the probability of smoking decreases with relative deprivation. Another result is that in urban areas the probability of smoking is higher for relatively deprived individuals, whereas in rural areas smoking probability and relative deprivation are not significantly related. In addition, in urban areas the probability of smoking is higher in individuals with high relative education-deprivation, although in rural areas the probability of smoking is higher in individuals with low relative education-deprivation.

**Key Words:** Smoking, income inequality, education inequality, relative deprivation

## ÖZET

### GÖRELİ YOKSUNLUĞUN SİGARA KULLANIMI ÜZERİNDEKİ ETKİSİ

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Bu tez çalışmasında bireyler arasındaki görelî yoksunluk ile sigara içme alışkanlıkları arasındaki ilişki incelenmektedir. Bu tez çalışmasında görelî yoksunluk, bireyleri farklı referans grupları içine alarak hem bireyler arasındaki gelir eşitsizliğiyle hem de bireyler arasındaki eğitim seviyesi farklılıklarıyla hesaplanmıştır. Çalışmada kullanılan veriler 2012 yılında Türkiye İstatistik Enstitüsü tarafından yapılan “Sağlık Araştırması Anketi”nden alınmıştır. Ayrıca örneklem grubu 25-64 yaş aralığındaki kişilerden oluşmaktadır. Bu çalışmada bağımlı değişken olarak bireylerin sigara içme durumu; bağımsız değişken olarak ise bireylerin medeni durumu, çalışma durumu ve gelir cinsinden hesaplanan görelî yoksunluk ve eğitim cinsinden hesaplanan görelî yoksunluk kullanılmıştır. Görelî yoksunluk hesaplanırken referans gruplar, cinsiyet, bölge, yaş grubu ve bunların kombinasyonu kullanılarak oluşturulmuştur. Bağımlı değişken ile bağımsız değişkenler arasındaki ilişkiyi incelemek için lojistik regresyon analizi kullanılmıştır.

Bu tez çalışmasının sonuçlarına göre, gelir cinsinden hesaplanan görelî yoksunluk ve eğitim cinsinden hesaplanan görelî yoksunluk arttıkça kişilerin sigara içme olasılığının arttığı görülmektedir. Erkekler arasında görelî yoksunluk arttıkça kişilerin sigara içme olasılığı artarken kadınlar arasında bu durumun tam tersi olduğu görülmektedir. Ayrıca kentte yaşayan görelî olarak geliri düşük bireylerin sigara içme olasılıklarının daha yüksek olduğu fakat bu etkinin kırdaki yaşayan insanlar arasında kaybolduğu görülmüştür. Buna ek olarak kentte yaşayan görelî olarak daha düşük eğitim seviyesine sahip olan bireylerin de sigara içme olasılıklarının daha yüksek olduğu fakat kırdaki yaşayan görelî olarak daha yüksek eğitim seviyesine sahip olan kişilerin sigara içme olasılığının daha yüksek olduğu görülmektedir.

**Anahtar Kelimeler:** Sigara kullanımı, gelir eşitsizliği, eğitim eşitsizliği, görelî yoksunluk



*To my lovely fiancée...*

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## TABLE OF CONTENTS

ABSTRACT .....	I
ÖZET .....	II
ACKNOWLEDGEMENTS .....	IV
TABLE OF CONTENTS .....	V
LIST OF TABLES .....	VI
TABLE OF FIGURES .....	VII
ABBREVIATION LIST .....	VIII
INTRODUCTION .....	1
TOBACCO.....	4
BRIEF HISTORY OF RELATIVE DEPRIVATION THEORY .....	11
THEORETICAL LITERATURE.....	14
DATA AND METHODOLOGY .....	22
3.1. Empirical Model:.....	24
3.2. Descriptive Statistics .....	26
RESULTS: .....	31
4.1. Results of Relative Deprivation On Income.....	31
4.1.a. Reference Group: All .....	31
4.1.b Reference Group: Gender .....	34
4.1.c Reference Group: Region.....	36
4.1.d Reference Group: Gender and Region.....	39
4.1.e Reference Group: Gender and Age Groups .....	41
4.2. Results for Relative Deprivation On Education .....	43
4.2.a Reference Group: All .....	43
4.2.b. Reference Group: Gender .....	46
4.2.c Reference Group: Region.....	48
4.2.d Reference Group: Gender and Region.....	49
4.2.e Reference Group: Gender and Age Groups .....	52
DISCUSSION AND RESULTS .....	55
REFERENCES.....	60



## LIST OF TABLES

Table 1 - Selected Constituents of Cigarette Smoke.....	4
Table 2 - Percentage of Individuals Smoking (2012) .....	8
Table 3-The Percentage of Individuals' Status of Smoking Tobacco Products by Gender and Age (2010,2012).....	9
Table 4 - Frequency Table of Variables.....	28
Table 5 - Descriptive Statistics .....	29
Table 6 - Frequency Table of Variables (Split Up Smoking Status) .....	30
Table 7 - The Odds Ratio of Smoking Status for Income Relative Deprivation .....	33
Table 8 – Average Marginal Effect After Logit for Income Relative Deprivation (IRD) .....	35
Table 9 – Comparison Table for Various Regression Results for IRD.....	37
Table 10 – The Odds Ratio of Smoking Status for Education Relative Deprivation (ERD) .....	45
Table 11 - Average Marginal Effect After Logit for Education Relative Deprivation (ERD)...	47
Table 12 - Comparison Table for Various Regression Results for ERD .....	50

## TABLE OF FIGURES

Graph 1 - Daily Smoking Among Adults (2000-2013 or Nearest Years).....7



## ABBREVIATION LIST

# OF CIGAR.	: Number of Cigarettes
COPD	: Chronic Obstructive Respiratory Disease
EMP	: Employed
ERD	: Education Relative Deprivation
IRD	: Income Relative Deprivation
LL	: Log Likelihood
P_R2	: Pseudo R-Square
RD	: Relative Deprivation
TL	: Turkish Liras
TurkStat	: Turkish Statistical Institute
WHO	: World Health Organization

## **CHAPTER ONE**

### **INTRODUCTION**

As far as the World Health Organization statistics are concerned, 12% percent of the deaths in the whole world population was caused by smoking. Smoking also causes other different illnesses, especially certain cancer types. For instance, it causes 71% percent of all lung cancer cases around the world (WHO Global Report on Mortality Attributable to Tobacco, 2012).

According to the statistics 23.8 percent of Turkish population uses tobacco and tobacco products every day (the percent of tobacco and tobacco users in male population is 37,3% and 10.7% in female population). Moreover, 13.3% percent of the population stated that they use these products from time to time (TurkStat). According to the Global Status Report conducted in 2010, tobacco users whose ages are over 15 consist of 22% percent of the world population (Global Adult Tobacco Usage Statistics, 2012).

As stated in Health Report published by TSI in 2012, 50 percent of smokers used tobacco and tobacco products first time between the ages 15 and 19. In addition, 2.9 percent of smokers used tobacco and tobacco products for the first time under age 10 (Health Report, 2012).

In Turkey, on average 4.2% percent of the average household income was spent on alcoholic products, cigarettes and tobacco in the last 12 years. This percentage remained unchanged in 2013. It is higher than education, health,

communication, entertainment and culture expenditures in Turkey (Turkish Statistical Institute Division of Household Expenditures).

The literature has an abundance of studies on the determinants of smoking. Besides, there are many research studies including the ones stated above tried to figure out the relationship between smoking habits and socio-economic status as well as psychological behaviors. More specifically, there are studies about the effect of income inequality on health and the effect of income inequality on bad health behaviors such as smoking. The results of these studies indicate that the income inequality adversely affected health and bad health habits. (Kondo, Kawachi, Subramanian (2008), Subramanyam, Kawachi, v.d (2009), Kawachi, Kennedy (1997), Cukur and Bekmez (2011)).

Other studies have shown that health and health behaviors of individuals are affected by both their wealth and the wealth of others (Eibner and Evans (2001), Siahpush et al. (2006), Ling (2009), Kuo , Chiang (2013), Balsa, French, Regan (2013)). This effect is best explained by relative deprivation hypothesis.

This study examines the effect of income and education relative deprivation of individuals in Turkey on tobacco addiction. The aim is to undermine the relationship between smoking behavior and income relative deprivation (IRD) and education relative deprivation (ERD) separately. In this study, income relative deprivation and education relative deprivation are calculated via the Yitzhaki Index (Yitzhaki (1979)). While calculating IRD and

ERD, we create reference groups based on gender, region, age group and the combination of them.

In the first part of the study we will give information about the effect of tobacco use on health and tobacco consumption briefly. In the second part of this study we will explain relative deprivation theory and the brief history of relative deprivation hypothesis. Also, we review the literature on not only the relationship between relative deprivation and health but also the relationship between relative deprivation and bad health habits such as smoking behavior. In the third part of our research study, we describe the data and analysis method and show descriptive statistics about dependent and independent variables. In the fourth part of our research study, we show the results of our analysis as well as investigating and interpreting them. Finally, we suggest some policies on reducing smoking rate.

## CHAPTER TWO

### TOBACCO

Using tobacco and tobacco products cause serious health problems and death. World Health Organization reports that almost 6 million people die from smoking, of whom, which is more than 5 million people, die from direct smoking and more than 600.000 are second-hand smokers exposed to smoking (WHO 2013). Also it is predicted that nearly 500 million people alive today will die from smoking. Till the end of 21<sup>st</sup> century, as one of the death causes, it is expected that smoking will cause 1 billion people to die (WHO, 2013).

Smoke contains more than 4.000 substances some of which are pharmacologically active, mutagenic and cancerogenic (Table 1). 92-95% of main flow fume is in gaseous phase and it includes 0.3–3.3 billion particles in 1 dml. The average diameter of the particle is 0.2-0.5 mm, which may be inhaled (Behr, J., Nowak, D., 2002).

**Table 1 - Selected Constituents of Cigarette Smoke**

<b>Particulate Phaze</b>	<b>Gas Phase</b>
Tar	Carbon Monoxide
Nicotine	Oxides of Nitragen
Aramatic Hydrocarbons	Aldehydes
Phenol	Hydrocyanic Acid
Cresol	Acrolein
B-Naphthylamine	Ammonia
Benzo(a)pyrene	Nitrosamines
Catechol	Hydrazine
Indole	Vinly Chloride
Carbazole	

Tobacco and tobacco products cause almost 50 chronic illnesses which do not cause death directly. However, it is the main reason for lung cancer, chronic obstructive respiratory disease (COPD) and various vascular diseases such as cardiovascular and cerebrovascular diseases. Studies show that smoking causes nearly 80% percent of all chronic lung diseases and causes nearly 14% percent of heart diseases and death from cancer (ASH, 2016). Also, Turkish Ministry of Health estimates 77 percent of lung cancer cases are caused by using tobacco or tobacco products in Turkey. In addition, as mentioned above, smoking is the main risk factor for COPD (Chronic Obstructive Pulmonary Disease). There is a direct dose-response association between smoking and COPD. As a result, the death rate of COPD is significantly higher in smokers when compared to non-smokers. Other than these, using tobacco and tobacco products lead to almost 20 deadly illnesses including many cancer types.

Epidemiological studies have pointed out that there is an association between smoking and many cancer types such as oral cavity, larynx, esophagus, kidney, pancreas, gastric, and cervix. In the U.S, one-third of cancer deaths is caused by smoking (Holbrook, JH.,1998). In Eastern Europe, including Turkey, 25 percent of deaths is caused by tobacco and tobacco products. WHO predicts that mortality risk of males in East Europe is going to be the highest in the 2020 (Tobacco Control in Turkey, 2009).

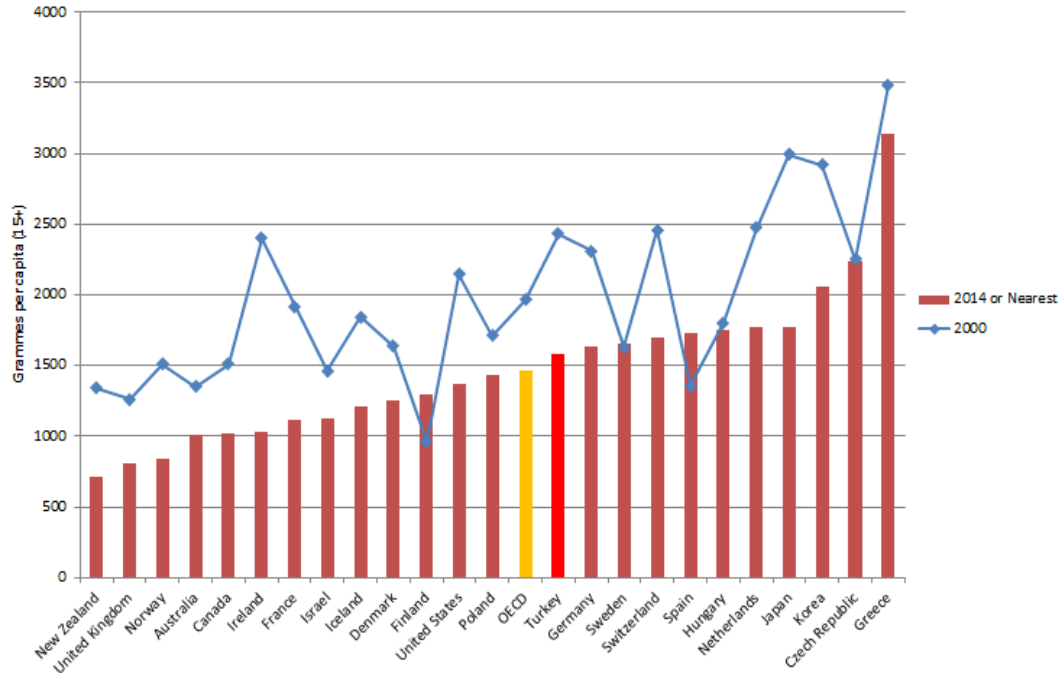
On the other hand, numerous prospective studies show that the rates of sudden death caused by myocardial infarction, recurrent heart attacks and coronary artery are higher in male and female smokers than non-smokers. Gastric and duodenum ulcer prevalence is 2 times higher in smokers than non-smokers. The data from the Turkish Ministry of Health shows that, in 2000, of all the patients who received inpatient



treatment, almost one million demanded treatments for the illnesses caused by smoking. Additionally, it is estimated that smoking causes 52 percent of the deaths in hospitals from diseases caused by smoking.

