MEASURING THE EFFECTS OF ANTI-TOBACCO POLICIES ON CIGARETTE DEMAND IN TURKEY

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1. Introduction

Governments use higher taxes, advertising bans, health warnings on cigarette packages and in public areas and territorial restrictions to decrease to demand for cigarettes. The aim is to reduce cigarette smoking and thus to increase welfare level in the society through health. Turkey has carried out remarkable anti-tobacco policies since 2008 by enacting Law No 5247 after it committed to implement the WHO Frame-work Convention on Tobacco Control (WHO-FCTC) in 2004 and declared a National Tobacco Control Program (NTCP) in 2006. As a result of taxes and regulations, cigarette sales have dramatically declined with an 11.2% decrease in the next decade, as depicted in Figure 1. However, most of this decline occurred in the post-2009 period, because the most critical policies such as the extended bans on smoking in July 2009 and tax increases in January 2010 and October 2011 have been implemented after 2009. In this project, I aim to empirically investigate the effects of governmental policies such as taxation and regulations on the long-term dynamics of demand for cigarettes in Turkey using linear regression models. By doing that, I aim to reveal if anti-tobacco policies are successful in Turkey and to introduce a fresh evidence from a recent anti-smoking policy in a developing country. Thus, the findings from this data analysis will be helpful to better understand the importance and effect of anti-smoking regulatory and taxation policies.

2. Taxation and Regulation on Smoking in Turkey

As depicted in Figure 1, cigarette consumption in Turkey dramatically increased until the 2000s. However, the increase in consumption, which started to decelerate in the beginning of the 2000s due to the economic crisis in 2001, had relatively remained constant between 2000 and 2009. In the end, cigarette consumption started to dramatically decrease as of 2009 because of major tobacco control policies initiated after 2009. Even though tobacco control policies began in the mid-1980s and the first anti-tobacco law was passed in 1996, Turkey carried out comprehensive anti-smoking initiatives after 2004, because it committed to implement the WHO-FCTC in 2004. Within the same year, The Ministry of Health (MoH) established a National Tobacco Control Committee to prepare the NTCP. Since then, Turkey has experienced important anti-smoking policies to discourage cigarette consumption. In 2006, government proclaimed the NTCP and an action plan. The main aim of the NTCP was to reduce the prevalence of tobacco use. The Program included ten different anti-tobacco measures from pricing and taxation to smoking cessation and advertising restrictions. Thus, the post-2004 period is cornerstone in regulation of the Turkish tobacco industry.

In order to better understand the post-2004 transformation in the cigarette industry and to provide a base for empirical analysis below, I classify policies initiated to reduce cigarette consumption in two main parts: taxation and regulation. Similarly, I separate all the post-2004 period as the pre- and post-2009 terms to better understand the effect of major anti-tobacco policies, since government did not take serious measures until July 2009, in spite of aforementioned developments. Accordingly, Turkey follows a cigarette excise tax policy to discourage cigarette consumption. Also, all tobacco products are subject to a value-added tax (VAT) of 18% of retail price. Cigarette tax includes an ad valorem tax with a specific floor value. For that reason, even though tax rates remain constant in a certain term, tax amount per unit such as cigarette stick, pack, or kilogram can differentiate in the same period, because firms constantly increase retail sale prices of cigarettes due to the inflationist nature of the Turkish economy. However, government proportionally enforced two major tax increases in the last decade. It increased excise taxes from

58.1% in 2005 to 63.4 in January 2010 and to 65% in October 2011 and to 65.25% in January 2013, respectively. Today, 80.25% of the retail cigarette price consists of taxes with an 18% VAT.

