CALCULATION OF AD VALOREM EQUIVALENTS OF NON-AD VALOREM TARIFFS - METHODOLOGY NOTES

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Introductory notes

1. The customs schedules use a variety of formats to specify individual tariff commitments. In most cases, tariffs are specified in ad valorem terms, as a simple percentage of the value of the imported product. However, the schedules of many countries contain a large number of tariffs specified in non-ad valorem terms.

2. The main types of non-ad valorem tariffs, according to their composition, are:
   - **Specific tariffs** - tariff is a fixed monetary value per unit of the dutiable item (e.g. 50 dollars per kilogram);
   - **Compound tariffs** - a combination of ad valorem and specific tariffs (such as 10 per cent plus 5 dollars per kilogram);
   - **Mixed tariffs** - a choice between ad valorem and/or specific tariffs depending on the condition attached (e.g. 10 per cent or 5 dollars per kilogram, whichever is greater);
   - **Technical tariffs** - tariff rate dependent on the input content such as sugar or alcohol (WTO AIE/S5).

3. The ability to compare levels of protection across countries and commodities is much diminished when a tariff schedule contains non-ad valorem tariffs. Thus, there is a need to calculate ad valorem equivalents (AVEs) of non-ad valorem tariffs. Such an analysis should, however, utilize a standard methodological approach applied to all countries and time periods.

Calculation of ad valorem equivalents of simple specific tariffs

4. The general approach to calculating AVE of a simple specific tariff is to divide the specific tariff by the price of a commodity. This, however, can be difficult given the lack of available price data. In order to solve this problem, the **world import unit value** can be used as a proxy for the price.

5. The following formula can be used to calculate AVE of a simple specific tariff:

$$AVE = \frac{100 * ST}{UCF * UV * XR} \qquad (1)$$

where:

AVE – Ad valorem equivalent of specific tariff (in per cent)

ST – Specific tariff

UCF – Quantity units conversion factor

UV – Import unit value (in US$ per imports quantity unit)

XR – Currency exchange rate

For example, a specific tariff of 5 US cents per kilogram will produce AVE of 20 per cent, provided that the import unit value is 0.25 US$ per kg.

6. The need for a Quantity units conversion factor (UCF) stems from the fact that both the specific tariff and the import unit value should be expressed in the same units. For example, if the specific tariff is expressed in hectolitres and the import unit price in litres, then a conversion factor of 100 should be applied.

All **derived quantity units** (like tonnes, hectoliters, kilometers, etc.) should be converted to their respective **basic units** (kilograms, litres, metres, etc.)

7. Currency exchange rates have to be used given the fact that the imports values are expressed in US$, while specific tariffs – in local currency units. These are annual averages of market exchange rates retrieved from the International Financial Statistics published by the IMF.

Calculation of import unit values

8. Import unit values can be calculated using the following formula:

$$UV = \frac{V * VCF}{Q * UCF} \qquad (2)$$

where:

V – Imports value (in US$ or 000 US$)

Q – Imports quantity

UCF – Quantity units conversion factor (explained in the paragraph 6)

VCF – Imports value conversion factor (= 1 if imports value is expressed in US$; = 1000 if imports value is in thousands US$).

9. Two sets of import unit values should be prepared, using two different sources of trade data.
   - Annual reporter's imports from World.
   - Annual imports from World of the OECD countries (excluding EU intra-trade)

10. The import unit values derived from reporter's imports should be calculated at two levels:
   - The national line level of the Harmonized System (HS) classification (8 – 10 digits) i.e. the most disaggregated level available for trade data. Commodities with incomplete trade data (i.e. missing imports value, quantity or quantity unit) should be excluded from calculations.
   - The HS 6-digit aggregation.

11. The import unit values derived from the OECD's imports should be calculated at the HS 6-digit level of aggregation.

12. The import unit values derived from reporter's imports should be combined with the specific tariffs (the formula 1) according to the following procedure:

(i) For each commodity with specific tariff, the import unit value (UV) with the corresponding basic quantity unit should be searched for, at the national line level. If such a value is found then AVE can be calculated, according to the formula 1.

(ii) For tariff lines not getting UV at the national line level, the same search should be done at the HS 6-digit level. There are usually more than one UVs at this level, calculated for various quantity units. It is therefore easier to find one-to-one match between quantity units of the specific tariffs and those of the import unit values.

13. The import unit values derived from the OECD's imports should be combined with the specific tariffs by searching for the corresponding quantity units directly at the HS 6-digit level.

