ORIGINAL INVESTIGATION

The Economics of Tobacco Use in Jordan

Nadia J. Sweis PhD[1], **Frank J. Chaloupka** PhD[2]

[1]*Department of Business Administration, Princess Sumaya University for Technology, Amman, Jordan;* [2]*Department of Economics, Institute for Health Research and Policy, Health Policy Center, University of Illinois at Chicago, Chicago, IL*

Corresponding Author: Nadia J. Sweis, PhD, Department of Business Administration, Princess Sumaya University for Technology, PO Box 1438, Al Jubaiha 11941, Amman, Jordan. Telephone: 962-7-75310030; E-mail: sweisnadia@gmail.com

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ABSTRACT

Introduction: We conducted an independent survey of tobacco use in Jordan following the methods and template of the Global Adult Tobacco Survey. Using data collected on cigarette use and cigarette prices, we estimated the price elasticity of cigarette demand in Jordan.

Methods: We used a 2-part model of cigarette demand. In the first part, we estimate the impact of prices on the decision to smoke while controlling for individual demographic and environmental characteristics. Conditional on smoking, we then estimate the effect of price on the number of cigarettes smoked.

Results: The total price elasticity of cigarette demand in Jordan was estimated to be −0.6. Smoking among women was found to be relatively unresponsive to price (elasticity of −0.01), whereas smoking among men was much more responsive to price (elasticity of −0.81).

Conclusions: The price elasticity estimates suggest that significant increases in tobacco taxes are likely to be effective in reducing smoking in Jordan, particularly smoking among men.

INTRODUCTION

More than one billion people smoke tobacco worldwide, 80% of whom live in low- to middle-income countries (World Health Organization [WHO], 2009). Therefore, the majority of tobacco-attributable deaths, which are preventable, occur in lower income countries. It has been estimated that tobacco kills up to half of all people who use it (WHO, 2010b). In 2010, 5.4 million people died due to tobacco-related diseases worldwide, and an additional 600,000 deaths were attributed to exposure to secondhand smoke (WHO, 2009). Without the adoption and implementation of effective interventions to reduce tobacco use, the WHO estimates that more than 8 million deaths in 2030 will be related to tobacco use, and 6.4 million of these deaths will occur in developing countries (WHO, 2009).

In Jordan, a developing country that has one of the smallest economies in the Middle East, an estimated 250 million Jordanian dinars or nearly 356 million in U.S. dollars are spent annually on tobacco products that are approximately 3% of the annual gross domestic product (Belbeisi, Al Nsour, Batieha, Brown, & Walke, 2009). In 2007, the U.S. Centers for Disease Control and Prevention collaborated with the Jordan Ministry of Health and Jordan University of Science and Technology and estimated that the lifetime prevalence of ever smoking 100 or more cigarettes was 7.8% among women and 61.8% among men (Belbeisi et al., 2009). Overall, this amounts to 40% of adults in Jordan having smoked at least 100 cigarettes previously. The prevalence of current smoking was reported to be 5.1% for women and 48.2% for men (Belbeisi et al., 2009).

The Global Youth Tobacco Survey was conducted in Jordan in 1999. This survey showed that 22.9% of students between 13 and 15 years of age (25% of male and 14.5% of female students) are smokers. The Global School Based Student Health Survey showed that the prevalence of smoking among youth of age 13–15 years in Jordan was rising over time, with youth prevalence rates of 18%, 19.9%, and 24.9% in 1000, 2004, and 2009, respectively.

Although tobacco use is increasingly common in Jordan, the demand for tobacco products and its determinants has not yet been modeled and the price elasticity of cigarette smoking has not been estimated. A better understanding of the factors associated with tobacco use is needed to provide the evidence base for antitobacco strategies in Jordan.

In this study, we provide the first estimate of the price elasticity of cigarette demand in Jordan using survey data on cigarette smoking and cigarette prices collected in the course of the author's doctoral dissertation.

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DATA

The Hashemite Kingdom of Jordan is a developing country with a population of 6 million and a per-capita gross national income of U.S.$4,350 (World Bank, 2010). We conducted a survey of adult tobacco use in Jordan following the sample selection methods and questionnaires developed by the Global Adult Tobacco Survey (GATS) Global Tobacco Surveillance System (GTSS, 2008) in 2011 with the help of students selected from different Jordanian universities. The total number of interviewed people of age 15 and older was around 4,000 individuals.