Fig 1. Cigarette consumption in Turkey by year
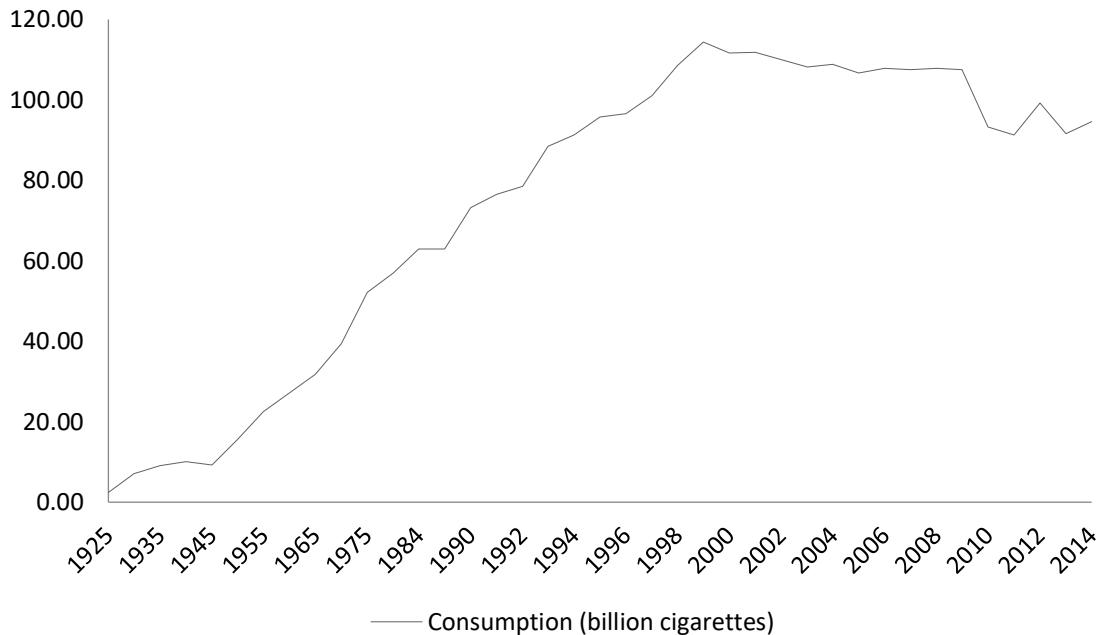
Source: TAPDK.

Regulations on cigarette smoking in Turkey consist of smoking bans in the indoors-public places, advertising restrictions, and cigarette sale prohibitions. In this context, the main regulatory policy initiated to decrease cigarette use in Turkey is Law No 5727 enacted in 2008. The implementation of this law has been done in two steps. The first step started in May 2008 and the law only prohibited in indoors-public places excluding hospitality venues. The second step begun in July 2009 and the smoke-free policies were extended to include all hospitality sector establishments, including hotels, restaurants, bars and cafes. Accordingly, even though Law No 5257 was *de jure* enacted in May 2008, the most important part of law including influential anti-smoking regulations was *de facto* in force in July 2009. For that reason, the effect of extended restrictions on smoking in July 2009 was more influential than the ones in May 2008, as illustrated in Figure 2. Cigarette consumption declined 47.7% within 8 months from June 2009 to February 2010 along with the effect of tax increase in January 2010. Regarding these anti-smoking measures, one interesting development is that cigarette consumption after July 2009 has never increased to the level in June 2009 in spite of increases in income in this period, even though consumption amount increased again after May 2008, as depicted in Figure 2. This clearly means that anti-smoking policies in Turkey started to be influential on smoking after July 2009.

Regarding other regulations, in May 2010, health warnings were enforced on cigarette packages, while government initiated a Smoking Cessation Service in October 2010, including 171 QuitLine and free distribution of medications helping giving up smoking. Lastly, advertising including brand sharing and stretching was totally prohibited in July 2012 and smoking bans were expanded to include public transportation with personal vehicles in June 2013. The transition to anti-smoking policy was well met by the society. Public support was over 96% among the non-smokers and 74% among the daily smokers. Consequently, regulation and tax policies have dramatically changed cigarette prices and consumption in Turkey. Figure 2 depicts this change. The average retail price of cigarettes in Turkey has risen in both normal and real terms after 2005. While prices increased 264% in normal terms, the price increase in real terms has been 63%. Annual

cigarette consumption declined 11% from 2005 to 2015, although national income and population in Turkey increased in the same period.

