

# Elasticity of Demand of Selected Excisable Products: CY 2008-2018\*

## I. INTRODUCTION

Aside from raising revenue, an excise tax is usually imposed to curb the consumption of a product that is considered harmful to health [e.g. tobacco and alcohol products and sugar-sweetened beverages (SSBs)] or to the environment (e.g. automobiles, minerals and petroleum products); or simply superfluous (e.g. jewelries and perfumes). Currently, excise taxes are imposed on alcohol, tobacco, petroleum, mineral products, automobiles and non-essential goods, as well on sugar-sweetened beverages and cosmetic surgery procedures with the passage of Republic Act (RA) No. 10963 or the TRAIN law<sup>1</sup> in 2018. Over the last decade, excise taxes on domestic trade which is about 80 percent of total excise taxes collection, contributed an average of 10 percent to total BIR tax collection and seven percent to total national government revenue.

Since the imposition of tax on a good or service has an impact on price, it is important to determine the extent by which price changes will affect the demand for a product; and since demand is also driven by level of income, it is equally important to determine the impact of income on demand. This paper estimates the price elasticity or the sensitivity of consumer demand of selected excisable products to changes in prices. The results of the estimates on alcohol, tobacco, petroleum, and automobiles may serve as inputs to proposals on restructuring the taxation of these excisable products.

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\* Prepared by Clarence D. Moral, Statistician II and Mariane Daiseree P. Mojica, Tax Specialist I, reviewed and approved by Jonah P. Tibubos, Statistician V, Tax Statistics Branch, NTRC.

<sup>1</sup> Entitled, "An Act Amending Sections 5, 6, 24, 25, 27, 31, 32, 33, 34, 51, 52, 56, 57, 58, 74, 79, 84, 86, 90, 91, 97, 99, 100, 101, 106, 107, 108, 109, 110, 112, 114, 116, 127, 128, 129, 145, 148, 149, 151, 155, 171, 174, 175, 177, 178, 179, 180, 181, 182, 183, 186, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 232, 236, 237, 249, 254, 264, 269, and 288; Creating New Sections 51-A, 148-A, 150-A, 150-B, 237-A, 264-A, 264-B, and 265-A; and Repealing Sections 35, 62, and 89; All Under Republic Act No. 8424, Otherwise Known as the National Internal Revenue Code of 1997, As Amended, and For Other Purposes." Approved December 19, 2017.

## II. TAX CHANGES ON SELECTED EXCISABLE PRODUCTS: 2008-2018

The country's sin taxes had undergone several tax changes during the period. Tax rates on alcohol and tobacco products increased by eight percent in 2009 and in 2011 via RA 9334<sup>2</sup> or the Sin Tax law of 2004. In 2013, the excise tax structure of sin products was simplified by increasing their tax rates and gradually shifting the excise taxation of fermented liquors (except brewed and sold at microbreweries or small establishments) and cigarettes to unitary tax system via RA 10351<sup>3</sup> or the Sin Tax Reform Act as implemented by RR 17-2012<sup>4</sup>. Under the TRAIN law, tax on cigarettes increased from P30.00 per pack to P32.50 per pack starting January 1, 2018 and further increased to P35.00 starting July 1, 2018.

In the case of petroleum products, RA 9337<sup>5</sup> reduced the tax rates of naphtha and regular gasoline from P4.80 per liter to P4.35 per liter while excise taxes on kerosene, diesel and bunker fuel oil were reduced to zero which were previously taxed at P0.60, P1.63, and P0.30 per liter, respectively. Under the TRAIN law, the excise tax on petroleum products were increased, specifically, on naphtha and regular gasoline, from P4.35 per liter to P7.00 per liter. Meanwhile, those products which are previously taxed at zero rate are now taxed as follows: kerosene, P3.00; diesel and bunker fuel oil, P2.50; and LPG, P1.00.

Automobiles, on the other hand were already taxed in terms of their prices instead of engine displacement and fuel type (diesel or gasoline) since September 2003 via RA 9224<sup>6</sup>. In particular, it provided a tax schedule of four price brackets with rates ranging from two percent to 60 percent. The law also included previously tax-exempt vehicles in the coverage of the excise tax. In 2018, the TRAIN law restructured the said tax schedule and imposed tax rates ranging from four percent to 50 percent which are directly applied to the net manufacturer's price/importer's selling price instead of imposing marginal tax rates.

