Fiscal policy impact on tobacco consumption in high smoking prevalence transition economies - the case of Albania

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Abstract

This paper analysis the determinant factors of tobacco consumption in of Albania, which is one of the countries with highest smoking prevalence in Europe. To empirically estimate the elasticity of cigarettes demand in Albania, this paper uses the Living Standard Measurement Survey (LSMS) applying the Deaton's (1988) demand model. Our paper estimates an Almost Ideal Demand System (AIDS), which allows disentangling quality choice from exogenous price variations through the use of unit values from cigarette consumption. Following a three-stage procedure, the estimated results suggest that the price elasticity is around -0.57. The price elasticity appears to be within the range of estimated elasticities in developing countries and in line with the estimates elasticities from the model using aggregate data. In terms of the control variables, it seems that the total expenditure, household size, male to female ratio and adult ratio are important determinants of tobacco demand in Albania. Thus, since an increase in price, which have been mainly driven by the increases of taxes, have demonstrated to have had a significant impact on tobacco consumption, the government should further engage in gradual increase of taxation.

Keywords: tobacco consumption, LSMS, Deaton, elasticity

1. Introduction

Both theoretical and empirical research have devoted substantial attention to the price elasticity of tobacco, both for economic purposes and health externalities caused by smoking. Despite the prevalence of smoking in Albania and the existence of some studies investigating the impact of tobacco control policy in the Albanian market (Levy et al., 2008, Ross et al., 2008, Zaloshnja, 2010), there is scarce empirical research on the price elasticity of tobacco.

Trying to fill the gap in the empirical literature, this paper aims at assessing the tobacco price elasticity from a microeconomic perspective. Investigating the

price elasticity becomes of special importance not only for the government in terms of using tobacco excise policies to increase budget revenues but also to reduce smoking prevalence as such to increase awareness for health issues. In addition to the tobacco price elasticity, this paper aims to assess other determinants of tobacco demand.

To empirically estimate the elasticity of cigarettes demand in Albania, this paper uses the Living Standard Measurement Survey (LSMS) as cross-section data for the year 2012. Whilst the majority of studies conducted in this field use Household Budget Survey, we are substantially determined by the data availability of our main variable of interests (quantity of cigarettes and expenditures of cigarettes) to use alternative surveys, which as abovementioned is the LSMS. Having data on our main variable of interest and other control variables at household level allows us to estimate the Deaton's (1988) demand model to estimate the elasticity of cigarettes demand by taking into account spatial variations.

The paper is structured as follows. After the introductory part, Chapter 2 focuses on explaining the empirical methodology used to estimate the elasticity of tobacco demand. Chapter 3 discusses the choice of estimation techniques and the data employed. Attention is paid to potential problems to take into account when estimating the Deaton's demand model such as collinearity between control variables, heteroscedasticity, etc. Chapter 4 presents the estimation results by interpreting their statistical and economic significance followed by several robustness checks. Finally, Chapter 5 concludes the paper.

2. Econometric model and methods

Deaton's model

In order to estimate the demand elasticities using the LSMS data, the methodology introduced by Deaton (1988) and further developed by Deaton (1990) was followed. This model, known as the Deaton model, is a consumer behavior model that uses unit values as a proxy of prices. Whilst price data are rarely accurate and sufficient at household level (Deaton, 1997), unit values are often considered superior to prices. However, prices and unit values are not identical. Measurement errors involving the quantity and variation in the quality of tobacco due to heterogenous nature of this product (John, 2005; 9) are some of the reasons of the differences between prices and unit values.

The Deaton's model with unit values consists of two equations, as follows:

$$w_{hc} = \alpha^0 + \beta^0 lnx_{hc} + \gamma^0 . z_{hc} + \theta lnp_c + u^0_{ch} \quad (1)$$

$$lnv_{hc} = \alpha^1 + \beta^1 lnx_{hc} + \gamma^1 . z_{hc} + \psi lnp_c + u^1_{hc} \quad (2)$$

where, subscripts h and c both on Equation (1) and (2) represent the household and territorial clusters, respectively. In Equation (1), the dependent variable w denotes the budget share of household on cigarettes in percentages, whereas v in Equation (2) represents the unit values. The right-hand side variables on both equations x, z, p represent the total expenditures of households, other household characteristics and cigarette price, respectively. The remaining terms, u_{ch}^{0} and u_{hc}^{1} represent the error terms.

