

Mauritius Institute of Health

Self-reported price of cigarettes, consumption and compensatory behaviours in a cohort of Mauritian smokers before and after a tax increase

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DECLARATION OF INTERESTS

None to declare.

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SUMMARY

Objective:

To assess the impact of the 25% excise tax increase in 2010 on cigarette price, consumption and behaviour of Mauritian smokers.

Methods:

Data were analysed from three waves of the International Tobacco Control Policy Evaluation Project Survey in Mauritius (the ITC Mauritius Survey) conducted on a nationally representative cohort sample of 600 adult smokers. Wave 1 (April-May 2009) and Wave 2 (August-November 2010) were conducted before the 2010 tax increase was implemented; Wave 3 (June-July 2011) was conducted after the tax increase. At Wave 2 and Wave 3, those cohort members who were lost to attrition were replaced by recruiting new smokers sampled from the same sampling frame. The actual number lost to attrition at each wave was very low (7.3% at Wave 2 and 3.8% at Wave 3). The analyses presented here are from 534 cohort smokers who participated at all three waves.

Key findings:

Cigarette prices

- (i) The tax increase resulted in an upward adjustment of cigarette prices by 17.8%. The mean price per cigarette increased by 16.7%, from MUR4.14 to MUR4.83, for cigarettes purchased in a pack. The reported mean price of the most popular brand (Matinée) increased from MUR4.26 to MUR4.97, i.e. by 71 cents per cigarette for a pack purchase. For a single purchase the mean price rose by 20.2%, from MUR5.64 to MUR6.78. One third of smokers still reported buying single cigarettes at their last purchase in 2010 and 2011, i.e. even after implementation of the ban on sale of single cigarettes in 2009.
- (ii) Following the ban on sale of single cigarettes and of packs containing less than 20 cigarettes in June 2009 the mean price per cigarette paid by Mauritian smokers fell from MUR4.80 to MUR4.60. Thus although the increased taxation in 2010 resulted in a price rise of 17.8%, the increase was only 12.7% on the price prevailing in 2009 without adjusting for cumulative inflation rate over this period (i.e., about 7%).
- (iii) No significant differences were noted in the perceptions of affordability of cigarettes among smokers. For example, the percentage of smokers who reported spending too much on cigarettes and of those thinking about cost of smoking did not change after the tax increase (70.8% vs. 70.4% and 73.2% vs. 73.1% respectively). On the other hand, the proportion of smokers who said that money spent on cigarette resulted in not having enough money for household essentials declined from 17.5% to 10.6% after the tax increase.

Cigarette consumption including quitting

- (iv) After the tax increase, daily cigarette consumption went down from 9.6 to 9.1 sticks per day i.e. a decline of 5.2% (significant at $\alpha=0.10$ level). When former smokers (i.e. those having quit smoking) were included in the analysis, the mean cigarette consumption per day decreased significantly from 8.6 to 7.9. Reductions in consumption were more likely among lighter smokers, those who were aged 55+ and those who were unemployed. On the other hand, smokers who were aged between 25 and 39, separated or widowed, and those with university or higher education increased their consumptions.
- (v) A total of 28 baseline (pre-tax increase) smokers, i.e. 5.3% of the sample reported having quit smoking at follow-up (post-tax increase). Smokers in the age group 40-54 (versus the 55+ age group) and smokers with higher income had a greater likelihood of quitting.
- (vi) No significant changes were observed in other characteristics of quitting behaviour after the upward revision of the tax rate. For example, the percentage of smokers making serious quit attempts at the previous year was 38.6% before the tax increase and 41% after the tax rise and of those having plans to quit within the next 6 months increased slightly from 23.8% to 26.9%.

Brand switching and other compensatory behaviours

- (vii) After the tax increase no significant trend was noted in brand switching, i.e. the vast majority of smokers (97.8%) did not offset price increases by switching from higher-priced brands to lower-priced brands.
- (viii) No other price minimization strategies such as purchase of cigarettes from low or untaxed sources were observed among smokers in response to increased cigarette prices.

Conclusions:

The 2010 increase in cigarette taxes and prices significantly reduced consumption of cigarettes through lower smoking intensity in continuing smokers. However, the results also indicate an absence of price minimization strategies among smokers in response to increased cigarette prices and that cigarettes are still affordable to Mauritian smokers. Raising cigarette taxes will not have the desired effect on smokers' consumption and their smoking behavior if necessary adjustments are not made in such a way to prevent cigarettes from becoming more affordable over time (taking into account inflation rates and income growth). More significant increases in tobacco taxes are required in the short and medium terms so as to gradually increase the excise tax component in the retail price from the present 55% level to the WHO recommended level of 70%. For tobacco taxes to be more effective, it is also important to further reduce opportunities for tax avoidance and evasion. Last but not the least, stronger enforcement of the ban on the sale of single cigarettes is needed.

1. INTRODUCTION

Increasing tobacco taxes and prices is identified worldwide as the most cost-effective intervention of tobacco control and a critical component of a comprehensive tobacco control strategy (IARC 2011). Article 6 of the WHO Framework Convention on Tobacco Control (FCTC) obligates countries that have ratified the treaty to use tax and price policies to reduce tobacco consumption. Higher tobacco taxes besides providing significant revenue to the government are effective for promoting cessation, preventing initiation and reducing consumption thereby improving public health.

As a Party to the FCTC, the Mauritian government took significant steps in tobacco control through the passing of the Public Health (Restrictions on Tobacco Products) Regulations in 2008 to address the high smoking prevalence rate (one of the highest in Africa at 21.7% overall, 40.3% for males and 3.7% for females). With the elimination of all forms of tobacco advertising, promotion, and sponsorship, introduction of very large pictorial warnings (occupying 65% of the pack's area), and a comprehensive smoking ban in public places, Mauritius has emerged as one of the leaders in tobacco control in Africa.

Taxation strategy has a preliminary foothold in tobacco control as price and tax measures were included in the National Action Plan on Tobacco Control (2008-2012) to prevent tobacco use among young people and adults (IARC, 2011). The Mauritius Revenue Authority (MRA), a branch of the Ministry of Finance, administers taxes on tobacco products. Table 1 gives the structure of taxes of cigarettes in Mauritius from 2007 onwards.