Smoking in women is associated with infertility, late pregnancy, dead birth and death risk during birth. Smoking in pregnancy leads to 14% of premature birth and constitutes 10% of all infant death (Turkey Tobacco Economics, 2010). Smoking mothers are also associated with asthma in infants. The relationship between being exposed to smoking and asthma is examined in a study in which 4331 children aged between 0-5 are studied. It is concluded that children whose mothers smoke half a pack a day are more at the risk of asthma by 2.1 times than the ones whose mothers do not smoke, which is higher at the age 1 by 2.6 times. Furthermore, infants whose mothers smoke during pregnancy weigh averagely 200-250 grams less and have the risk of preterm birth (Turkey Tobacco Economics, 2010). Smoking rate in women who have anxiety disorders, bulimia (psychogenic overeating and vomiting), depression, attention deficits and alcoholism is higher.

OECD's Health at Glance (2013) report shows that average tobacco using rate is 20.9 % of the adult population in all OECD countries. Graph - 1 shows that smoking rate is less than 15 % only in the six of the 34 OECD countries. India (10.7%), Sweden (13.1%) and South Africa (13.8%) have the lowest rates of adult regular smoking population. Russian Federation (33.8 %), Greece (31.9%) and Chile (29.8 %) have the highest rates of adult regular smoking population. Additionally, Graph-1 also shows that tobacco consumption per capita in Turkey is higher than average tobacco consumption for all OECD countries.



**Graph 1 - Tobacco Consumption (2000, 2014 or Nearest Year) (Grammes per Capita)**

**Source: Author's calculations based on OECD Health Data**

Global Adult Tobacco Survey data and OECD's Health at Glance (2013) data report that 23.8 percent of adult population is using tobacco or tobacco product regularly in Turkey. Graph-1 shows that this rate has been decreasing in the last decades; however, this rate is still higher than the average tobacco using rate in all OECD countries.

In Turkey the first report on using tobacco or tobacco products was prepared in 1988. According to this report, 44 percent of adult population was using tobacco or tobacco products (Turkey Tobacco Economics, 2010). Table - 2 shows that smoking prevalence is lower in adult women population than adult men population in Turkey (the percentage of tobacco or tobacco users in the male population is 37.3 and in the female

population is 10.7). In addition, it reports that rural population has lower rate of daily smoking than the urban population (the percent of tobacco and tobacco users in urban population is 25.7 and in the rural population is 18.9).

**Table 2 - Percentage of Individuals Smoking (2012)**

[15 ≤ age]	Smoking Status		
	Daily	Less than	Not at all / Never
<b>Year</b>	<b>2012</b>	<b>2012</b>	<b>2012</b>
<b>Total</b>	<b>23,8</b>	<b>3,3</b>	<b>72,9</b>
Male	37,3	4,1	58,5
Female	10,7	2,4	86,8
<b>Urban</b>	<b>25,7</b>	<b>3,3</b>	<b>70,9</b>
Male	38,9	4,1	56,9
Female	13,0	2,6	84,4
<b>Rural</b>	<b>18,9</b>	<b>3,1</b>	<b>77,9</b>
Male	33,3	4,2	62,5
Female	4,7	2,0	93,2

Source: Turkish Health Survey, 2012.

As stated in Health Report published by TSI in 2012, 52.8 percent of smokers used tobacco and tobacco products for the first time between the ages of 15 and 19 (the percent of tobacco or tobacco users in the male population between the ages of 15 and 19 is 55.5 and 40.9 in the female population between the ages of 15 and 19). In addition, 0.9 percent of smokers used tobacco and tobacco products for the first time under the age of 10 (the percent of tobacco or tobacco users in the male population under the age of 10 is 1.1 and 0.3 in the female population under the age of 10). Additionally, the highest smoking rate is observed at the ages between 35 and 44 in a daily smoker. The lowest smoking rate is observed at the ages above 75 in the daily smoker (see Table 3).

**Table 3-The Percentage of Individuals' Status of Smoking Tobacco Products by Gender and Age (2010,2012)**

	2010			2012		
	Total	Male	Female	Total	Male	Female
<b>Daily smoker</b>	<b>25,4</b>	<b>39,0</b>	<b>12,3</b>	<b>23,2</b>	<b>35,9</b>	<b>10,8</b>
15-24	16,4	27,1	6,1	14,3	24,1	4,6
25-34	32,7	48,2	17,0	30,5	45,9	14,9
35-44	34,5	49,2	19,5	30,9	44,4	17,3
45-54	28,8	43,7	13,8	27,7	42,0	13,4
55-64	20,4	32,7	8,8	17,4	27,9	7,4
65-74	11,2	20,6	4,2	10,1	17,8	3,8
75+	7,3	15,1	0,9	5,6	12,6	0,8
<b>Occasional smoker</b>	<b>4,1</b>	<b>4,5</b>	<b>3,7</b>	<b>3,6</b>	<b>4,3</b>	<b>2,9</b>
15-24	3,4	4,3	2,6	2,9	4,3	1,5
25-34	5,6	5,6	5,6	4,8	4,6	4,9
35-44	4,6	4,4	4,8	4,6	4,9	4,4
45-54	4,9	4,8	5,0	3,6	4,1	3,1
55-64	2,6	4,3	0,9	2,3	4,1	0,5
65-74	1,5	2,4	0,8	1,7	2,7	0,9
75+	1,2	1,7	0,9	1,9	2,9	1,2
<b>Non-smoker</b>	<b>17,1</b>	<b>23,0</b>	<b>11,5</b>	<b>14,3</b>	<b>19,8</b>	<b>8,9</b>
15-24	9,4	11,7	7,2	5,7	6,5	5,0
25-34	13,2	12,6	13,7	11,5	11,7	11,2
35-44	17,4	21,1	13,7	14,0	18,2	9,8
45-54	20,7	29,1	12,4	18,5	26,3	10,6
55-64	27,7	43,1	13,0	23,8	38,0	10,1
65-74	25,5	47,4	9,3	24,4	44,9	7,4
75+	29,3	55,3	7,7	20,4	42,2	5,7
<b>Never smoker</b>	<b>53,4</b>	<b>33,5</b>	<b>72,6</b>	<b>59,0</b>	<b>40,0</b>	<b>77,3</b>
15-24	70,8	56,9	84,2	77,1	65,1	88,9
25-34	48,6	33,6	63,7	53,3	37,8	69,0
35-44	43,5	25,2	62,0	50,5	32,5	68,5
45-54	45,6	22,5	68,8	50,2	27,6	72,9
55-64	49,3	19,9	77,3	56,5	30,0	82,0
65-74	61,8	29,6	85,6	63,8	34,5	88,0
75+	62,2	27,9	90,5	72,1	42,3	92,3

Source: Turkish Health Survey, 2012.

Besides, average age to start smoking is between 11 and 18 in Turkey. In other words, the smokers start smoking before they graduate from high school (Karlıkaya C.,et al,2016). Thus, increasing the standard of living and quality of community health care, and decreasing the demand of the tobacco are some of the important factors to decrease the harmful effects of tobacco. There are some control activities for tobacco usage in Turkey as well as all around the world. For this purpose, partial solutions are not effective and adequate. Cooperation between national and international sectors is significant. According to CDS's study there are some suggestions for reducing the rate of smoking and reducing the rate of starting smoking:

- Performing smoking ban or restriction in workplaces and public areas;
- Increasing the cigarettes prices, tax on cigarettes;
- Informing people about the harmful effects of smoking with mass media advertising and campaigning;
- Regulating and restricting tobacco sales and banning the sales to young people.
- Informing children and adolescents on harmful effects of smoking in school. Thereby, preventing starting smoking among young people.

## **BRIEF HISTORY OF RELATIVE DEPRIVATION THEORY**

According to Gordon (1999), deprivation refers to the lack of welfare, often implies the neediness of materials, goods and resources, but equally applicable to psychological factors. Deprivation can be understood in two separate ways as absolute deprivation and relative deprivation. Absolute deprivation may be described as the situation in which an individual is absolutely deprived when he/she cannot meet his/her own three basic necessities for survival (nutrition, water resources and shelter) However, relative deprivation is not only related to lacking basic necessities. Relative deprivation also means that the individual compares himself/herself to other people in the society and thinks his/her standard of living is worse than the one others have and wants promotion to his/her standard of living.

The Relative Deprivation Theory first occurred in Samuel Stouffer's survey on American soldiers in World War II in 1949. According to this survey, military police was more contented than U.S. Army Air corpsmen although they could get a promotion more slowly than the corpsmen. Then, Stouffer implied that relative deprivation shows itself best when two similar groups are compared; therefore, he compared two military police groups the second time. Later Davis (1959) claimed that Stouffer could not define and measure relative deprivation in the American soldiers accurately.

After Stouffer's ideas, Merton and Kitt (1950) studied the relative deprivation theory and extended the idea on reference group basis. Merton and Kitt's main contributions were to include social comparisons to the research of the theory. Furthermore, Davis (1959) was the first formal theorist who studied relative deprivation. According to Davis (1959), relative deprivation occurs when a person who has the

lacking of something desired compares himself/herself to other people within his/her social environment containing the things s/he desires.

Another theorist who studied relative deprivation (RD) formally was Runciman (1966). Runciman defined relative deprivation of X as: *“a person is relatively deprived of X when (i) he does not have X, (ii) he sees some other person or persons, which may include himself at some previous or expected time, as having X (whether or not this is or will be in fact the case), (iii) he wants X, and (iv) he sees it as feasible that he should have X (op.cit..p.10)”* Besides, Runciman (1966) divided the RD into two categories: 1) individual RD in which the person compares himself/herself to other people and 2) group RD in which the person compares his/her group to other groups.

Pettigrew describes RD in three steps. First, individuals must make comparisons since it will not be possible without comparisons. Second, this comparison must be made in the path that the comparing individual must perceive s/he or his/her group is on the disadvantageous side. This perceived comparative disadvantage indicates the difference between RD and frustration-aggression hypothesis and other non-comparative models of social justice and discrimination. Lastly, this perceived disadvantage must be perceived as unfair. If the individual feels that the situation is unfair to him/her or his/her group, it causes anger and dissatisfaction, which is the essential milestone of RD.

Crosby (1976) propounded and formulated individual RD, which states that RD has five important preconditions as follows:

- a) The person compares himself/ herself with others who have the desired X;

- b) The person wants X;
- c) The person feels entitled to X desired;
- d) The person thinks that it is reasonable to obtain X;
- e) The person does not blame himself/herself because of not having X.

On the other hand, Crosby is the first theorist who both regards RD as an involved variable rather than hypothetical construct and who formalizes the link between antecedent conditions of RD, behavioral dependent variables and the mediating variables.

Folger (1987) states that the individual compares and contrasts his/her situation or story with others and feels irritated if s/he thinks that a) outcomes of other alternative situation are higher; b) more legitimate contingencies and procedures might have led to better outcomes c) his/her existent state will not upgrade to better situation in near future.

In brief, the history of relative deprivation theory dates back to nearly 70 years ago and since then it has been used by social scientists such as psychologists, sociologists, and others. In recent years the RD theory has been used for explaining the relationship between inequality and health status and health behaviors. Next, we discuss the literature on relative deprivation and health status and health behaviors, such as tobacco consumption.



## **THEORETICAL LITERATURE**

As mentioned above, we are interested in studying the association between relative deprivation and health outcomes especially those caused by tobacco use. In this chapter, we review the literature on the relationship between RD and health behaviors. Moreover, we review the literature on other calculation methods of income inequality and health behaviors. In summary, according to RD theory the individual's health is affected not only by his/her own income level but also by other individuals' income level (Gravelle, 1998). Relative deprivation is one of the theories which explains the relationship between income inequality and impairment of health.

Researchers have studied mechanism of RD or income inequality and health different ways and found different results. While some researchers have examined the relationship between RD and smoking or other unhealthy behaviors, some researchers have examined the relationship between RD and health outcomes or self-rated health. Thus, we first review the studies on the relationship between RD and smoking. Then, we review the studies on the relationship between RD and other health outcomes as well as self-rated health.