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<sup>2</sup> Entitled "An Act Increasing the Excise Tax Rates Imposed On Alcohol and Tobacco Products, Amending for the Purpose Sections 131,141, 142, 143, 144, 145 And 288 Of The National Internal Revenue Code, As Amended" Approved December 21, 2004 and took effect on January 1, 2005.

<sup>3</sup> Entitled "An Act Restructuring the Excise Tax On Alcohol and Tobacco Products by Amending Sections 142, 143, 144, 145, 8, 131 And 288 Of Republic Act No. 8424, Otherwise Known as the National Internal Revenue Code Of 1997, As Amended By RA 9334, And For Other Purposes" Approved December 19, 2012

<sup>4</sup> Subject: Prescribing the Implementing Guidelines on the Revised Tax Rates on Alcohol and Tobacco Products Pursuant to the Provisions of Republic Act No. 10351 and to Clarify Certain Provisions of Existing Revenue Regulations, issued December 26, 2012.

<sup>5</sup> Entitled "An Act Amending Sections 27, 28, 34, 106, 107, 108, 109, 110, 111, 112, 113, 114, 116, 117, 119, 121, 148, 151, 236, 237 And 288 Of The National Internal Revenue Code (NIRC) Of 1997, As Amended, And For Other Purposes" Approved May 24, 2005

<sup>6</sup> Entitled "An Act Rationalizing the Excise Tax On Automobiles, Amending For The Purpose The NIRC of 1997, And For Other Purposes" Approved August 29, 2003, effective immediately.

**III. REVENUE PERFORMANCE OF EXCISE TAXES: 2008-2018**

During the period, over half (53 percent) of the total collection from domestic excise taxes came from tobacco; 29 percent from alcohol; 11 percent from petroleum; two percent from automobile; and the remaining five percent from other excisable products (See Figure 1). In 2018, additional P35.50 billion excise taxes were collected from SSBs and around P4 million from cosmetic procedures.

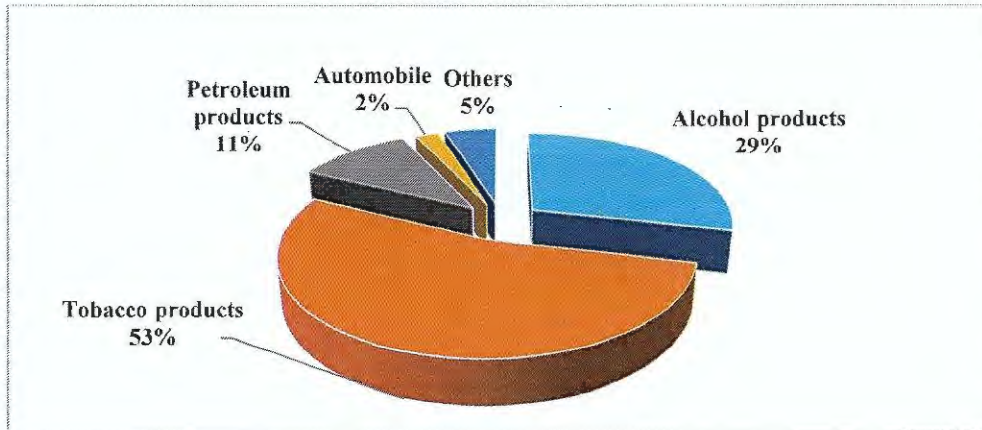


Figure 1. BIR Collection on Excise Tax, By Type: 2008-2018  
 Note: Others include mineral and miscellaneous products

Under the period covered by the Sin Tax law of 2004 (2008-2012), total collection on excise taxes grew by only four percent on the average representing eight percent of total BIR collection. On the other hand, the period covered by Sin Tax reform law (2013 to 2017) registered an annual growth rate of 25 percent, representing 11 percent of total internal revenue collection. For the first year of the implementation of the TRAIN law, collection increased by 39 percent from P209.49 billion in 2017 to P290.61 billion in 2018 representing 15 percent of total BIR collection. Within the period under review, the share of excise taxes to GDP was estimated at one percent. (See Figure 2 and Table 1.)