The GATS questionnaire used in Jordan consists of two main questionnaires: household and individual.

The household questionnaire we used in Jordan provides information about the household members who considered the selected household as their primary place of residence the night prior to the survey date. It also collects information about the number of household members 15 years of age and older eligible to be interviewed.

The core questionnaire consists of eight sections, collecting individual information about background and demographic characteristics of tobacco use.

The sample for the GATS was selected using a multistage, geographically clustered design. As shown in Table 1, the sample size was 4,090 individuals, with 42% of the sample size are females who smoke cigarettes and 58% are males. Cigarette smoking prevalence was 35.2% with an average price of cigarettes of approximately JD1.43 (approximately $2) and an average quantity of eight packs per week. The highest prevalence of cigarette smoking was among those who were at age group 24–30, students, male, and with a high school level of education completed.

Demand Analysis

We use a two-part model of cigarette demand, first estimating the impact of price and other factors on smoking participation and then estimating the impact of price and other factors on cigarette consumption among smokers.

In part 1 of the model, the outcome is a dichotomous variable equal to 1 if an individual reports smoking any number of cigarettes on a daily basis or less than daily basis, and 0 if no smoking is reported.

Table 1. Descriptive Statistics of the Collected Sample Used in the Regression Analysis

Sample size	4,090
Percentage of females who smoke cigarettes	42
Percentage of male who smoke cigarettes	58
Average price of pack of cigarettes (20 cigarettes)	JD 1.43 ($2)
Percentage of cigarette smokers	35.2
Average quantity of packs smoked per week	8
Highest prevalence of cigarette smoking was among	Students, age group 24–30, male, high school completed

In part 2 of the model, the outcome is the number of cigarettes smoked per day.

According to GATS toolkit, the total price elasticity of demand measures the percentage change in the number of cigarettes consumed, which results from a 1% increase in the price of cigarettes. The total price elasticity of demand can be derived by summing the price elasticities of demand from the first and second part of the two-part model (i.e., summing the prevalence price elasticity of demand and the conditional price elasticity of demand; WHO, 2010a).

Explanatory Variables

Price: The main economic variable of interest is price. The individual price paid per cigarette can be calculated by dividing the reported expenditure on cigarettes by the quantity of cigarettes at last purchase. These individual-level self-reported prices cannot be included in our model of cigarette demand due to endogeneity. One way to address this is to create a local or geographically based measure of individual prices (Ross & Chaloupka, 2003). We have, therefore, created an average price for each of the 12 governorates in Jordan and assigned the relevant governorate-level average price to respondents living in each governorate.

Age: Age in the model is defined through seven categorical variables: 15–18, 19–23, 24–30, 31–40, 41–50, 51–60, and 60+.

Gender: We transformed this into a dichotomous variable with 1 indicating male and 0 indicating female.

Education: Education is defined through eight categorical variables available: no formal schooling level of education, less than primary school completed, primary school completed, less than secondary school completed, secondary school completed, high school completed, college/university completed, and postgraduate education completed.

Work status: We created four categorical "work status" variables based on the four available choices in the survey, employed, student, unemployed, and not in the labor market.

Total number of individuals living in household: We created three categorical household variables based on ranges of total number of people in a household: 1–3, 4–6, and more than 6.

Total number of males >15 years old in household: We created three categorical variables here based on ranges of the number of males over the age of 15 in a household: 0–1, 2–3, and more than 3.

Rules of smoking at home: We created four dichotomous variables based on individual survey answer: smoking allowed at home, not allowed, not allowed with exceptions, and no known rules on smoking in the home.

Rules of smoking at work: We created four dichotomous variables based on individual survey answers as follows—workplace smoking allowed in some indoor areas, never allowed, and no known policy.

Wealth: The survey asks respondents about utilities and household items, such as electricity, flush toilet, a home phone, a cell phone, television, radio, refrigerator, car, motorcycle, and washing machine. A dichotomous variable was created where 0 indicated that a household does not have the particular item, and 1 indicated that the household has the item. Based on the dichotomous variables for each item, a wealth index was constructed for each individual by weighting ownership by the inverse of the percentage of population that possesses the particular asset.

