Capstone Project I

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

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Springboard

Machine Learning Bootcamp

2019-2020

Motivation

- Four major initiatives to anti-tobacco period
  - In 2004, Turkey committed to implement the WHO Framework Convention on Tobacco Control
  - In 2006, Turkey declared a National Tobacco Control Program
  - Turkey enacted a law banning smoking in public areas in 2008 and put the law in force in 2009
  - Also, excise taxes were increased in 2005, 2010 and 2011, respectively.

- Thus, Turkey has initiated remarkable anti-tobacco policies such as taxation and strict regulations in the last decade.

- According to a recent report (WHO, 2013) on the tobacco control policies throughout the world, “Turkey is the only country that projects its entire population of 75 million with all the significant tobacco measures at the highest level and it marks singular achievement”, in spite of its late and short experience.

Taxation

- 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

Regulation

- 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.

Regulation

- 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.

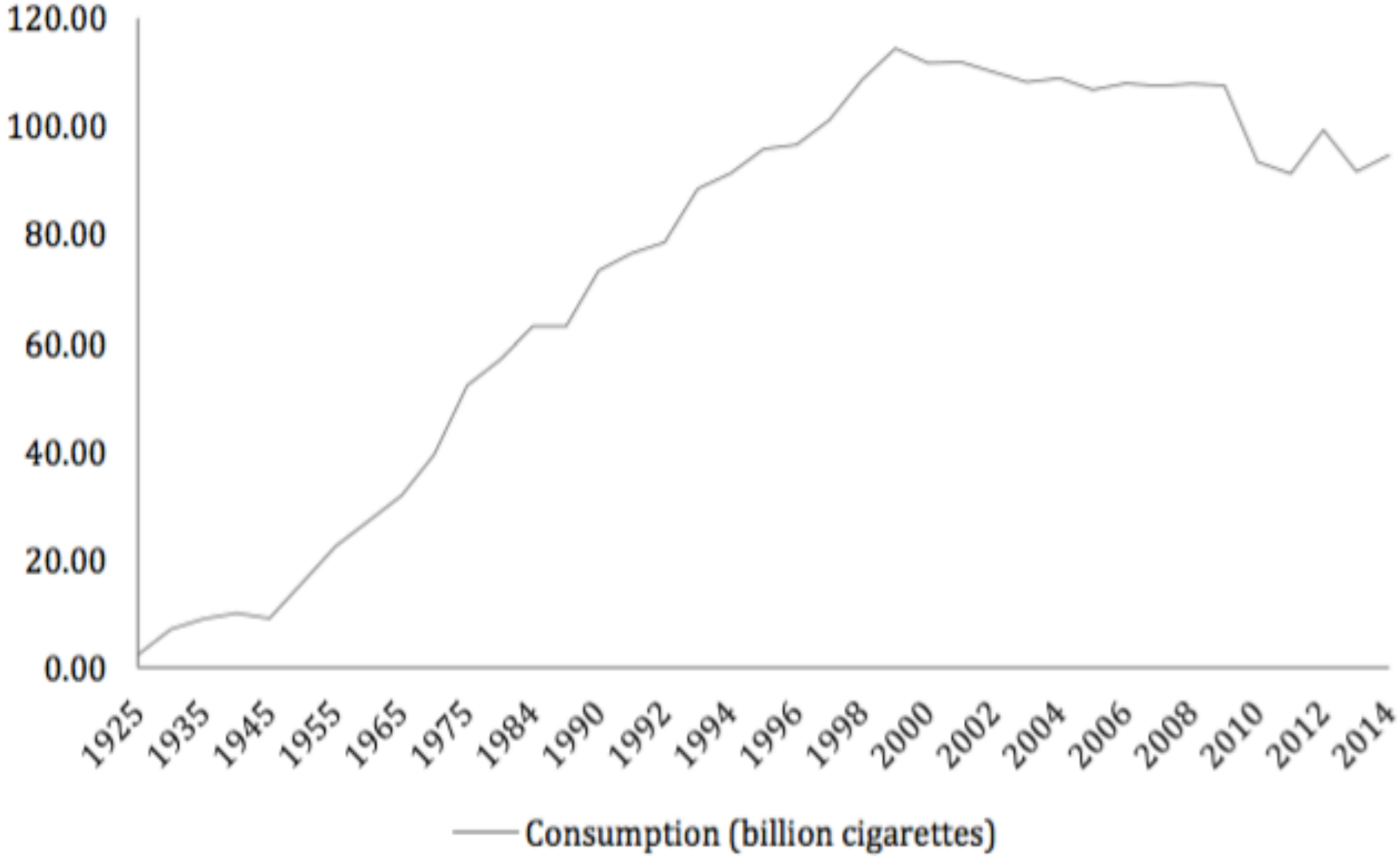
Regulation

- 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.