Eibner and Evans (2001) examine the impact of relative deprivation on health status and health behaviors such as smoking, body mass index (BMI), exercise habits, using alcohol, mortality and seat belt use. They use individual-level data taken from "National Health Interview Survey Multiple Cause of Death Files" from 1988 to 1991. They calculate RD with Deaton formulation based on Yitzhaki index for various reference groups defined by location, age, race and education.

Results of this study show that higher RD is associated with smoking, body mass index, exercise and wearing seat belts. The results also show that when RD increases, the odds of smoking and the body mass index increase and the doing exercise and wearing seat belts decrease. Moreover, RD causes not only higher probability of mortality rate but also higher poor self-report health, and the higher blood pressures.

Siahpush et al. (2006) aim to examine the association between smoking and RD and also the relation between smoking and income inequality, perception of relative material well-being by considering socio-economic variables such as sex, marital status, levels of education. They use a cross-sectional with 2762 participants from Australia to shed light on this relationship. They calculate the objective RD by Yitzhaki Index and find that the objective RD does not affect the probability of smoking. However, the higher perceived RD is associated with the higher odds of smoking. Additionally, when the sense of income inequality is higher and material well-being is lower, the probability of smoking increases.

Ling (2009) study the effect of RD and income inequality on health outcomes such as BMI, blood pressures and risky health behaviors (E.g. smoking cigarettes older adults in China). He studies individual level data and RD index is calculated by Deaton's formulation. Moreover, he calculates RD separately for rural and urban areas. His study shows that there is a strong and positive relationship between RD and high waist circumference, being obese and being underweight, having hypertension or undernutrition for the whole sample. Additionally, his study indicates that the association between RD and smoking is positive and significant. However, there is not any relationship between RD and other negative health outcomes. This study shows that

the effects of RD on health outcomes and health behavior are different among the whole sample and sub-samples. For instance, while the effect of RD on nutritional impact is positive for overall population, it is negative for urban sub-sample. On the other hand, the effect of RD on smoking is positive and significant for all reference groups.

Lhila and Simon (2010) study the association between RD and infant health. However, they do not examine the relationship between RD and health outcomes or risky behaviors such as smoking, using alcohol etc. directly. Instead, they examine the association between mother's RD and smoking since they think that RD may cause stress and affect the probability of engaging in risky behaviors as smoking. They calculate RD index with Deaton's formulations.

Their findings show the association between RD and low birthweight of children, preterm birth and mothers' using tobacco is significant and positive. Namely, relatively deprived pregnant women are more likely to smoke than non-deprived pregnant women.

Kuo, Chiang (2013) analyzes RD hypothesis by examining the relationship between income RD calculated by Yitzhaki Index and self-rated health, depressive symptoms, and smoking among working-age Taiwanese men and women. In their study, they focus on whether depressive symptoms have an effect on the relation between RD and self-rated health in order to distinguish psychosocial side of RD. They used individual level data with 26,755 participants whose ages are between 25 and 64. They use self-rated health, depressive symptoms and smoking behavior separately as a dependent variable. The age groups, marital status, ethnicity, educational attainment, absolute income are used as independent variables.

According to the results of the models, there seem to be a correlation between higher RD and higher pervasiveness of poor self-rated health, depressive symptoms and current smoking rate among the Taiwanese individuals. However, when gender and age are combined in the reference group, the effect of income RD on smoking disappears for male participants.

Balsa, French and Regan (2013) examine the relationship between relative RD and risky behaviors such as alcohol consumption, smoking and drinking intoxication among the middle and high school teenagers. They use “National Longitudinal Study of Adolescent Health”. They define RD by the head of household’s education level. They do not study the effect of relative deprivation on adolescent’s risky behaviors directly. They use adolescent’s risky behaviors as a dependent variable and they use the head of household’s relative deprivation as an independent variable. Their results show the effect of RD on risky behaviors such as alcohol consumption, smoking and using intoxicating substances is statistically significant for males. This effect disappears for female participants. When RD increases the use of intoxicating substances, number of cigarettes smoked increases. Moreover, the head of household’s years of schooling increase alcohol consumptions. In other words, parental RD is affected by using intoxication substances and cigarettes positively but it affects alcohol consumption negatively.

Subramanian, Kawachi, et al (2009) examine the association between income RD calculated by Yitzhaki index and self-rated health. They use “Current Population Survey” data conducted by Census Bureau of the U.S. and the data contain 639,022 participants. Their reference groups are based on combination of age, gender education,

living area and race. Their results show that increased income relative deprivation causes increased odds of reporting poor health. The study also shows that the reference group having the lower rank of income is related to worse health status. Additionally, the results consisted with the results for the reference groups combining for the other factors.

Kondo, Kawachi, Subramanian (2008) test the RD measuring income inequality and health status. They use individual data containing demographic variables, household income, job status and self-rated health in Japan for both genders whose ages are between 24 and 64. They calculate RD with Yitzhaki index for the all reference group based upon occupation, location, age groups and their combinations. They use the self-rated health as a dependent variable and used RD as an independent variable in their study and they do analysis for each gender. The results of their study demonstrate that the higher relative deprivation is linked to poor health status and this relation is statistically significant for each gender. According to the results, they do not find any differences between genders in terms of this relation. The positive and significant relation between RD and poor health do not change for other reference groups.

Kondo, Saito and Kawachi (2014), aim to investigate the relationship between RD and risk of mortality from leading causes and also the relationship between RD and bad health behavior and depressive symptoms that cause serious diseases among older Japanese individuals from both genders. They use the data including older Japanese individuals whose ages are 65 or older and living in various regions. RD is calculated with Yitzhaki index for this study. The dependent covariates are mortality rate caused by diseases and mortality rate caused by stress-related health behaviors and they also favor

demographic (age, gender and marital status) and socioeconomic variables (income level and education level). According to results, the association between mortality rate and the income relative deprivation is significant and positive. In other words, when the older Japanese individual feel more deprived in reference to other individuals in same reference group, bad health behaviors such as smoking, less walking and no health checkup and depressive symptoms increase for men, not for women. Thus stress-related mortality rate increase only for men.

Kawachi, Kennedy (1997) investigate the association between inequality of household income and leading-cause mortality. They do not consider income inequality as RD, the income inequality is calculated with Robin Hood index. The higher Robin Hood Index means higher unequal income distribution. Results show that income inequality is associated with social mistrust and social mistrust is associated with mortality rate. Moreover, results also show that increased the income inequality leads to higher probability of coronary heart disease, malignant neoplasm and higher probability of infant mortality rate.

Salti (2010) investigate the relationship between income relative deprivation and mortality in South Africa. They use individual-level data from the “October Household Surveys” from 1994 to 1998 years. The RD index is calculated with Deaton formulation for all reference groups. The reference groups include nationality, province, race, age and the combination of these. According to the results, the relationship affecting mortality rate is significant for all reference groups. The higher RD leads to an increase in the odds of mortality rate. However, for some reference groups such as Asian men and women, white men and women, the effects of RD on mortality rate disappears.

Moreover, although the impact of relative deprivation on mortality rate is statistically significant for urban and rural black men, it is significant just for rural white men.

Cukur and Bekmez (2011) examine the association between income inequality and health outcomes, especially infant mortality rates. They take the data from Turkish Statistical Institute and other studies. They use infant mortality rate as a dependent variable and income per capita, income inequality and interaction between income per capita and income inequality as independent variables. Income inequality is calculated with Theil index. If the Theil index is near zero, income inequality is more egalitarian. Moreover, findings show that the income inequality significantly affects infant mortality rate. If the income inequality is getting worse, the infant mortality rate is getting higher while higher income level decreases the infant mortality rate.

Jones and Wildman (2008) examine RD and mental health based on “British Household Panel Survey” data. He calculates RD by using Yitzhaki/Hey and Lambert formulation; however, in his formulation only the people having income less than 50% of the mean are regarded as deprived. According to the results, there is a significant relationship between RD and health for women participants, but there is not any significant relation between RD and health status for men participants.

Yngwe, Fritzell and Lundberg (2003) examine and analyze the structure of RD and health. They use Swedish Survey of Living Conditions data and they define relatively deprived people as the individuals having income levels lower than 70% percent of mean income in the reference group. The reference groups are formed by social class, age and region. Their findings indicate that RD affects self-rated health. The effect of relative deprivation on poor self-rated health is positive. In other words,

relatively deprived individuals have poor health status. This effect is more obvious for the men than for the women.





## CHAPTER THREE

### DATA AND METHODOLOGY

The data used in this study are taken from Turkish Health Survey for the year 2012, conducted by Turkish Statistical Institute. The questions in the survey are asked in three different groups, age group between 0-6, age group between the ages 7-14, and age group in the ages 15 or above. However, we use data for individuals whose ages are between 25 and 64 years in an attempt to analyze the effect of income RD on smoking and to the effect of education RD on smoking status. Because the labor force consists of individuals at the ages between 24 and 64 years old. After our restriction, our sample contains 19,313 individuals (10,428 women and 8,885 men).

The Health Survey includes gender (female , male), region (urban, rural), marital status (single, married, divorced, widowed), job status (employed, unemployed), educational background (illiterate, literate but no degree, primary school (5 years), junior high school (8 years), secondary school, high schools and their equivalents, undergraduate or higher education, graduate or PhD) , age groups (0-6, 7 – 14, 15 – 24, 25 – 34, 35 – 44, 45 – 54, 55 – 64, 65 – 74, 75+), household income per capita (less than 350 TL, 351 TL - 500 TL, 501 TL – 620 TL, 621 TL – 750 TL, 751 TL – 900 TL, 901 TL – 1100 TL, 1101 TL – 1300 TL, 1301 TL – 1700 TL, 1701 TL – 2300 TL, more than 2301 TL), whether participants use tobacco and tobacco product or not.

Marital status of individuals consists of four categories as single, married, divorced and widowed. However, we combine divorced and widowed individuals

because both divorced and widowed individuals married before but they are single now. Thus, marital status of individuals includes three categories.

Job status consists of two categories as employed and unemployed. The individuals having regular jobs are under the category “employed” and the individuals do not work but seek for job are under the category “unemployed”.

In our analysis we used individual income as mid-point of income categories. Additionally, we calculated income relative deprivation with income. Similarly, we calculated education relative deprivation with years of education. So we defined years of education as if the individual is illiterate, his/her education year is equal to 0. If the individual is literate but no degree, his/her education year is equal to 2. If the individual completed primary school, his/her education year is equal to 5. If the individual completed middle school, his/her education year is equal to 8. If the individual completed high school, his/her education year is equal to 11. If the individual completed university, his/her education year is equal to 15. If the individual completed master degree or Phd, his/her education year is equal to 17.

In our study, we examine smoking status. As for smoking the following question is asked: “Are you still using tobacco products?” If the answer is “yes, every day” or “yes, but sometimes”, we accept that the individual is smoker. If the answer is “no, not now” then we accept the individual is non-smoker.

We used other demographic factors such as gender, region and age groups while forming reference group. Our reference group is divided as all individuals, gender, region, gender and region, gender and age groups. Thus, we have five reference groups.

In our study we use income RD and education RD as independent variables. Thus in order to measure RD, we use Yithzaki formulation indicated in his article published in 1979. This index is also used in the previous studies. (Siahpush, M., Borland, R., Taylor, J., Singh, G. K., Ansari, Z., & Serraglio, A. (2006), Ling, D. C. (2009), Balsa, A. I., French, M. T., & Regan, T. L. (2014)). The formulation is the following:

$$IRD_i = \frac{1}{N} \sum_j^n (y_j - y_i) \quad \text{for all } y_j > y_i$$

$$ERD_i = \frac{1}{N} \sum_j^n (x_j - x_i) \quad \text{for all } x_j > x_i$$

When  $IRD_i$  is income RD of individual “i”,  $ERD_i$  is education relative deprivation of individual “i”. “ $y_i$ ” is individual’s own income and “ $y_j$ ” is the income of others in the same reference group, specifically higher than “ $y_i$ ”. “ $x_i$ ” is individual’s own years of education and “ $x_j$ ” is the education year of others in the same reference group, specifically higher than “ $x_i$ ”. Then we normalize both income RD and education RD. Therefore, both income RD and education RD values are between 0 and 1. If the value is 0, it means that the individual is non-deprived, if the value is 1, it means that the individual is the most deprived.

### **3.1. Empirical Model:**

In order to investigate individual’s smoking behavior, we estimate following models:

$$S_i = \beta_0 + \beta_1 IRD_i + \beta_2 IRD_i^2 + \beta_3 M_i + \beta_4 J_i$$

$$S_i = \beta_0 + \beta_1 ERD_i + \beta_2 ERD_i^2 + \beta_3 M_i + \beta_4 J_i$$

$S_i$  is individual  $i$ 's smoking status. If the individual "i" is smoker,  $S_i$  is equal to 1, if individual "i" is non-smoker,  $S_i$  is equal to 0.

"IRD" is income relative deprivation that is between 0 and 1. "ERD" is education relative deprivation that is between 0 and 1. If the value is 0, it means the individual is non-deprived, if the value is 1 it means the individual is the most deprived.

$M_i$  is marital status of individual "i" as single, married and divorced/widowed. If the individual "i" is single,  $M_i$  is equal to 0, if the individual "i" is married,  $M_i$  is equal to 1, if the individual "i" is divorced/widowed,  $M_i$  is equal to 2.