Fig 2. Cigarette prices and consumption in the post-2004 period

Average nominal price per pack .... Average real price per pack

Cigarette consumption (million packages)
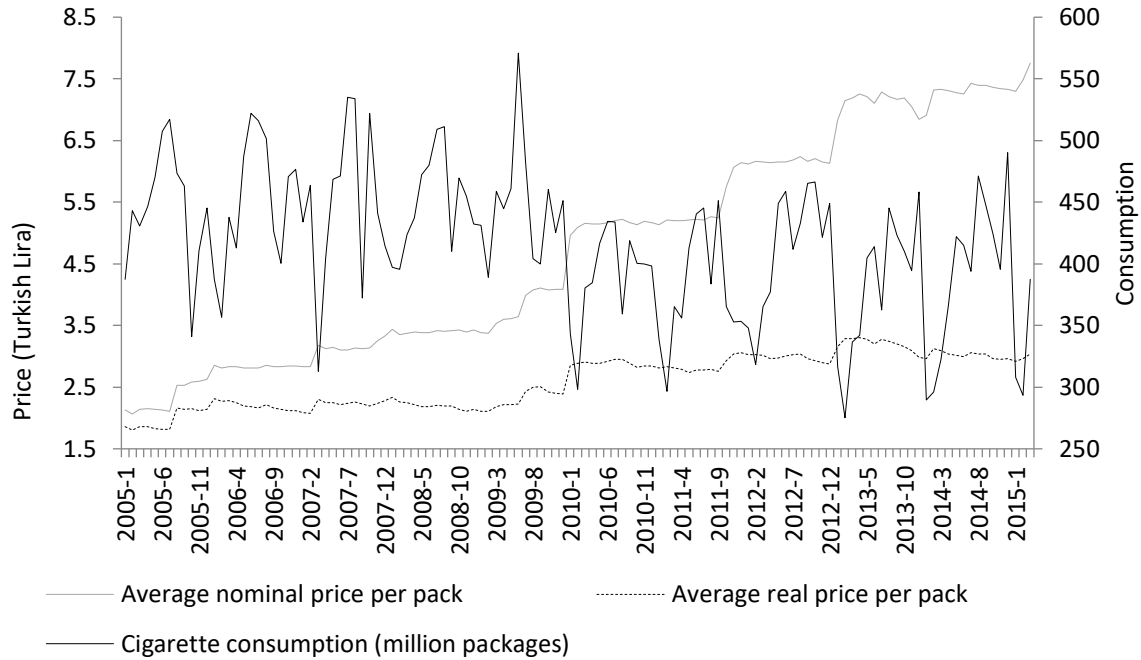
3. *Data*

In this project, I use country-level aggregate time series-monthly data, including the 2005:1-2015:2 periods for all the variables in the estimation models. As the quantity of demand, I use the total cigarette consumption as packages. As prices, I employ average price per package. Tax data consist of excise taxes for cigarettes, but not other or general tobacco products. Consumption, price, and tax data are monthly obtained from TAPDK (Tobacco and Alcohol Market Regulatory Authority). For real prices, price data are deflated by the Consumer Price Index (CPI). In order to control changes in income, the Total Industry Product Index (TIPI) that is highly correlated with the Gross Domestic Product (GDP) is used. Data regarding TIPI and CPI are taken from the Turkish Statistical Institute (TUIK). All data are used in logarithmic form to interpret coefficients in the estimation models as long-term demand elasticities.
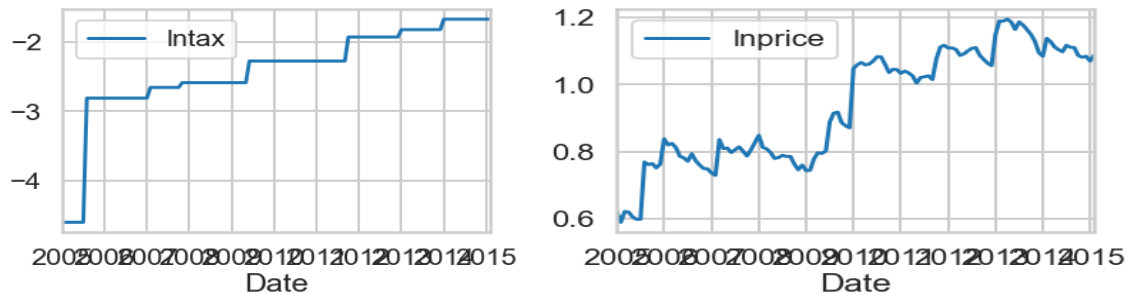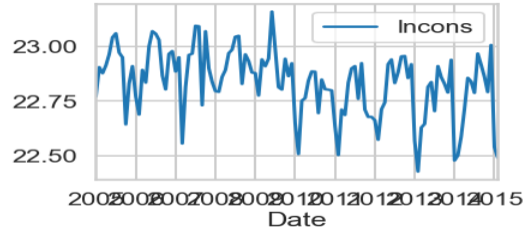
Dummy variables