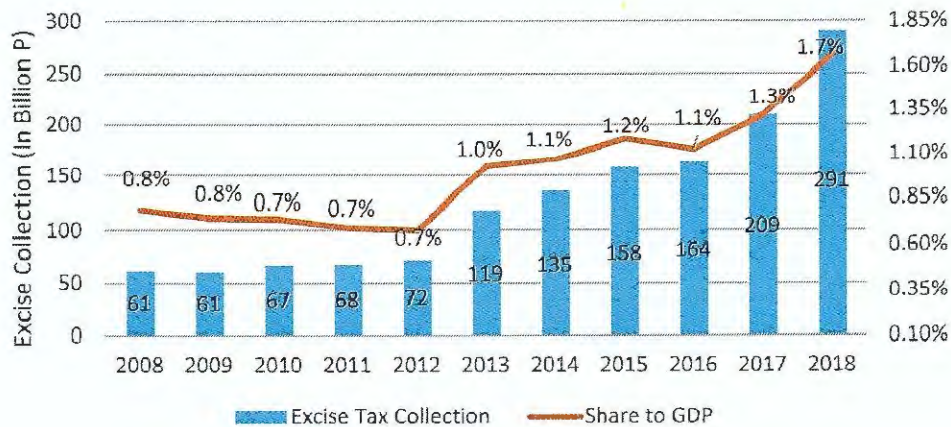


Figure 2. Excise tax collection and share to GDP: 2008-2018

Table 1  
*Excise Tax Collection and Growth Rate, by Type: CY 2008-2018 (In Billion Pesos)*

**Excise Tax Collection**

<b>Year</b>	<b>Total</b>	<b>Alcohol</b>	<b>Tobacco</b>	<b>Petroleum</b>	<b>Automobile</b>
2008	61.42	19.84	27.56	11.38	1.66
2009	60.55	20.64	24.24	12.77	1.88
2010	67.20	21.78	31.73	9.83	2.37
2011	67.99	22.87	26.00	9.96	2.00
2012	72.35	23.90	32.94	10.16	2.34
2013	118.86	33.54	71.61	8.50	2.35
2014	135.32	37.52	82.34	9.42	2.33
2015	158.32	42.21	99.50	11.89	2.45
2016	163.51	50.27	95.05	13.11	3.13
2017	209.49	61.05	125.91	15.51	4.20
2018	290.61	68.81	136.01	39.00	5.46

<b>Growth Rate</b>					
<b>Year</b>	<b>Total</b>	<b>Alcohol</b>	<b>Tobacco</b>	<b>Petroleum</b>	<b>Automobile</b>
2008-2009	-1.41%	4.03%	-12.06%	12.23%	13.22%
2009-2010	10.99%	5.54%	30.92%	-23.02%	25.93%
2010-2011	1.17%	5.01%	-18.07%	1.33%	-15.69%
2011-2012	6.40%	4.47%	26.71%	1.97%	16.88%
2012-2013	64.29%	40.34%	117.38%	-16.30%	0.57%
2013-2014	13.85%	11.90%	14.98%	10.77%	-0.78%
2014-2015	17.00%	12.50%	20.85%	26.21%	5.07%
2015-2016	3.28%	19.09%	-4.47%	10.29%	27.59%
2016-2017	28.13%	21.44%	32.46%	18.31%	34.14%
2017-2018	38.72%	12.71%	8.02%	151.44%	30.19%
Average	18.24%	13.70%	21.67%	19.32%	13.71%

*Note:* Total collection includes other excise tax.  
Source of basic data: BIR

By type of product, the excise tax collection on alcohol increased continuously from P19.84 billion in 2008 to P68.81 billion in 2018. During the period 2008-2012, collection on alcohol ranged from four percent to six percent. After the implementation of RA 10351, its collection growth surged from four percent in 2012 to 40 percent in 2013 and continued to increase registering a two-digit growth until 2018 despite the excise tax on alcohol not being part of the TRAIN law.

On tobacco collections exhibited an upward trend, increasing from P27.56 billion in 2008 to P136.01 billion in 2018. It recorded its highest growth rate of 117 percent in 2013 due to the increase in tax rate caused by RA 10351. Although it is increasing in terms of trend, some years showed decreases in collections on years when there were increases in the tax rate (i.e. 2009 and 2011, and 2016).

On petroleum collections increased from P11.38 billion in 2008 to P39.00 billion 2018. During the period, collection decreased twice, i.e., in 2010 by 23 percent and in 2013 by 16 percent. In 2018, under the TRAIN law, collection on petroleum reached P39.00 billion as

compared to previous years wherein its highest collection reached only up to P15.51 billion. In the same year, excise tax collection on petroleum increased by 151 percent.

