One concern that needs to be taken into account is cross-country comparability. While many statistical measures based on national standards may make perfect sense and suit national needs very well, it should not be forgotten that international comparison is important even from a national point of view.

HE HARMONI ED S S EM NOMENCLA RE

Nearly all national tariff nomenclatures follow the Harmonized System (HS), which is maintained by the World Customs Organization. Its member countries, which are mostly also Members of the WTO, have agreed to adopt the HS product classification as their international standard nomenclature. The HS product classification is broken down by Sections, Chapters, Headings and, at its most detailed level, Subheadings (HS six-digit codes). The HS product classification is

(1) Simple average of all tariff line duties

The simple average of all tariff line duties is probably the most commonly used indicator. It is defined as follows:

$$Ta(1) = Sum(T_i) / Count(T_i)$$

Each tariff line (Ti) has exactly the same weight irrespective of its economic importance. The relative weight of a HS subheading depends on the number of individual tariff lines in that subheading compared to the overall number of national

A.1

A.3
D t . t t

C t		A . t		D
		M t 1	M t 2	
S t	2006	13.4	7.6	5.7
	2006	31.8	26.8	5.0
N	2006	12.4	8.6	3.8
r .	2006	9.2	10.6	-1.4
B	2006	10.6	12.3	-1.7
P .	2006	8.1	9.9	-1.8

In this publication method 2, i.e. simple averages with pre-aggregation, was used as the main method in the summary tables and also in the country tables. In addition, trade weighted averages, based on HS six-digit pre-aggregations, are presented in Part A.1 of the country pages. In Part B import trade-weighted averages are based on bilateral tariff line trade flows, taking also into account preferential treatment as applicable. In the bilateral context, it appears quite appropriate and very relevant to focus on traded tariff lines. In the absence of prohibitive market access conditions, these tariff lines are of interest from an exporter's perspective. The difference between MFN and preferential trade-weighted duties gives an indication of the preferential rent.

B. ME HODOLOG FOR HE ES IMA ION OF NON-*AD ALOREM* ARIFFS

Countries use various types of tariffs in their currently applied or in their bound tariff schedules. In most cases, tariffs are expressed in *ad valorem* terms, i.e., as a simple percentage of the value of the imported product. However, some countries express some or even a substantial number of tariffs in non-*ad valorem* terms as classified in Box 1.[5]

B B.1

- t

• **S t :** The customs duty is not related to the value of the imported goods but to its weight, volume, surface, etc. The specific duty stipulates how many units of currency are to be levied per unit of quantity (e.g. 2.00 Swiss Francs/kg).
• **C t :** The customs duty is a tariff comprising an *ad valorem* duty to which is added or subtracted a specific duty (e.g. 10 per cent plus US$2.00/kg; 20 per cent less US$2.00/kg).
• **M t** : The customs duty is based on a conditional choice between an *ad valorem* duty and a specific duty, subject to an upper (ceiling) and/or a lower (floor) limit.
• **t** : The customs duty is determined by complex technical factors such as alcohol content, sugar content or the value of the imported product (e.g. 8.2 per cent + T1, where T1 refers to a specific formula duty based on the agricultural component).

The proliferation of non-*ad valorem* duties (NAVs) is partly due to the tariffication process for agricultural products undertaken during the Uruguay Round, whereby quantitative restrictions and variable levies applicable to agricultural products were converted into tariffs and tariff rate quotas. This tariffication process resulted in the adoption of specific duties, often combined with quotas, rather than pure *ad valorem* tariffs. The co-existence of *ad valorem* and non-*ad valorem* tariffs makes the comparison of countries' tariff profiles difficult, hence the need to calculate *ad valorem* equivalents for the non-*ad valorem* tariffs.

There is a general, albeit incorrect, perception that NAVs are used only by developed countries. In reality, NAVs are applied by 68 out of the 151 countries shown in this publication including several LDCs (see the summary tables). The use of these tariffs varies strongly from country to country from 80% of tariff lines in Switzerland to only one tariff line in

One of the peculiarities of NAVs resides in the fact that even if they are applied to a limited number of tariff lines, the products concerned are often classified as sensitive, either because governments collect significant tariff revenues, e.g. cigarettes and alcoholic drinks, or for protecting domestic products against lower priced imports. These highlight the importance of analysing NAVs. In order to compare the level of protection among products and across countries, the different NAVs applied by a country have to be "normalized" and treated homogeneously.