Deaton's model (Deaton, 1990, p.5) assumes that prices are the same across the households in the same cluster, and therefore makes possible to have consistent estimates of the parameter θ by using cluster deviation-from-the-mean approach.[1]

The unit values (the share of household expenditure on cigarettes to quantity consumed) is calculated only for those households who have indeed purchased cigarettes. For households with zero cigarettes consumption, due to the ln term of the unit values equation, are omitted from the estimates. Unit values represent variation not only in the prices of cigarettes but also in the quality of cigarettes (i.e. different brands of cigarettes). Accordingly, a consumer of cigarettes, faced with increasing prices, might either consume fewer cigarettes (quantity reduction) or consume the same amount of cigarettes but of a lower quality (quality shading), while assuming that the expenditures for cigarettes remain the same. Hence, referring to Equation (2), the coefficient β^1 represents the expenditure elasticity of quality, while the coefficient ψ represents price elasticity of quality. In the absence of quality shading, the latter coefficient would be equal to one, whereas the former coefficient would be zero.

The semi-elasticity of price θ, cannot be estimated as prices are not observed. Nevertheless, having prices on both Equations (1) and (2), the Deaton model enables the estimation of the θ parameter. We rearrange Equation (2) so that logarithm of prices is moved to the left-side of equation, whereas unit values, household total expenditure, other control variables for the household characteristics and error terms would be on the right-side. We then substitute rearranged equation (2) in the budget share equation and obtain direct link between unit values and other control variables:

$$w_{hc} = \alpha^2 + \beta^2 lnx_{hc} + \gamma^2 . z_{hc} + \hat{\phi} lnv_{hc} + u_{ch}^{2} \qquad (3)$$

Estimation of the model

[1] From a technical perspective, the estimates from the above approach is done by including dummy variables for each cluster,

Following Deaton (1990, p.19), the estimation of the model goes under three stages. First, Equations (1) and (2) are estimated by using deviation from the mean approach. In the second stage, we use estimates from the first stage to remove the effect of total household expenditure and other control variables from the budget share and unit values, which can be written as follows:

$$\tilde{y}_{hc}^{0} = w_{hc} - \tilde{\beta}^{0} ln x_{hc} - \tilde{\gamma}^{0} z_{hc} \quad (4)$$

$$\tilde{y}_{hc}^{1} = ln v_{hc} - \tilde{\beta}^{1} ln x_{hc} - \tilde{\gamma}^{1} z_{hc} \quad (5)$$

These new variables are then used to create cluster averages of budget shares and unit values and use them to create second stage equations:

$$y_{c}^{0} = \alpha^{0} + \theta ln p_{c} + f_{c} + u_{c}^{0} \quad (6)$$

$$y_{c}^{1} = \alpha^{1} + \psi ln p_{c} + u_{c}^{1} \quad (7).$$

We use these variables and the variance and covariance of estimated residuals in Equations (1) and (2), to calculate the parameter ϕ from Equation (3):

$$\hat{\phi} = \frac{cov(\hat{y}_{c}^{0}, \hat{y}_{c}^{1}) - \hat{\sigma}^{01}/n_{c}}{var(\hat{y}_{c}^{1}) - \hat{\sigma}^{11}/n_{c}^{+}} \quad (8)$$

In the third stage, we introduce the assumption on weak separability which enables us to calculate parameter θ as:

$$\theta = \phi / [1 + (w - \phi) \frac{\beta^{1}}{\beta^{0} + w(1 - \beta^{1})}] \quad (9)$$

Based on Deaton (1990) and John (2005), if the estimated unit value elasticity of expenditure is close to zero, the price semi-elasticity will be estimated unbiasedly by parameter ϕ. However, in the presence of quality shading, the θ parameter needs to be corrected for bias (more precisely needs to be corrected downwards). The final formula for the elasticity will be:

$$\epsilon_{p} = \left(\frac{\theta}{w}\right) - \psi \quad (10).$$

Additionally, since in the equation (1) on the left hand side we have budget shares and not logarithm of quantity, parameter β^0 does not estimate the expenditure elasticity of demand. Instead, as the budget shares can be defined as the product of quantity and quality divided by total expenditure, i.e. w = q*v/x, we can arrive to an estimate of total expenditure elasticity by taking the log and the first derivative with respect to expenditure of this identity. We arrive to:

$$\frac{\partial lnw}{\partial lnx} = \frac{\partial lnq}{\partial lnx} + \frac{\partial lnv}{\partial lnx} - \frac{\partial lnx}{\partial lnx} \quad (11)$$

