Methodology and assumptions on the automobile excise revenue estimates
as of 9 June 2017

The automobile excise for local cars was computed using the excise tax collections of automobiles submitted by the BIR for the year 2015. The values of the base tax were given in the data set, so the values of tax bracket break and the marginal tax rate will be known as well. The data on locally manufactured automobiles included information on net manufacturing price (NMP) and its corresponding VAT and excise tax. However, the data on imported automobiles do not provide information on the net importers' selling price as this detail wasn't given in the data set, so the net importer's selling price ($NISP$) has to be estimated. Moreover, the landed cost of vehicles from the Authority To Release Imported Goods (ATRIG) report for the year 2015 were not used as tax base since the value of landed cost pertains to the value of total importation and not on a per automobile basis. Thus, the net importer's selling price ($NISP$) has to be estimated as well. This was estimated using the following formula:

$$N = \frac{(X - a)}{r} + b,$$

where:

N is the **net manufacturer's** or **importer's price**,
X is the **automobile excise tax** paid for this car,
r is the **marginal tax rate**,
a is the **base tax** paid, and
b is the **tax bracket break**.

The formula for N was derived by reversing the following formula:

$$X = a + r(N - b).$$

The values for a, b, and r are from the automobile excise schedules:

Table 1: Current automobile excise schedule

N	a	+	r	times the excess of N from	b
Below 600,000			2%	of the entire amount	
600,000 to 1,100,000	12,000	+	20%	times the excess of N from	600,000
1,100,000 to 2,100,00	112,000	+	40%	times the excess of N from	1,100,000
Above	512,000	+	60%	times the excess of N from	2,100,000

Table 2: Proposed automobile excise schedule, 2018

N	a	+	r	times the excess of N from	b
Below 600,000			3%	of the entire amount	
600,000 to 1,100,000	18,000	+	30%	times the excess of N from	600,000
1,100,000 to 2,100,00	168,000	+	50%	times the excess of N from	1,100,000
2,100,000 to 3, 100,00	668,000	+	80%	times the excess of N from	2,100,000
Above 3, 100,000	1,468,000	+	90%	times the excess of N from	3,100,000

Table 3: Proposed automobile excise schedule, 2019 onwards

N	a	+	r	times the excess of N from	b
Below 600,000			4%	of the entire amount	
600,000 to 1,100,000	24,000	+	40%	times the excess of N from	600,000
1,100,000 to 2,100,00	224,000	+	60%	times the excess of N from	1,100,000
2,100,000 to 3, 100,00	824,000	+	100%	times the excess of N from	2,100,000
Above 3, 100,000	1,824,000	+	120%	times the excess of N from	3,100,000

The proposed automobile excise tax schedule was then applied to the NMP's or computed $NISP$'s.

The computation of the national revenue estimate R_j for the year j for cars i for the proposed automobile excise was computed using the following formula:

$$R_j = \sum_{i=1}^{n} (1+g)^{j-2015}(1+f_j)\cdot(1+\eta_I\cdot\Delta I_j+\eta_P\cdot\Delta P_i)\cdot u_i\cdot X_i,$$

where g is the growth rate of removals (assumed to be constant per year at 6 percent), f_j is the assumed frontloading effect or the change in the purchasing behavior of car buyers for the year j in anticipation of the tax reform (plus 20 percent more units for 2017 as panic buying occurs, and minus 20 percent in 2018 as these have been bought already during the previous year), η_I is the income elasticity of demand of cars (computed to be constant at 1.58), ΔI_j is the percentage change in income for the year j (9 percent in 2016 and 2017, 8 percent in 2018, and 10 percent in 2019), η_P is the price elasticity of automobile prices (computed to be constant at -1.02), ΔP_i is the percentage change in the price of the car from the automobile excise proposal, u_i is the number of units of car i, $X_{i,j}$ is the computed excise for car i at year j depending on the year considered, and n is the total number of cars in both the local and imported car datasets.

Note that $(1+g)^{j-2015}$ corresponds to the change in the number of units due to the increase in sales of cars from the baseline year of 2015. $(1+f_j)$ corresponds to the frontloading effect that is expected to occur during the year 2017 and 2018 wherein car buyers will advance their orders during the second half of 2017 to take advantage of lower car prices before the automobile excise will be implemented. $(1+\eta_I\cdot\Delta I_j+\eta_P\cdot\Delta P_i)$ is the multiplier that takes into account consumer behavior when their incomes change and the prices of their desired goods change.

To determine the price and income elasticity of automobile demand, a log-log regression, or a double logarithmic transformation, of the relationship between automobile demand, car prices, and disposable income was performed using the following equation:

$$\log(D_t) = \beta_0 + \beta_1\log(\overline{P_t}) + \beta_2\log(I_{t-1}) + \epsilon$$

where:

$\beta_0, \beta_1,$ and β_2	are the regression coefficients,
t	is the period of observation in years,
D_t	is the demand for automobiles at year t,
$\overline{P_t}$	is the average price of automobiles at year t,
I_{t-1}	is disposable income for the year $t-1$,
ϵ	is the regression error, and
$\log(\cdot)$	is the natural logarithm.

As a proxy for automobile demand D_t at year t, annual new vehicle registrations from the Land Transportation Office (LTO) were used. Meanwhile, the 2004 to 2012 price data of the Bureau of Internal Revenue (BIR) were used to get the average automobile price $\overline{P_t}$ at year t, and

the price data for the years 1981 to 2003 were derived using inflation data. Finally, the national disposable income from the previous year was computed by deducting tax revenues from the nominal GDP for the values of I_{t-1}. The periods t of observation are from 1981 to 2012.

Finally, the computation for the incremental revenue $R_{I,j}$ for the year j is the difference between the revenue $R_{p,j}$ of year j using the proposed automobile excise schedule, and the revenue $R_{c,j-1}$ of the previous year using the current schedule:

$$R_{I,j} = R_{P,j} - R_{C,j-1}.$$

Note that the estimated incremental revenue for imported cars for the year 2015 was multiplied by 0.73, which was the ratio of the BOC 2015 actual excise tax collection to the 2015 excise tax collection reported in the ATRIG report. This adjustment takes into account the lag between importation and release of imported cars.