14. If a strict, one-to-one correspondence between the quantity unit specified in the specific tariff and that of the import unit value could not be found (for instance, for many textiles the specific rate is based on a sheet of one square meter, while the import quantities are given in kilograms), then the value of AVE can not be calculated and should be allocated the value of –1.

Calculation of compound and mixed tariffs

15. Compound and mixed tariffs contain at least one simple specific component and/or at least one ad valorem component, linked with logical and/or arithmetic operators. There are various types of these tariffs in the tariff schedules, several computable, but others non-computable.

16. The computable tariffs are of the following types:

- Addition or subtraction of specific and/or ad valorem tariff components,
- Choice between specific and/or ad valorem tariff components,
- Choice between specific and/or ad valorem tariff components, subject to upper and/or lower limits.

17. AVEs of compound or mixed tariffs that contain no more than two components (specific and/or ad valorem) can be calculated according to the following procedure:

(i) Calculate AVE for each simple specific component of the tariff, using formulas 1 and 2.

(ii) If AVEs for all specific components could be calculated, then calculate the AVE of the whole tariff, using formulas 4 – 11 listed in the Annex 3.

(iii) If at least one AVE of the specific component could not be calculated, then the AVE of the tariff cannot be calculated and should be allocated the value of –1.

18. The compound or mixed tariff that contains more than two ad valorem and/or specific components usually represents one of the following morphological types:

- The arithmetic function (usually SUM, MAXIMUM or MINIMUM) with two arguments (described herein as tariff segments), which themselves are compound tariffs.
- A choice between specific and/or ad valorem tariff components, being subject to upper and lower limits.

19. AVEs of compound or mixed tariffs of the first type mentioned above can be calculated using the following formula:

AVE = F(AVE1, AVE2) (3)

Where:

F – an arithmetic function (SUM, MAXIMUM or MINIMUM)

AVE1 – AVE of the first segment of the tariff

AVE2 – AVE of the second segment of the tariff

20. A general procedure to calculate AVEs according to the Formula 3, contains the following steps:

(i) Calculate AVE for each segment of the tariff, using a general procedure defined in the paragraph 17.

(ii) If AVEs for all segments could be calculated, then use them as arguments to a function to calculate the AVE of the whole tariff (formulas 7, 12 and 13 in the Annex 3).

(iii) If at least one AVE of the segment could not be calculated, then the AVE of the tariff can not be calculated and should be allocated the value of –1.

21. AVEs of mixed tariffs with a single ad valorem component and two specific components, being upper and lower limits, can be calculated using the following set of formulas:

AVE = AT, when AT >= AV1 and AT <= AV2 (4)

AVE = AV1, when AT < AV1

AVE = AV2, when AT > AV2

Where:

AT – Ad valorem tariff

AV1 – AVE of the first specific component

AV2 – AVE of the second specific component

22. AVEs of mixed tariffs with a single specific component and two ad valorem components, being upper and lower limits, can be calculated using the following set of formulas:

AVE = AV, when AV >= AT1 and AV <= AT2 (5)

AVE = AT1, when AV < AT1

AVE = AT2, when AV > AT2

Where:

AV – AVE of the specific component

AT1 – First ad valorem component

AT2 – Second ad valorem component

23. The non-computable tariffs include, among others:

- Unspecified variable tariffs,
- Tariff element applicable to input content, for example agricultural component or metal content,
- Two or more tariff components specified, but without indication of what condition to apply,
- Blank tariff line or incomplete description.

Technical tariffs are in general non-computable.

Output data format

24. The suggested output data format has been included in the Annex 4. The output should provide comprehensive information on how AVEs have been calculated (including intermediary results for segments of complex tariffs) and therefore should enable easy verification and analysis of the results. A few columns need further explanation.

25. Column 4 contains the reference imports quantity, i. e. the volume of imports (after eventual multiplying by the Quantity units conversion factor), that was used to calculate the import unit value, according to the formula 2.

26. Column 5 contains an ISO code of imports quantity unit. It is always the basic (converted) unit, according to conversion table available in the Annex 1.

27. Column 6 contains so called “Imports Aggregation Level” (IAL) and provides the information at which level of the national product classification the import unit values were combined with the specific tariff information.

- The code ‘N’ indicates that AVE was estimated on the basis of the import unit value calculated at the basic level of the national product nomenclature (national line), thus providing the best possible accuracy of data.
- The code ‘Hn’ indicates that AVE was estimated on the basis of the import unit value calculated at the aggregated level of 6-digit (subheading) of the Harmonized System Product Nomenclature.