$J_i$  is job status of individual "i" as employed and unemployed. If the individual "i" is employed  $J_i$  is equal to 1, if the individual "i" is unemployed  $J_i$  is equal to 0.

We examine the effect of both income RD and education RD on smoking status for each reference group separately. The theory states that RD is associated with smoking and the relation is positive. In other words, when the individual feels himself/herself as relatively deprived, he/she is more likely to smoke (Eibner and Evans, 2001; Siahpush, 2006; Ling, 2009; Lhila and Simon, 2010; Kuo and Chiang, 2013, Balsa, French, and Regan, 2013).

In our model smoking status is used as dependent variable in separate models. Income relative deprivation, education relative deprivation, marital status and job status are independent variables in our analysis. Income relative deprivation and education relative deprivation are exogenous variables in separate models. In addition, we restrict our sample to the age range between 25 and 64. The individual starts school at the age of 7 and completes his/her primary education around 17 years for our sample. So we may

say that 25-year old individual in our sample completes his/her education. We use logistic regression to estimate the parameters that affect the smoking since our dependent variable is binary. Firstly, we find the effect of IRD and ERD on the odds of smoking and then we find the marginal effect of IRD and ERD on smoking separately. We use Stata for the statistical analysis.

### **3.2. Descriptive Statistics**

Table 4 presents some basic and descriptive statistics for our variables. As it is stated above, our sample contains 19,313 individuals. The 53.99 % percent of the sample (10,428) is women and the 46.01 % percent of the sample (8,885) is men. 14,583 individuals (the %75.51 percent of the whole sample) live in urban areas and 4,730 individuals (the %24.49 percent of the sample) live in rural areas. Moreover, the 8,996 individuals (the %46.58 percent of the whole sample) are employed and 10,317 individuals (the %53.42 percent of the sample) are unemployed. Besides the 1,836 individuals (the %9.51 percent of the whole sample) are single, the 16,298 individuals (the %84.39 percent of the whole sample) are married and the 1,179 individuals (the %6.10 percent of the whole sample) are divorced or widowed.

The average age is 43.19 years for the whole sample; 42.87 years for female participants and 43.56 years for male participants (Table 5).

In our sample the percentage of current smokers is 31.31% in the whole sample, 18.89 % percent of the female population consists of current smokers and 45.89 % percent of the male population consists of current smokers. Table 4 also shows two other dependent variables as we use for robustness check. One of them is the participants answering the question “Have you ever smoked regularly?” as “yes”. 39.69 % percent of

the participants answer as “yes”. The percent of female participants is 21.73 % and 60.77 % for the male participants. Other dependent variable used for robustness check is the number of cigarettes that used in a day. The average number of cigarettes used is 3.41 for the whole sample; 5.71 for the male participants and 1.45 for the female participants (Table 5).

The education year, used for calculation of education relative deprivation index (ERD) is averagely 7.40 year for whole sample; 6.55 year for female participants and 8.41 year for male participants. In other words, our whole sample do not complete primary school. However, the men participants complete their primary school education while the women participants do not complete. The 7.67 % percent of the population is non-literate (for the women population of the non-literate ratio is the 12.61 % percent and for the men population, it is the 1.87 % percent). Besides the 1.14 % percent of the population complete 17 years of schooling (the ratio is the 12.61 % percent for the women population and it is the 1.87 % percent for the men population). The average education relative deprivation (ERD) is 46030,21 for the whole sample, the average ERD is 24884,25 for the female population and the average ERD is 19913,05 for the male population.

The household income used for the calculation of income RD index (IRD) is averagely 1,379.10 Turkish Liras (TL) for the whole sample, 1,356,05 Turkish Liras (TL) for female participants and 1,406,14 Turkish Liras (TL) for male participants. Likewise, 1,506.54 TL for the participants living in urban areas and 1,067.04 TL for the participants living in rural areas. The income RD (IRD) is 1,204,095 for the whole sample; the IRD is 1,231.138 for the male population and 1,181.054 for the female population; 1,305.31 for the urban population and 892 for the rural population (Table 5).

**Table 4 - Frequency Table of Variables**

	N	Percent %		N	Percent %
<b>GENDER</b>			<b>INCOME (TL)</b>		
<b>MALE</b>	8885	46.01	<b>&lt;350</b>	696	3.60
<b>FEMALE</b>	10428	53.99	<b>351 - 500</b>	760	3.94
	<b>19313</b>		<b>501 - 620</b>	575	2.98
<b>REGION</b>			<b>621 - 750</b>	1636	8.47
<b>RURAL</b>	4730	24.49	<b>751 - 900</b>	2333	12.08
<b>URBAN</b>	14583	75.51	<b>901 - 1100</b>	2399	12.42
	19313		<b>1101 - 1300</b>	1237	6.41
<b>JOB STATUS</b>			<b>1301 - 1700</b>	3169	16.41
<b>UNEMPLOYED</b>	10317	53.42	<b>1701 - 2300</b>	2623	13.58
<b>EMPLOYED</b>	8996	46.58	<b>&gt;2300</b>	3885	20.12
	<b>19313</b>		<b>19313</b>		
<b>MARITAL STATUS</b>			<b>IRD</b>		
<b>SINGLE</b>	1836	9.51	<b>0</b>	3885	20.12
<b>MARRIED</b>	16298	84.39	<b>6054911</b>	2623	13.58
<b>DIVORCED</b>	1179	6.10	<b>2290367</b>	3169	16.41
	<b>19313</b>		<b>3793551</b>	1237	6.41
<b>AGE</b>			<b>4923774</b>	2399	12.42
<b>25-34</b>	5541	28.69	<b>6130099</b>	2333	12.08
<b>35-44</b>	5487	28.41	<b>7264278</b>	1636	8.47
<b>45-54</b>	4870	25.22	<b>8382825</b>	575	2.98
<b>55-64</b>	3415	17.68	<b>9631049</b>	760	3.94
	<b>19313</b>		<b>1204095</b>	696	3.60
<b>SMOKE STATUS</b>			<b>19313</b>		
<b>NON-SMOKER</b>	13266	68.69			
<b>SMOKER</b>	6047	31.31			
	<b>19313</b>		<b>ERD</b>		
<b># OF CIGAR.</b>			<b>0</b>	220	1.14
<b>0</b>	14052	72.76	<b>440</b>	2656	13.75
<b>1-10</b>	2750	14.24	<b>11944</b>	3469	17.96
<b>11-20</b>	2068	10.71	<b>30979</b>	2073	10.73
<b>21-30</b>	217	1.12	<b>56233</b>	8611	44.59
<b>&gt;31</b>	226	1.17	<b>107320</b>	803	4.16
	<b>19313</b>		<b>142984</b>	1481	7.67
<b>EDUCATION (YEAR)</b>			<b>19313</b>		
<b>0</b>	1481	7.67			
<b>2</b>	803	4.16			
<b>5</b>	8611	44.59			
<b>8</b>	2073	10.73			
<b>11</b>	3469	17.96			
<b>15</b>	2656	13.75			
<b>17</b>	220	1.14			
	<b>19313</b>				
<b>Source: Turkish Health Survey, 2012.</b>					

**Table 5 - Descriptive Statistics**

	Variable	GENDER	LOCATION	AGE	MAR. STAT	JOB STAT.	INCOME	SMOKING	EDU YEAR	IRD	ERD	# OF CIG.
<b>ALL</b>	<b>Obs</b>	19313	19313	19313	19313	19313	19313	19313	19313	19313	19313	19313
	<b>Mean</b>	0.54	0.76	43.19	0.97	0.47	1379.10	0.31	7.40	373.10	2.38	3.41
	<b>Std. Dev.</b>	0.50	0.43	10.70	0.39	0.50	656.96	0.46	4.40	330.16	1.98	7.86
	<b>Min</b>	0	0	30	0	0	175	0	0	0	0	0
	<b>Max</b>	1	1	60	2	1	2301	1	17	1204	7.40	99
<b>MALE</b>	<b>Obs</b>	8885	8885	8885	8885	8885	8885	8885	8885	8885	8885	8885
	<b>Mean</b>	0	0.76	43.56	0.91	0.74	1406.14	0.46	8.409904	372.38	2.24	5.71
	<b>Std. Dev.</b>	0	0.43	10.66	0.36	0.44	655.79	0.50	4.118587	335.51	1.79	9.85
	<b>Min</b>	0	0	30	0	0	175	0	0	0	0	0
	<b>Max</b>	0	1	60	2	1	2301	1	17	1231	8.41	99
<b>FEMALE</b>	<b>Obs</b>	10428	10428	10428	10428	10428	10428	10428	10428	10428	10428	10428
	<b>Mean</b>	1	0.75	42.87	1.01	0.23	1356.05	0.19	6.54603	373.09	2.39	1.45
	<b>Std. Dev.</b>	0	0.43	10.73	0.41	0.42	657.11	0.39	4.446337	325.19	1.96	4.84
	<b>Min</b>	1	0	30	0	0	175	0	0	0	0	0
	<b>Max</b>	1	1	60	2	1	2301	1	17	1181	6.55	60
<b>URBAN</b>	<b>Obs</b>	14583	14583	14583	14583	14583	14583	14583	14583	14583	14583	14583
	<b>Mean</b>	0.54	1	42.54	0.96	0.47	1480.31	0.33	8.047384	361.26	2.44	3.45
	<b>Std. Dev.</b>	0.50	0	10.57	0.40	0.50	637.78	0.47	4.439912	338.15	2.08	7.81
	<b>Min</b>	0	1	30	0	0	175	0	0	0	0	0
	<b>Max</b>	1	1	60	2	1	2301	1	17	1305.31	8.05	99
<b>RURAL</b>	<b>Obs</b>	4730	4730	4730	4730	4730	4730	4730	4730	4730	4730	4730
	<b>Mean</b>	0.55	0	45.18	0.98	0.46	1067.04	0.26	5.418393	342.09	1.80	3.27
	<b>Std. Dev.</b>	0.50	0	10.86	0.36	0.50	615.88	0.44	3.602324	255.76	1.64	8.01
	<b>Min</b>	0	0	30	0	0	175	0	0	0	0	0
	<b>Max</b>	1	0	60	2	1	2301	1	17	892	5.42	80



**Table 6 - Frequency Table of Variables (Split Up Smoking Status)**

	SMOKING STATUS				SMOKING STATUS				
	0		1		0		1		
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	
<b>GENDER</b>					<b>INCOME (TL)</b>				
<b>MALE</b>	4808	36.24%	4077	67.42%	<b>175</b>	504	3.80%	192	3.18%
<b>FEMALE</b>	8458	63.76%	1970	32.58%	<b>425</b>	532	4.01%	228	3.77%
	<b>13266</b>		<b>6047</b>		<b>560</b>	428	3.23%	147	2.43%
					<b>685</b>	1132	8.53%	504	8.33%
<b>REGION</b>					<b>825</b>	1659	12.51%	674	11.15%
<b>RURAL</b>	3513	26.48%	1217	20.13%	<b>1000</b>	1655	12.48%	744	12.30%
<b>URBAN</b>	9753	73.52%	4830	79.87%	<b>1200</b>	843	6.35%	394	6.52%
	13266		6047		<b>1500</b>	2107	15.88%	1062	17.56%
					<b>2000</b>	1788	13.48%	835	13.81%
<b>JOB STATUS</b>					<b>2301</b>	2618	19.73%	1267	20.95%
<b>UNEMPLOYED</b>	8015	60.42%	2302	38.07%		<b>13266</b>		<b>6047</b>	
<b>EMPLOYED</b>	5251	39.58%	3745	61.93%					
	<b>13266</b>		<b>6047</b>		<b>IRD</b>				
					<b>0</b>	2618	19.73%	1267	20.95%
<b>MARITAL STATUS</b>					<b>6054911</b>	1788	13.48%	835	13.81%
<b>SINGLE</b>	1187	8.95%	649	10.73%	<b>2290367</b>	2107	15.88%	1062	17.56%
<b>MARRIED</b>	11315	85.29%	4983	82.40%	<b>3793551</b>	843	6.35%	394	6.52%
<b>DIVORCED</b>	764	5.76%	415	6.86%	<b>4923774</b>	1655	12.48%	744	12.30%
	<b>13266</b>		<b>6047</b>		<b>6130099</b>	1659	12.51%	674	11.15%
					<b>7264278</b>	1132	8.53%	504	8.33%
<b>AGE</b>					<b>8382825</b>	428	3.23%	147	2.43%
<b>25-34</b>	3665	27.61%	1886	31.19%	<b>9631049</b>	532	4.01%	228	3.77%
<b>35-44</b>	3522	26.53%	1965	32.50%	<b>1204095</b>	504	3.80%	192	3.18%
<b>45-54</b>	3363	25.33%	1507	24.92%		<b>13266</b>		<b>6047</b>	
<b>55-64</b>	2726	20.53%	689	11.39%					
	<b>13276</b>		<b>6047</b>		<b>ERD</b>				
<b>EDUCATION (YEAR)</b>					<b>0</b>	152	1.15%	68	1.12%
<b>0</b>	1342	10.12%	139	2.30%	<b>440</b>	1843	13.89%	813	13.44%
<b>2</b>	663	5.00%	140	2.32%	<b>11944</b>	2121	15.99%	1348	22.29%
<b>5</b>	5967	44.98%	2644	43.72%	<b>30979</b>	1178	8.88%	895	14.80%
<b>8</b>	1178	8.88%	895	14.80%	<b>56233</b>	5967	44.98%	2644	43.72%
<b>11</b>	2121	15.99%	1348	22.29%	<b>107320</b>	663	5.00%	140	2.32%
<b>15</b>	1843	13.89%	813	13.44%	<b>142984</b>	1342	10.12%	139	2.30%
<b>17</b>	152	1.15%	68	1.12%		<b>13266</b>		<b>6047</b>	
	<b>13266</b>		<b>6047</b>						

Source: Turkish Health Survey, 2012.

