Journal of Life Economics

THE ECONOMIC EFFECTS OF GROWING ANTISMOKING ATTITUDES IN TURKEY: AT THE FRAMEWORK OF GENERAL EQUILIBRIUM ANALYSIS

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ABSTRACT

This study aims to investigate the effects of changing smoking attitudes as income grows on the output level of the tobacco industry and on the share of tobacco goods in household budget in Turkey for the period of 2004-2014 using GTAP general equilibrium model. Our analysis indicates that the share of tobacco product in household budget decreases 21% with economic growth between 2004-2014 and also this rate in household budget declines almost 50% with anti-smoking attitudes. And also this study indicates that if consumer demand for tobacco goods hadn't been changed, industrial output could have increased nearly 98%.

Keywords: *Income Elasticity of Demand, Computable General Equilibrium*

JEL Classification: *C68, D12*

1. INTRODUCTION

Awareness about the serious health consequencesofcigarette smoking have been increasing. As more becomes known about the negative effects of cigarettes on health, consumer attitudes toward smoking have begun to change. Smoking is increasing viewed unfavorably, and there is a growing anti-smoking attitude among people. Globally, cigarette consumption has declined during the most recent decade. Between 2000 and 2010, the prevalence of tobacco smoking in men fell in 125 countries, and in women fell in 155 countries (WHO, 2015).

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Declining cigarette consumption is correlated with a country's stage of development (Goel and Nelson, 2006). According to this study, the level of economic development in a country appears to be a key determinant of tobacco use. Approximately more than half of the high and upper middle income countries witnessed a decline in per capita cigarette consumption more than 20 percent since the 1990s. On the other hand, cigarette consumption actually increased over the same period in half of the low income countries.

Turkey is one of the countries which reduce cigarette consumption and has decreasing trend in cigarette sales since late of 1990s (see Table.1).Relating the income per capita growth in Turkey, people's consumption behaviors and their economic results will be analyzed in this study. It is aimed to investigate the effects of changing smoking attitudes as income grows on the output level of the tobacco industry and on the share of tobacco goods in household budget in Turkey for the period of 2004-2014 using GTAP general equilibrium model.In this context, we will look at the effect of changing smoking attitudes at the period between 2004-2014 which Turkey's real per capita income (with 1998 prices)has increased from 4758$ to 6362$. To achieve this, GTAP model will be used by creating a 3x3 database with a tobacco sector for Turkey. To explore the effects of changing consumer attitudes about smoking as incomes grow, we used the model that describes long-term income growth by incorporating macro projections for endowment growth and productivity effects, following the methodology used byArndt et al. (1997) and Burfisher (2011). Then, we will simulate the effects of projected economic growth when (1) Turkish consumer preferences remain unchanged, and (2) consumers become more averse to tobacco products as their incomes grow. Thanks to these two different simulations, this study aims to answer to these questions: how will consumer attitudes toward smoking affect Turkish tobacco industryas income rises? And how will these anti-smoking preferences affect the share of tobacco goods in household budget?

The paper is structured as follows. Firstly, literature will be presented about the questionery of inverse relationship between income growth and cigarette demand. Secondly, the method used in this study and robustness check will be explained. And lastly, results from scenarios will be presented.

2. LITERATURE

A significant amount of study in this issuefocus on not only cigarette prices and income levels that determine the demand for cigarettes but also how health warnings -such as advertising- and taxes on tobacco products effect smoking attitudes (Tansel, 2006; Townsend, 1987; Dagli, 1999; Warner, 1977). The studies which focus on the price elasticity of cigarette demand uses time series analysis to estimate the relationship between cigarette demand and income levels. Existing literature on Turkey finds the reverse relation between cigarette demand and prices.According to Yurekli et al. (2010) predicted price elasticity of cigarette demand is between -0,33 and -0,44 for Turkey.