where $\frac{\partial \mathrm{lnq}}{\partial \mathrm{lnx}}$ represents the total expenditure elasticity of demand, $\frac{\partial lnw}{\partial lnx}$ is the budget share elasticity which can be estimated from equation (1) as $\frac{\beta^0}{w}$, while $\frac{\partial lnv}{\partial lnx}$ is the elasticity of quality to expenditure from equation (2). After we rearrange the equation and replace the identities with estimates from equations (1) and (2) we estimate the total elasticity of expenditure as (Deaton, 1997):

$$\epsilon_x = 1 - \beta^1 + (\frac{\beta^0}{w}) \quad (12).$$

Following John (2008), the standard errors are retrieved from the bootstrapping procedure (1000 replications) in order to determine whether the above elasticity is statistically significant.

3. Data and stylized facts

In order to estimate the price elasticity of the cigarettes consumption, in this paper we use the LSMS conducted in 2012, as being the most recent survey with all the information necessary to perform the analysis. Whilst this survey is nationally representative (6671 households), it is important to note that it covers both urban and rural areas across the 12 prefectures of Albania. The information used from LSMS is gathered/merged by different modules such as Education, Poverty, Health, Purchases and Labor. The Health module was the main focus since it contains information on cigarette consumption and the respective expenditures, which forms the basis of our research.

Before going through the three-stage procedure, some descriptive statistics are offered to better understand the heterogeneity of the LSMS sample. The

regression results presented in Table 1 show considerable variations of the real cigarettes unit values and budget shares between the 12 prefectures. With respect to the constant term, the regression results indicate that the average price for a cigarette paid by the average household in 2012 is about 57 leks. Variations of prices across the prefecture show that households in Tiranë and Durrës pay larger prices compared to Berat as the base category. As to the budget share, an average household in Berat spend about 8.8% of their budget on cigarettes, while households in the other prefectures spend on average from 1.2 percentage points more to 3 percentage points less of their budgets on cigarettes.

Table 1: Regional and time variation of cigarettes unit values and budget shares

VARIABLES	Unit Value (per cigarette pack)	Cigarettes budget share (in %)
Dibër	-28.14***	-0.0293***
	(5.724)	(0.00650)
Durrës	15.40**	-0.0013
	(6.356)	(0.00693)
Elbasan	2.403	-0.0116*
	(6.024)	(0.00642)
Fier	2.727	0.00101
	(6.696)	(0.00688)
Gjirokastër	7.024	-0.00598
	(6.356)	(0.00680)
Korcë	-3.138	-0.00598
	(6.191)	(0.00664)
Kukës	-4.471	-0.0170***
	(5.724)	(0.00620)
Lezhë	0.0585	-0.0304***
	(6.927)	(0.00715)
Shkodër	2.608	-0.00227
	(7.359)	(0.00779)
Tiranë	10.84*	0.0111*
	(5.969)	(0.00647)
Vlorë	3.043	-0.0204***
	(6.367)	(0.00674)
Constant	56.84***	0.0881***
	(4.458)	(0.00482)
Observations	1,980	1,691
R-squared	0.042	0.047

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Author's calculation based on the HBS data.
Note: Berat is considered a base category.

4. Results

Definition of clusters and the vector of covariates

Before interpreting the results, it is important to clarify the definition of clusters and vector of covariates. First, clusters are defined based on the information on primary sampling units. Overall, there are 603 clusters defined in this study.

In term of the descriptive statistics of variables used in first-stage regression, there are several control variables used such as total expenditures in logarithmic form, household size in logarithmic form, gender and composition of households. The descriptive statistics of all variables used in the estimation of the first stage regressions are reported in Table 2.

Before reporting the first stage regression results, households with zero expenditure are not considered in the analysis, given the "fundamentally different" preferences of cigarettes between consumer and the non-consumers (John, 2008). The households that enter first stage regression have an average male ratio of about 54%. Mean and maximum years of education of 10.5 and 12.2 suggest that on average adult household members have a secondary level of education. Furthermore, about 50% of the households are from urban areas.