## CHAPTER FOUR

### RESULTS:

As it is mentioned above we present the results in two sections. In the first section, we present the effect of income RD on smoking status of each reference group separately. In the second section, we present the effect of relative deprivation of education on smoking status for each reference group. Besides, we demonstrate both the odds ratios and marginal effect of logistic regressions for each reference group and each relative deprivation variable.

#### **4.1. Results of Relative Deprivation On Income**

We present the odds ratio and marginal effect after logistic regression for income relative deprivation variables in this section.

##### **4.1.a. Reference Group: All**

Table 7 shows the odds ratios of the effect of RD on income for smoking status. Firstly, we explain the odds ratio and marginal effects after logistic regression to calculate RD on income for all individuals. When we look at the effects of income RD on smoking status results, it may be seen that the results reflect our estimations. The odds of smoking for relatively deprived people is 1.66 (CI:1.194 – 2.318) when the reference group contains all participants. This odds ratio implies that the odds of smoking for the most relatively deprived people are 1.66 times higher than the odds of smoking for the relatively non-deprived people. According to marginal effect results, the probability of smoking increases by 0.11 percent for the highest income RD level (see Table 8). Also we can see that this variable is statistically significant.

Table 9 shows that the relationship between IRD and the number of tobacco and tobacco products used is positive and significant for all the participants. The odds of the highest number of smoking used versus other numbers of tobacco and tobacco products used are 2.044 times higher. Thus we can say that when the IRD increases the number of tobacco and tobacco products used increases, too. This result is consistent to our main regression results.

Table 9 also shows that the multinomial logistic regression results. According to the results, the relative risk ratio for the most relatively deprived individuals decreases by 1.75 (1/0.57) for the ones quitting smoking versus being a current smoker. Additionally, the relative risk ratio for the most relatively deprived individuals decreases by 1.61 (1/0.62) for never smoking individuals versus being current smoker. Therefore, it can be said that for the individuals who feel poor compared to other individuals it is hard to quit smoking.

As we have seen for this reference group (all individuals), employed participants are more likely to smoke than unemployed participants. Additionally, married variable results indicate that married people are less likely to smoke while widowed/divorced people are the most likely to smoke.

**Table 7 - The Odds Ratio of Smoking Status for Income Relative Deprivation**

	EMP	MARRIED	DIV/WID	IRD	IRD-SQ	C	N	LL	P_R2
<b>ALL</b>	2.547***	0.898**	1.326***	1.664***	0.551***	0.288***	19,313	-11563	0.04
	(0.0843)	(0.0480)	(0.108)	(0.282)	(0.112)	(0.0173)			
<b>GENDER</b>									
<b>MALE</b>	1.478***	0.974	2.028***	2.098***	0.616*	0.551***	8,885	-6079	0.01
	(0.0747)	(0.0660)	(0.311)	(0.471)	(0.166)	(0.0437)			
<b>FEMALE</b>	1.339***	0.771***	1.632***	0.483***	0.925	0.318***	10,428	-4957	0.02
	(0.0792)	(0.0681)	(0.181)	(0.133)	(0.313)	(0.0299)			
<b>REGION</b>									
<b>URBAN</b>	2.475***	0.928	1.500***	2.274***	0.482***	0.288***	14,583	-8943	0.03
	(0.0939)	(0.0552)	(0.135)	(0.455)	(0.124)	(0.0192)			
<b>RURAL</b>	3.177***	0.805*	0.716*	0.832	1.321	0.231***	4,730	-2549	0.05
	(0.225)	(0.0990)	(0.143)	(0.304)	(0.497)	(0.0323)			
<b>GENDER AND REGION</b>									
<b>MALE URBAN</b>	1.436***	0.971	2.057***	2.842***	0.415**	0.556***	6,744	-4615	0.01
	(0.0840)	(0.0735)	(0.357)	(0.772)	(0.148)	(0.0493)			
<b>MALE RURAL</b>	1.615***	1.001	1.893*	1.245	1.175	0.516***	2,141	-1461	0.01
	(0.163)	(0.151)	(0.619)	(0.579)	(0.563)	(0.0929)			
<b>FEMALE URBAN</b>	1.531***	0.853*	1.817***	0.738	1.067	0.292***	7,839	-4067	0.02
	(0.105)	(0.0822)	(0.218)	(0.227)	(0.409)	(0.0306)			
<b>FEMALE RURAL</b>	1.144	0.636*	0.795	0.230**	1.930	0.217***	2,589	-790.1	0.01
	(0.173)	(0.156)	(0.259)	(0.169)	(1.531)	(0.0582)			
<b>GENDER AND AGE</b>									
<b>MALE 25 34</b>	1.314**	1.184*	6.636***	3.234***	0.313**	0.611***	2,397	-1640	0.01
	(0.178)	(0.112)	(2.987)	(1.423)	(0.170)	(0.0841)			
<b>MALE 35 44</b>	1.161	1.253	3.564***	1.469	1.154	0.599**	2,553	-1757	0.01
	(0.170)	(0.227)	(1.284)	(0.608)	(0.578)	(0.126)			
<b>MALE 45 54</b>	1.041	1.280	2.043*	2.095	0.634	0.549*	2,307	-1585	0.03
	(0.0960)	(0.386)	(0.813)	(0.944)	(0.341)	(0.172)			
<b>MALE 55 64</b>	1.017	1.110	1.819	1.152	0.796	0.414	1,628	-1021	0.002
	(0.116)	(0.594)	(1.067)	(0.641)	(0.520)	(0.224)			
<b>FEMALE 25 34</b>	1.444***	1.073	3.402***	2.012	0.230**	0.219***	3,144	-1589	0.02
	(0.154)	(0.128)	(0.791)	(1.041)	(0.150)	(0.0306)			
<b>FEMALE 35 44</b>	1.187*	0.814	2.434***	0.328**	2.088	0.405***	2,934	-1571	0.02
	(0.119)	(0.143)	(0.554)	(0.156)	(1.159)	(0.0768)			
<b>FEMALE 45 54</b>	1.032	0.303***	0.916	0.145***	2.293	0.867	2,563	-1142	0.04
	(0.133)	(0.0766)	(0.255)	(0.0842)	(1.620)	(0.224)			
<b>FEMALE 55 64</b>	0.756	0.328***	0.954	0.326	0.336	0.368**	1,787	-519.2	0.06
	(0.241)	(0.140)	(0.414)	(0.320)	(0.447)	(0.159)			

(1) \* 1% level of significance, \*\* 5% level of significance, % 10 level of significance

(2) Robust standart errors are shown in paranthesis

(3) Dependent variable is smoking status. (0:non-smoker; 1:smoker)

(4) LL: Log Likelihood; P\_R2:Psuedo R-Square

#### **4.1.b Reference Group: Gender**

In this sub-section we indicate the results of relative deprivation on income calculated for each gender.

Table 7 demonstrates that the effect of income relative deprivation on smoking status is different for each reference group. When we look at the male group, the results show that the odds of smoking for the most relatively deprived men are 2.10 times higher than the odds of smoking for the most relatively non-deprived men (CI:1.352 – 3.258). However, the odds ratio is totally opposite for female. The odds of smoking for the most relatively non-deprived women is 2.08 (1/0.48) times higher than the odds of smoking for the most relatively deprived women (CI:0.281 – 0.830). The marginal effects of logistic regression also reflect the same results. Men who are the most relatively deprived in terms of income raise the probability of smoking by 0.184 percent, but for women being the most relatively deprived reduces the probability of smoking by 0.11 percent (see Table 8). In addition, the results are statistically significant.

Table 9 shows that the relationship between IRD and the number of tobacco and tobacco products used is positive for male participants but it is negative for female participants. Similar to the results above, the odds of the highest number of smoking rate versus other numbers of tobacco and tobacco products used is 2.275 times higher for the male participants and 0.516 times higher for the female participants. The results indicate that although IRD increases the number tobacco and tobacco products used for the male participants, it decreases the number tobacco and tobacco products used, too. According to the results, although IRD affects smoking and increases the number of cigarettes used,

**Table 8 – Average Marginal Effect After Logit for Income Relative Deprivation (IRD)**

	<b>EMP</b>	<b>MARRIED</b>	<b>DIV/WID</b>	<b>IRD</b>	<b>IRD-SQ</b>	<b>N</b>
<b>ALL</b>	0.198***	-0.0230**	0.0642***	0.108***	-0.126***	19313
	(0.00690)	(0.0116)	(0.0187)	(0.0358)	(0.0430)	
<b>GENDER</b>						
<b>MALE</b>	0.0970***	-0.00642	0.173***	0.184***	-0.120*	8885
	(0.0125)	(0.0168)	(0.0361)	(0.0557)	(0.0668)	
<b>FEMALE</b>	0.0438***	-0.0399***	0.0926***	-0.109***	-0.0117	10428
	(0.00884)	(0.0145)	(0.0207)	(0.0414)	(0.0507)	
<b>REGION</b>						
<b>URBAN</b>	0.198***	-0.0163	0.0950***	0.180***	-0.160***	14583
	(0.00820)	(0.0131)	(0.0213)	(0.0438)	(0.0565)	
<b>RURAL</b>	0.212***	-0.0417*	-0.0626*	-0.0336	0.0510	4730
	(0.0125)	(0.0247)	(0.0365)	(0.0670)	(0.0690)	
<b>GENDER AND REGION</b>						
<b>MALE URBAN</b>	0.0899***	-0.00734	0.177***	0.259***	-0.218**	6744
	(0.0145)	(0.0188)	(0.0406)	(0.0674)	(0.0885)	
<b>MALE RURAL</b>	0.119***	0.000264	0.158**	0.0544	0.0400	2141
	(0.0250)	(0.0374)	(0.0785)	(0.115)	(0.119)	
<b>FEMALE URBAN</b>	0.0722***	-0.0269	0.122***	-0.0514	0.0110	7839
	(0.0115)	(0.0169)	(0.0240)	(0.0521)	(0.0650)	
<b>FEMALE RURAL</b>	0.0110	-0.0430	-0.0237	-0.120**	0.0538	2589
	(0.0124)	(0.0269)	(0.0339)	(0.0600)	(0.0649)	
<b>GENDER AND AGE</b>						
<b>MALE 25 34</b>	0.0681**	0.0422*	0.381***	0.293***	-0.291**	2397
	(0.0338)	(0.0236)	(0.0571)	(0.110)	(0.136)	
<b>MALE 35 44</b>	0.0374	0.0561	0.297***	0.0961	0.0357	2553
	(0.0367)	(0.0447)	(0.0747)	(0.103)	(0.125)	
<b>MALE 45 54</b>	0.00988	0.0602	0.176*	0.184	-0.113	2307
	(0.0229)	(0.0722)	(0.0962)	(0.112)	(0.133)	
<b>MALE 55 64</b>	0.00365	0.0222	0.137	0.0308	-0.0499	1628
	(0.0249)	(0.111)	(0.126)	(0.121)	(0.143)	
<b>FEMALE 25 34</b>	0.0601***	0.0111	0.254***	0.114	-0.240**	3144
	(0.0173)	(0.0186)	(0.0536)	(0.0845)	(0.106)	
<b>FEMALE 35 44</b>	0.0304*	-0.0369	0.199***	-0.198**	0.131	2934
	(0.0178)	(0.0330)	(0.0497)	(0.0843)	(0.0986)	
<b>FEMALE 45 54</b>	0.00430	-0.213***	-0.0198	-0.266***	0.114	2563
	(0.0178)	(0.0569)	(0.0636)	(0.0796)	(0.0972)	
<b>FEMALE 55 64</b>	-0.0202	-0.105*	-0.00651	-0.0810	-0.0789	1787
	(0.0230)	(0.0576)	(0.0603)	(0.0716)	(0.0951)	

(1) \* 1% level of significance, \*\* 5% level of significance, % 10 level of significance

(2) Robust standart errors are shown in paranthesis

(3) Dependent variable is smoking status. (0:non-smoker; 1:smoker)

IRD decreases the odds of quitting smoking versus being current smoker. This result is also consistent to our main regression results.

When the marital status variable results are concerned, it is indicated that the probability of smoking increases for employed individuals for both male participants and female participants. When we form the reference groups based on gender, the effects of married dummies disappear for male participants; however, both married dummies result for female participants and divorced/widowed dummy for both genders are the same as the first results for which reference group is based on all participants.

#### **4.1.c Reference Group: Region**

In this sub-section we show the results of relative deprivation on income calculated for urban areas and rural areas.