On the other hand, this broad trend veils differences among categories of countries. According to Goel and Nelson (2004), declining cigarette consumption is correlated with a country's stage of development. Approximately more than half of the high and upper middle income countries in their data set witnessed a decline in per capita cigarette consumption more than 20 percent since the 1990s. In contrast, cigarette consumption actually increased over that period in half of the low income countries.Goel and Nelson (2004) suggest a number of reasons why a country's stage of development may affect its national smoking habits. Wealthier nations have better resources to monitor and control tobacco use, and a more educated population might be more aware of the health risks posed by smoking are some of the reasons. These variations reflect the significant differences across countries in smoking behaviors.

The income-elasticity of cigarette demand deserves more attention in its own right asan interesting example of the basic economics of health behaviors. Existing evidence seemsto suggest that whether the income elasticity is positive or negative varies systematicallyacross time periods, countries, and demographic groups for high-income countries like theU.S. the sign appears to have reversed over time, so that cigarettes appear to have switchedfrom being a normal good to an inferior good[1] (Wasserman et al. 1991; Kenkelet al. 2014). Within low and middle income countries, cigarettes might still be a normal good (Bobak et al. 2000; Peck 2011). Deaton's study (2002) suggests that smoking is inferior: the total elasticity of demand with respect to income is -0.078 according to his OLS regression. Similarly we also found that smoking is an inferior good in Turkey[2].

Across the world, the prevalence of smoking tends to be higher in low-income andmiddle-income countries than in high-income countries. And also income differences in a country may specify the predisposition of cigarette consumption. The strong association between low-income and smoking in the U.S. is a good example. 33 percent of adults who earn less than $15,000 per year smoked, compared to only 11 percent of adults earning more than $50,000 per year in 2010 (Deaton, 2002).Turkey as a case has a similar trend at the point of the reverse relation between income level and smoking. Thetable below introducesthe consumption levels of tobacco products in Turkey from 1925 to 2014. While looking at this graph, it should also be considered that Turkey has increasing GDP per capitaespecially between 2002-2014. This inverse relation between income and consumption shed lights to the inferiority of smoking in Turkey.

Table 1. Domestic Sales of Cigarette in Turkey

Years	Amount (Billion Unit)	Years	Amount (Billion Unit)
1925	2,42	**1996**	96,60
1930	7,13	**1997**	101,10
1935	9,07	**1998**	108,60
1940	10,07	**1999**	114,40
1945	9,17	**2000**	111,70
1950	15,76	**2001**	111,80
1955	22,43	**2002**	110,00
1960	27,13	**2003**	108,16
1965	31,84	**2004**	108,87
1970	39,40	**2005**	106,72
1975	52,20	**2006**	107,91
1980	57,00	**2007**	107,45
1984	63,00	**2008**	107,86
1985	63,00	**2009**	107,55
1990	73,30	**2010**	93,35
1991	76,50	**2011**	91,22
1992	78,50	**2012**	99,26
1993	88,40	**2013**	91,66
1994	91,30	**2014**	94,68
1995	95,80		

Source: TAPDK (Tobacco and AlcoholMarket Regulatory Board)

The inferiority effect of smoking in Turkey is not a topic which analyzed in literature. As such, this is the first study in Turkey which analyzes the consumption and production

effects of changing smoking behavior as income grows.The finding of this study distinguishes by the other studies done which analyzed the relation between income and cigarette consumption. This study tries to answer both the decrease oftobacco consumption in household budget and the decrease of production in tobacco industry at the framework general equilibrium.

3. METHODOLOGY

The model used in this study is GTAPgeneral equilibrium model. General equilibrium models describe the motivations and behavior of all producers and consumers in an economy and the linkages among them.The model encompasses all economic activity in an economy simultaneously. This includes production, consumption, employment, taxes, savings, trade and linkages among them. For example, if consumer's behavior changes for a certain good, this will be felt throughout the economy. The changes in consumer demand and industry output will then affect employment, incomes, taxes, and savings and of course trade flows. A general equilibrium model describes all of these relations in an economy. CGE models mentality is: "Everything depends on everything else".

In a CGE model, equilibrium occurs at the price which clears the market. Producers choose input and output levels that maximize their efficiency. Consumers maximize their utility given their budgets and the prices of goods. And by creating disequilibrium, namely, by changing an exogenous variable in the model, all of the CGE model equations are re-solved to find new solution values for all of the endogenous variables in the model. The new values represent a new equilibrium in which the supply is again equal to demand at some set of prices.