Lastly, the excise tax on automobile increased from P1.66 billion in 2008 to P5.46 billion in 2018. During the period, its collection decreased by 16 percent in 2011 and a slight decrease by one percent in 2014.

#### **IV. TRENDS IN VOLUME OF REMOVALS OF CIGARETTES AND ALCOHOL PRODUCTS: 2008-2018**

During the period, highest volume of removals of 5.72 billion packs of cigarettes packed in 20s was recorded in 2012, a year before the implementation of the sin tax law when it grew by 25 percent. After the sin tax law implementation, volume of removals continuously decreased except in 2015 and 2018 when it increased by 10 percent and 27 percent, respectively. The increases in the volume of removals of cigarettes during the period were due to frontloading of manufacturers in years before an increase in excise tax. (See Tables 2 and 3.)

The increase in the excise tax on cigarettes had led to a decrease in cigarette consumption. Based on the 2015 Philippine Global Adult Tobacco Survey, tobacco use prevalence significantly decreased among adults from 30 percent in 2009 to 24 percent in 2015 while the prevalence of current cigarette smoking among adults significantly decreased from 28 percent to 23 percent. The survey also revealed that four out of five (82 percent) smokers reported that the number of cigarettes they smoked decreased because of the increase in price.

On alcohol products, the volume of removals for fermented liquors recorded an average of 1.58 billion liters from 2008 to 2018. It followed a generally increasing trend except in 2011 and 2013 when decreases were noted. Volume of removals of distilled spirits was seen higher from 2013 to 2018 than the preceding years despite the increase in excise taxes under the sin tax reform law. An erratic trend in the volume of removals of wine was also observed. From 0.85 million liters production in 2008, it doubled to 1.99 million liter in 2017 averaging 1.42 million liters. This suggests that the implementation of sin tax reform law had low effect on wine consumption. The increase in the volume of removals for all type of alcohol products implied an ineffective measure of the restructuring of excise tax rates from discouraging consumption (Jurado, 2018).

Table 2  
*Volume of Removals and Growth Rate of Cigarette and Alcohol Products: CY 2008-2018*

Year	Cigarettes	Alcohol Products (In Million Liter)		
	(In Million, Packed in 20s)	Fermented Liquor	Distilled Spirit	Wines
2008	4,679.58	1,450.47	324.34	0.85
2009	4,051.31	1,474.77	268.74	1.31
2010	5,206.98	1,581.40	259.78	1.44
2011	4,581.87	1,556.19	254.85	1.59
2012	5,722.49	1,572.75	287.32	1.18
2013	4,233.53	1,397.29	371.82	1.15
2014	3,638.01	1,410.97	415.87	1.25
2015	4,008.60	1,431.30	398.46	1.62
2016	3,239.54	1,641.18	407.70	1.43
2017	3,145.35	1,825.47	441.15	1.78
2018	3,983.79	2,041.19	457.52	1.99
Average	4,226.46	1,580.27	353.41	1.42

Year	Cigarettes	Alcohol Products (In Liter)		
	(Packed in 20s)	Fermented Liquor	Distilled Spirit	Wines
2008-2009	-13.43%	1.67%	-17.14%	53.40%
2009-2010	28.53%	7.23%	-3.34%	10.07%
2010-2011	-12.01%	-1.59%	-1.90%	10.65%
2011-2012	24.89%	1.06%	12.74%	-25.94%
2012-2013	-26.02%	-11.16%	29.41%	-2.65%
2013-2014	-14.07%	0.98%	11.85%	8.51%
2014-2015	10.19%	1.44%	-4.19%	30.26%
2015-2016	-19.19%	14.66%	2.32%	-11.80%
2016-2017	-2.91%	11.23%	8.20%	24.64%
2017-2018	26.66%	11.82%	3.71%	11.67%

Source of basic data: BIR

## V. TRENDS IN SALE OF AUTOMOBILES: 2008-2018

Sale of passenger vehicles showed continuous increases from 2008 to 2017 with the highest increase of 48 percent in 2014. However, with the first year implementation of the TRAIN law, sale of passenger vehicles went down by 22 percent in 2018. (See Table 4.)