Let i be asset i from the list of 10 asset categories:

$$w_i = 1/(\text{mean of asset } i \text{ indicator variable})$$

Household j's wealth index is therefore

$$\text{Wealth} = \sum_{i=1}^{10} w_i \cdot f_{ij}$$

where f_{ij} is the indicator variable for asset j that 1 if household owns that asset j and 0 otherwise.

RESULTS

From the smoking participation model as shown in Table 2, we found that the price is negatively correlated with the decision to smoke; however, the results were not statistically significant.

Wealth was negatively associated with the decision to smoke, and the results were statistically significant.

Gender had a positive correlation with the decision to smoke. Males were more likely to smoke than females. The results were statistically significant.

If the individual belongs to the age groups 15–18, then she (he) is less likely to smoke than those who are 60 and above. The results were statistically significant. For other age groups, the results were mixed and not statistically significant.

Those with less than primary schooling completed are more likely to smoke than those with a postgraduate degree. Those with primary school and less than secondary school completed are less likely to smoke than those with a postgraduate completed. The results were statistically significant. The results for other educational groups were not statistically significant.

Employed persons and students persons were more likely to smoke than those not in the labor market. The results were significant.

The other variables such as the number of individuals living at home, number of males living at home, smoking rules at home and work, marriage, and religion have mixed results; however, the results were not statistically significant.

From the conditional cigarette demand model as shown in Table 3, we found that the price is negatively correlated with the quantity smoked. The results were statistically significant.

Wealth was positively correlated with quantity smoked, and the results were statistically significant.

Gender had a positive correlation with the quantity smoked. Males tend to smoke a higher quantity than females; however, the results were statistically insignificant.

If the individual was aged 15-18 then the individual was less likely to smoke more compared to those who are 60 and above. Those in age groups 19–23, 24–30, 31–40, 41–50 or 51–60 are more likely to smoke more than those who are 60 and above. However, the p value for age group 24–30, 31–40, 41–50, and 51–60 was statistically significant.

Individuals with less than primary school completed, primary school, and less than secondary school completed are more likely to smoke more than those with postgraduate studies completed. However, the results were statistically significant.

For the other variables such as gender, marriage, religion, number of individuals living at home, the number of males living in the house, unemployed, and smoking rules at home and work, the results were statistically not significant.

The elasticity of the demand for cigarettes in Jordan was estimated to be −0.6, that is, the sum of the conditional price elasticity of −0.235 and the smoking participation elasticity of −0.365 as shown in Tables 2 and 3. The elasticity of the demand for cigarettes for females was estimated to be −0.008 and for males −0.81. Young people were more price elastic than old people. Estimated price elasticities by age groups were as follows: −1.2 (age 15–23), −1.01 (age 24–30), −1.11 (age 31–40), −0.75 (age 41–50), −0.05 (age 51–60), and -0.06 (age over 60) (Table 4).

Table 2. Model of Smoking Participation

	Smoking participation model		
	All	Males	Females
Price	−.267	−.683**	−.904***
	(.260)	(.297)	(.126)
Wealth	−.060***	.019	.002
	(.0124)	(.014)	(.001)
Gender	1.46***		
	(.092)		
Age group 15–18	−1.46	−1.717***	Omitted
	(.357)	(.395)	
Age group 19–23	−.297	.115	.237
	(.290)	(.328)	(.429)
Age group 24–30	−.318	.085	.152
	(.275)	(.308)	(.382)
Age group 31–40	.313	.284	.149
	(.277)	(.311)	(.441)
Age group 41–50	.081	.405	.306
	(.277)	(.315)	(.389)
Age group 51–60	.449	.192	−.614
	(.284)	(.321)	(.396)

(Continued)