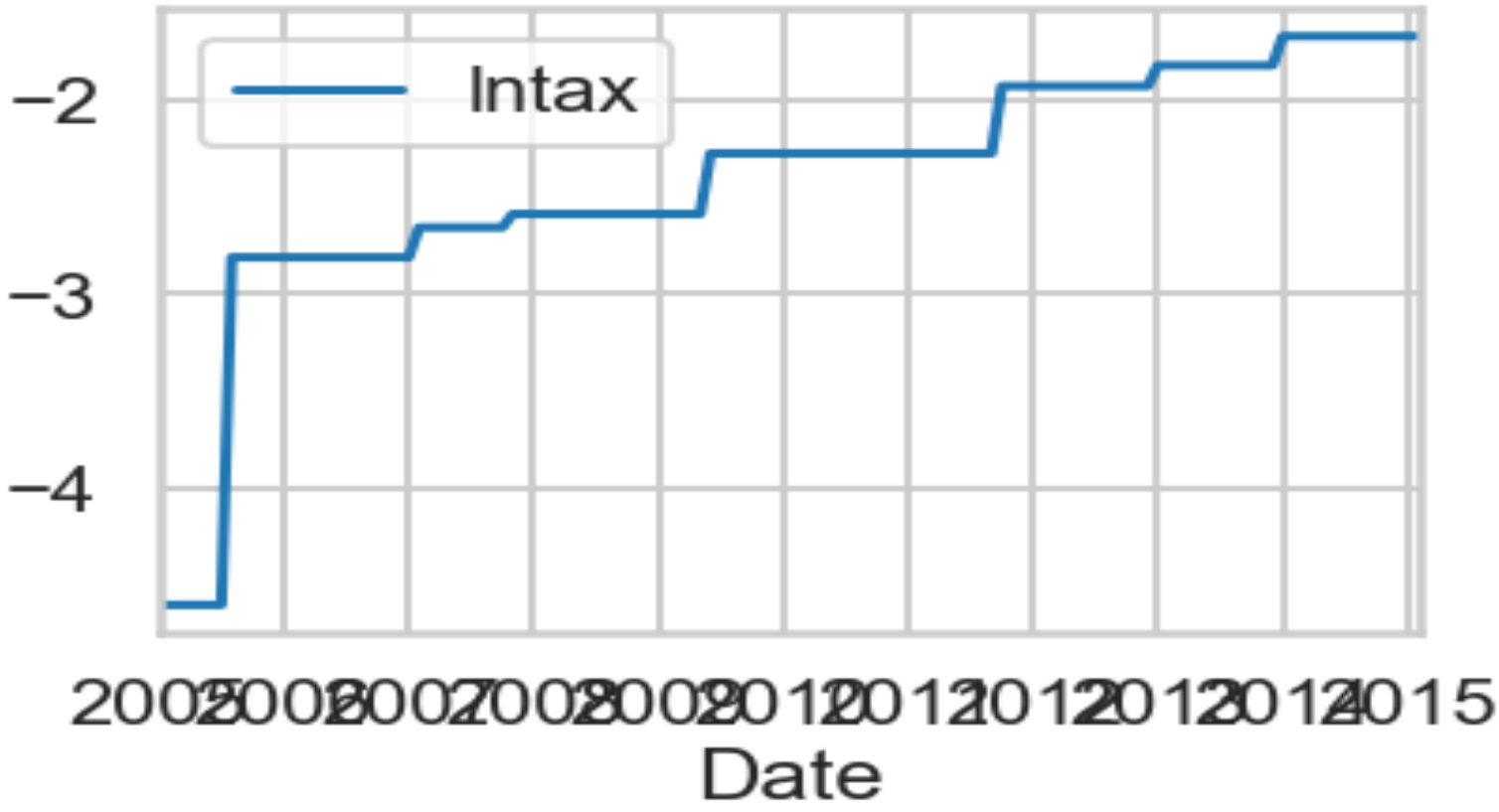
Aim

- This research examines the long-term dynamics of demand for cigarette in Turkey.
- The aim is to reveal the effect of excise taxes and regulations on cigarette consumption.
- Using monthly and quarterly data that cover the pre- and post- anti-smoking policy periods, we estimate demand elasticities and compare the pre- and post- taxation and regulation terms.