Table 1: Structure of taxes on cigarettes in Mauritius

Year	Excise Duty (MUR per 1000 sticks)	Custom Duty (Ad Valorem)	VAT	Remarks
2007-2008	2,370	30%	15%	Category A
	1,770	30%	15%	Category B
	2,010	30%	15%	Category C
	2,130	30%	15%	Category D
1 st July 2008 – 19 th Nov 2010	2,200	Nil	15%	Only one category
20 th Nov 2010 – 4 th Nov 2011	2,750	Nil	15%	Only one category
5 th Nov 2011 – 9 th Nov 2012	3,160	Nil	15%	Only one category
10 th Nov 2012 – Dec 2012	3,540	Nil	15%	Only one category

Source: Mauritius Revenue Authority

Prior to the closure of the British American Tobacco manufacturing plant in 2008, a combination of *ad valorem* and specific excise taxes was levied on all locally produced cigarettes. Imported cigarettes had custom and excise duties as well as a *value added tax* (VAT) imposed on them. After domestic tobacco manufacturing stopped in 2008, only imported cigarettes have been sold domestically.

In July 2008, a specific excise tax of Mauritian Rupees (MUR) 2,200 was imposed per thousand sticks of cigarettes and a VAT of 15% of the total of above mentioned tax plus the base cost of cigarettes applied prior to sale. There was no change in the excise tax rate until November 2010 when it was revised to MUR 2,750, i.e. an increase of 25%. Since then, Mauritius has been

moving in the direction of higher tobacco taxes with two successive annual increases; the custom excise duty increased by 15% to MUR 3,160 in November 2011 followed by a second increase of 12% to MUR 3,540 in November 2012. The VAT has remained at 15% of the price to the consumer. The percentage share of total taxes on the average retail price of a pack of cigarettes (20 cigarettes per pack) sold in Mauritius during the year 2011 ranged between 55% and 87% compared to 50% and 84% in 2010. As of December 2010, 72% of the retail price of the most sold brand of cigarettes in Mauritius (Matinée) consisted of taxes. *(It is to be noted that with the abolition of the ad valorem component in 2008, the percentage share of taxes on the average retail price did not change significantly: 67.3% in 2007 compared to 68.2% in 2008).*

With the increase in taxes, the following questions emerge:

- What has been the impact of the cigarette tax increases on Mauritian smokers?
- What has been the magnitude of the increase in retail prices of different brands of cigarettes?
- Have higher retail prices made cigarettes less affordable, reduced consumption and encouraged quitting behaviour?
- Are specific subpopulations particularly young adults, low-income and low-education smokers more responsive to increased cigarette prices?
- Do smokers adopt price minimization strategies, for example, switching from higher priced cigarettes to lower priced ones and/or do they adopt other compensatory behaviours (like avoiding/evading taxes) that offset price increases?
- What is the ‘right’ level of tobacco taxation in Mauritius?
- Should the taxation policy also take into account people’s income and the overall affordability so that it will lead to sufficient impact on tobacco consumption?

At present, there is very limited information on these important issues concerning taxation policy in Mauritius, particularly regarding the impact of tax increases on cigarette prices and the resulting variation on behavior of the smokers among low- and middle-income countries (LMICs) like Mauritius. In the absence of sufficient evidence, tobacco control advocates in Mauritius have needed to rely on extrapolations from the evidence available from other countries, mostly high-income countries (HICs). The Ministry of Finance officials and other policy makers cannot be convinced by favorable policies or strategies for the long term fiscal and health needs of the country on the grounds of divergence in socio-cultural, demographic and economic attributes between HICs and LMICs. It may be the case, for example, that solutions based on the experience of HICs may lead to recommendations that would be unrealistic or difficult to implement in the LMICs. There is, thus, an urgent need to generate a strong and credible country-specific evidence base on the strength of tobacco taxation as a tobacco control measure with respect to reduction in tobacco consumption and revenue generation, and on how the tax affects different socio-economic groups.

The major obstacle to the generation of an evidence base on the effectiveness of taxation and price policies in countries like Mauritius is the non-availability of appropriate data. Some LMICs have used time series data in the absence of cross-sectional data to study the

effectiveness of tax and price policies in reducing tobacco consumption (van Walbeek et al, 2012, Hu & Mao, 2002). However, individual or household- level data are necessary to obtain sub-population level estimates of prevalence, consumption, and price responsiveness to tobacco, and to establish the causal relationship between tobacco use and socio-cultural, demographic, economic, and policy variables. The International Tobacco Control Policy Evaluation (ITC) Project longitudinal surveys currently conducted in 22 countries (including Mauritius) to measure the behavioural and psychosocial effects of tobacco control policies implemented under the WHO Framework Convention on Tobacco Control (FCTC) offer a unique opportunity to fill this gap.

The ITC Mauritius Project started in 2009 to evaluate the impact of the newly implemented tobacco control legislation. Three annual waves of a cohort survey of a nationally representative sample of smokers have been conducted between 2009 and 2011. The 25% increase in custom excise rate in Mauritius occurred in November 2010, that is between Wave 2 and Wave 3 of the ITC Mauritius Survey, which therefore offers the opportunity to examine the data in a cohort sample of adult Mauritian smokers before and after the large excise tax increase in order to assess the effects of tobacco taxation on individual perceptions and behaviour.

2. OBJECTIVE

The objective of the study is to assess the impact of 25% excise tax increase in 2010 on cigarette price, consumption, and behaviour of Mauritian smokers.