Table 7 and Table 8 demonstrate that the effect of income relative deprivation on smoking status is different for each reference group. When we look at urban areas reference group, the results show that the odds of smoking for the most relatively deprived men is 2.27 times higher than the odds of smoking for the most relatively non-deprived men (CI: 1.536 - 3.366) and the probability of smoking increases by 0.18 percent for the highest income relative deprivation level in urban areas. However, the odds ratio is totally opposite for people living in rural areas. When we examine people living in rural areas, we see that the effect is negative and disappearing. In other words, the odds of smoking for the most relatively non-deprived individuals living in rural areas are higher than the odds of smoking for the most relatively deprived individuals living in rural areas (OR: 0.83 CI:0.281 – 0.830) and the probability of smoking decreases for

**Table 9 – Comparison Table for Various Regression Results for IRD**

		CURRENT SMOKE (MULTINOMIAL)*	CURRENT SMOKE (BINARY)**	CURRENT SMOKE (ORDERED)***	QUIT SMOKING (BINARY) **
		<b>IRD</b>	<b>IRD</b>	<b>IRD</b>	<b>IRD</b>
<b>ALL</b>	NEVER SMOKE	0.623*** (0.109)	1.664*** (0.282)	2.044*** (0.356)	1.383** (0.222)
	QUIT SMOKE	0.565** (0.158)			
	BASE GROUP: CURRENT SMOKER				
<b>GENDER</b>					
<b>MALE</b>	NEVER SMOKE	0.431*** (0.106)	2.098*** (0.471)	2.275*** (0.497)	1.929*** (0.440)
	QUIT SMOKE	0.625 (0.203)			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE</b>	NEVER SMOKE	2.392*** (0.665)	0.483*** (0.133)	0.516** (0.157)	0.318*** (0.0833)
	QUIT SMOKE	0.337** (0.183)			
	BASE GROUP: CURRENT SMOKER				
<b>REGION</b>					
<b>URBAN</b>	NEVER SMOKE	0.455*** (0.0937)	2.274*** (0.455)	2.896*** (0.600)	1.780*** (0.341)
	QUIT SMOKE	0.437** (0.150)			
	BASE GROUP: CURRENT SMOKER				
<b>RURAL</b>	NEVER SMOKE	1.209 (0.454)	0.832 (0.304)	0.792 (0.296)	0.717 (0.244)
	QUIT SMOKE	1.262 (0.731)			
	BASE GROUP: CURRENT SMOKER				
<b>GENDER AND REGION</b>					
<b>MALE URBAN</b>	NEVER SMOKE	0.322*** (0.0941)	2.842*** (0.772)	3.291*** (0.881)	2.474*** (0.674)
	QUIT SMOKE	0.477* (0.197)			
	BASE GROUP: CURRENT SMOKER				
<b>MALE RURAL</b>	NEVER SMOKE	0.671 (0.347)	1.245 (0.579)	1.363 (0.614)	1.233 (0.591)
	QUIT SMOKE	1.170 (0.752)			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE URBAN</b>	NEVER SMOKE	1.539 (0.477)	0.738 (0.227)	0.774 (0.258)	0.490** (0.144)
	QUIT SMOKE	0.336* (0.206)			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE RURAL</b>	NEVER SMOKE	4.720** (3.490)	0.230** (0.169)	0.119** (0.101)	0.111*** (0.0763)
	QUIT SMOKE	0.570 (0.784)			
	BASE GROUP: CURRENT SMOKER				



**Table 9 Continued...**

		<b>CURRENT SMOKE (MULTINOMIAL)*</b>	<b>CURRENT SMOKE (BINARY)**</b>	<b>CURRENT SMOKE (ORDERED)***</b>	<b>QUIT SMOKING (BINARY) **</b>
<b>GENDER AND AGE GROUP</b>					
<b>MALE 25 34</b>	NEVER SMOKE	0.231*** (0.106)	3.234*** (1.423)	3.525*** (1.528)	5.167*** (-2.315)
	QUIT SMOKE	4.118 (3.826)			
	BASE GROUP: CURRENT SMOKER				
<b>MALE 35 44</b>	NEVER SMOKE	0.701 (0.313)	1.469 (0.608)	1.667 (0.657)	1.291 (0.544)
	QUIT SMOKE	0.634 (0.415)			
	BASE GROUP: CURRENT SMOKER				
<b>MALE 45 54</b>	NEVER SMOKE	0.452 (0.233)	2.095 (0.944)	2.215* (0.957)	1.366 (0.648)
	QUIT SMOKE	0.529 (0.314)			
	BASE GROUP: CURRENT SMOKER				
<b>MALE 55 64</b>	NEVER SMOKE	0.634 (0.394)	1.152 (0.641)	1.535 (0.871)	1.830 (0.962)
	QUIT SMOKE	1.323 (0.877)			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE 25 34</b>	NEVER SMOKE	0.538 (0.280)	2.012 (1.041)	1.465 (0.862)	0.858 (0.434)
	QUIT SMOKE	0.174 (0.187)			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE 35 44</b>	NEVER SMOKE	3.488*** -1.669	0.328** (0.156)	0.423* (0.215)	0.296*** (0.136)
	QUIT SMOKE	0.509 (0.527)			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE 45 54</b>	NEVER SMOKE	7.757*** -4535	0.145*** (0.0842)	0.262** (0.169)	0.220*** (0.119)
	QUIT SMOKE	2.131 -2293			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE 55 64</b>	NEVER SMOKE	4.310 (4.241)	0.326 (0.320)	0.286 (0.288)	0.073*** (0.054)
	QUIT SMOKE	0.0872* (0.118)			
	BASE GROUP: CURRENT SMOKER				

\* Multinomial Logistic Regression , \*\* Binary Logistic Regression, \*\*\* Ordered Logistic Regression

- (1) For the multinomial logistic regression base group is people who are still smoker.
- (2) Binary means that analysis for the participant did by binary logistic regression
- (3) Ordered means that number of using cigarettes was grouped and it used as dependent variable.
- (4) Quit smoking means that the sample contains the participants who are smoker in the past and currently smoker.
- (5) Current Smoke (Binary) is the baseline estimation.

highest level of income relative deprivation. As it is mentioned before, the coefficient is statistically insignificant for rural areas.

Table 9 also shows the same results. The association between IRD and the number of tobacco and tobacco products used is positive and significant for participants living in urban areas; however, it is negative and insignificant for the participants living in rural areas. The odds of the highest number of smoking rate versus other numbers of tobacco and tobacco products used are 2.896 times higher for the participants living in urban areas. Moreover, according to Table 9 the results show that quitting smoking is hard for the individuals feeling relatively poor among the people living in the urban areas but it is different for individuals living in rural areas. The relative risk ratio for the most relatively deprived individuals increases by 1.26 for the individuals quitting smoking versus individuals being current smokers. However, these results are insignificant.

The job status covariates results are the same as results above for reference group based on all participants and gender. The results for marital status covariates for urban region are also the same with marital status covariates for male participants. However, being divorced/widowed and married decreases the probability of smoking in rural region.

#### **4.1.d Reference Group: Gender and Region**

In this sub-section, we indicate the results of income RD calculated for each gender living in urban areas and in rural areas separately.

Table 7 demonstrates the odds ratio and Table 8 shows average marginal effect after logistic regression. When we calculate RD on income based on gender and location, only the results of males living in urban areas are statistically significant. The odds ratio of smoking for this reference group is 2.84 (CI: 1.669 – 4.839). These results indicate that the odds of smoking for the most relatively deprived male living in urban areas is 2.84 times higher than the odds of smoking for the most relatively non-deprived male living in urban areas (OR: 0.83 CI:0.281 – 0.830). The probability of smoking is quite high for the most relatively deprived men living in urban areas. The probability increases by 0.26 percent for the highest level of income relative deprivation. Although the probability of smoking for males living in rural areas is less than the probability of smoking for males living in urban areas, it is still positive and insignificant (0.054). For the other reference groups, while the effect is opposite for females living in both urban areas and rural areas but it is statistically insignificant. Furthermore, for the reference group consisting of female living in rural areas, the marginal effect is statistically significant with a 90% confidence level and has a negative impact on the probability of smoking. When the female individuals living in rural areas feel the most relatively deprived about income, the probability of smoking decreases by 0.12 percent.

Indistinguishable with the results of other reference groups, Table 9 indicates that the results for IRD and number of tobacco and tobacco products used are consistent with the results for current smokers and IRD. Similarly, there are only significant results for male individuals living in urban areas and female individuals living in rural areas. Additionally, we may imply that if the men living in urban areas have lower income with reference to other men, he uses a greater number of cigarettes. However, this effect

is different for female living in rural areas. In other words, the richer female living in the rural area smoke greater number of cigarettes.

When the job status and marital status variables are concerned, the results show that the odds of smoking for employed people are higher than the odds of smoking for unemployed people for all reference groups considering gender and region. However, the effect of income RD on smoking disappears for female participants living in rural areas. As for marital status variables, the effects of income RD on smoking status do not change for both male participants living in urban areas and male participants living in rural areas and female participants living in urban areas. However, the effects of income RD on smoking status disappear for divorced/widowed female participants living in rural areas and both married male participants living in urban areas and male participants living in rural areas (see Table 7).

#### **4.1.e Reference Group: Gender and Age Groups**

In this sub-section, income RD is calculated for each gender and age group. Table 7 and table 8 show the results for the odds of smoking and average marginal effects after logistic regression.

The effects of income RD, the main covariates for our research, on smoking status are divided into five reference groups (males at the age group ranging between 35 and 45, males at the age group ranging between 45 and 54, males at the age group ranging between 55-64, females at the age group ranging between 25 and 35, females at the age group ranging between 55 and 64). The reference group includes males at the age group ranging between 25 and 34; the reference group includes females at the age

group ranging between 45 and 54, the results of which contradict each other. The odds of smoking for the most relatively deprived people are 3.23 times higher than the odds of smoking for the most relatively non-deprived people for the males at the age group ranging between 25 and 34. The probability of smoking rises by 0.293 percent for income RD for the group consisting of males in the age group ranging between 25 and 34. However, the odds of smoking for the most relatively non-deprived people are 6.90 (1/0.145) times higher than the odds of smoking for the most relatively deprived people if the reference group is female at the age group ranging between 45 and 54. This is the highest odds ratio among all reference groups. Additionally, being relatively deprived reduces the probability of smoking for females (for females at the age group between 35 and 44 it is -0.198 percent, for females at the age group ranging between 45 and 54 it is -0.266 percent).

Table 9 shows that the odds of using the highest number of cigarettes for the most relatively deprived people are 3.53 times higher for the males at the age group ranging between 25 and 34. The results also indicate that if female individuals at the age group between 35-44 and 45-54 have less income, they consume fewer number of cigarettes than richer female individuals at the same age groups.

For job status, covariates of only three reference groups results are statistically significant, such as males in the age group ranging between 25-34, females in the age group ranging between 25-34 and females in the age group ranging between 35-44. The effect of income relative deprivation on smoking is the same as the reference group controlling for all, gender, location, gender and location (see Table 7 and Table 8).

As for job status covariates, the effects of RD on income for smoking individuals disappear for some reference groups. However, significant results show that the effects are the same as the previous results for divorced/widowed dummies. As for married dummies, for male participants at the ages between 25 and 34, the odds of smoking status for married people are higher than the odds of smoking status for single people. Other significant results are the same as previous results (see Table 7 and Table 8).

## **4.2. Results for Relative Deprivation On Education**

In this section, we explain the relationship between education RD and smoking status. As we explain above, we present the results for each reference group considering for all, gender, location, gender and age group, gender and location, gender age and location.

### **4.2.a Reference Group: All**

In this sub section we calculate education RD for all individuals and examine the relation between smoking status and education RD. Table 10 and Table 11 show the odds ratio of smoking status and average marginal effects after logit.

First of all, just as income relative deprivation, there is a significant relation between smoking status and education relative deprivation. According to results high education RD is associated with high probability of smoking status. The odds of smoking for the highest education relative deprivation are 4.38 times higher than the odds of smoking for lowest education RD (CI: 3.091 – 6.207). For individuals who are relatively deprived, the probability of smoking increases by 0.31 percent. In the other words, the lowest education level associates with the highest smoking probability.

Table 12 shows that the relationship between ERD and the number of tobacco and tobacco products used is positive and significant for the all participants. The results support our first results. They indicate that people who are less educated use more cigarettes. The odds of the highest number of smoking categories versus other number of tobacco and tobacco products used are 6.31 times higher. Another regression result indicates that the relative risk ratio for the individuals who are the most deprived individuals decrease by 4.48 times for quitting smoking versus being current smoker. Thus, we can say that more educated individuals may quit smoking easily when compared to less educated individuals.

The job status covariates results indicate employed participants are more likely to smoke than the unemployed participants. (see Table 10 and Table 11). Additionally, for marital status covariates, the odds of smoking for married people are less than the odds of smoking for single people but the odds of smoking for divorced/widowed participants is higher than the odds of smoking for single participants.