Cigarette Consumption in Turkey by Year

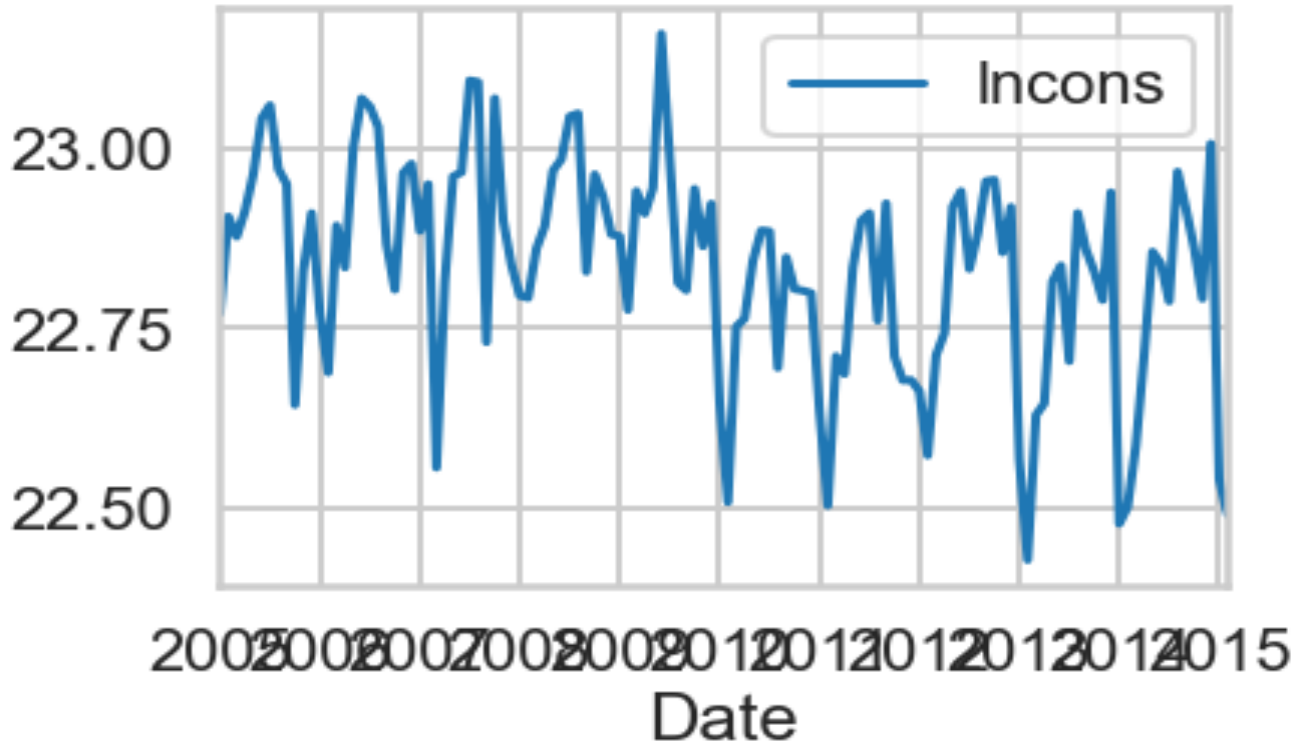


Changes in tax rates per cigarette stick after 2004



Changes in prices after 2004

Changes in demand after 2004



Empirical Methodology