3. METHODS

3.1 Sample and Design

Data for this study come from the ITC Mauritius Survey Waves 1 to 3, which is a longitudinal survey of 600 adult Mauritian smokers (aged 18 years or older) randomly selected using a stratified multistage sampling design. Smokers were defined as those who reported having smoked more than 100 cigarettes in their lifetime, and had smoked at least once a month. Data were collected by structured questionnaire through face-to-face interviews. Waves 1 and 2 were conducted in April-May 2009 and August-September 2010 respectively, i.e. before the tax increase when excise duty was MUR 2,200 per thousand cigarettes. Wave 3 was conducted in June-July 2011, i.e. six months after excise duty increased by 25% to MUR 2,750 per thousand cigarettes. The retention rates for smokers were 92.7% at Wave 2 and 96.2% at Wave 3. To compensate for respondents lost to attrition, new respondents were randomly selected at Waves 2 and 3 using the same sampling design as in Wave 1. Only longitudinal smokers (N=534) are included in the analyses of the taxation effect, but it should be noted that because attrition rate is low, any biases that might be present due to attrition, would be much lower than in other longitudinal studies in which attrition rates can be 20-30% at each wave. Below, we present analyses of the impact of attrition, and find that differences between those who were lost to attrition and those who were successfully resurveyed were not significant on many key measures.

Two primary analytic samples of this study consisted of smokers who participated at Wave 1 and successfully followed up at Wave 2 and the smokers who participated in both Wave 2 and Wave 3. Smokers who reported having made quit attempts since the previous wave and were still not smoking at time of follow-up survey were classified as having quit smoking.

3.2 Variables

The smoking-related cognitions and behavior assessed were:

- Smoking status (daily/non-daily/quitter)
- Cigarette consumption (daily/weekly for non-daily smokers, from which, two other variables were derived :
 - (i) “Consumption per day”
 - (ii) “Smoking type” (heavy/light using median daily consumption)
- Brand choice
Brands were further grouped into three categories based on reported prices at Wave 3: low (<MUR4.00 per stick), medium (between MUR4.00 & 5.00) and high (>MUR5.00)
- Place of last purchase
- Form of last purchase (single/pack/carton)
- Brand of last purchase
- Quantity of last purchase
- Price paid at last purchase
- Price per cigarette
For purchase by carton and pack, unit price was derived from the unit price per carton or per pack
- Time passed since the end of the respondent’s last serious quit attempt
From the above, the variable “whether the respondent made any serious attempt to quit in the previous year” was derived
- Intention to quit
The four response options were recoded to “plan to quit within the next month/next 6 months” or “beyond 6 months/no plan to quit” so as to reflect intention to quit in the next 6 months
- Whether price motivates thoughts and actions toward quitting
- Whether spending on cigarette is regarded as too much
- Whether money spent on tobacco resulted in not having enough money for household essentials
- Whether the respondent made special efforts to buy cheaper products than those available in local stores
- Whether price is an important factor in brand selection
- Whether the respondent had thought about cost of smoking
- Whether rising costs of essentials gave thought on quitting

The ITC Survey also contains socio-demographic information including age, sex, marital status, education, employment status, and household income.

3.3 Statistical Analyses

All analyses were conducted using SAS 9.2.

The data before and after excise tax increase were first analysed using descriptive statistics (frequency, percentage, means and standard deviation). Unweighted two sample t-tests and chi-square tests were conducted to compare demographic characteristics and smoking behavior of respondents who were successfully followed up after tax increase (i.e. at Wave 3)

and the respondents who dropped out. Since the retention rate was very high at Wave 3, no tests were done to compare the differences between the baseline sample and the sub sample that was followed.

Simple logistic procedures were used to test the differences before and after tax increase, namely between Wave 2 and Wave 3 on consumption, prices, heaviness of smoking index (HSI), smoking status, form of last purchase, quit attempt, plan to quit and smoker type, adjusting for survey design and the sampling longitudinal weights. Multiple logistic regression analysis was also conducted to examine whether socio-demographic and smoking related characteristics are factors associated with quitting behaviour at follow-up wave. In order to investigate whether there is a systematic trend of changes between waves, same procedures were used to test the differences between Wave 1 and Wave 2 smokers.

The Survey Frequency procedures in SAS were used with the survey design and survey weights to investigate brand switching between Waves 1 and 2, and between Waves 2 and 3.

Our analysis focuses on two important measures: the reported purchase price and the daily cigarette consumption before and after tax increase. The Surveyreg procedures in SAS were used to test if the mean prices and mean consumptions were significantly different for Wave 2 and Wave 3 smokers, adjusting for the survey design and the Wave 2 to Wave 3 longitudinal weights. Mean prices were further investigated in the Surveyreg model with purchase form and the last purchased brands as the explanatory variables to see if price changes were different across different brands or by form of purchase between Waves. Mean consumptions were also further investigated in the model by socio-demographics and by smoking behaviours controlling for survey waves.

3.4 Ethics approval

The survey and research protocol was reviewed and given ethical clearance by the Office of Research Ethics, University of Waterloo and the Mauritius National Ethics Committee.

4. RESULTS

4.1 Characteristics of smokers

A total of 598 smokers participated in Wave 1 Survey in 2009. Of these, 555 completed Wave 2 in 2010. The Wave 2 sample including replenishment consisted of 601 smokers out of which 578 were followed up at Wave 3 in 2011. A total of 534 smokers completed all the three waves.

Table 2 below presents the socio-demographic characteristics and smoking behaviour of the Wave 1 sample, the entire baseline sample in Wave 2 as well as the smokers who were followed up in Wave 3 and those lost to follow-up.

Out of the 598 smokers enrolled at Wave 1, 94.0% were men and 6.0% women. The mean age at recruitment was 44 years. The vast majority (94.8%) were daily smokers smoking an average of between 9 and 10 cigarettes daily. No statistically significant differences were found in both demographic characteristics and smoking related variables between Wave 2 to 3 continuers (followed-up sample) and the respondents who dropped out at Wave 3.

Table 2: Demographic characteristics of baseline samples in Waves 1 and 2, and comparisons between participants followed up and lost to follow-up at Wave 3.