Table 2. Continued

	Smoking participation model		
	All	Males	Females
No formal schooling level of education	.542*	−.338	−.402
	(.306)	(.345)	(.335)
Less than primary school completed	1.82***	1.804**	.311
	(.377)	(.809)	(.274)
Primary school completed	−.866***	−.615*	.311
	(.284)	(.320)	(.274)
Less than secondary school completed	−.579***	−.264	Omitted
	(.202)	(.237)	
Secondary school completed	.181	.429**	Omitted
	(.180)	(.215)	
High school completed	.042	.153	Omitted
	(.149)	(.163)	
College/university completed	.172	−.248*	−.059
	(131)	(.142)	(.130)
Number of individuals at home from 1 to 3	.021	−.114	.051
	(.108)	(.129)	(.105)
Number of individuals at home from 4 to 6	.113	−.010	−.075
	(.104)	(.126)	(.094)
Number of males at home from 0 to 1	−.025	−.122	.247
	(.166)	(.180)	(.232)
Number of males at home from 2 to 3	.378**	.287	.294
	(.169)	(.181)	(.24)
Religion (Muslim)	−.018	−.058	.132
	(.162)	(.182)	(.205)
Married	.054	.032	.027
	(.078)	(.090)	(.086)
Employed	1.34***	1.061***	.985***
	(.276)	(.267)	(.295)
Student	1.47***	1.622***	1.28***
	(.296)	(.300)	(.312)
Unemployed	−.081	.558*	−1.24***
	(.289)	(.311)	(.312)
Smoking allowed at home	−.130	−.07	−.008
	(.103)	(.119)	(.119)
Smoking not allowed at home	−.031	.041	.058
	(.116)	(.135)	(.134)
Smoking not allowed with exceptions at home	.043	.096	.180
	(.146)	(.172)	(.168)
Smoking allowed anywhere at work	.133	.158	.062
	(.116)	(.135)	(.123)
Smoking allowed only in some areas at work	.053	.141	.068
	(.103)	(.122)	(.113)
There is no policy for smoking at work	−.141	−.156	−0/061
	(.256)	(.305)	(0.278)
Constant	−1.71***	−.221	.333
	(.631)	(.669)	(.513)
N	4,090	2,370	1,720
Price elasticity	−.365	−.465	.255

Note. Standard errors in parentheses.
*$p < .10$, **$p < .05$, ***$p < .01$.

When estimating price elasticity according to wealth index, we divided individuals into four groups, and the price elasticity was as follows:

Lowest quintile (−0.73), first quintile (−0.75), second quintile (−0.85), and highest quintile (−1.7) as shown in Table 4.

We used the two-part model (the conditional and participation models) to estimate the price elasticity of different age groups and wealth quintiles. Each age group and each wealth quintiles were regressed separately against the quantity smoked and smoking participation variable.

Table 3. Model of Conditional Cigarette Demand

	Conditional cigarette demand model		
	All	Males	Females
Price	−.164***	−.237***	−.179*
	(.074)	(.082)	(.179)
Wealth	.012***	.001	−.001
	(.003)	(.004)	(.008)
Gender	.020		
	(.032)		
Age group 15–18	−.127	−.221*	Omitted
	(.165)	(.119)	
Age group 19–23	.100	−.047	.371
	(.082)	(.102)	(.371)
Age group 24–30	.211***	.017	.907***
	(.081)	(.096)	(.177)
Age group 31–40	.169**	−.047	1.082***
	(.073)	(.096)	(.179)
Age group 41–50	.174**	.026	.958***
	(.075)	(.097)	(.189)
Age group 51–60	.307***	.162	.737***
	(.084)	(.100)	(.153)
No formal schooling level of education	.252**	.100	1.358***
	(.099)	(.108)	(.186)
Less than primary school completed	.134**	−.07	1.184***
	(.064)	(.138)	(.189)
Primary school completed	.336***	.24	.053***
	(.101)	(.100)	(.053)
Less than secondary school completed	.452***	.397***	Omitted
	(.081)	(.072)	
Secondary school completed	.070	.023	Omitted
	(.057)	(.057)	
High school completed	.043	.014	Omitted
	(.046)	(.046)	
College/university completed	.103***	.110***	.272**
	(.035)	(.040)	(.107)
Number of individuals at home from 1 to 3	−.044	−.038	.023
	(.031)	(.035)	(.077)
Number of individuals at home from 4 to 6	−.247	−.008	−.038
	(.028)	(.034)	(.073)
Number of males at home from 0 to 1	−.082*	−.099**	−.222
	(.045)	(.051)	(.210)
Number of males at home from 2 to 3	−.090**	−.130***	−.291
	(.041)	(.050)	(.217)
Religion (Muslim)	.015	−.026	.147
	(.037)	(.049)	(.103)
Married	.003	.015	−.01
	(.021)	(.025)	(.048)
Employed	−.173***	−.185*	−.130
	(.065)	(.089)	(.089)
Student	−.294***	−.362***	.604***
	(.071)	(.097)	(.130)
Unemployed	−.125*	−.047	−.18
	(.077)	(.104)	(.119)
Smoking allowed at home	.013	.010	.017
	(.026)	(.032)	(.062)
Smoking not allowed at home	−.006	−.007	.008
	(.033)	(.036)	(.071)
Smoking not allowed with exceptions at home	−.012	−.009	−.032
	(.039)	(.046)	(.088)