The model is GTAP and the data base is version 7 of the GTAP data with all regions except Turkey aggregated into ROW and with the commodities aggregated to three sectors, namely "manufacturing/agriculture" (containing all manufacturing sectors including agricultural goods), "services" and "tobacco". And the Social Accounting Matrix[3] (SAM) generated from GTAP database reports the values of all goods and services that are produced and the income generated from their sale.

In this study,aggregation of sectors has been made on specifically tobacco industry that is relevant to the research question. We used the GTAP database[4] to develop a small, three sectors, and three factor database for 2004 for Turkey and an aggregated rest-of-world region (hereafter ROW). Three sectors are tobacco, agriculture/manufacturing, and services; and the three factor of production are land, labor, and capital.

Our static CGE model describes an economy in equilibrium before and after a model shock.Firstly, ten years macro projection (2004-2014) is defined to see before and after of the economic growth. To define our experiment, we need to know the cumulative growth in endowment and productivity over our projection time period of 2005-2014[5]. Table 2 presents the calculations for factor endowments and productivity. By using these data, cumulative growth rates in endowments and productivity for Turkey and Rest of World during 2005-2014 were calculated to define 10 year macroprojection as a model shock. This shock isessential tosee the growth effect in the last decade and consequently a new macroeconomic equilibrium with higher levels of capital, labor and productivity. For example, if the economy's total capital stock is assumed to increase by %122, our model results describe the microeconomic changes in capital stock in each industry, industry output, commodity demand, and so forth. Given projections of these variables, the model can be solved for the structure of the output in the year 2014. Base simulation in this study is generated by using cumulative growth rates which is presented in table 3.

Table 2. Annual Growth Rates in Factor Endowments and Productivity

	Base Quantity	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Labor Force Cumulative											
TUR	1	-0,015	0,010	0,016	0,029	0,035	0,037	0,041	0,021	0,035	0,034
ROW	1	0,017	0,016	0,016	0,015	0,015	0,014	0,014	0,013	0,013	0,014
Capital Stock											
TUR	1	0,270	0,213	0,164	0,167	-0,423	0,555	0,278	-0,130	0,063	0,069
ROW	1	0,097	0,107	0,137	0,079	-0,163	0,139	0,118	0,016	0,036	0,029
Total Factor Productivity											
TUR	1	0,139	0,024	0,138	0,051	-0,014	0,004	-0,050	0,050	-0,004	-0,003
ROW	1	0,036	0,036	0,066	0,057	-0,004	0,038	0,056	0,006	0,007	0,021

Source: Author calculation.

Notes: Employment data for Turkey from TUİK and employment data for ROW from UNCTAD. Capital Stock is accounted by dividing gross capital formation to Turkish GDP for each year. ROW's Capital stock is accounted in the same fashion. By dividing the world GDP to gross capital formation, we get the world capital stock and then, by extracting Turkish capital stock from world capital stock we get the ROW's capital stock.Capital stock formation and GDP data are from World Bank. Total Factor Productivity (TFP)was accounted by using classical Solow approach. Our log difference TFP equations' factor shares are respectively 1/3and 2/3 for capital and labor.

The table below shows the cumulative growth rates of tree important variable for classic economic growth theory.Turkey stands out with a very high rate of capital accumulation, and high rate of TFP growth according to ROW according to the cumulative growth between 2004-2014.

Table 3. Cumulative Growth Rates over the Period 2004-2014 (Percentage Change)

	Labor Force
TUR	22,84
ROW	15,52
	Capital Stock
TUR	122,08
ROW	67,18
	TFP
TUR	37,16
ROW	27

Sources: Author calculation

Secondly, twoscenarios are defined to see the effects of economic growth and downward trend of cigarette demand. In the first scenario, the growth experiment has been run byusing the default parameters[6] in the Constant Difference of Elasticities[7] (CDE) of GTAP model. In this scenario, there are no changes in attitudes about smoking as incomes grow. In the second scenario, it is assumed that consumers in Turkey develop stronger antismoking attitudes as their incomes grow.The income elasticity of demand parameter was changed to see the effect of anti-smoking attitudes. As seen appendix A, income elasticity of demand for tobacco products has been calculated -0,1758.