	All Participants in Wave 1 (n=598)		All Participants in Wave 2 (n=601)		Participants followed to Wave 3 (n=578)		Participants dropped out in Wave 3 (n=23)		Test of difference follow-up v/s drop-out
	n	%	n	%	n	%	n	%	p - value
Gender									
Male	562	94.0%	568	94.5%	546	94.5%	22	95.7%	0.806
Female	36	6.0%	33	5.5%	32	5.5%	1	4.3%	
Age Group									
18-24	47	7.9%	50	8.3%	49	8.5%	1	4.3%	0.197
25-39	184	30.8%	183	30.4%	175	30.3%	8	34.8%	
40-54	227	38.0%	227	37.8%	222	38.4%	5	21.7%	
55+	140	23.4%	141	23.5%	132	22.8%	9	39.1%	
Marital Status									
Married	451	75.4%	465	77.4%	447	77.3%	18	78.3%	0.970
Separated/Widowed	36	6.0%	33	5.5%	32	5.5%	1	4.3%	
Single	111	18.6%	103	17.1%	99	17.1%	4	17.4%	
Education									
No Education	146	24.4%	171	28.5%	165	28.5%	6	26.1%	0.286
Primary	287	48.0%	270	44.9%	263	45.5%	7	30.4%	
Secondary	130	21.7%	124	20.6%	116	20.1%	8	34.8%	
University or higher	35	5.9%	36	6.0%	34	5.9%	2	8.7%	
Employment									
Employed	506	84.6%	503	83.7%	486	84.1%	17	73.9%	0.195
Unemployed/Inactive	92	15.4%	98	16.3%	92	15.9%	6	26.1%	
Income									
Low (<MUR 10,000)	274	45.8%	233	38.8%	228	39.4%	5	21.7%	0.352
Moderate(MUR 10,000-25,000)	257	43.0%	295	49.1%	281	48.6%	14	60.9%	
High(≥MUR 25,000)	58	9.7%	70	11.6%	66	11.4%	4	17.4%	
Not reported	9	1.5%	3	0.5%	3	0.5%			
Smoking Status									
Daily	543	90.8%	514	85.5%	493	85.3%	21	91.3%	0.719
Non-daily	55	9.2%	39	6.5%	38	6.6%	1	4.3%	
Having quit smoking	-	-	48	8.0%	47	8.1%	1	4.3%	
Ave No of Cigarettes Per Day	598	9.1	553	9.4	531	9.5	22	8.1	0.531
Form of Last Cigarette Purchase									
Carton	7	1.2%	4	0.7%	3	0.6%	1	4.5%	0.091
Pack	477	79.8%	386	64.1%	377	65.3%	14	60.9%	
Single, Loose	167	28.0%	161	29.2%	154	29.1%	7	31.8%	
Self-reported Price (MUR)	592	4.80	549	4.60	527	4.60*	22	4.60*	0.998
Serious Quit Attempt in Last Year									
Yes	227	38.2%	232	38.6%	227	39.3%	5	21.7%	0.090
No	368	61.8%	369	61.4%	351	60.7%	18	78.3%	
Plan to Quit									
Within next 6M	135	23.6%	124	23.8%	118	23.7%	6	27.3%	0.699
Beyond 6M/not planning to quit	438	76.4%	396	76.2%	380	76.3%	16	72.7%	

* Mean Price reported at W2

4.2 Effect of excise tax increase on cigarette prices

Table 3 shows the mean prices per cigarette at Waves 2 and 3, by form of purchase and by brand based on reported prices by individual smokers for their last purchase. The mean price per cigarette was not estimated for those who bought cartons of cigarettes because of the very small number of such buyers. All the mean prices at Wave 3 i.e. after the excise tax increase of 25% were significantly higher than those at Wave 2. Smokers overall paid a mean of MUR5.42 for purchase of one cigarette stick at Wave 3 compared to MUR4.60 at Wave 2, i.e. an overall increase of MUR0.82 per cigarette which represents an increase of 17.8% over the pre-tax price ($p < 0.001$). It is found that for pack purchase the unit price went up by 16.7% compared to 20.2% for loose purchase. In fact the mean price per cigarette rose from MUR4.14 to MUR4.83 i.e. MUR0.69 more when purchased in pack whereas the unit price for single cigarette purchase increased by MUR1.14 from MUR5.64 to MUR6.78. Furthermore, the difference between the mean prices of single and pack purchases which was MUR1.50 prior to tax increase went up to MUR1.95 after tax increase (i.e. an increase of 30%).

In Mauritius different brands of cigarette are sold in the local market at varying prices. The tax increase resulted in significant rise in prices of all cigarette brands. The upward price adjustments ranged between 65 cents and 71 cents per cigarette for pack purchases of the most popular brands. Thus the price of the medium-priced *Matinée* brand which is the preferred brand for more than 55% of the smokers increased by 71 cents whereas the price of the high-priced *Benson & Hedges* brand rose by 70 cents. A similar increase (14.2%) is reported in the purchase prices of the low-priced brands (*Viceroy*, *Matelot*, *Savera* and *Paradis*). These figures indicate that the excise tax increase of 55 cents per cigarette stick was passed on to consumers of all cigarette brands without any significant degree of overshifting or undershifting of the tax.

A decrease of 4.2% in the overall mean price per cigarette is noted between Wave 1 and Wave 2, i.e. after the implementation, in June 2009, of phase two of the Public Health (Restrictions on Tobacco Products) Regulations 2008 which concerned measures relating to packaging and labelling of tobacco products banning the sale of single cigarettes and of packs containing less than 20 cigarettes (effectively banning the sale of packs containing only 10 cigarettes). These measures led to a fall in mean price from MUR4.80 at Wave 1 to MUR4.60 at Wave 2. This decline in the mean price per cigarette is explained by the fact that the unit price of cigarette is much lower when cigarettes were purchased in a pack of 20 compared to a pack of 10. For example, for the most popular brand (*Matinée*), smokers at Wave 1 were paying MUR85 for a pack of 20 whereas a pack of 10 used to cost them MUR50. Thus although the increased taxation in 2010 resulted in a price rise of 17.8%, the increase is only 12.7% on the price prevailing in 2009 (which was then MUR4.80) without adjusting for inflation (the cumulative inflation rate between Wave 1 and Wave 3 is about 7%).