$$Qd_t = f(P_t,\ Y_t,\ R_t) \quad (1)$$

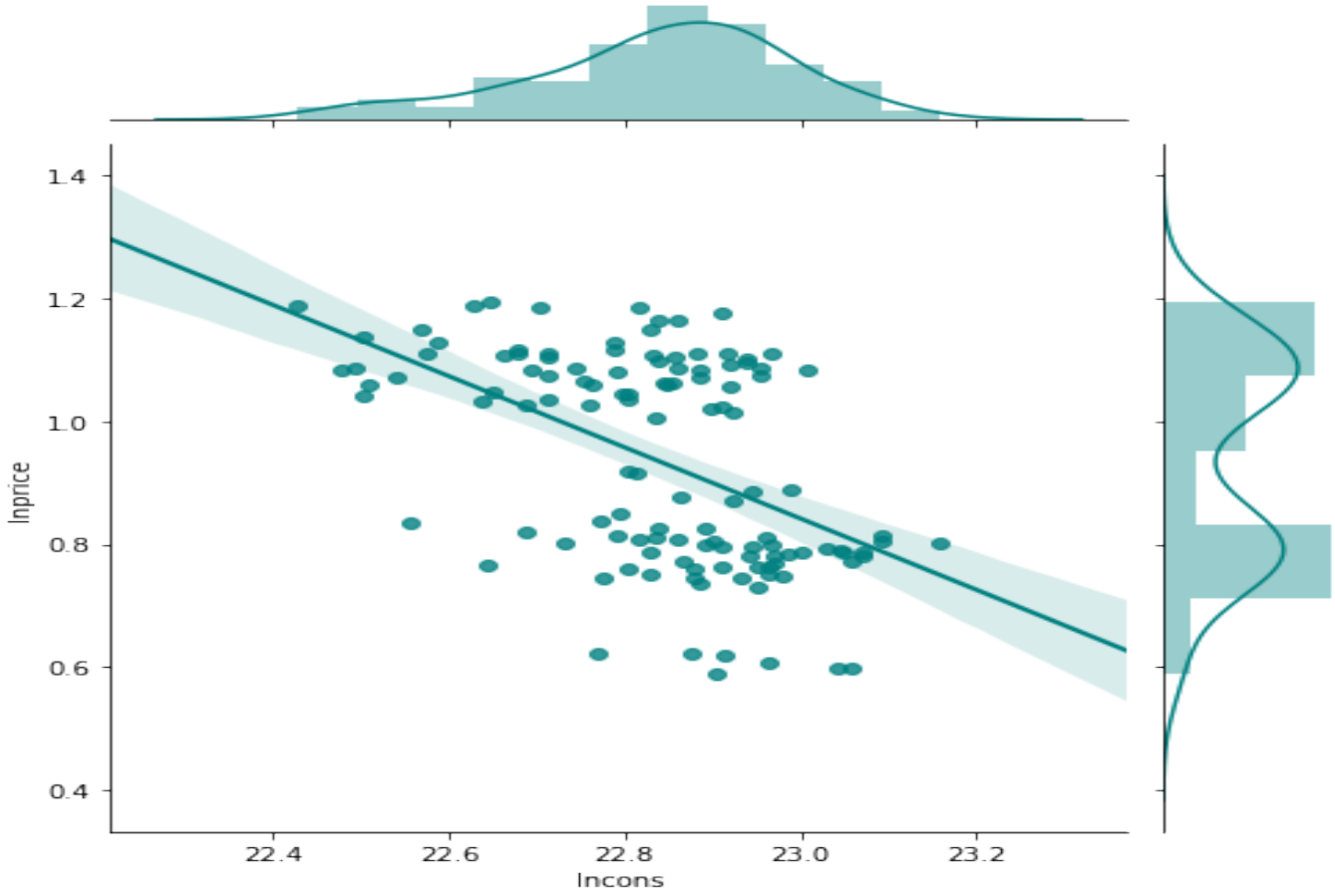
$$lnQd_t^{cig} = \beta_0 + \beta_1 lnP_t^{cig} + \beta_2 lnY_t^{income} + \beta_3 lnD_t^{tax,reg} + \varepsilon_t \quad (2)$$