Table 4  
*Passenger Vehicle Sales: 2008-2018*

Year	Sales (In units)	% Inc./Dec.
2008	44,428	-
2009	46,229	4.05%
2010	58,691	26.96%
2011	44,862	23.56%
2012	48,328	7.73%
2013	61,214	26.66%
2014	90,287	47.49%
2015	116,381	28.90%
2016	133,188	14.44%
2017	139,424	4.68%
2018	109,020	-21.81%

Source: ASEAN Automotive Federation

## VI. CONSUMPTION PATTERN OF PETROLEUM PRODUCTS: 2008-2018

The aggregate demand for petroleum products continuously increased from 101.20 million barrels in 2008 to 168.81 million barrels in 2018, except for a four percent decline in 2011. (See Table 5.)

Among the petroleum products, highly demanded were diesel oil, gasoline, fuel oil, and LPG. Diesel oil which is generally used by transport and manufacturing industry accounted for 41 percent of total demand; gasoline, which is used by motor vehicles, 30 percent; LPG which is commonly used for household cooking, 11 percent; and fuel oil which is used for power generation, 11 percent, while the remaining 14 percent was shared by other petroleum products.

Consumption of gasoline and diesel during the period were generally increasing except in 2011 where a slight decrease of one percent was observed. Meanwhile, consumption of LPG increased from 11.51 million barrels in 2008 to 20.47 million barrels in 2018 or an average rate of six percent. On the other hand, fuel oil was found to have a decreasing trend with an average decline of four percent annually. Its highest decline in consumption was recorded in 2011 at a rate of 30 percent. Lastly, other petroleum products displayed positive growth averaging 10 percent during the period with only a slight decrease of three percent in 2018. (See Table 6.)

Table 5  
*Petroleum Product Consumption (In Million Barrels): CY 2008-2018*

Year	Total Consumption	Gasoline*	Diesel**	Fuel Oil	LPG	Others***
2008	101.20	22.06	40.65	16.23	11.51	10.74
2009	107.30	23.80	43.64	15.79	12.56	11.52
2010	111.81	24.64	45.05	17.90	12.55	11.66
2011	106.86	24.40	44.55	12.57	12.62	12.72
2012	110.99	25.87	46.56	12.52	12.43	13.60
2013	117.49	27.45	49.51	12.47	12.71	15.34
2014	124.50	28.60	52.64	13.36	13.07	16.82
2015	143.23	32.83	58.72	14.57	14.84	22.27
2016	155.41	36.11	64.91	12.86	16.93	24.61
2017	166.76	39.10	68.74	11.72	18.55	28.64
2018	168.81	40.28	70.94	9.34	20.47	27.77

\*include bioethanol

\*\*include biodiesel

\*\*\*Includes Kerosene, aviation fuel, asphalts, solvents, naphtha/reformate, condensate

Source: Department of Energy

Table 6  
*Growth Rates of Petroleum Product Consumption: CY 2008-2018*

Year	Total Consumption	Gasoline	Diesel**	Fuel Oil	LPG	Others***
2008-2009	6.03%	7.88%	7.34%	-2.75%	9.10%	7.22%
2009-2010	4.20%	3.55%	3.24%	13.38%	-0.09%	1.29%
2010-2011	-4.43%	-0.99%	-1.12%	-29.79%	0.62%	9.02%
2011-2012	3.87%	6.03%	4.52%	-0.37%	-1.51%	6.96%
2012-2013	5.85%	6.11%	6.32%	-0.37%	2.25%	12.80%
2013-2014	5.97%	4.17%	6.34%	7.13%	2.82%	9.66%
2014-2015	15.04%	14.81%	11.53%	9.01%	13.53%	32.34%
2015-2016	8.51%	9.96%	10.55%	-11.71%	14.04%	10.53%
2016-2017	7.30%	8.30%	5.90%	-8.88%	9.61%	16.36%
2017-2018	1.23%	3.00%	3.20%	-20.30%	10.34%	-3.01%
Average	5.36%	6.28%	5.78%	-4.47%	6.07%	10.32%

Source of basic data: Department of Energy



## VII. HISTORICAL DATA ON PRICE

The average prices of each product used in this study were the average gross retail prices inclusive of taxes (excise and value added tax) and should be differentiated from the net retail price classification under the law.