Table 3: Mean Prices by wave, by form of purchase and by brands[§] most sold

Wave	Wave 2		Wave 3		% change	Mean Price Difference (95% C.I.)	p - Value
	n	Mean Price/ Cig (MUR)	n	Mean Price/ Cig (MUR)			
Overall Wave	527	4.60	508	5.42	17.8	0.82 (0.64, 1.00)	< 0.001
By Form of Purchase^δ							
All brands Pack	370	4.14	340	4.83	16.7	0.69 (0.63, 0.74)	< 0.001
Single	154	5.64	162	6.78	20.2	1.14 (0.67, 1.61)	< 0.001
For Matinée Brand only							
Pack	201	4.26	193	4.97	16.7	0.71 (0.66, 0.76)	< 0.001
Single	92	5.90	95	7.09	20.2	1.19 (0.64, 1.74)	< 0.001
By Most Purchased Brands^ψ							
Benson & Hedges	22	5.05	15	5.75	13.9	0.70 (0.57, 0.82)	< 0.001
Matinée	201	4.26	193	4.97	16.7	0.71 (0.66, 0.76)	< 0.001
Pall Mall	91	3.82	86	4.47	17.0	0.65 (0.53, 0.77)	< 0.001
By Brand Group^ψ							
Low	31	3.39	23	3.88	14.2	0.48 (0.23, 0.74)	< 0.001
Medium	304	4.13	288	4.82	16.7	0.69 (0.64, 0.75)	< 0.001
High	33	5.02	27	5.75	14.5	0.73 (0.63, 0.84)	< 0.001

[§] There is one outlier of price in Wave 3 and it is omitted from the regression.

^δ Price per cigarette was not estimated for the very small number of smokers who bought cartons.

^ψ For pack buyers only.

4.3 Impact of increased tax on cigarette consumption

To study the impact of the excise tax increase on cigarette consumption, self-reported quantity of cigarettes smoked by current smokers before and after the tax increase was analysed. It is noted that increases in cigarette taxes led to a reduction of 5.2% in cigarette consumption: the daily mean consumption which was 9.6 sticks per day at Wave 2 went down to 9.1 at Wave 3 ($p=0.073$) (see Table 4).

Significance tests used to assess differences in consumption, however, showed significant reductions in consumption among smokers aged 55+ (from 10.06 to 8.94, $p=0.045$), smokers with secondary level education (from 9.83 to 8.35 cigarettes per day, $p=0.032$), among unemployed smokers (from 8.54 to 6.92, $p=0.019$) and among light smokers i.e. those smoking less than the median of 8 cigarettes/day (from 4.35 to 4.00, $p=0.020$). On the other hand, smokers who were aged between 25 and 39, separated or widowed, and those with university or higher education increased their consumption. However, only in the latter group the increase was significant (from 7.67 to 10.12, $p=0.007$).

Table 4: Average Cigarette Consumption per Day (CPD) at Wave 2 (before tax increase) and Wave 3 (after tax increase), by demographic characteristics and smoking related variables

	Wave 2		Wave 3		% Change	Mean CPD Diff (95% C.I.)	p - Value
	n	Mean CPD	n	Mean CPD			
Total	531	9.58	511	9.07	-5.3	-0.51 (-1.07, 0.05)	0.073
By Age Group							
18 - 24	46	7.05	46	6.18	-12.3	-0.87 (-1.90, 0.16)	0.094
25 - 39	167	9.36	165	9.76	+4.3	0.40 (-0.54, 1.33)	0.397
40 - 54	205	10.19	193	9.33	-8.4	-0.86 (-1.90, 0.18)	0.102
55 +	113	10.06	107	8.94	-11.1	-1.12 (-2.23,-0.02)	0.045 *
By Gender							
Female	28	7.59	26	7.67	+1.1	0.08 (-1.01, 1.17)	0.879
Male	503	9.73	485	9.18	-5.7	-0.55 (-1.14, 0.04)	0.065
By Marital Status							
Married	414	10.04	388	9.43	-6.0	-0.60 (-1.32, 0.11)	0.095
Separated/Widowed	27	7.63	33	9.67	+26.7	2.04 (-0.32, 4.39)	0.089
Single	90	8.41	90	7.51	-10.9	0.89 (-1.83, 0.04)	0.061
By Education							
No Education	149	10.04	136	9.04	-10.0	-1.00 (-2.12, 0.13)	0.082
Primary Level	245	9.44	231	9.26	-1.9	-0.18 (-1.10, 0.74)	0.697
Secondary Level	108	9.83	115	8.35	-15.1	-1.48 (-2.82,-0.13)	0.032 *
University Level or Higher	29	7.67	29	10.12	+31.9	2.45 (0.69, 4.22)	0.007 *
By Employment							
Employed	456	9.77	435	9.48	-3.0	-0.29 (-0.94, 0.36)	0.374
Unemployed/Inactive	75	8.54	75	6.92	-19.0	-1.62 (-2.97, 0.28)	0.019 *
By Income							
Low Income	210	9.18	175	8.66	-5.8	-0.53 (-1.79, 0.73)	0.405
Moderate	261	9.92	277	9.28	-6.5	-0.64 (-1.65, 0.37)	0.208
High Income	58	9.53	56	9.06	-4.9	-0.47 (-2.50, 1.55)	0.640
Not Reported	2	10.89	3	11.04	+1.4	0.15 (-8.14, 8.45)	0.970
By Smoking Status							
Daily smoker	493	10.11	462	9.81	-3.0	-0.30 (-0.89, 0.29)	0.317
Non daily Smoker	38	1.49	42	1.24	-16.8	-0.25 (-0.86, 0.35)	0.404
By Form of Purchase							
Pack	372	10.89	341	10.45	-4.0	-0.44 (-1.23, 0.35)	0.272
Single	154	6.38	163	5.87	-8.0	-0.51 (-1.84, 0.82)	0.445
By Quit Attempt in Last Year							
Yes	187	7.95	193	7.48	-5.9	-0.47 (-1.55, 0.61)	0.386
No	344	10.44	318	10.03	-3.9	-0.41 (-1.13, 0.31)	0.265
By Plan to Quit							
Within next 6M	118	8.27	130	6.86	-17.1	-1.41 (-2.94, 0.13)	0.072
Beyond 6M/Not Planning	380	9.89	353	9.81	-0.8	-0.08 (-0.83, 0.67)	0.824
Smoker Type							
Heavy Smoker	288	13.90	259	13.55	-2.5	-0.35 (-1.25,-0.57)	0.454
Light Smoker	243	4.35	252	4.00	-8.0	-0.35 (-0.64,-0.06)	0.020 *

* Significant at $\alpha = 0.05$ level

When smokers having quit smoking are not removed from the sample (n=578) in the analysis of means CPD (with their daily consumption defined as 0), a significant decrease in consumption is found: from 8.6 cigarettes per day at Wave 2 to 7.9 cigarettes per day at Wave 3 ($p=0.002$).