Additionally, I include dummy variables representing the changes in anti-smoking policies such as taxes and regulations into the. However, I only include dummies for major anti-smoking policies into the model, but not all the changes in taxes and regulations. This is because all taxes and regulations do not affect significantly consumption. As a matter of fact, when I regress dummies for May 2008, May 2010, October 2010, July 2012, and June 2013 along with price, tax, and income together or separately in all the models, coefficients for those dummy variables were economically and statistically insignificant for all the scenarios, even when they were regressed only along with income to consumption. For those reasons, I do not include those dummy variables that represent the changes in May 2008, May 2010, October 2010, July 2012, and May 2013 into the model. However, although the tax increase in January 2013 alone is not a significant increase to raise prices and thus the demand for cigarettes, it becomes meaningful, when I evaluate this tax increase along with major anti-alcohol regulations initiated in January 2013. This hypothesis is acceptable, because alcohol and cigarette in Turkey are complementary goods and cigarette consumption in Turkey declines to its lowest level in February 2013. I define these policies as mix strategy, because government simultaneously started to use both the tax increase on cigarettes and the most extensive advertisement and sale bans on alcohol in Turkey as of January 2013.

Accordingly, I employ four different dummies only representing the aforementioned major tax and regulation measures on smoking in Turkey. The first dummy variable is *regulation dummy (July 2009)* used to proxy the effect of extensive smoking bans in July 2009. The second one is *tax dummy (January 2010)* that represents the effect of tax increase in January 2010. *Tax dummy (October 2011)* that is the third dummy is used to proxy the effect of tax increase in October 2011. Lastly, I use a *mix strategy dummy (January 2013)*, which proxies the effects of strict anti-alcohol policies and tax increase in January 2013.

4. *Regression Analysis and Estimation Strategy*

I employ an aggregate time-series data for a single country and mainly estimate the effect of price on the demand for cigarettes using a conventional model of demand and controlling for income and tobacco control policies such as excise tax and regulations on consumption. I do not include the addictive nature of smoking and supply dynamics into the model, because there are no data about the addictive and supply features of smoking in Turkey. Accordingly, the paper uses a classical demand estimation methodology to empirically investigate the relationship between anti-smoking policies and consumption/demand in Turkey. The traditional models of demand estimation for cigarettes are as follows:

$$Qd_t = f(P_t, \ Y_t, \ R_t) \tag{1}$$

In Eq. (1), Qd_t is cigarette consumption in period t, P_t is price in period t, Y_t is a vector of shift variables including income, related prices, advertising, and R_t is a vector of regulation and tax variables. Accordingly, our model specifies the log of the demand for cigarettes as a function of

the log of the own price, income, and dummy variables representing taxation and regulation. I estimate:

$$lnQd_t^{cig} = \beta_0 + \beta_1 lnP_t^{cig} + \beta_2 lnY_t^{income} + \beta_3 lnD_t^{tax,reg} + \mathcal{E}_t \tag{2}$$