**Table 10 – The Odds Ratio of Smoking Status for Education Relative Deprivation (ERD)**

	EMP	MARRIED	DIV/WID	ERD	ERD-SQ	C	N	LL	PR2
<b>ALL</b>	2.283***	0.902*	1.487***	4.380***	0.0570***	0.314***	19,313	-11377	0.0523
	(0.0778)	(0.0493)	(0.124)	(0.779)	(0.0121)	(0.0188)			
<b>GENDER</b>									
<b>MALE</b>	1.474***	0.899	1.905***	8.835***	0.0853***	0.510***	8,885	-6050	0.0128
	(0.0749)	(0.0620)	(0.294)	(2.177)	(0.0287)	(0.0403)			
<b>FEMALE</b>	1.155**	0.918	2.034***	0.303***	0.518**	0.365***	10,428	-4833	0.0437
	(0.0705)	(0.0839)	(0.232)	(0.0865)	(0.156)	(0.0339)			
<b>REGION</b>									
<b>URBAN</b>	2.306***	0.893*	1.560***	7.349***	0.0506***	0.299***	14,583	-8857	0.0436
	(0.0909)	(0.0541)	(0.143)	(1.476)	(0.0127)	(0.0201)			
<b>RURAL</b>	2.602***	0.912	1.100	0.383*	0.340**	0.340***	4,73	-2460	0.0877
	(0.189)	(0.118)	(0.228)	(0.203)	(0.176)	(0.0479)			
<b>GENDER AND REGION</b>									
<b>MALE URBAN</b>	1.471***	0.880*	1.931***	10.26***	0.0980***	0.498***	6,744	-4586	0.0142
	(0.0866)	(0.0680)	(0.338)	(3.004)	(0.0412)	(0.0441)			
<b>MALE RURAL</b>	1.496***	0.972	1.920**	2.765*	0.152***	0.591***	2,141	-1456	0.0137
	(0.151)	(0.150)	(0.623)	(1.630)	(0.0972)	(0.106)			
<b>FEMALE URBAN</b>	1.334***	0.918	2.053***	0.978	0.254***	0.329***	7,839	-4003	0.0325
	(0.0940)	(0.0899)	(0.251)	(0.303)	(0.0857)	(0.0340)			
<b>FEMALE RURAL</b>	1.016	0.875	1.360	0.00716***	15.10**	0.292***	2,589	-758.6	0.0509
	(0.155)	(0.234)	(0.472)	(0.0102)	(19.22)	(0.0759)			
<b>GENDER AND AGE</b>									
<b>MALE 25 34</b>	1.272*	1.133	5.787***	43.07***	0.0118***	0.504***	2,397	-1617	0.0267
	(0.169)	(0.106)	(2.520)	(23.89)	(0.00976)	(0.0669)			
<b>MALE 35 44</b>	1.065	1.171	3.395***	10.63***	0.0797***	0.567***	2,553	-1747	0.0128
	(0.150)	(0.212)	(1.227)	(4.952)	(0.0545)	(0.118)			
<b>MALE 45 54</b>	1.020	1.170	1.942	9.062***	0.0995***	0.501**	2,307	-1578	0.00779
	(0.0942)	(0.359)	(0.785)	(4.451)	(0.0642)	(0.159)			
<b>MALE 55 64</b>	1.033	1.069	1.774	4.200**	0.271**	0.335**	1,628	-1018	0.00461
	(0.115)	(0.578)	(1.050)	(2.572)	(0.175)	(0.184)			
<b>FEMALE 25 34</b>	1.393***	1.087	3.223***	1.484	0.269**	0.232***	3,144	-1586	0.0200
	(0.146)	(0.133)	(0.747)	(0.752)	(0.164)	(0.0307)			
<b>FEMALE 35 44</b>	1.161	0.871	2.342***	0.495	0.801	0.397***	2,934	-1565	0.0226
	(0.118)	(0.154)	(0.534)	(0.250)	(0.407)	(0.0754)			
<b>FEMALE 45 54</b>	0.840	0.442***	1.215	0.0126***	7.617***	1.126	2,563	-1094	0.0838
	(0.113)	(0.116)	(0.350)	(0.00845)	(4.943)	(0.298)			
<b>FEMALE 55 64</b>	0.549*	0.382**	1.073	0.00540***	10.21**	0.767	1,787	-482.5	0.123
	(0.189)	(0.164)	(0.470)	(0.00607)	(10.71)	(0.347)			
(1) * 1% level of significance, ** 5% level of significance, % 10 level of significance									
(2) Robust standart errors are shown in paranthesis									
(3) Dependent variable is smoking status. (0:non-smoker; 1:smoker)									
(4) LL: Log Likelihood; P_R2:Pseudo R-Square									



#### **4.2.b. Reference Group: Gender**

In this part we explain the results of the reference group consisting of gender. The education RD results are different for each reference group. Although the odds of smoking for the most relatively deprived males are 4.380 times as high as the odds of smoking for the least relatively deprived males, the odds of smoking for the least relatively deprived females are 3.30 (1/0.303) as high as the odds of smoking for the most relatively deprived female (see Table 10). Otherwise, the probability of smoking increases by 0.541 per cent for the most relatively deprived males but it decreases by 0.171 per cent for the most relatively deprived females. To sum up, if the reference group consists of males, highly educated males are more likely to smoking than less educated males (see Table 11).

The effect of ERD on the number of tobacco and tobacco products used among genders is also different. When educated men use less cigarettes, educated females use more cigarettes. The odds of the highest number of smoking versus other numbers of tobacco and tobacco products used are 11.43 times higher for less educated men but it is 3.57 times lower for less educated women (see Table 10). This finding is also consistent with other results. Besides the relative risk ratio results demonstrate that the odds of quitting smoking versus the odds of currently smoking decrease for both male individuals and female individuals who are relatively less educated compared to other individuals who are in the same genders.

**Table 11 - Average Marginal Effect After Logit for Education Relative Deprivation (ERD)**

	<b>EMP</b>	<b>MARRIED</b>	<b>DIV/WID</b>	<b>ERD</b>	<b>ERD-SQ</b>	<b>N</b>
<b>ALL</b>	0.172***	-0.0217*	0.0905***	0.308***	-0.597***	19313
	(0.00704)	(0.0116)	(0.0191)	(0.0368)	(0.0434)	
<b>GENDER</b>						
<b>MALE</b>	0.0963***	-0.0266	0.158***	0.541***	-0.611***	8885
	(0.0126)	(0.0172)	(0.0362)	(0.0612)	(0.0835)	
<b>FEMALE</b>	0.0206**	-0.0119	0.126***	-0.171***	-0.0943**	10428
	(0.00874)	(0.0131)	(0.0198)	(0.0411)	(0.0428)	
<b>REGION</b>						
<b>URBAN</b>	0.182***	-0.0247*	0.105***	0.434***	-0.649***	14583
	(0.00850)	(0.0134)	(0.0218)	(0.0433)	(0.0537)	
<b>RURAL</b>	0.166***	-0.0161	0.0177	-0.167*	-0.187**	4730
	(0.0123)	(0.0232)	(0.0385)	(0.0924)	(0.0889)	
<b>GENDER AND REGION</b>						
<b>MALE URBAN</b>	0.0959***	-0.0317	0.160***	0.578***	-0.577***	6744
	(0.0146)	(0.0193)	(0.0409)	(0.0727)	(0.104)	
<b>MALE RURAL</b>	0.0998***	-0.00702	0.161**	0.252*	-0.467***	2141
	(0.0251)	(0.0382)	(0.0774)	(0.146)	(0.158)	
<b>FEMALE URBAN</b>	0.0478***	-0.0139	0.143***	-0.00370	-0.227***	7839
	(0.0117)	(0.0162)	(0.0237)	(0.0514)	(0.0555)	
<b>FEMALE RURAL</b>	0.00115	-0.00977	0.0271	-0.356***	0.196**	2589
	(0.0110)	(0.0206)	(0.0303)	(0.0996)	(0.0910)	
<b>GENDER AND AGE</b>						
<b>MALE 25 34</b>	0.0600*	0.0312	0.360***	0.940***	-1.109***	2397
	(0.0333)	(0.0234)	(0.0593)	(0.139)	(0.207)	
<b>MALE 35 44</b>	0.0158	0.0393	0.284***	0.591***	-0.633***	2553
	(0.0352)	(0.0450)	(0.0746)	(0.116)	(0.171)	
<b>MALE 45 54</b>	0.00498	0.0386	0.164*	0.547***	-0.573***	2307
	(0.0229)	(0.0746)	(0.0983)	(0.122)	(0.160)	
<b>MALE 55 64</b>	0.00698	0.0142	0.132	0.313**	-0.284**	1628
	(0.0242)	(0.114)	(0.129)	(0.133)	(0.141)	
<b>FEMALE 25 34</b>	0.0540***	0.0131	0.240***	0.0643	-0.214**	3144
	(0.0171)	(0.0189)	(0.0527)	(0.0825)	(0.0985)	
<b>FEMALE 35 44</b>	0.0264	-0.0244	0.186***	-0.125	-0.0392	2934
	(0.0180)	(0.0322)	(0.0486)	(0.0894)	(0.0898)	
<b>FEMALE 45 54</b>	-0.0223	-0.126**	0.0391	-0.561***	0.261***	2563
	(0.0173)	(0.0497)	(0.0566)	(0.0866)	(0.0843)	
<b>FEMALE 55 64</b>	-0.0353*	-0.0707	0.00764	-0.307***	0.137**	1787
	(0.0199)	(0.0442)	(0.0467)	(0.0675)	(0.0633)	
(1) * 1% level of significance, ** 5% level of significance, % 10 level of significance						
(2) Robust standart errors are shown in paranthesis						
(3) Dependent variable is smoking status. (0:non-smoker; 1:smoker)						

For job status, employed males and employed females are related to higher probability of smoking. Moreover, being married decreases the probability of smoking but being divorced/widowed increases the probability of smoking (see Table 11).

#### **4.2.c Reference Group: Region**

In this section we present the results for reference group based on location. When we analyze the education RD covariate, the results are different for each reference group. The result for participants living in urban areas shows that being relatively deprived is highly effective on the probability of smoking. In contrast to the participants living in rural areas, being relatively non-deprived affects the probability of smoking. When the reference group is people living in urban areas, the probability of smoking increases by 0.43 percent for relatively deprived individuals. However, the probability of smoking decreases by 0.17 percent for relatively deprived individuals if the reference group is rural areas. Additionally, if reference group is urban areas, the odds of smoking for participants who are relatively deprived is 7.35 times as high as the odds of smoking for participants who are relatively non-deprived. When the reference group is rural areas the odds of smoking for participants who are relatively deprived are 0.42 times as low as the odds of smoking for participants who are relatively non-deprived (see Table 10 and Table 11).

If the individuals living in urban areas get more education, they consume more number of cigarettes; however, for urban areas reference group, it is different. The relationship between ERD and the number of cigarettes is negative; therefore, we may say that higher levels of ERD decrease the odds of more number of cigarettes used.

Besides, quitting smoking is hard for urban individuals who feel less educated compared to others. However, this situation disappears for rural individuals. Although results show that the relative risk ratio for the individuals who are most relatively deprived increases for individuals quitting smoking versus being current smoker. This result is insignificant (see Table 12).

Regarding the job status, it can be said that the odds of smoking for employed participants are higher than the odds of smoking for unemployed participants for each reference group. Furthermore, the probability of smoking is positively and significantly affected by being divorced/widowed. However, this effect is negative but insignificant for married dummies.

#### **4.2.d Reference Group: Gender and Region**

In this sub-section we create reference groups based on gender and location. We study whether education deprivation affects smoking status or not for different reference groups.

Education RD covariate results say that being relatively deprived increases the probability of smoking by 0.58 percent for the male participants living in urban areas and 0.25 percent for the male participants living in rural areas. Additionally, the odds of smoking for relatively deprived male participants living in urban areas is 10.26 as high as the odds of smoking for relatively non-deprived ones. However, for the female participants living in both urban and rural area the results change (see Table 10 and Table 11).