This "normalization" is most commonly done by converting these different measures into *ad valorem* equivalents (AVEs). An AVE is an estimate of *ad valorem* effect that a NAV duty has on the imports. It has to be kept in mind that AVEs are only "imperfect" estimates because the *ad valorem* equivalent of a specific tariff at a given date will remain equivalent only as long as the price of the imported goods remains unchanged.[6]

AD VALOREM EQUIVALENTS BASED ON UNIT VALUES

There are two main methods of AVE estimation that were used in the GATT/WTO context: revenue collected divided by the value of imports, and unit values based on import values divided by import quantities.

The revenue method will not be discussed further because it has more serious limitations in its use than the unit value method. In particular, it requires that MFN dutiable trade has taken place in the reference period. The unit value method is relatively easier to apply to situations with no trade flows and/or situations with multiple preferential rates.

The unit value method requires that the value of imports is first divided by the import volume (quantity) to derive the import unit value (UV). The AVE is then calculated as the specific part of the NAV divided by the UV and the result is presented as a percentage.[7] For example, if the import value is US$10,000 and the corresponding import volume is 100 tonnes, the unit value would be US$100/tonne. A specific duty of US$10/tonne expressed as a percentage of the resulting unit value (US$100/tonne) would give an AVE of 10 per cent.

6 Analogously, AVEs will diverge when the price of a product varies. It can be observed that specific tariffs tend to discriminate against exports from low-income countries, whose producers often specialize in the lower price-quality segment of export markets. In addition, the price decrease for many commodities in recent years has further penalized many least developed countries, as the AVE of specific duties for these commodities increased correspondingly. For example, the protection is equal between a US$20/tonne specific tariff and a 20 per cent *ad valorem* tariff, when the price equals US$100/tonne. If the price falls to US$50/tonne, however, the same specific tariff is equivalent to a 40 per cent protection level.

7 For compound duties the *ad valorem* part is then added or subtracted to arrive at one AVE value. For mixed duties the AVE of the specific part is then subject to the conditional choice expressed in the duty.

( ) **t** : UVs are calculated, for each bilateral trade flow and then a import-weighted average is calculated.

$$UV_k = \frac{\sum_{i=1}^{n}\left[\left(V_{ik}\big/Q_{ik}\right) * V_{ik}\right]}{\sum_{i=1}^{n}\left[V_{ik}\right]}$$

The drawback of this method is that the result is strongly affected by high value transactions.

( ) **S** **:** All UVs calculated for each bilateral import trade flow are summed up and divided by the total number of bilateral trade flows

$$UV_k = \frac{1}{n}\sum_{i=1}^{n}\left[V_{ik}\big/Q_{ik}\right] = \frac{1}{n}\sum_{i=1}^{n}\left[UV_{ik}\right]$$

In this method all UVs are given the same weight in the calculation of the average UV. Small trade transactions are often more numerous and costly per unit and have a tendency to push the average upwards if a minimum trade threshold is not used. Extreme UVs may also unduly affect the result.

( ) **M** : This approach, also based on individual bilateral UVs, uses the median UVs which is not sensitive to extreme values However, the use of the median is not appropriate in a multimodal structure, i.e. the product covered under a specific tariff line includes two or more quite distinctly priced sub items. In a graphical perspective, one would see a UV distribution with multiple peaks.

To determine which methodology calculates most accurately the UVs required for the estimation of AVEs one needs to test the different methodologies and analyse their sensitivity to variations in the data. It is important to understand and interpret the origin of these variations and to correct them if possible. This would also enable the identification of multimodal UV distributions. The remainder of this paper investigates and elaborates on the problems that can be faced when analysing trade data and it introduces different approaches and methods adopted to overcome these problems in the calculation of AVEs for this publication.

The analysis was done for all of the about 28,000 NAVs that were present in the tariff schedules. For about 15,000 tariff lines UVs were calculated at the tariff line level. For the remainder of the NAVs HS six-digit UVs were used.

190WORLD

The elimination of the extreme values has, on the one hand, enabled to bring closer together the estimated UVs, but on the other hand, it has only partially eliminated all the risks associated with dispersion of UVs.

Apart from the identification and elimination of outliers, bilateral UVs may exhibit certain properties that require the use of a different algorithm. The choice of the calculation method depends significantly on the characteristics of the distribution of the bilateral UVs. In an ideal world, a thorough analysis of each sample would be undertaken as a way to better adapt the methodology. Since the volume of data under analysis is significant, it was judicious to come up with an automated methodology.