In 2008, the average gross retail price of cigarettes packed in 20s was P17.65 which increased to P49.90 in 2018. Significant increases in the price of cigarettes were noticed in 2013 and 2018 during the first year implementation of the sin tax reform law and the TRAIN law which led in the increase of cigarette prices by 48 percent and 22 percent respectively, compared to a digit percentage increase on prices in other years. These laws had caused the gradual increases in excise taxes on cigarette products until it reached a unitary excise tax of P32.50 per pack in 2018. Overall, it can be observed that prices of cigarettes packed in 20s had been consistently increasing.

Among alcohol products, wines are the most expensive, on average, costing about P201.40 per 750 ml bottle. On the other hand, a liter of distilled spirits cost about P72.61 while the price of fermented liquors is about P62.18 per liter bottle. The prices of all alcohol products also showed an increasing pattern attributable to increases in excise taxes.

The prices of the most common models of automobiles are observed in the analysis of this study. The average price of automobiles during the period was P791,629 with the highest increase of 17 percent noted in 2012.

Petroleum prices remained unstable despite zero-excise tax rates on kerosene, diesel, and bunker fuel oil from 2008 to 2018. The movement in the prices of petroleum products was attributable to exogenous factors such as the increase or decrease in prices of petroleum in the world market. In 2015, a huge drop in petroleum prices was observed which ranged from P9 per liter to as much as P14 per liter. It can be noticed that from 2014 to 2016, price of gasoline fell from P52.24 in 2013 to P39.80 in 2016. A significant decrease in price was also observed in other petroleum products. In the global picture, the drop in oil prices in mid-2014 to early 2015 was primarily driven by excessive supply due to the booming U.S. shale oil production, receding geopolitical concerns, and shifting in OPEC policies. Moreover, deteriorating demand from mid-2015 to early 2016 played a role as well in the continuous drop in world market oil price in 2016 (Stocker et. al, 2018). The strong influence of world market price in the domestic price of petroleum products contributed to the decrease in retail pump prices of petroleum products for the period mentioned. (See Tables 7 and 8.)

Table 7  
Average Gross Retail Price of Cigarettes, Alcohol Products and Automobiles and Average Retail Pump Prices of Petroleum Products per Liter: CY 2008-2018 (Amounts in Pesos)

Year	Cigarettes	Alcohol Products (P/L)			Petroleum (P/L)			
	(Packed in 20s)	Fermented Liquor	Distilled Spirit	Wines*	Gasoline Common Price	Diesel Oil	LPG	Automobiles
2008	17.65	48.23	60.37	178.22	48.56	44.26	29.41	695,000
2009	18.34	51.61	62.86	186.43	36.16	28.23	26.20	695,000
2010	19.11	53.41	64.84	185.14	43.51	33.89	32.74	705,000
2011	20.40	54.94	66.83	191.13	54.33	44.37	38.21	705,000
2012	21.59	57.50	68.10	194.64	54.34	44.45	41.02	825,000
2013	31.96	63.97	74.25	200.49	52.24	42.13	40.44	825,000
2014	33.83	66.91	77.10	206.24	52.15	41.64	39.87	840,000
2015	35.25	68.42	78.57	207.58	42.23	27.37	30.40	840,000
2016	37.72	70.36	80.04	217.51	39.80	25.36	28.96	848,000
2017	40.96	72.23	81.88	222.55	45.89	32.14	34.60	848,000
2018	49.90	76.38	83.91	225.45	54.47	43.02	37.66	881,900
Average	29.70	62.18	72.61	201.40	47.61	36.99	34.50	791,629

\* Peso per 750 mL

\*\* Average prices of car from top 10 car manufacturers in the Philippines based on year 2018 sales.

Source: PSA for the average retail price of cigarettes packed in 20s and alcohol products, DOE for petroleum prices, and carguide.ph for price the of automobiles.

Table 8  
Growth Rates of Average Gross Retail Price of Cigarettes, Alcohol Products and Automobiles and Average Retail Pump Prices of Petroleum Products per Liter: CY 2008-2018