**Table 12 - Comparison Table for Various Regression Results for ERD**

		CURRENT SMOKE (MULTINOMIAL)*	CURRENT SMOKE (BINARY)**	CURRENT SMOKE (ORDERED)***	QUIT SMOKING (BINARY) **
		<b>ERD</b>	<b>ERD</b>	<b>ERD</b>	<b>ERD</b>
<b>ALL</b>	NEVER SMOKE	0.255***	4.380***	6.312***	2.805***
		(0.0470)	(0.779)	-1152	(0.474)
	QUIT SMOKE	0.223***			
		(0.0629)			
BASE GROUP: CURRENT SMOKER					
<b>GENDER</b>					
<b>MALE</b>	NEVER SMOKE	0.0720***	8.835***	11.43***	10.68***
		(0.0192)	(2.177)	-2856	(-2.590)
	QUIT SMOKE	0.311***			
		(0.109)			
BASE GROUP: CURRENT SMOKER					
<b>FEMALE</b>	NEVER SMOKE	4.571***	0.303***	0.280***	0.111***
		-1325	(0.0865)	(0.0864)	(0.0304)
	QUIT SMOKE	0.0849***			
		(0.0456)			
BASE GROUP: CURRENT SMOKER					
<b>REGION</b>					
<b>URBAN</b>	NEVER SMOKE	0.153***	7.349***	9.906***	4.077***
		(0.0318)	(1.476)	-2055	(0.777)
	QUIT SMOKE	0.129***			
		(0.0419)			
BASE GROUP: CURRENT SMOKER					
<b>RURAL</b>	NEVER SMOKE	3.102**	0.383*	0.685	0.397*
		-1716	(0.203)	(0.366)	(0.199)
	QUIT SMOKE	1.825			
		-1453			
BASE GROUP: CURRENT SMOKER					
<b>GENDER AND REGION</b>					
<b>MALE URBAN</b>	NEVER SMOKE	0.0687***	10.26***	13.75***	10.72***
		(0.0216)	(3.004)	-4171	(-3.074)
	QUIT SMOKE	0.219***			
		(0.0910)			
BASE GROUP: CURRENT SMOKER					
<b>MALE RURAL</b>	NEVER SMOKE	0.183***	2.765*	3.820**	5.510***
		(0.119)	(1.630)	(2.180)	(-3.303)
	QUIT SMOKE	1.415			
		(1.151)			
BASE GROUP: CURRENT SMOKER					
<b>FEMALE URBAN</b>	NEVER SMOKE	1.380	0.978	0.880	0.334***
		(0.435)	(0.303)	(0.294)	(0.0987)
	QUIT SMOKE	0.0504***			
		(0.0286)			
BASE GROUP: CURRENT SMOKER					
<b>FEMALE RURAL</b>	NEVER SMOKE	149.9***	0.00716***	0.00522***	0.0124***
		(213.1)	(0.0102)	(0.00860)	(0.0167)
	QUIT SMOKE	27.59			
		(76.34)			
BASE GROUP: CURRENT SMOKER					

**Table 12 Continued....**

		<b>CURRENT SMOKE (MULTINOMIAL)*</b>	<b>CURRENT SMOKE (BINARY)**</b>	<b>CURRENT SMOKE (ORDERED)***</b>	<b>QUIT SMOKING (BINARY) **</b>
<b>GENDER AND AGE GROUP</b>					
<b>MALE 25 34</b>	NEVER SMOKE	0.0173*** (0.01000)	43.07*** (23.89)	46.42*** (26.57)	37.23*** (20.45)
	QUIT SMOKE	0.156 (0.176)			
	BASE GROUP: CURRENT SMOKER				
<b>MALE 35 44</b>	NEVER SMOKE	0.0862*** (0.0427)	10.63*** (4.952)	10.96*** -5130	7.195*** (-3.349)
	QUIT SMOKE	0.132*** (0.0992)			
	BASE GROUP: CURRENT SMOKER				
<b>MALE 45 54</b>	NEVER SMOKE	0.0998*** (0.0557)	9.062*** (4.451)	13.45*** -6685	7.166*** (-3.603)
	QUIT SMOKE	0.128*** (0.0802)			
	BASE GROUP: CURRENT SMOKER				
<b>MALE 55 64</b>	NEVER SMOKE	0.143*** (0.0974)	4.200** (2.592)	6.651*** -4224	5.128*** (-2.946)
	QUIT SMOKE	0.519 (0.376)			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE 25 34</b>	NEVER SMOKE	0.741 (0.378)	1484 (0.752)	1.116 (0.637)	0.745 (0.375)
	QUIT SMOKE	0.165* (0.177)			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE 35 44</b>	NEVER SMOKE	3.574** -1.844	0.495 (0.250)	0.371* (0.199)	0.0905*** (0.0447)
	QUIT SMOKE	0.00254*** (0.00258)			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE 45 54</b>	NEVER SMOKE	132.8*** (90.71)	0.0126*** (0.00845)	0.0172*** (0.0122)	0.00915*** (0.00580)
	QUIT SMOKE	0.894 (1.066)			
	BASE GROUP: CURRENT SMOKER				
<b>FEMALE 55 64</b>	NEVER SMOKE	132.8*** (90.71)	0.0126*** (0.00607)	0.0172*** (0.0122)	0.00915*** (0.00580)
	QUIT SMOKE	0.894 -1066			
	BASE GROUP: CURRENT SMOKER				

\* Multinomial Logistic Regression , \*\* Binary Logistic Regression, \*\*\* Ordered Logistic Regression

(1) For the multinomial logistic regression base group is people who are still smoker.

(2) Binary means that analysis for the participant did by binary logistic regression

(3) Ordered means that number of using cigarettes was grouped and it used as dependent variable.

(4) Quit smoking means that the sample contains the participants who are smoker in the past and currently smoker.

(5) Current Smoke (Binary) is the baseline estimation.

The marginal effect results for female participants living in rural areas demonstrate that the probability of smoking decreases by 0.36 percent for relatively deprived individuals. Although it has the same effect on the probability of smoking for female participants living in urban areas, it is statistically insignificant. Therefore, it can be said that when the reference group consists of the female participants living in rural areas, the effect of education relative deprivation on smoking status disappears (see Table 11).

Moreover, ERD also affects the number of tobacco and tobacco products used. This effect is also the same as the effects of ERD on smoking status. Higher ERD associates with the using more number of cigarettes for males both living in urban areas (OR=13.75) and living in rural areas (OR= 3.82). However higher ERD associates with less number of cigarettes for females living in rural area (see Table 12). For female participants living in urban area this effect disappears.

Regarding job status covariates, the results for reference group are similar to the previous results, but the effect disappears for the reference group consisting for female participants living in rural areas. When we investigate marital status covariates, the probability of smoking is the highest for divorced/widowed participants for all reference groups but the probability of smoking is the lowest for married participants.

#### **4.2.e Reference Group: Gender and Age Groups**

We form the reference group based on gender and age group, regarding the education relative deprivation covariate, and we note that there is a positive and significant relationship between education RD and smoking for males in all age groups.

When we investigate the results, it is shown that the odds ratio of smoking for relatively deprived men is 43.07 times as high as the odds ratio of smoking for relatively non-deprived men if the reference group consists of age group between 25 and 34. It is 10.63 times higher for the reference group consists of age group between 35 and 44, and it is 9.07 times higher for the reference group consisting of age group between 45 and 54, and it is 4.20 times higher for the reference group consists of age group between 55 and 64 (see Table 10). Also we find that the probability of smoking increases by 0.94 percent for relatively deprived individuals when the reference group is males aged between 25 and 34. For males aged between 34 and 45, it increases by 0.59 percent, for males aged between 44 and 55, it increases by 0.55 percent, for the males aged between 54 and 65, it increases by 0.31 percent. In addition, the ERD also affects the number of cigarettes used for male individuals in all the age groups. According to regression results (see Table 12), the odds of highest number of cigarettes used versus other number of cigarettes used are higher (OR of 25-34 age group is 46.42, OR of 35-44 age group is 10.96, OR 45-54 age group is 13.45 and OR of 55-64 age group is 6.65).

For the reference group of female and age group together, the effects disappear for the ages between 25 and 34, and the ages between 35 and 44. However, the results for females aged between 44 and 54 and aged between 55 and 64 are still statistically significant and there is a negative relationship between education RD and smoking for each reference group. Being relatively deprived decreases the probability of smoking by 0.56 percent for the female participants aged between 45 and 54. Moreover, there is a negative relationship between ERD and the number of tobacco and tobacco products consumed for female at the age group between 35 and 44, 45 and 54 as well as 55 and



64. Therefore, we may imply that higher education level increases both the odds of smoking and the number of cigarettes used for female individuals.

The effects of employment on smoking status disappear for many reference groups. The effects of being married on smoking status are similar to job status.



## **CHAPTER FIVE**

### **DISCUSSION AND RESULT**

Our research explores the effect of income RD on smoking behaviors and the effect of education RD on smoking behaviors for all participants and reference groups defined by gender, region and age group.

Our research shows that both income RD and education RD are associated with smoking status. Income RD and education RD affect smoking status negatively and significantly. In other words, the odds of smoking for people who are relatively deprived of income and relatively deprived of education are higher than the odds of smoking for relatively non-deprived participants. Additionally, both education RD and income RD increase the probability of smoking.

Although there are various results in the literature, we may say that our results are consistent with other researchers' studies on income RD and smoking as well as education RD and smoking in the literature. Similar to our findings, other studies show that the higher income relative deprivation is associated with the higher odds of smoking (Eibner and Evans, 2001; Siahpush, 2006; Ling, 2009; Lhila and Simon, 2010; Kuo and Chiang, 2013). Moreover, Balsa, French, and Regan (2013) also show that education RD is associated with smoking. It is consistent with our research results.

The reason for this might be an increase in the tendency of smoking due to psychological stress caused by the situation of being more relatively deprived when compared to whole population in terms of both income and education. This situation is clarified through the effects of psychological stress studied by in Social Control Theory

(Balsa, French and Regan, 2013). Moreover, the higher level of education both increase the awareness of harmful effect of smoking and the level of income.

In more detailed analyses, we define RD for various reference groups. We find that the association between income RD/education RD and smoking changes across reference groups.

For instance, when reference groups are formed according to gender, tendency to smoke decreases among women when IRD increases while tendency to smoke increases among men when IRD increases. This difference is interesting among results for female and the results for male since in most of the countries higher education level and higher income level lead to lower rate of smoking for all participants. However, according to Kılıç and Öztürk (2014), there is a difference between tobacco consumption among men and women. They also find that there is significant and positive relation between education and tobacco consumption for females and all participants. According to them, this difference occurs due to the fact that when females have higher education level, they gain the economic independence and it causes the rate of smoking to increase for the female population.

For the reference groups chosen according to rural and urban residence, we find that among people living in urban areas higher IRD increases the odds of smoking significantly. However, in rural areas no statistically significant effect has been found, which is sensible given the lower average income level and lower income inequality in rural areas (see Table 5). Table 7 shows that the income RD for participants living in urban areas is higher than IRD for participants living in rural areas. Also the rate of

people who have the highest income level in urban areas is higher than the rate of people who have the highest income level in the rural areas. There are similar results for the ERD.

For the reference group created by gender and region, we find that it is significant for men living in urban areas and females living in rural areas. Additionally, the effect of IRD and ERD on smoking for the men living in urban areas is the same in reference groups based on men and urban area. Table 7 explains that relationship. It shows that there is a more egalitarian relation between income and education in rural area. However, the effect of IRD and ERD on the smoking is significant only for women living in rural areas. As it is said above, the results for women are explained by economic independence. On the other hand, it may be deprived of healthy data for the rural area since it is challenging to determine the number of women using tobacco or tobacco product in rural areas.

For the reference group defined by gender and age group together, the results show that the effect of IRD on smoking disappears for many reference groups consist of male population, but the effects of IRD on smoking are significant for female reference groups. It is consistent with Kılıç and Öztürk's results for the female individuals. According to them, females use tobacco at older ages because they gain economic independence at older ages.

Also, we use the number of cigarettes smoked and smoking regularly as dependent variables for the consistency analysis. The findings show that both IRD and

ERD are positively associated with smoking for the same reference groups. Thus, we may say that our result is robust.

There are some limitations and weaknesses in our study in terms of data and the relative deprivation measures. To start with data limitations, first, the surveys are conducted on the reference persons of the households, who may not know or may not want to reveal whether other participant(s) in the same household smoke or not. Second, although we have considerably reliable data for urban areas, data from rural areas may not be as reliable. Especially women may conceal the fact that they smoke. Men in rural areas may feel more reluctant to acknowledge that women smoke. A limitation on the definition of income relative deprivation is related to the reliability of household income information in the data. Since collecting income is not the main purpose of the survey, monthly household income is recorded only as income brackets in the data. The highest income bracket is 2301 TL or above. However, in 2012 Turkish monthly income per capita was 1577 TL. Clearly, income data are more reliable for below-average incomes than above average incomes. Therefore, our measures of income relative deprivation are underestimates of the true relative deprivation experienced by the poor households.

Another limitation of our study is about the way the reference groups are defined. Reference groups in our study are formed in terms of gender, region, and age group. However, people may consider different reference groups, such as their friends, neighbors, colleagues and even their relatives. Since the survey does not ask any questions about comparison group, it is quite difficult to know how exactly reference groups are formed. The problem is not specific to this study; it is a general problem in studies that have to define reference groups exogenously.

Results of our study show that IRD and ERD generally increase the odds of smoking. However, there are some differences among the reference groups. For instance, although the odds of smoking are increased for relatively poor and relatively less educated men individuals, it is decreased for relatively rich and relatively high educated women. A similar situation is valid for the reference group based on region. In urban areas, individuals who feel less wealthy and less educated are more likely to smoke. However, individuals who feel more wealthy and more educated have a higher probability to smoke.

Differently from other studies in the literature, this study undermines the effect of RD on smoking addiction. Also, differently from other studies, income RD and education RD is calculated by comparisons of education and income level of individuals compared to other individuals. This study differentiates itself from the other studies on RD in Turkey.

Our findings indicate that income inequality and education level inequality affect smoking differently among the reference groups. Thus, policy implications should be different for different reference groups. Namely, different policies should be applied for women, men, urban areas and rural areas. In general, an increase in social standards of individuals may decrease the probability of smoking. For instance, policy makers may increase the accessibility of cultural centers for poor and less educated individuals. Thereby, they may not feel socially deprived compared to other individuals who earn more money and have higher education. Additionally, policy makers should increase the awareness of detrimental effect of smoking especially among women and among rural area. Policies should be specially designed for gender and regional groups.

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