Furthermore, a number of findings relating to cost of smoking suggests that perceptions of the affordability of cigarette did not change significantly after the tax increase:

- The proportion of smokers who reported spending too much money on cigarettes did not significantly change after the price increase: 70.8% at Wave 2 versus 70.4% at Wave 3.
- The percentage of smokers who thought about cost of smoking also did not change: about 73.1% at both Waves.
- On the other hand, the proportion of smokers who said that money spent on cigarette resulted in not having enough money for household essentials such as food declined from 17.5% at Wave 2 to 10.6% at Wave 3 ($p=0.004$).

4.4 Tax Increase and Quitting

The study also looked at the impact of increased cigarette prices on quitting. Among 531 smokers who participated in Wave 2 Survey (pre-tax increase) and who also completed Wave 3 (post-tax increase) survey, 28 or 5.3% reported they had quit smoking by Wave 3. Univariate and multivariate logistic regression analyses were used to determine predictors of quitting (see Table 5). When socio-demographic characteristics and other covariates were controlled for in the model, smokers in the age group 40-54 are significantly more likely to quit compared to the 55+ age group (OR=2.947, $p=0.019$). Furthermore, smokers with higher income have a greater likelihood of quitting (OR=5.457, $p=0.029$). On the other hand, smokers who had made no serious quit attempt within the last year were less likely to quit ($p<0.001$).

Table 5: Results of logistic regression analyses predicting quitting based on Waves 2 to 3 quitters

Variables Associated with Quitting	Univariate Model		Multivariate Model	
	Odds Ratio (95% C.I.)	p - value	Odds Ratio (95% C.I.)	p - value
Age Group				
18-24 vs. 55+	No quitter in this category		No quitter in this category	
25-39 vs. 55+	0.368 (0.111, 1.217)	0.101	0.543 (0.152, 1.937)	0.346
40-54 vs. 55+	1.517 (0.594, 3.872)	0.384	2.947 (1.196, 7.261)	0.019 *
Sex				
Female vs. male	1.22 (0.372, 4.007)	0.743	2.278 (0.521, 9.961)	0.274
Marital Status				
Separated/widowed vs. Married	0.659 (0.084, 5.19)	0.692	0.891 (0.097, 8.178)	0.919
Single vs. Married	0.125 (0.017, 0.933)	0.043 *	0.531 (0.069, 4.111)	0.544
Education				
Low Education vs. No Education	1.009 (0.346, 2.937)	0.987	0.728 (0.272, 1.947)	0.527
SC/HSC/Vocational vs. No Education	1.23 (0.493, 3.064)	0.657	0.74 (0.241, 2.274)	0.600
University or Higher vs. No Education	0.381 (0.041, 3.578)	0.399	0.137 (0.009, 2.119)	0.155
Employment				
Unemployed/inactive vs. Employed	1.746 (0.722, 4.224)	0.216	2.406 (0.979, 5.912)	0.056
Income				
Not reported vs. Low	No quitter in this category		No quitter in this category	
Moderate Income vs. Low	1.91 (0.678, 5.385)	0.221	2.452 (0.696, 8.637)	0.163
High Income vs. Low	2.045 (0.936, 4.472)	0.073 *	5.457 (1.192, 24.978)	0.029 *
Quit Attempt the previous year				
No vs. Yes	0.249 (0.097, 0.643)	0.004 *	0.163 (0.061, 0.438)	< 0.001 *
Plan to quit				
Beyond 6M/No plan vs Within next 6M	0.929 (0.406, 2.125)	0.861	1.945 (0.763, 4.961)	0.164
Smoker Type				
Light smoker vs. Heavy smoker	1.141 (0.478, 2.724)	0.767	1.063 (0.415, 2.726)	0.898

* Significant at $\alpha = 0.05$ level

Logistic regression analyses based on Waves 1 to 2 quitters (48 out of 555 smokers) showed that the only statistically significant predictor was smoking intensity where lighter smokers were more likely to quit ($p < 0.001$).

Among Wave 1 to Wave 2 smokers who had quit, 24 (or 51.0%) cited price as an important reason for quitting. However, reasons other than price were found to be more important, for example, 45 quitters (or 94.5%) stated “concern about effects of smoking on non-smokers” as reason for quitting, 43 quitters (or 91.3%) mentioned “wanting to set an example for their children”, and 42 quitters (or 88.7%) cited “health reasons”.

Among Wave 2 to Wave 3 smokers who had quit, 15 (or 54.8%) reported price to be a major reason for quitting. Similarly other reasons were found to be more important: for example, 26 (or 93.2%) mentioned health reasons, 20 (or 77.2%) because of concern about effects of smoking on non-smokers, and 21 (or 74.9%) cited “wanting to set an example for their children”.

For all the smokers who participated in both Wave 1 and Wave 2, no significant change is noted in the smokers’ opinion on whether price motivates thoughts and actions toward quitting after the price increase. The percentage of respondents who responded positively increased only marginally in the post tax increase findings, from 62.6% at Wave 2 to 64.8% at Wave 3 ($p = 0.503$). In contrast, the percentage of smokers who said that the rising cost of essentials like food or fuel gave thought on quitting declined from 58.8% at Wave 2 to 53.9% at Wave 3 ($p = 0.219$).

With respect to other characteristics of quitting behavior, analysis shows no significant change after tax increase in the percentage of smokers making serious quit attempt at last year (from 38.6% at Wave 2 to 41.0% at Wave 3; $p = 0.464$) and of those having plans to quit within next 6 months (from 23.8% at Wave 2 to 26.9% at Wave 3; $p = 0.575$).