MEAS RES OF DISPERSION AND AS MME R

A very useful and robust measure to describe the dispersion of a data series is the interquartile range ratio, which is the ratio between the lower (Q_1) and upper (Q_3) quartile ($IRR = Q_1/Q_3$). The closer the ratio's value is to 1, the lower and the more stable the dispersion is. A low value of the ratio denotes a high variability of the UVs included in the data series. Moreover, a high variation does not allow the extraction of a representative UV sample. The IRR's sensitivity can in certain instances be caused by inaccuracies in the data set or by the presence of two or more categories or varieties of products in the same tariff line. This phenomenon is more often encountered when the analysis is undertaken at the HS six-digit level because of the aggregation of different products under the same subheading.

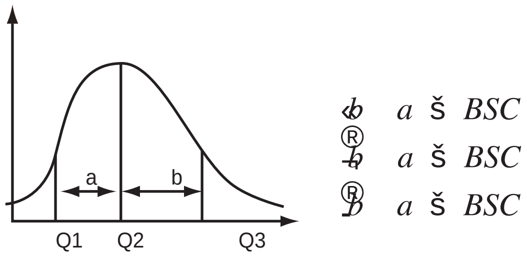
Two levels of sensitivity have been tested. The first one has an IRR greater than 0.5 and the second one has an IRR greater than 0.25. For a stable range, the value of the upper quartile (Q_3) must be at most two times greater (respectively four times) than value of the lower quartile (Q_1).

According to the results of the analysis about 80 per cent of the tariff line UVs satisfy the first level of sensitivity ($IRR>0.25$) and 46 per cent satisfy the second level ($IRR>0.5$). The percentage for the second level can be improved to 66 per cent if outliers are removed as outlined above. While an IRR value of 0.5 can be considered as extremely constraining and inflexible, the thoroughness of the methodology pays off in terms of the increased reliability. If the IRR value is > 0.5, the sample can be considered as stable and its median UV can be considered as the sample's representative value.

Before coming to such a conclusion, one must verify whether this median is also properly centered. To perform this verification, the Bowley's asymmetry coefficient (Bowley Skewness Coefficient: BSC) has been used. It is calculated as follows:

$$BSC = \frac{(Q_3 - Q_2) - (Q_2 - Q_1)}{(Q_3 - Q_2)}$$

Its value ranges from -1 to +1, and it is equal to zero if the median is located exactly in the middle of the interquartile range.



Over 80 per cent of the tariff line UVs have a BSC between –0.5 and 0.5 and their distribution can be considered as symmetrical. The median UV for these tariff lines has been used for calculating AVEs (as long as the conditions relating to the IRR hold and that there are at least three observations available for the calculation). The remaining lines were treated separately with a different algorithm because of their high dispersion.

Using again the example of product 04041006 imported by the EU, none of the two prerequisite conditions have been met, even though the elimination of extreme values has reduced the dispersion in the sample. The BSC for this product is equal to 0.66 and the IRR is 0.42. As a result, this product was assigned to the group of other products which have not been retained according to this criteria. It would have to go through the UV's additional identification procedures.

In summary, 58 per cent of the tariff lines satisfy the two conditions and among them 42 per cent have a minimum of three observations and have therefore been retained for the calculation of median UVs.

The starting point is a partition where each interval is represented by an initial central value(C(0,1), C(0,2) and C(0,3)). The starting values for the current algorithm are the three quartiles: Q_1, Q

Graph B.1 shows how after five successive iterations a stable partition is obtained. In this final partition, the first central value goes from C(0,1)=500 US$/tonne to C(5,1)=547 US$/tonne for 109 observations and 23 million US$ of trade. The second value goes from C(0,2)=680 US$/tonne to C(5,2)=1,562 US$/tonne for 39 observations and 38 million US$ of trade and the third central value goes from C(0,3)=1,488 US$/tonne to C(5,3)=4,304 US$/tonne for 21 observations and 35 million US$ of trade. The average weighted UV calculated using these three values is 1,246 US$/tonne which is nearly two times higher than the median.

Out of the series included in this process, 24 per cent have a minimum of 10 observations. The remaining series were disregarded and treated using HS six-digit (see table B.3).