we estimate where $Qdcig$ is the demand for cigarette in the country in period t, $Pcig$ is the price of cigarette in period t, $Yincome$ is income in the country in period t, $Dtax,reg$ are dummies for tax and regulation, and E 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.

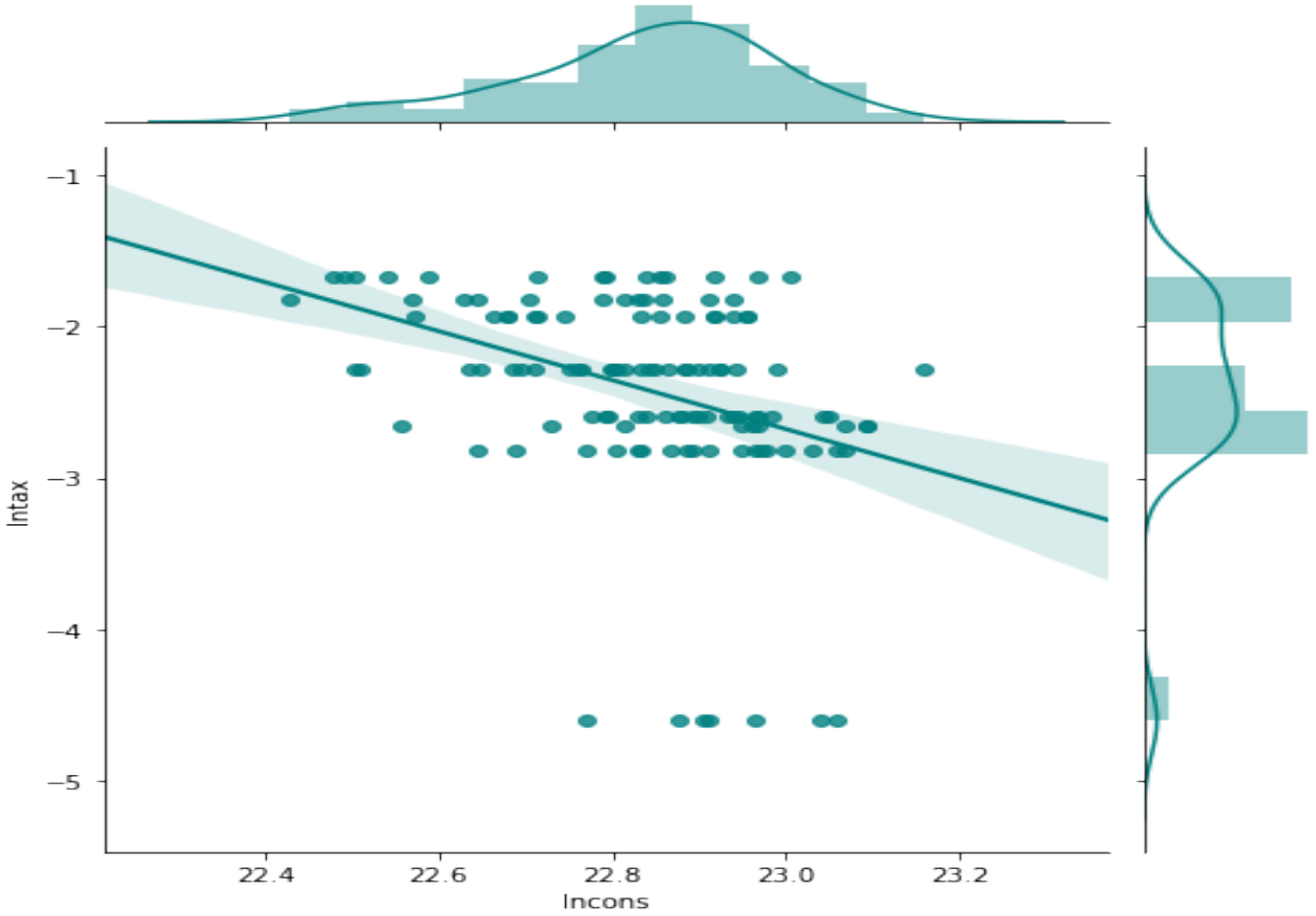
Data

- We estimate the aggregate demand for cigarettes and use the aggregate national level data.
- We employ monthly data, including the 2005:1-2015:2 periods for all the variables in the demand estimation models.
- As the quantity of demand, we use the total cigarette consumption as packages.