Year	Cigarettes	Alcohol Products			Petroleum			
	(Packed in 20s)	Fermented Liquor	Distilled Spirit	Wines	Gasoline Common Price	Diesel Oil	LPG	Automobiles
2008-2009	3.91%	7.01%	4.13%	4.61%	-25.54%	-36.22%	-10.91%	0.00%
2009-2010	4.20%	3.49%	3.15%	-0.69%	20.33%	20.05%	24.96%	1.44%
2010-2011	6.75%	2.86%	3.07%	3.24%	24.87%	30.92%	16.71%	0.00%
2011-2012	5.83%	4.66%	1.89%	1.84%	0.02%	0.18%	7.35%	17.02%
2012-2013	48.03%	11.25%	9.04%	3.01%	-3.86%	-5.22%	-1.41%	0.00%
2013-2014	5.85%	4.60%	3.83%	2.87%	-0.17%	-1.16%	-1.41%	1.82%
2014-2015	4.20%	2.26%	1.91%	0.65%	-19.02%	-34.27%	-23.75%	0.00%
2015-2016	7.01%	2.84%	1.87%	4.78%	-5.75%	-7.34%	-4.74%	0.95%
2016-2017	8.59%	2.66%	2.30%	2.32%	15.30%	26.74%	19.48%	0.00%
2017-2018	21.83%	5.75%	2.48%	1.30%	18.70%	33.85%	8.84%	4.00%

### VIII. ESTIMATION PROCEDURE

The elasticity of demand for excisable products is derived from relating the demand for the product (represented by volume of removals and domestic consumption) with average gross retail prices of each product and with personal income (represented by personal consumption expenditures). The following multiple linear regression fitted to the natural logarithm of the data series was used:

$$LNY_i = \alpha + \beta_1 LNP_i + \beta_2 LN PCE_i + \beta_3 D_i$$

Where:

$Y_i$  = demand for the product represented by volume of removals or domestic consumption

$P_i$  = average gross retail price for each product

$PCE_i$  = personal consumption expenditure as a proxy for personal income

$D_i$  = dummy variable

The regression analysis was done individually for each product. The coefficients  $\beta_1$  and  $\beta_2$  are the resulting price and income elasticities. The equation included a dummy variable to account for the impact of the increase in excise tax. The intercept in the equation was also set to zero which indicates nil demand if price and personal consumption expenditure are equal to zero.

One indicator to measure the goodness of fit of the function is the coefficient of determination statistics or  $R^2$  which indicates the strength of linear relationship between variables. An  $R^2$  of at least 0.60 is generally considered a good fit. Thus, if at least 60 percent of the variation in the demand of the product is being explained by the changes in price and personal income, the regression model may already be considered. Another measure of a good fit is the test of significance of the computed regression coefficients. Typically, a p-value of less than 0.05 is considered significant. However, a value of less than 0.1 is also considered in cases of small number of data points.

### IX. FINDINGS AND ANALYSES

The regression result shows a good fit as computed  $R^2$  is high and within the acceptable level for each product. The estimated p-value for all products were statistically significant with p-value less than 0.05, except for diesel and household LPG which are significant at 90 percent level of confidence.

### A. Price Elasticity

The resulting coefficient on each regression per product is the price elasticity of demand. If the coefficient is greater than one, then demand is said to be elastic. Elastic demand means that consumers are very responsive to changes in price. As such, a small price change will lead to a relatively large change in quantity demanded. In contrast, a coefficient less than one is said to be inelastic and consumers are not very responsive to price changes.

The demand for cigarettes packed in 20s is price inelastic at 0.84 which implies that for every one percent increase in the price, demand will only decline by 0.84 percent with income held constant. (See Table 9) For taxation purposes, this means that any proposal to increase the tax on cigarettes will not necessarily result to a significant decrease in demand but would still yield a revenue increase for the government. This result proved the addictive nature of cigarette smoking, thus any attempt to increase its price would only result to a minimal reduction on demand.

In the case of alcohol products, results showed that the demand for fermented liquors is elastic at 1.42. This means that a one percent increase in the price of beer reduces demand more proportionately by 1.42 percent with income held constant. Distilled spirits and wines on the other hand, were inelastic at 0.96 and 0.12, respectively, implying that these products are unresponsive to changes in price holding income constant.

Petroleum products are also found to be inelastic. The price elasticity of diesel is at 0.09, while gasoline and household LPG elasticities are almost the same and are found at 0.24 and 0.23, respectively. This indicates that a one percent increase in price causes a minimal 0.09 percent reduction in the demand for diesel, 0.23 percent for LPG, and 0.24 percent for gasoline holding income constant. Since these products are considered as necessities, price changes have little effect on their demand.