where Qd_t^{cig} is the demand for cigarettes in the country in period t, P_t^{cig} is the price of cigarettes in period t, Y_t^{income} is income in the country in period t, $D_t^{tax,reg}$ dummies for tax and regulation, and $\mathcal{E}_t$ is the unobservable random disturbance term. In Eq. (2), parameters β_0, β_1, β_2, and β_3 are estimated as long-term elasticities, because the variables are used in logarithmic form. I do not include other price variables into the model, because there are no close substitute or complementary goods for cigarettes. However, I proxy changes in tastes and preferences by a vector of dummy variables D. The following figures depict the relationships and correlations among fundamental variables of my regression model identification.
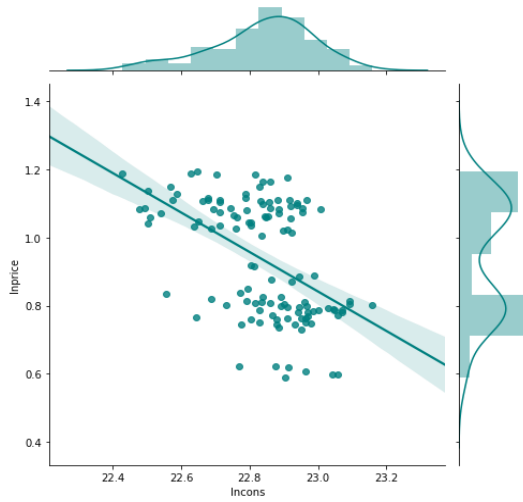
Relationship between Consumption and Price
(Pearson Corr = -0.50)
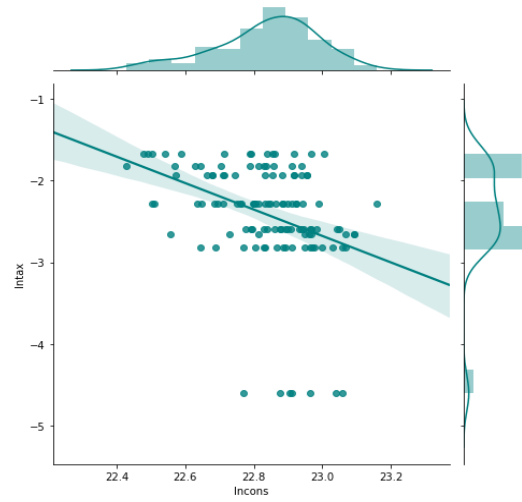
Relationship between Consumption and Tax
(Pearson Corr = -0.36)
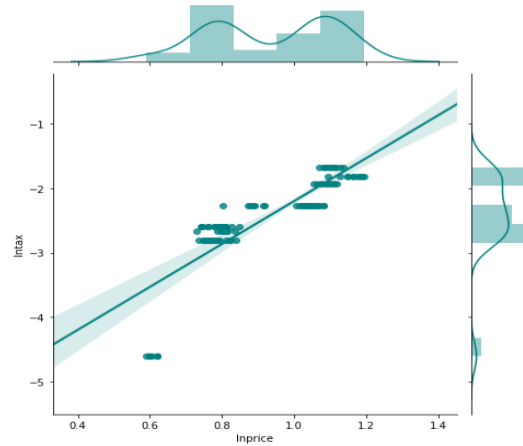
Relationship between Tax and Price
(Pearson Corr = 0.85)
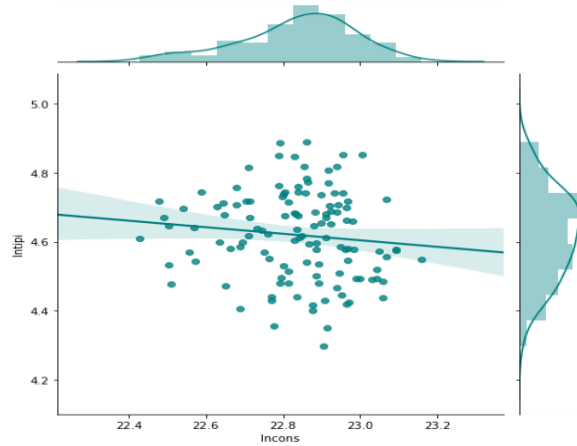
Relationship between Consumption and Income
(Pearson Corr = -0.11)