B.3

D t t t t

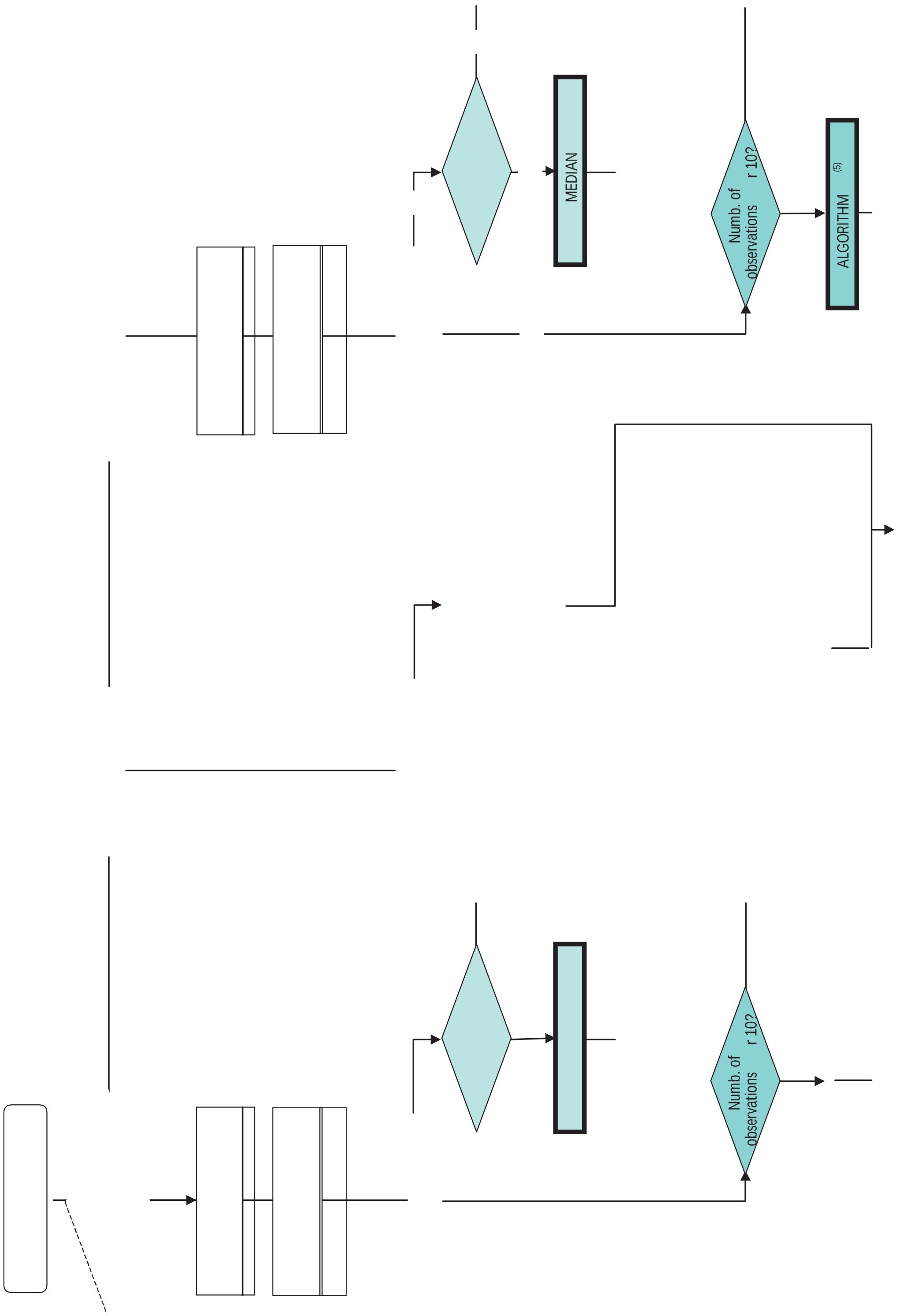
The calculation of UVs using reference groups data was done for 57 per cent of the NAVs. The remaining UVs were based on world imports. Even at the world level, the selection procedure of the UVs followed the same stringency. It allowed to cover another two per cent of the NAVs. In the end, for only four per cent of the NAVs no AVEs could be calculated. This was due to the use of undefined units or non-quantifiable technical measures by countries.

B.4

O t t t

M t	S t t
	38
HS - t	57
HS - t	2
t	3
t	1

COA Et 7( )59(A)44.9(t)36.9(.)36.9( )55( )36.9 (. 7)


MEDIAN
Numb. of observations r 102
ALGORITHM (5)
Numb. of observations r 102