Demand for automobiles is price inelastic at 0.87 which suggests that a one percent increase in price will only yield a minimal decrease in demand of 0.87 percent. Some people would still buy a car even with a price increase by one percent given that there is an additional income. According to a survey conducted by the National Economic and Development Agency (NEDA) in 2015, 77 percent of the Filipinos preferred to use their own car to travel to places than using public transportation. Increasing demand for cars may be attributed to the desire of Filipino families to own a car in the future for more mobility. Consumers perceived that owning a car may be the best substitute for public transportation given the frequent interruptions of the country's railways system and the heavy traffic congestions being experienced in the metro.

Table 9  
*Estimated Price Elasticity of Demand for Selected Excisable Products: CY 2008-2018*

Excisable Products	Price Elasticity		
	Coefficient	R <sup>2</sup>	p-value
Cigarettes (Packed in 20s)	0.84	0.99	0.00
Fermented Liquors	1.42	0.99	0.01
Distilled Spirits	0.93	0.99	0.00
Wines	0.12	0.89	0.00
Gasoline	0.24	0.99	0.00
Diesel	0.09	0.99	0.06
Household LPG	0.23	0.99	0.09
Automobiles	0.87	0.99	0.01

### B. Income Elasticity

Coefficient signs for income elasticity of all products are positive which indicates that increase in income promotes increase in consumption of the products while holding price constant.

Positive income elasticity indicates normal good and a negative value indicates an inferior good. It can be observed that all of the products have positive coefficients making them a normal good implying that any increase in income will also lead to an increase in consumption of the product holding price constant. A varying degree of consumer sensitivity can be observed on each product.

The demand for most of the products are considered income elastic and these products are cigarettes, fermented liquors, and diesel which implies more than one percent increase in consumption in case of one percent increase in income. As for automobile, a one percent increase in income might lead to a 2.73 percent rise in demand for automobile.

Income elasticity estimates for distilled spirits, wines, gasoline, and LPG appeared to be less than one which means smaller degree of response to demand in case of changes in income. Moreover, income elasticity of gasoline seemed to be almost unitary elastic at 0.99 which means same consumption of the product regardless of changes in income. (See Table 10.)

Table 10

*Estimated Income Elasticity of Demand for Selected Excisable Products: CY 2008-2018*

Excisable Products	Income Elasticity		
	Coefficient	R <sup>2</sup>	p-value
Cigarettes (Packed in 20s)	1.33	0.99	0.00
Fermented Liquors	1.56	0.99	0.00
Distilled Spirits	0.96	0.99	0.00
Wines	0.07	0.89	0.00
Gasoline	0.99	0.99	0.00
Diesel	1.07	0.99	0.00
Household LPG	0.91	0.99	0.00
Automobiles	2.73	0.99	0.00

## X. CONCLUSION AND RECOMMENDATION

Taxation should be seriously considered as an effective policy to internalize the social cost of consuming excisable products. The foregoing price and income elasticity results indicate the degree of responsiveness of the consumers' demand for selected excisable products to changes in price and income.

The more inelastic the demand is for a certain product, the larger the excise tax revenue that can be generated from that product. The more elastic the demand is, the easier it is for consumers to reduce quantity instead of paying higher prices.

Increasing the excise tax on tobacco during the period was an effective measure to discourage Filipinos from smoking and raise revenue as evidenced by the decreasing demand in tobacco products. On the other hand, although the increased excise tax on alcoholic products was seen to have a low effect on its consumption, increasing excise tax on alcohol may still be considered to discourage alcohol consumption. Additional revenue from sin taxes may be used for further implementation of the Universal Health Care Act or RA 11223 which has been just recently passed.

With regard to petroleum products, being considered necessities since used primarily as input for manufacturing and transportation, these products are price inelastic. Aside from that, the limited substitute for petroleum products also contributes to its price inelasticity. For these reasons, imposing excise tax on petroleum products to address environmental and health issues will be more effective if there are substitutes for fuels for transportation and manufacturing sector. Increasing excise tax on petroleum products should also be done slowly

and predictably over time in order to signal consumers the need to prepare for long term higher prices.

In the case of income elasticity of demand for excisable products, results show that people are willing to spend their extra income on buying a car even with an increase on its price since they prefer to own a car than utilizing public transportation. For revenue generation, the government may still opt to impose additional tax on automobiles in the future since automobile is price inelastic. The additional revenues may be used to improve the public transportation especially the mass transportation, such as repair and maintenance of current railway systems, and adding more railways all throughout the country, or even subsidizing the fare of public commuters.



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