3.1. Robustness of Results

Systematic sensitivity analysis is taken from Arndt and Hertel (1996) which reports sensitivity of a simulation with respect to changes in the values of the parameters which determine income elasticity of demand. In economic simulations, results often hinge crucially on values of key parameters such as income elasticity of demand which has been changed in this study (INCPAR). To see how variations in the values of this parameter affect model results, systematic sensitivity analyzes checks the robustness of the results.

Table 4. Systematic Sensitivity Analysis of Preferences Changes on Tobacco Quantities in Turkey

	Model Result	Mean	Standard Deviation	95% Confidence Interval	
				Upper	Lower
Production	47.52	47.67	5.40	71.81	23.53
Private consumption	18.91	19.04	6.58	48.45	-10.37

Source: GTAP model (version 7.0)

According to systematic sensitivity analyzes (SSA) (Arndt, 1996), both production and private consumption variables have a positive mean values and both of them are significantly greater than the standard deviations. We can conclude that these findings we found are robust. This shows the accuracy of the results in the sense that the probability of this is high even allowing for the variations in the parameters we varied in the SSA calculations.

4. EMPRICAL EVIDENCES

The impact of economic growth and downward trend of cigarette demand despite increasing income have different impacts on household budget. The table below displays budget shares of each commodity group in total private household spending according to GTAP model general equilibrium analyses.

Table 5.Private Household Budget Shares Under Alternative Scenarios

	Base		Income Growth		Income Growth with TUR No-Smoking Preferences	
	TUR	ROW	TUR	ROW	TUR	ROW
Tobacco	0,024	0,025	0,019	0,023	0,012	0,023
Agr./Mfg.	0,509	0,298	0,452	0,287	0,456	0,287
Services	0,467	0,677	0,529	0,69	0,533	0,69
Total	1.00	1.00	1.00	1.00	1,00	1,00

Source: GTAP model (version 7.0)

As income elasticity of demand for tobacco and the aggregation of agriculture and manufacturing sectors (Agr/Mfg) are less than one and that for services is greater than one, all else equal, this means that demand for these inelastic sectors will increase by proportionately less than the increase in income, whereas consumption of services will increase by proportionately more than the change in income. Therefore, the services budget share is expected to expand while the share of tobacco and agr/mfg will decline in both scenarios.

As seen in table 5, budget shares of tobacco and agr/mfg sectors has declined at following two scenarios after the economic growth. Economic growth reduces the household budget share for tobacco from 2.4% to 1.9%. And the last scenario shows the economic effects of non-smoking preferences in household budget. This scenario differs from the other two scenarios which is used default elasticity parameters. The income elasticity of demand which is measured -0.175 was imposed in this scenario and the result for change of the budget share under this scenario is comparatively minimal but worth to specify and the household budget share for tobacco product dropped to 1.2% withantismoking preferences in Turkey.

Table 6displays the impact of economic growth anddownward trend of cigarette demand despite increasing income on industrial output as a percentage change from base scenario.

Table 6. Industry Output with and without Changes in Turkey Smoking Preferences (% change from base)

	Income Growth Without Changes in Smoking Preferences		Income Growth with No-Smoking Preferences	
	TUR	ROW	TUR	ROW
Tobacco	98,48	64,65	35,35	64,62
Agr./Mfg.	124,35	67,99	124,37	67,99
Services	136,26	71,38	136,92	71,38

Source: GTAP model (version 7.0)

Economic growth causes the equilibrium demand and supply to increase from the initial equilibrium. As seen in table 6, economic growth causes to increase all the sectors' outputs. But the output increase of tobacco sector increases less than the other sectors in all scenarios as a percentage change. On the other hand, tobacco sectorwith the non-smoking attitudesincreases its output even less then the income growth scenario.Antismoking preferences will cause the equilibrium quantities to fall compared to situation which is no change in smoking preferences. If consumer demand hadn't been changed, industrial output would have increased nearly 98 percent. With anti-smoking attitudes the total output of the sector increases only35,4% which is less then income growth scenario with the growing demand of cigarette like the trend in Turkey before 1999 (see Table1).