(Continued)

Table 3. Continued

	Conditional cigarette demand model		
	All	Males	Females
Smoking allowed anywhere at work	.005	.040	−.081
	(.029)	(.036)	(.069)
Smoking allowed only in some areas at work	.028	.019	.078
	(.033)	(.033)	(.067)
There is no policy for smoking at work	.002***	.029	−.069
	(.066)	(.086)	(.155)
Constant	.462***	.867***	−.696
	(.154)	(.183)	(.380)
N	1,718	995	723
Price elasticity	−.235	−.345	−.263

Note. Standard errors in parentheses.
*$p < .10$, **$p < .05$, ***$p < .01$.

Table 4. Price Coefficients, Sample Sizes, and Elasticity Estimates for the Subsamples Defined by Age and by Wealth

	Conditional cigarette demand model			Smoking participation model		
	Price coefficient	Sample size	Price elasticity	Price coefficient	Sample size	Price elasticity
Age group 15–23	−.323**	242	−.28	−.99**	576	−.92
	(.185)			(.528)		
Age group 24–30	.079**	150	.11	−1.283**	357	−1.118
	(.170)			(.581)		
Age group 31–40	.502**	170	.07	−1.36***	405	−1.115
	(.239)			(.313)		
Age group 41–50	−.030	284	−.052	−.783***	676	−.70
	(.060)			(.225)		
Age group 51–60	.0136	562	.019	−.0071	1,338	−.068
	(.0476)			(.177)		
Age group 60+	−.059	310	−.007	−1.63***	738	−.052
	(.342)			(.505)		
Lowest wealth quintile	−.045	392	−.065	−0.62	933	−.665
	(.072)			(.321)		
First wealth quintile	−.051	401	−.074	−.731	955	−.676
	(.259)			(.210)		
Second wealth quintile	−.247*	495	−.37	−.701	1,179	−.48
	(.082)			(.211)		
Highest wealth quintile	−.325	430	−.471	−1.323	1,023	−1.229
	(.178)			(.532)		

Note. Standard errors in parentheses. Total price elasticity is the sum of the conditional and the participation model elasticities.
*$p < .10$, **$p < .05$, ***$p < .01$.

DISCUSSION AND CONCLUSIONS

Jordan has high rates of tobacco smoking. We find that with 42.2% of adults of age 15 and older are smoking tobacco, and that Jordan has one of the highest male smoking prevalence rates in the world and among the highest female smoking rates in the region. As a comparison, the overall tobacco smoking rates in Egypt in 2009 is 19.4%, 37.7% men and 0.5% women (WHO, 2009). The high rate of tobacco smoking in Jordan is likely to have considerable negative health and economic consequences. To reduce these costs, the Jordanian government can adopt strong tobacco control policies. Based on the results from our analysis of cigarettes demand in Jordan, increasing cigarette prices by significantly increasing cigarette taxes would be effective in reducing cigarette consumption and cigarette consumption among continuing smokers. Our estimates of the price elasticity of cigarette demand in Jordan indicate that a 10% increase in price would reduce smoking prevalence in Jordan by 3.7% while reducing overall cigarette consumption by 6%.

Our estimates show that younger people appear to be more price responsive and that is consistent with the economic

theory. Younger smokers generally earn lower wages and are less dependent on tobacco, both of which would tend to make them more price sensitive.

There are several limitations in this analysis. We were not able to study the differences between urban and rural regions. We were not able to estimate the impact of income on cigarette demand given that the GATS does not include questions on income. The use of the traditional pen-and-paper data collection procedure might have resulted in a bias. The sample is a single cross-section, so the estimates reflect associations between price and other covariates and cigarette smoking.

Despite these limitations, our survey of smoking in Jordan provides important insight about tobacco use in Jordan and allows us to produce the first estimate of the price elasticity of cigarette demand for the country. The survey data clearly show that tobacco use is a significant concern in Jordan, whereas the price elasticity estimates show that significant increases in taxes that raise cigarette prices would be effective in reducing cigarette smoking and its consequences.

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DECLARATION OF INTERESTS

None declared.

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