28. Column 7 contains so called “Exception Code” explaining why AVE could not be calculated. The code may assume the following values:

- B – AVE of the first specific component of a tariff could not be calculated
- C – AVE of the second specific component of a tariff could not be calculated
- F – AVE of the first segment of a complex tariff could not be calculated
- G – AVE of the second segment of a complex tariff could not be calculated
- M – the tariff is non-computable
- V – the import unit value could not be calculated (usually due to non-matching quantity units)

29. Column 8 contains the value of AVE calculated for a tariff in column 2. The value of –1 indicates that the AVE could not be calculated.

30. Columns 9 and 10 contain values of AVE of respectively the first and the second segment of a complex tariff.

Quality of data

31. There are three main areas of possible quality problems:

- Quality of imports statistics
- Quality of tariffs statistics
- Conversion of quantity units

32. It is essential that national imports statistics are available at the most disaggregated level, corresponding to that of tariffs nomenclature. It is also important that import quantities are expressed, whenever appropriate, in their natural or primary units like pieces, heads, numbers, etc. instead of secondary units of kilograms. This methodology stipulates the use of aggregated imports at HS-6 level as a proxy to missing import data at the national line level, but this obviously diminishes the accuracy of final estimates.

33. It is essential that descriptions of non-ad valorem tariffs are complete and valid. It is useful to store them in a standardized format so that the AVE calculation software based on this methodology can easily recognize the structure of even most complex tariffs.

34. Conversions of quantity units that are not physically identical (like Litres of Pure Alcohol against Litres or Kilograms Gross Weight against Kilograms) may diminish the accuracy of the estimates, since the respective UCF may not be accurate enough. For example the UCF of 2.5 will produce valid results only for alcoholic beverages with an alcoholic strength by volume of exactly 40 per cent.

Results

35. A set of programs has been developed in UNCTAD to implement this methodology and practically verify its usefulness. The test runs have been performed for the QUAD countries (Canada, EU, Japan and USA).

36. Information on applied tariffs for the year 2000 was retrieved from the UNCTAD Trade Analysis and Information System (TRAINS), version 8. Imports values and quantities of the QUAD countries in the year 1999, at the national line level, were retrieved from the same database. Imports values and quantities of the OECD countries in the year 1999, at the HS 6-digit level, were retrieved from the United Nations Trade Data System (COMTRADE).

37. The results obtained for the QUAD countries have been summarized in the Annex 2.
Ad valorem equivalents could be calculated for 16,559 tariff items, which makes 77.6 per cent of the total number of non-ad valorem tariff items in the QUAD (in the year 2000). It should be stressed however, that 98.6 per cent of cases for which AVEs could not be calculated, are the non-computable tariffs, mainly technical. Excluding the non-computable tariffs, we get just 48 tariff items for which AVEs could not be calculated (0.2 per cent of the total number of non-ad valorem tariff items).

Summary notes

38. Distinctive features of this methodology could be summarized as follows:

- Use of applied rates of duty tariffs.
- Use of world import unit values to calculate AVE of a simple specific tariff.
- Use of two sets of import unit values, based on two different sources of trade data (annual reporter's imports. from world at the national line level and annual imports from world of the OECD countries, at HS - 6 digit level).
- Use of two-levels (the national line and HS 6-digit) searching strategy to combine the specific tariff with its respective import unit value.
- Automatic conversion quantity units and respective quantities to provide better match between specific tariffs and import unit values.
- Well-structured, bottom-up approach to calculate AVEs of complex tariffs. First, AVEs of all simple specific components are calculated, then those of the tariff's segments and finally the AVE of the complex tariff.

39. Main advantages of this methodology could be summarized as follows:

- Use of input data that are easily available in the public domain (especially statistics of imports).
- High "hit rate" i.e. the ratio of tariffs for which AVEs could be calculated to the total number of non-ad valorem computable tariffs.
- A user-friendly format of the output data, which enables easy verification and convenient analysis of obtained results.