5. CONCLUSION

In this study it is tried to answer to how consumer attitudes toward smokingaffects Turkish tobacco industryas income rises and how these anti-smoking preferences affects the share of tobacco goods in household budget. These effects were shown through the method of computable general equilibrium.

Growing amount of literature focusing on declining cigarette demand correlated with a country's economic growth is consistent with the case of Turkey in this study. CGE analysis in this study verifies the adverse relation between economic growth and cigarette demand in Turkey. The shares of tobacco product in household's budget declines after the economic growth which we assumed there is no change in attitudes of smoking.Economic growth reduces the household budget share for tobacco from 2.4% to 1.9%and with the effects of non-smoking preferences in household budget share drops to 1.2% withantismoking preferences in Turkey.In another saying, these rates indicate that the share of tobacco product in household budget decreases 21% with economic growth and this rate in household budget declines almost 50% with anti-smoking attitudes.

On the other hand, Economic growth causes to increase all the sectors' outputs but antismoking preferences cause the equilibrium quantities to fall in tobacco sector.If consumer demand hadn't been changed, industrial output would have increased nearly 98%. Anti-smoking attitudes cause the total output of the sector to increase 35.4% which is less then income growth scenario with the growing demand of cigarette like before 1999.

NOTES

1. The cigarette is normal at (p,w) if $\partial x(p,w)/\partial w \geq 0$; this means that demand is nondecreasing in wealth. If cigarette's wealth effect is instead negative, then it is called inferior (Mas-Colell et al, 1995)

2. As seen in appendix A

3. It can be asked for from the author.

4. Version 7.0 of the GTAP database, released in 2008, describes 113 countries and fifty seven commodities in a 2004 base year.

5. We begin with 2005 because 2004 is the base year for our data.

6. The model database provides the values of all exogenous variables and parameters, and the initial equilibrium values of all endogenous variables.

7. An important and useful characteristic of CDE demand system is that it is nonhomothetic. Namely, as incomes change, consumers can purchase proportionately more luxury goods and spend a smaller share of their budget necessities, depending on the income elasticity of demand specified for each good.

8. The equation of income elasticity of demand is $(Q_2\text{-}Q_1)/Q_1$ / $(income_2\text{-}income_1)/income_1$. Here, Q_2 implies the consumption of tobacco goods (per person) in 2014 and Q_1 is the same for 2004. There is a limitation to our analysis in this point. The limitation is that the GTAP database combines beverages with tobacco just like TUIK database does. But fortunately we can see the weight of consumptions for each group of good. Therefore we weight the cigarette consumption and beverages in tobacco. Beverages approximately constitute %7 of tobacco goods. Cigarette consumption data is extracted from TAPDK and respectively 1,196.691 units and 1,536.691 units. And $income_2$ and $income_1$ implies respectively reel GDP per capita in 2014 (with 1998 prices) and reel GDP per capita in 2004. Data is extracted from TUIK and respectively 4758$ for 2004 and 6362$ for 2014.

9. Appendix A

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APPENDIX

Appendix A. Base INCPAR Parameter Values and Updated Values

	Base Parameter Values		Updated Parameter Values
	TUR	ROW	TUR
Tobacco	0.678	0.710	-0,175
Agr./Mfg.	0.801	0.828	no change
Services	1.232	1.086	no change

Notes: $INCPAR_i$: a parameter related to the income elasticity of demand for good i. Larger $INCPAR_i$parameter value implies larger income elasticity of demand.

- Inferior goods: $INCPAR_i < 0$
- Income insensitive (necessity) goods: $0 < INCPAR_i < 1$
- Income sensitive (luxury) goods: $1 < INCPAR_i$
- Homothetic demand: $INCPAR_i = 0$ for all I