***Project Proposal I***

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

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.

Fig 1. Cigarette consumption in Turkey by year

Source: TAPDK.

***Data***

I will estimate the aggregate demand for cigarettes and use the aggregate national level data. I employ monthly and quarterly data, including the 2005:1-2015:2 and 2005:1-2014:4 periods for all the variables in the demand estimation models, respectively. As the quantity of demand, I use the total cigarette consumption as packages. As prices, I employ average price per package. Price is proxied by tax rates and this impacts on consumption, as shown in figure 2. 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 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, I employ GDP in order to control changes in income. Data regarding TIPI and CPI are taken from the Turkish Statistical Institute (TUIK). All data are used in logarithmic form to interpret coefficients as demand elasticities.

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

***Dummy variables***

Additionally, I include dummy variables representing the changes in anti-smoking policies such as taxes and regulations into the model. 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. For those reasons, I will 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 (Bilgic et al., 2010) 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.

***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:

(1)

In Eq. (1), is cigarette consumption in period *t*, is price in period *t*, is a vector of shift variables including income, related prices, advertising, and 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:

(2)

where is the demand for cigarettes in the country in period *t*, is the price of cigarettes in period *t*, is income in the country in period *t*, dummies for tax and regulation, and is the unobservable random disturbance term. In Eq. (2), parameters , , , and 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, following Leu (1984), Wasserman et al. (1991), Tansel (1993), I proxy changes in tastes and preferences by a vector of dummy variables *D*.

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. Following the previous literature (Chaloupka and Wechsler, 1997; Adda and Cornaglia, 2006; Abrevaya and Puzzello, 2012), 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 and quarterly time-series data, including the 2005:1-2015:2 and 2005:1-2014:4 periods, respectively. 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.