Annex 1: Conversion of Quantity Units

Primary Quantity Unit			Converted (Basic) Quantity Unit			Quantity Units Conversion Factor (UCF)
Code	Abb.	Name	Code	Abb.	Name	
1	2	3	4	5	6	7
165	KGG	Kilogram Gross Weight	166	KGM	Kilogram	1
167	KGN	Kilogram Net Weight	166	KGM	Kilogram	1
168	TNE	Tonne	166	KGM	Kilogram	1000
174	CKN	100 Kilograms Net Weight	166	KGM	Kilogram	100
175	CKB	100 Kilograms Gross Weight	166	KGM	Kilogram	100
176	TNN	Tonne Net Weight	166	KGM	Kilogram	1000
177	TNG	Tonne Gross Weight	166	KGM	Kilogram	1000
008	KMT	Kilometre	006	MTR	Metre	1000
017	HMT	Hectometre	006	MTR	Metre	100
060	MSM	Thousand Square Metres	055	MTK	Square Metre	1000
115	MQM	Thousand Cubic Metres	113	MTQ	Cubic Metre	1000
122	HLT	Hectolitre	120	LTR	Litre	100
830	PFL	Proof Litre	120	LTR	Litre	2.5
831	LPA	Litre of Pure Alcohol	120	LTR	Litre	2.5
657	NAR	Number of Articles/Items	380	NEH	Number/Each/Head	1
784	HUP	Hundred of Pieces	380	NEH	Number/Each/Head	100
796	PCE	Piece	380	NEH	Number/Each/Head	1
798	MIL	Thousand	380	NEH	Number/Each/Head	1000

Annex 2: Summary of calculation results obtained for the QUAD countries

(tariffs of 2000)

Reporter	Total Number of non-ad valorem tariff items	No of Items for which AVEs were calculated	No of Items for which AVEs could not be calculated			Notes
			Total	of which non-computable tariffs	of wchich computable tariffs	
Canada	593	590	3	0	3	
EU	15'227	11'114	4'113	4'101	12	Agriculture component, additional duties on sugar
Japan	1'672	1'633	39	17	0	
USA	3'835	3'262	573	540	33	Temporary and certain trade agreements rates were not available in the input data
Total QUAD	**21'327**	**16'599**	**4'728**	**4'658**	**48**	

Annex 3 : Formulas for calculating ad valorem equivalents

No	Formula	Description	Example of a tariff
1	**AVE = 100 * SPT / UCF *IUV *EXR**	Basic formula to calculate AVE of a simple specific tariff	**95.00 EUR/DTN**
2	**AV1 = 100 * SPT1 / UCF1 *IUV1 *EXR**	AVE of the first specific component of a compound/mixed tariff	**1.19 EUR/KGM** + 27.50 EUR/DTN
3	**AV2 = 100 * SPT2 / UCF2 *IUV2 *EXR**	AVE of the second specific component of a compound/mixed tariff	1.19 EUR/KGM + **27.50 EUR/DTN**
4	**AVE1 = AT1 + AV1**	AVE of a simple compound tariff (single ad valorem and specific components)	**8.30% + 95.00 EUR/DTN**
5	**AVE1 = MIN(AT1,AV1)**	AVE of a simple mixed tariff (minimum of ad valorem and specific components)	**17.30% MIN. 1.00 EUR/HLT**
6	**AVE1 = MAX(AT1,AV1)**	AVE of a simple mixed tariff (maximum of ad valorem and specific components)	**5.40% MAX. 3.50 EUR/HMT**
7	**AVE = AV1 + AV2** **AVE = SUM(AVE1,AVE2)**	AVE of a compound tariff (sum of two specific components or two tariff segments)	**1.19 EUR/KGM + 27.50 EUR/DTN**
8	**AVE = MIN(AV1, AV2)**	AVE of a mixed tariff (minimum of two specific components)	**1.30 EUR/HPA MIN. 7.20 EUR/HLT**
9	**AVE = MAX(AV1, AV2)**	AVE of a mixed tariff (maximum of two specific components)	**1.30 EUR/HPA MAX. 7.20 EUR/HLT**
10	**AVE = MIN(AT1, AVE2)**	AVE of a mixed tariff (minimum of an ad valorem and a specific component)	**11.5% MIN. 8.30% + 4.50 EUR/DTN**
11	**AVE = MAX(AT1, AVE2)**	AVE of a mixed tariff (maximum of an ad valorem and a specific component)	**11.5% MAX. 8.30% + 4.50 EUR/DTN**
12	**AVE = MIN(AVE1, AVE2)**	AVE of a mixed tariff type 1 (minimum of two tariff segments)	**8.60% + 20.20 EUR/DTN MIN. 19.40% + 9.40 EUR/DTN**
13	**AVE = MAX(AVE1, AVE2)**	AVE of a mixed tariff type 1 (maximum of two tariff segments)	**8.60% + 20.20 EUR/DTN MAX. 19.40% + 9.40 EUR/DTN**
14	**AVE = AT, when AT >= AV1 and AT <= AV2** **AVE = AV1, when AT < AV1** **AVE = AV2, when AT > AV2**	AVE of a mixed tariff type 2 (a single ad valorem and two specific components)	**18.40% MIN. 22.00 EUR/DTN MAX. 24.00 EUR/DTN**
15	**AVE = AV, when AV >= AT1 and AV <= AT2** **AVE = AT1, when AV < AT1** **AVE = AT2, when AV > AT2**	AVE of a mixed tariff type 2 (a single specific and two ad valorem components)	**25.00 EUR/DTN MIN. 10.2% MAX.18.50%**