- As prices, we employ average price per package.
- Tax data consist of excise taxes on cigarette prices, 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 in the analysis of monthly data, the Total Industry Product Index (TIPI) that is highly correlated with the Gross Domestic Product (GDP) is used.
- Differently, in the analysis of quarterly data, we employ GDP in order to control for changes in income.
- Data regarding TIPI and CPI are taken from the Turkish Statistical Institute (TUIK). All data are used in logarithmic form.

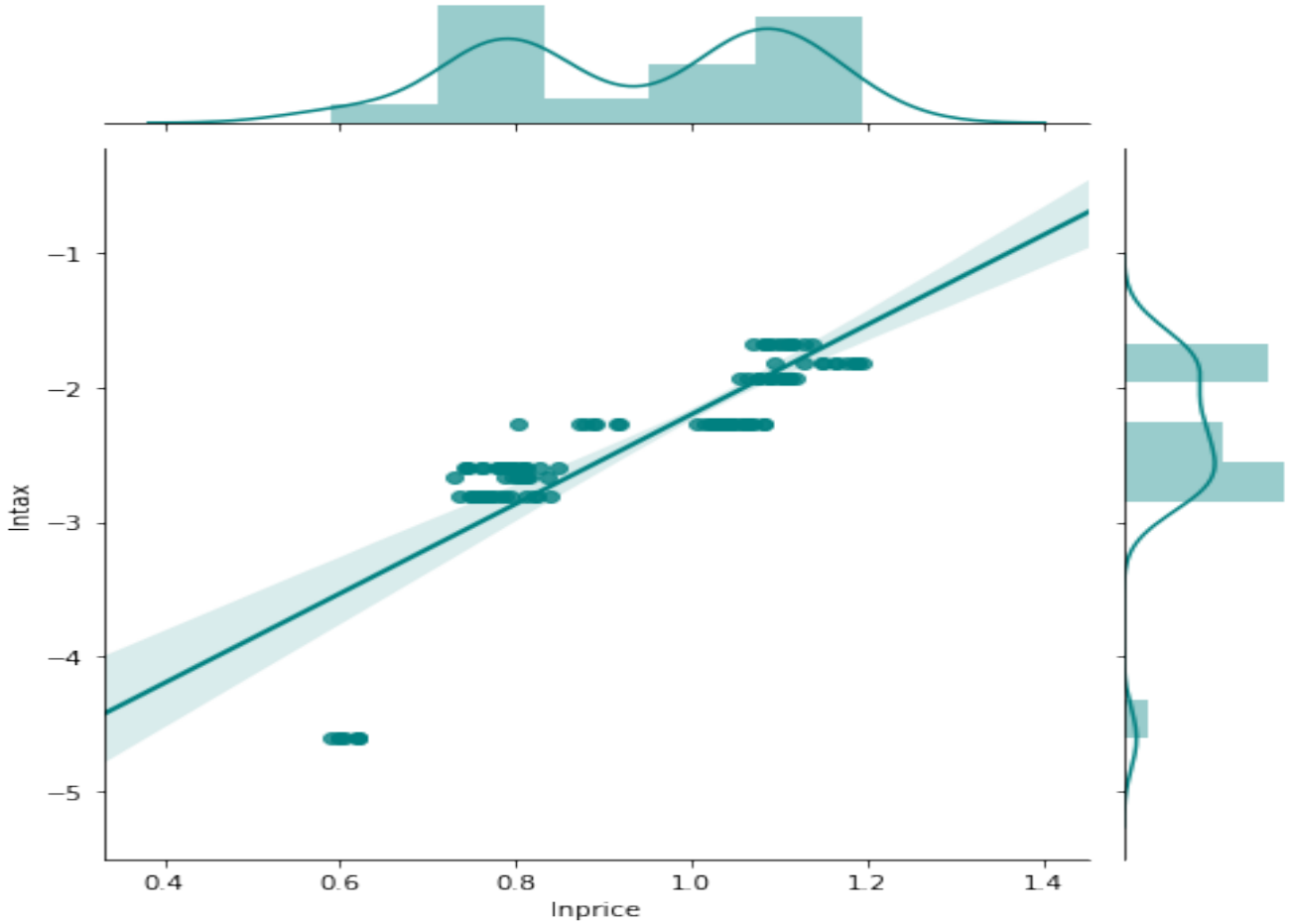
Relationship between Consumption and Price (Pearson Corr = -0.50)