Table 2: Descriptive statistics of variables used in the first-stage regression

	Obs.	Mean	Std dev.	Min	Max
Unit Value, Cigarettes (ln)	1551	4.02	0.78	0.15	6.96
Budget share, Cigarettes	1551	0.08	0.05	0.001	0.44
Total expenditure (ln)	1551	13.12	0.39	11.70	14.66
Household size (ln)	1551	1.35	0.42	0	2.77
Male ratio	1551	0.54	0.16	0	1
Adult ratio	1551	0.84	0.19	0.22	1
Mean education	1551	10.51	1.92	4.25	17.62
Maximum education	1551	12.22	2.73	8.5	20
Rural Settlements	1551	0.50	0.50	0	1

Author's calculation based on the HBS data.

Note: Conditional on being in the first stage regression.

First stage – household level regression

The results of the first stage regression at household level are presented in Table 3. Starting with the results of unit values equation, it is important to note that the coefficient for total expenditure, which is statistically significant, represents the quality elasticity of expenditure. More precisely, this elasticity is about 0.5%, which suggests that households with 10% higher expenditure will buy cigarettes that are about 5% more expensive.

Moving to the other control variables, the first-stage regression results suggest that the unit value is lower in larger households, among households with more men and elderly in the household. There is no statistical effect of education (neither mean nor maximum years of education) on the unit value. Next, attention is devoted to the cluster fixed effects, which are statistically significant indicating that spatial variation among prefectures is important.

Table 3: First-stage regression results

VARIABLES	Unit Value (per pack, ln)		Cigarettes budget share (in %)	
Total expenditure (ln)	0.525***	(0.057)	-0.018***	(0.004)
Household size (ln)	-0.270***	(0.053)	-0.012**	(0.003)
Male ratio	-0.249**	(0.101)	0.019**	(0.007)
Adult ratio	-0.205**	(0.099)	-0.001	(0.007)
Mean education	-0.006	(0.017)	-0.002*	(0.001)
Maximum education	0.013	(0.011)	-0.001	(0.000)
Cluster dummies	F(602, 943) 4.266***		F(614, 1061) 4.218***	
Constant	-2.299***	(0.701)	0.339***	(0.051)
Observations	1543		1682	
R-squared	0.764		0.720	

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Author's calculation based on the HBS data.

Moving to the estimated coefficients from the budget share equation, it is noted that households with a higher level of expenditure spend a lower share of their budget on cigarettes. More precisely, the coefficients on total expenditure suggest that households with 10% higher expenditure spend about 0.2 percentage points less of their budget on cigarettes. Also, budget shares on cigarettes are higher among smaller households (in terms of household size), households with lower average education and households with higher shares of men. Similar to unit value regression results, the cluster fixed effect is significant, highlighting the importance of spatial variation.

Estimated values of the coefficients for logarithm of total expenditure from equations (1) and (2) are used to arrive to the estimate of the total expenditure elasticity of demand, by using the formula from the equation (12). The estimated value of total expenditure elasticity is, in line with the expectations positive and estimate at 0.239. However, this estimate should be treated with caution, as it indicates the elasticity on intensive margin, i.e. in the sample of households with positive consumption. In other words, among the households

which consume cigarettes, 10% higher total expenditure is associated with 2.39% higher the quantity of cigarettes smoked.

Second stage – cluster level estimates

Exploring further on the regional effects from the variability of unit values and budget share, the results emphasize once more the importance of taking into account the regional preferences. Finally, after following all the procedure explained in Section 2, we obtain the price elasticity of cigarette demand of -0.57. Namely, if cigarette prices would increase in Albania by 10%, the quantity demanded for cigarettes would decrease by 5.7%. Similar results were obtained by following the bootstrapping procedure. The results suggest that demand for cigarette is inelastic (ξ= -0.551; SE_{ξ} = 0.094, t = 5.861).

5. Conclusions

Following the Deaton's (1988) demand model and employing cross-sectional household survey data, this paper estimated the price elasticity for cigarette demand, which to the best of our knowledge this is the first empirical research conducted in Albania. Following a three-stage procedure, the estimated results suggest that the price elasticity is around -0.57. The price elasticity appears to be within the range of estimated elasticities in developing countries and in line with the estimates elasticities from the model using aggregate. In terms of the control variables, it seems that the total expenditure, household size, male to female ratio and adult ratio are important determinants of tobacco demand in Albania.

The results presented depend on two assumptions. Firstly, we assume that the initial consumption of cigarettes does not depend on the cigarette prices, due to which households with zero cigarettes consumption were excluded from the analysis, and the estimated price elasticity is on the intensive margin. Additionally, due to methodological reasons and low expenditure , cut tobacco is excluded from the analysis.

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