Notes:
AT – Ad valorem tariff
AV – Ad valorem equivalent (AVE) of a simple specific tariff
AVE1 – Ad valorem equivalent of the first segment of a compound/mixed tariff
AVE2 – Ad valorem equivalent of the second segment of a compound/mixed tariff

Annex 4 : Output data format

Product Code	Tariff	Imports Value (US$)	Imports Quantity	Qty Unit	I A L	E C	AVE	AVE1	AVE2	Imp. Unit Value
1	2	3	4	5	6	7	8	9	10	11
0102900510	10.20% + 93.10 EUR/DT	313'654	91'373'000	166	N		**39.09**	39.09	.	3.43
0102902910	10.20% + 93.10 EUR/DT	65'662	23'426'000	166	N		**45.59**	45.59	.	2.80
0102907999	10.20% + 93.10 EUR/DT	497'969	206'291'000	166	N		**51.29**	51.29	.	2.41
0103911000	41.20 EUR/DT	140'542	93'460'000	166	N		**29.19**	29.19	.	1.50
0103921100	35.10 EUR/DT	18'967	25'809'000	166	N		**50.89**	50.89	.	0.73
0103921900	41.20 EUR/DT	387'319	371'847'000	166	N		**42.14**	42.14	.	1.04
0104103000	80.50 EUR/DT	226'500	96'328'000	166	N		**36.47**	36.47	.	2.35
0201100099	12.80% + 176.80 EUR/DT	1'961	871'000	166	N		**96.46**	96.46	.	2.25
0201202091	12.80% + 176.80 EUR/DT	86	32'000	166	N		**82.89**	82.89	.	2.69
0402109100	1.19 EUR/KGM + 27.50 EUR/DTN	88'885	72'817'000	166	H1		**127.86**	103.86	24.00	1.22
0402109900	1.19 EUR/KGM + 21.00 EUR/DTN	30	11'000	166	N		**54.69**	46.49	8.20	2.73
0402911100	34.70 EUR/DT	6	5'000	166	N		**30.81**	30.81	.	1.20
0402911900	34.70 EUR/DT	21	18'000	166	H1		**31.69**	31.69	.	1.17
0402913100	43.40 EUR/DT	15	13'000	166	N		**40.07**	40.07	.	1.15
0402913900	43.40 EUR/DT	21	18'000	166	H1		**39.63**	39.63	.	1.17
1006102100	211.00 EUR/TN	7	2'000	166	N		**6.42**	6.42	.	3.50
1006102300	211.00 EUR/TN	10	19'000	166	N		**42.71**	42.71	.	0.53
1704905111	9.00% + Agri. Comp. MAX. 18.70% + Add. Duty on Sugar	.	.			M	**-1.00**	.	.	.
2105009190	8.00% + 38.50 EUR/DTN MAX. 18.10% + 7.00 EUR/DT	1'563	660'000	166	N		**25.32**	25.32	21.25	2.37
2105009910	7.90% + 54.00 EUR/DTN MAX. 17.80% + 6.90 EUR/DT	16'088	6'750'000	166	N		**32.04**	32.04	20.88	2.38
2106909823	9.00% + Agricultural Component	.	.			M	**-1.00**	.	.	.
2401102000	18.40% MIN. 22.00 EUR/DTN MAX. 24.00 EUR/DT	14'067	3'599'000	166	N		**6.54**	.	.	3.91
2401103000	18.40% MIN. 22.00 EUR/DTN MAX. 24.00 EUR/DT	96	20'000	166	N		**5.33**	.	.	4.80
9111100000	0.50 EUR/NAR MIN. 2.70% MAX. 4.60	25'542	261'663	380	N		**2.70**	.	.	97.61
9111201000	0.50 EUR/NAR MIN. 2.70% MAX. 4.60	7'467	1'328'663	380	N		**4.60**	.	.	5.62

Note:
The above table does not fully reflect the real output data format because it is limited to calculations based on reporter's imports from world. The real output contains also the headings similar to those in columns 3 – 11, but with the information based on the OECD's imports from world (as mentioned in the paragraph 9).