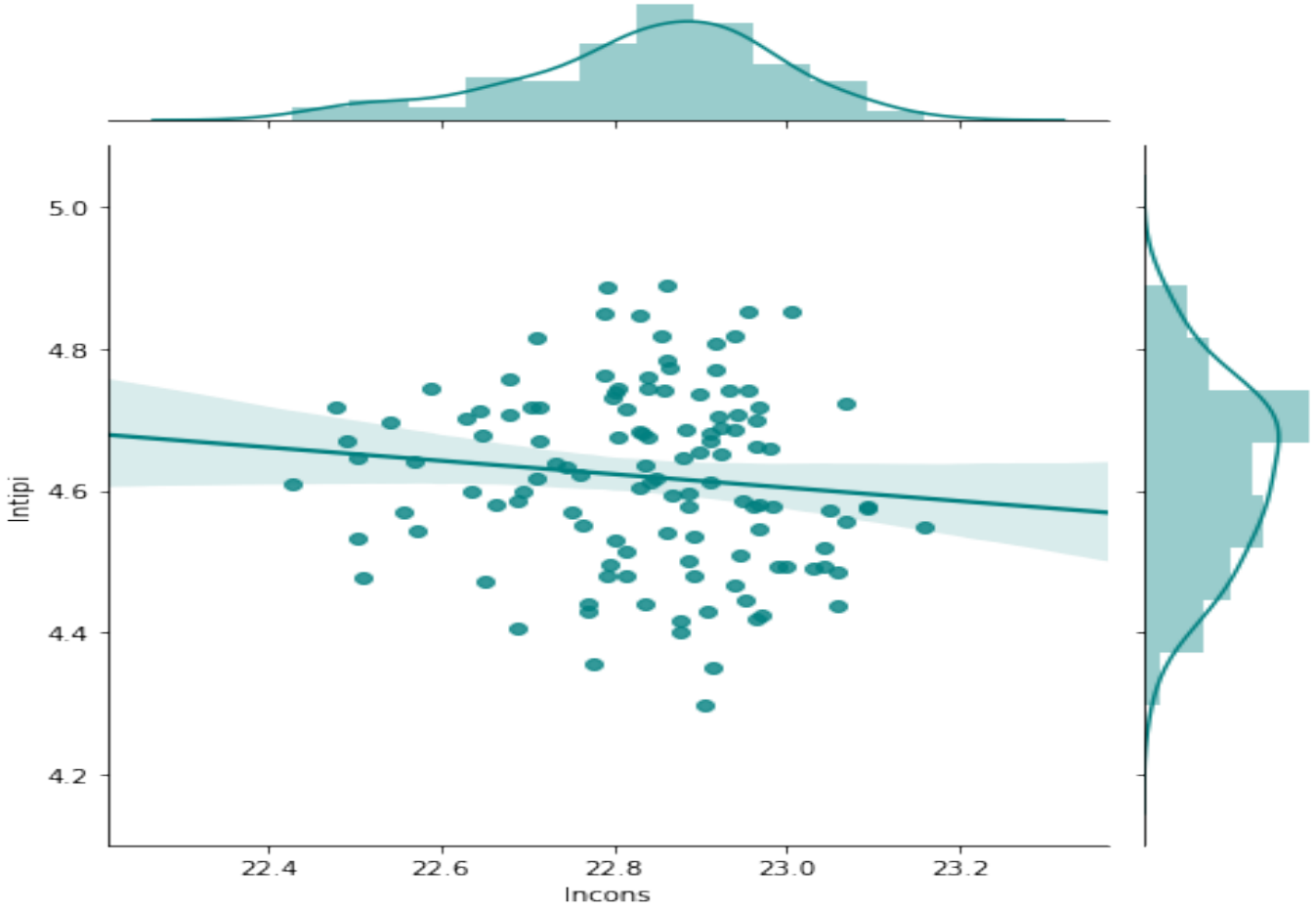
Relationship between Consumption and Tax (Pearson Corr = -0.36)