Under these circumstances, by estimating Eq. (2) with dummy variables, it is possible to test the hypothesis meaning that tax increases and anti-smoking regulation policies reduce the demand for cigarettes. I investigate different relationships between the variables in Eq. (2) through different

models under various scenarios. However, I do not include tax and price into the model at the same time, because the inclusion of tax and price that are highly correlated variables can lead to collinearity problem. I estimate the models using log *price* in place of log *tax* or dummies for tax and regulation along with price. In all the scenarios and models, I employ income as explanatory variable for controlling other non-price effects on smoking. I use monthly time-series data, including the 2005:1-2015:2 periods. I develop three different strategies to reveal the most robust results. First, I estimate the long-term dynamics of demand for cigarettes in Turkey under full sample with monthly data. By this strategy, I test nine different demand estimation models under three various scenarios. Second, I examine the pre- and post- taxation and regulation periods with sub samples presenting the different periods for an intertemporal comparison to better understand the effect of tax and regulations. Third, I analyze demand equations estimated in the models developed as per the first-second strategies through quarterly data. The aim is to reveal the probable estimation problems and to find the most robust results. Table 1 shows summary statistics.

Table 1. Descriptive statistics for full sample-monthly data

	Full sample				
	Obs.	Mean	Std. Dev.	Min	Max
Fundamentals					
Consumption	122	22.83585	.1486538	22.42866	23.15842
Price	122	.9368507	.1705143	.5897022	1.19482
Tax	122	-2.410671	.6647273	-4.60517	-1.673976
Income (TIPI)	122	4.61972	.1264947	4.298645	4.889597
Dummies					
Regulation dummy (July 2009)	122	.557377	.4987452	0	1
Tax dummy (January 2010)	122	.5081967	.5019944	0	1
Tax dummy (October 2011)	122	.3360656	.4743095	0	1
Mix strategy dummy (January 2013	122	.2131148	.4111968	0	1

Table 2. The regression results for full sample (monthly data)

VARIABLES	Scenario 1 $Qd_t = f(P_t,\ Yinc_t,\ R_t)$				Scenario 2 $Qd_t = f(Tax_t,\ Yinc_t,\ R_t)$		Scenario 3 $Qd_t = f(Yinc_t,\ R_t)$		
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 1	Model 2	Model 3
Cigarette price	-0.636***	-0.505**	-0.568***	-0.533***					
	(0.0918)	(0.210)	(0.156)	(0.169)					
Income (TIPI)	0.414***	0.439***	0.452***	0.428***	0.285**	0.385***	0.404***	0.377***	0.361***
	(0.107)	(0.117)	(0.115)	(0.113)	(0.123)	(0.123)	(0.122)	(0.121)	(0.113)
Excise tax					-0.117***	-0.0577**			
					(0.0275)	(0.0244)			
Regulation dummy		0.0104	-0.0059			-0.138***	-0.0526	-0.155***	
(July 2009)		(0.0488)	(0.0504)			(0.0333)	(0.0382)	(0.0307)	
Tax dummy		-0.0440		-0.0266			-0.121***		0.165***
(January 2010)		(0.0500)		(0.0522)			(0.0386)		(-0.0307)
Tax dummy		-0.0148		-0.0176			-0.00638		-0.0477
(October 2011)		(0.0378)		(0.0350)			(0.0379)		(0.0352)
Mix strategy dummy		-0.563	-0.0487				-0.0735*	-0.0922**	
(January 2013)		(0.0423)	(0.0389)				(0.0418)	(0.0367)	
Constant	21.52**	21.30***	21.29***	21.37***	21.23***	20.99***	21.07***	21.19***	21.26***
	(0.437	(0.520)	(0.503)	(0.471)	(0.624)	(0.600)	(0.550)	(0.547)	(0.514)
Observations	122	122	122	122	122	122	122	122	122
R-squared	0.330	0.343	0.340	0.322	0.163	0.268	0.316	0.287	0.2922

Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Results from monthly data: Full sample models

Table 2 includes the OLS results from 9 different models for 3 various scenarios. Each equation includes the variables used to estimate the related long-term relationships for each scenario. Dummy variables are used to proxy the effect of taxation and regulations on smoking. Under the first scenario, I estimate the relationships between price, income and consumption with and without dummies. Then, I drop price variable from the first-scenario models and estimate relationships between tax, income, consumption and regulation dummies under Scenario 2. Lastly, I observe the relationships between income, dummies, and consumption under Scenario 3. Using those different scenarios and models, I aim to reveal the effect of tax and regulation policies on consumption in the most robust way.