4.5 Increased taxation, brand switching and other compensatory smoking behaviour

The study also investigated whether smokers offset price increases by switching from higher-priced brands to lower-priced brands. Our analysis indicates that the vast majority of smokers stayed within the same brand group between Waves 2 and 3 (see Table 6). Out of 488 smokers, only 11 or 2.2% switched to cheaper price brands, and among whom 6 switched from the medium-brand group to lower-brand group and 5 of the high-brand smokers shifted to medium-brand group. On the other hand, a higher number of smokers (18 or 3.6%) switched to more expensive brands, 12 from low-priced brand smokers shifted to medium-priced brands, and 6 of the medium group to high-priced brands. No smokers switched two levels between Waves. We also examined the brand substitution between Waves 1 & 2 (with no change in tax rates between Waves) and observed a more or less similar switching pattern with majority of smokers keeping to their usual brand groups and 3.3% (16 smokers) switching to cheaper brands and 7.1% (34 smokers) switching to more expensive brands.

Table 6: Brand Switching between Waves

		Between Wave 2 and Wave 3		Between Wave 1 and Wave 2	
		n=488	% (95% C.I.)	n=481	% (95% C. I.)
Low	Low	26	64.1% (38.9%, 89.3%)	25	53.8% (39.7%, 68.0%)
	Medium	12	35.9% (10.7%, 61.1%)	20	46.2% (32.0%, 60.3%)
	High	-	-	-	-
Medium	Low	6	1.3% (0.15%, 2.4%)	11	1.8% (0.6%, 3.0%)
	Medium	404	97.5% (95.7%, 99.2%)	384	95.5% (93.6%, 97.5%)
	High	6	1.3% (0%, 2.7%)	14	2.7% (1.2%, 4.2%)
High	Low	-	-	-	-
	Medium	5	11.1% (1.3%, 21.0%)	5	19.9% (6.9%, 32.9%)
	High	29	88.9% (79.0%, 98.7%)	22	80.1% (67.1%, 93.1%)

Other cost minimizing behaviours like buying cigarettes from low or untaxed sources were also studied. 7.4% of smokers at Wave 2 reported that they made special efforts to buy cheaper products than those available in local stores. At Wave 3, this percentage remained almost unchanged (7.6%).

At Wave 2, 85.5% of smokers made their purchases in local shops and 11.3% in supermarkets. At Wave 3, the percentage buying from local shops increased slightly to 89.6% and purchase from supermarkets decreased to 8.7% (*note*: it appears that single cigarettes can still be bought from some local shops). Cheaper sources that could offset price increases were used very infrequently (e.g. duty free shops 0.4% and 0.6%). None of the respondents reported purchasing cigarettes by internet.

5. DISCUSSION

This study is the first to examine the changes in cigarette prices, consumption and smoking behaviour in a cohort of Mauritian smokers after a tax increase. The findings indicate that the excise tax increase in November 2010 from MUR 2,200 to MUR 2,750 per thousand sticks was passed on, as expected, to consumers of all cigarette brands without any significant degree of over-shifting or under-shifting of the tax. With a fully specific excise tax structure and a VAT rate of 15.0% of retail price, the increase of about 16.7% in price per cigarette is as expected, although a slightly lower increase is noted in the price of the cheaper brands. However, relatively higher prices are paid for purchase of single cigarettes. One third of smokers still reported buying single cigarettes at their last purchase at both Waves 2 & 3, i.e. even after implementation of the ban on sale of single cigarettes in 2009. The cigarette retailers normally charge higher prices for selling single cigarettes (for which the tobacco industry no longer establishes recommended prices) and the ITC Mauritius data showed that the already large unit price differentials between pack and single purchases for the different brands at Wave 2, widened further after the new prices on cigarette packs came into force with the result that the price paid for single cigarettes increased by more than 20%. Increased tobacco taxes, passed on to consumers in the form of higher cigarette prices, provide an economic disincentive to smokers

particularly in the low-income groups. But the relative ease with which smokers could still buy single cigarettes in Mauritius would reduce the impact of increased prices by giving smokers the opportunity not to disburse the amount required for purchase of a pack of 20 cigarettes.

The majority of previous studies have found that raising cigarette prices through increased taxes is a highly effective measure to reduce tobacco consumption (IARC, 2011). In our study, the decline in reported consumption resulting from higher taxes was 5.2%. Reductions in consumption were more likely among lighter smokers, those who were aged 55+ and those who were unemployed. According to the only available estimate for the short run price elasticity (around -0.4, calculation based on aggregate time series analysis and which is near to that of estimates for HICs), a 10% increase in price is expected to cause a 3.6% reduction in cigarette consumption (Busawon, 2012 and IARC, 2011). From this estimate it is predicted that the conditional price elasticity (responsiveness of tobacco consumption to price change among continuing smokers, and for which no estimate for Mauritius is available) would be less than -0.36. The change in cigarette consumption found in our study is consistent with this prediction.

The effect after the 2010 tax increase on quitting which is a more desirable health outcome than reduced consumption is more encouraging as 5% of smokers stopped smoking. In striking contrast to other studies showing greatest sensitivity to price among lowest socioeconomic groups we found that smokers with higher incomes were more likely to change their smoking behaviour. However such behaviour change may be a temporary change. As the assessment of quitting activity is based on quite a small number of quitters and there have been two other successive increases of taxes in 2011 and 2012, quitting behaviour together with responses to cigarette consumption has to be further assessed using data from future ITC Mauritius Surveys.

It is crucial to understand the extent to which compensatory smoking behaviour and use of contraband cigarettes may alter the intended impact of cigarette taxation so that optimal policies can be designed. The results of our study show a general absence of efforts by smokers to offset cigarette price increase either by brand switching or other cost minimizing behaviour through either tax avoidance or tax evasion. Despite the large price gaps between different brand categories (low-priced brands costing four fifths the price of the medium brands and about two thirds the price of premium brands) smokers did not shift to less expensive brands, showing that they are generally loyal to their preferred brands. On the contrary there appears rather to be a tendency among smokers to stop smoking low-price cigarettes and turn to more expensive local brands. This latter pattern could possibly be explained by either the improved economic situation of the smokers or by their perceptions of distinct brands as indications of higher social status.