Relationship between Tax and Price (Pearson Corr = 0.85)



Relationship between Consumption and Income (Pearson Corr = -0.11)



Summary Statistics

	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

The OLS results

	Scenario 1 $Qd_t = f(P_t, Yinc_t, R_t)$				Scenario 2 $Qd_t = f(Tax_t, Yinc_t, R_t)$		Scenario 3 $Qd_t = f(Yinc_t, R_t)$		
VARIABLES	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

The OLS results for sub samples

	Scenario 1: The pre- and post- regulation and mix strategy periods				Scenario 2: The pre- and post-taxation and periods			
	Sub-samples				Sub-samples			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
VARIABLES	2005:1 2009:6	2009:7 2015:2	2005:1 2012:12	2013:1 2015:2	2005:1 2009:12	2010:1 2015:2	2005:1 2011:9	2011:10 2015:2
Cigarette price	-0.34	-0.865***	-0.542***	0.83	-0.321*	-0.911***	-0.545***	-0.413
	(-0.267)	(-0.214)	(-0.0893)	(-0.706)	(-0.190)	(-0.319)	(0.102)	(0.550)
Income (TIPI)	0.112	0.658***	0.323***	1.642***	0.11	0.754***	0.246*	0.980***
	(-0.165)	(-0.155)	(-0.119)	(-0.374)	(-0.137)	(-0.144)	(0.131)	(0.212)
Constant	22.66***	20.62***	21.86***	14.01***	22.66***	20.22***	22.20***	18.58***
	(-0.699)	(-0.689)	(-0.509)	(-2.25)	(-0.555)	(-0.642)	(0.574)	(1.341)
Observations	54	68	96	26	60	62	81	41
R-squared	0.032	0.289	0.285	0.466	0.037	0.272	0.247	0.304

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

Concluding Remarks

- We find that the long-term average price and income elasticities of demand for cigarette in Turkey are -0.561 and 0.38, respectively.
- The long run tax elasticity of demand is centered on -0.11.

Concluding Remarks

- Regarding dummies, we find that excise taxes and regulations have economically and statistically significant impact in reducing cigarette consumption.
- The findings from the full sample analyses confirm that government has reduced cigarette consumption through taxation and regulation during the last decade.
- The results from the sub-sample analyses suggest that most of this effect stems from tax increases and regulations in the post-2009 period.

Thank you…

An Empirical Investigation on Anti-Smoking Policies in Turkey

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