In the first scenario, I find that price has a negative and statistically significant effect on smoking at 1% and 5% significance levels for all equations in Scenario 1, including price variable. The price elasticity of demand varies from -0.50 to -0.63. According to the results from the monthly data analysis, I calculate that the long-term price elasticity of demand for cigarettes in Turkey is -0.56 on average. The findings confirm that the long run demand elasticities in the post-2004 anti-smoking policies period are higher than the previous literature. I estimate that this is because of the consistent taxation and regulation policies in the last decade. Similarly, I find that income has a positive and statistically significant impact on smoking at 1% and 5% significance levels for all equations in both Scenario 1 and Scenario 2 and Scenario 3. The income elasticity of demand for cigarettes ranges from 0.28 to 0.45. According to the results from the monthly data analysis, I calculate that the long-term income elasticity of demand for cigarettes in Turkey is 0.39 on average. The statistically and economically significant and relatively higher demand and income elasticities confirm that governments led to a remarkable decline in consumption through tax and regulation policies in the last decade in Turkey.

Regarding dummies, whereas the results regarding dummy variables economically, but not statistically, corroborate this inference for the first-scenario models, the second- and third-scenario demand estimation models present more robust evidence affirming that taxes and regulations have been influential in reducing consumption, because coefficients for dummy and tax variables are highly significant in those models both economically and statistically. The first-scenario dummy findings suggest that even though regulations in July 2009, the mix strategy in January 2013, and the tax increases in January 2010 and October 2011 mostly have a negative effect on consumption, they do not have a meaningful effect on smoking, because these coefficients do not have statistically significant values. I estimate that this is due to close correlations between price and dummy variables including the changes in taxes.

Because of concerns about endogeneity between price, taxation, and regulation in the first scenario, I drop the price variable from Eq. (2) in Scenario 2 and directly estimate the relationships between tax and consumption to reveal the effect of taxation and regulation by means of the models with and without regulation dummies. I find that an increase in excise taxes has a negative and statistically significant effect on smoking at 1% and 5% significance levels for all equations in Scenario 2. The long-term tax elasticity of demand for cigarettes varies from -0.05 to -0.11. This finding affirms that a 10% increase in excise taxes in the long run brings bout a decline between 0.5% and 1.8% in the demand for cigarettes in Turkey. This finding is consistent with the results from Scenario 1. Tax elasticities corroborate the findings regarding price elasticities in Scenario 1. Also, tax and price elasticities together suggest that governments in Turkey have generated higher tax revenues through excise taxes on smoking in the last decade.

As expressed before, for the equations in Scenario 2, income also has a positive and statistically significant impact on smoking. Lastly, regulation dummies in the tax models suggest that regulations have a negative impact on smoking. *Regulation dummy (July 2009)* is significant at a 1% significance level and a negative effect under this scenario. As can be understood from the first-two scenarios, the relationships between consumption and dummies are generally as expected, but not statistically significant in some models. One can claim that this is because there are the tax changes and regulations in close intervals to each other and this leads to endogeneity in the analysis with monthly data. For that

reason, under Scenario 3, I only investigate the relationship between consumption and dummies using income to control other explanatory variables in these regressions. Table 2 shows the results. Under this scenario, dummies that represent the changes in taxes and regulations are mostly statistically significant and as expected. Clearly, as different from the previous estimations, these findings confirm more strongly the presence of relationship between dummies and consumption. Also, this evidence is consistent with the previous findings and corroborates that the increase in taxes and restrictive regulations on smoking considerably reduce consumption. Shortly, when I investigate the long-term dynamics of consumption only along with income as explanatory variable, dummy variables become statistically more significant. I estimate that this is because there is no any correlation relationship between income and dummy variables.