Substitution between cigarettes and other tobacco products is also not a concern as tobacco is consumed mainly in the form of cigarettes. A possible reason for very little engagement of smokers in tax avoidance/evasion behaviour is that Mauritian smokers do not have easy access to cheaper purchasing outlets. Another likely explanation is the robust tax administration system. Also the share of illicit cigarettes in the total cigarette consumption in Mauritius is very low (ITC Mauritius National Report: Results of Wave 3 Survey) because

according to present regulations the country of origin along with the statement “Sale allowed in Mauritius only” need to be printed on cigarette packs and an excise stamp should be affixed on all cigarette packs.

Increasing cigarette excise tax rates has been viewed as an effective and politically popular method for countries to not only achieve the public health goal of reducing cigarette consumption or improving smokers’ behaviour but also to raise revenues in order to meet their fiscal responsibilities. In Mauritius, tobacco is an important source of revenue for the government and over the last 10 years tobacco taxes account for about 4% of total government revenue. Given the inelastic demand for tobacco products, the excise duty collected from cigarette imports which was MUR2.35 billion in 2010 went up to MUR3.08 billion in 2011, i.e. an increase of about 31% though the number of cigarette sticks imported increased by only about 5% from 1056m in 2010 to 1106m in 2011(MRA, 2012). The additional revenues collected from higher taxes can thus also be used in more effective means of reducing cigarette consumption and deterring potential future smokers from starting to smoke.

In addition to an absence of price minimization strategies among smokers in response to increased cigarette prices, a number of other findings also indicate that cigarettes are still affordable to Mauritian smokers. For example, higher taxation did not appear to force smokers to reduce purchase of household essentials to maintain their cigarette consumption. Cigarette consumption is determined more by affordability than just the price (Blecher and Van Walbeek, 2004). Affordability, in addition to the price of the product takes into account the individual’s income as it refers to the ability of an individual to buy a product. The affordability index (measured by the ratio of average cigarette pack price to per capita Gross Domestic Product which is a proxy to income) did not change between 2009 and 2011 (Busawon, 2012). From 1.38 in 2009 it fell to 1.33 in 2010 and went back to 2009 level again a year after (a higher affordability means that the price of a pack of cigarettes would require a lower percentage of one’s daily income and *vice versa*). Similar affordability data are also shown by the ITC Mauritius Survey which takes into account the price of cigarettes; the number of cigarettes smoked daily and reported household income. These data showed a slight decrease of 0.73% in affordability between Waves 2 and 3 (ITC Mauritius National Report: Results of Wave 3 Survey). To keep the affordability of cigarettes at the same level from year to year, the price would have to increase by the inflation rate plus the rate of real per capita income growth in the economy.

The WHO recommendation is that excise tax share should make up at least 70% in final consumer price. At present, for the most sold brand (Matinée), the excise tax as a proportion of the retail price is about 55%, thus the need to uprate specific duties in the short and medium terms so as to increase the tax component in the retail price. The WHO recommendation for tax levels should be viewed as a baseline rather than as a ceiling when being used as tobacco control policy. Also, the focus should be on the increase in the retail price of cigarette rather than the share of all taxes in the retail price because it is the retail price of cigarettes that affects the consumption decision of smokers, not the share of tax in the retail prices. Comparison of cigarette price and affordability among twelve African countries which participated in the

African Tobacco Situation Analysis(ATSA) Project, shows that Mauritius together with South Africa have the lowest cigarette price as a percentage of GDP per capita, which means that cigarettes are more affordable despite prices being higher compared to other countries (Drope & Madigan, 2011). A study conducted by Ross et al. (2011) examining predictors of what smokers in the United States, Canada, United Kingdom, and Australia say they will do in response to a hypothetical 50% increase in cigarette prices found that anticipated higher prices increased the likelihood of adult smokers reducing their consumption of cigarettes and increasing intentions to quit. In the short and medium terms, therefore large tax changes are more likely to make cigarette less affordable and effectively achieve the public health goal of reducing cigarette consumption.

The study has some limitations. First, the data are self-reported, which may introduce recall and social desirability biases (for example inaccurate reports of cigarette consumption and prices and underestimation of illegal forms of tax avoidance). Another limitation is that the observed changes cannot be attributed directly to the tax increase as tax and other tobacco control policies are mutually reinforcing. Although no new policies were implemented between Waves 2 and 3 except for the tax rate revision and an anti-smoking media campaign, synergistic effects of interactions between tobacco control policies in addition to price could not be ruled out. Last but not least, the ITC Survey does not have data to measure the impact of increased taxation on underage smokers and smoking initiation among youth.

6. CONCLUSION AND RECOMMENDATIONS

The analysis of the ITC Mauritius Survey data shows that the major tax change of November 2010 which effectively increased the prices that smokers in Mauritius paid for cigarettes, significantly reduced consumption of cigarettes. On the other hand, cigarettes still remained affordable to Mauritian smokers. Although further research is needed to fully understand the impact of the more recent yearly increases in excise rates and their trends as well as their effects on tobacco use initiation among youths in Mauritius, the results of the study are useful for informed decision making by government in tobacco control through taxation. The tobacco control programme in Mauritius should continue using the tax and pricing policy as a major tobacco control instrument. The following recommendations are made to render the tobacco taxation system more effective in reducing tobacco use and improving the health in the population:

- (i) Tobacco taxes should be increased on a regular/annual basis by at least the combination of inflation and income growth.
- (ii) Significant tobacco tax and price increases are required in the short and medium terms to reduce the affordability of cigarettes. WHO recommendation is that excise tax represents at least 70% of the retail price. At present for the most popular brand (Matinee), the excise tax share in the final consumer price is only 55%.

- (iii) There should be strong enforcement of the ban on sale of single cigarettes.
- (iv) Additional measures are required to further reduce opportunities for tax evasion and avoidance:
 - Ratification and implementation of the Protocol on Illicit Trade adopted at the Conference of Parties (COP-5)
 - Building the technical capacity of tobacco tax officials
 - Introduction of an effective licensing system for the sale of tobacco products
 - Reduction of the duty-free allowance for tobacco products from 250g to 125g
- (v) Part of revenue collected from taxes on tobacco products should be utilized to strengthen the national tobacco control programme.

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