WORLD TRADE ORGANIZATION

TN/MA/S/3
9 September 2002

(02-4711)

Negotiating Group on Market Access

FORMULA APPROACHES TO TARIFF NEGOTIATIONS

Note by the Secretariat[1]

I. INTRODUCTION

1. The present study was prepared in response to a request from the delegation of Brazil to prepare a study that illustrates the various modalities used in tariff negotiations.

2. The study is divided into four sections including an introduction. Section II reviews the mandate for tariff negotiations. Section III covers different formulae that have been proposed and adopted. The approach that has been taken in this section is to divide the different approaches into two types depending on whether they are a function of the initial tariff rate. The study does not cover the request and offer approach, since this is bilateral in nature. Section IV then closes with a discussion of the types of exceptions that have historically been used.

3. It should be noted that this study is meant to complement the studies that have been listed in the documents TN/MA/S/1 and TN/MA/S/1/Add. 1.

II. MANDATE FOR MODALITIES

4. The actual modality for tariff negotiations that have been used by contracting parties has evolved since the first set of negotiations. Up to and until the 1956 Geneva Tariff Conference the rules and procedures used for negotiations was the selective product-by-product approach. Article XXVIII*bis*, established in 1957, allows for Members to establish procedures that are acceptable to them. It leaves it to the participants to decide whether the negotiations should be carried out on a selective product-by-product basis or by the "application of such multilateral procedures as may be accepted by the contracting parties concerned". Full use of this provision was made during the Kennedy Round of negotiations (1964-1967) where negotiations would be based upon a plan of "substantial linear tariff reductions".

5. The Ministerial Declaration of the Tokyo Round stated that negotiations should aim, *inter alia*, to "conduct negotiations on tariffs by employment of appropriate formulae of as general application as possible". In slight contrast, the Ministerial Declaration that established the Uruguay Round broadened the mandate for negotiators by stating using the term "appropriate methods", without providing a definition for appropriate. Similar language is used in paragraph 16 of the Doha Ministerial Declaration, which says that modalities “should be agreed”.

---

[1] This document has been prepared under the Secretariat's own responsibility and without prejudice to the positions of Members and to their rights and obligations under the WTO.

III. FORMULAS APPROACHES

6. Two types of formulas can be used in negotiations. The first type is one that reduces the applicable tariff rates by the same amount, regardless of the initial tariff rate. These are called tariff independent formulas. The second type of formula is called a tariff dependent, since the percentage reduction in tariff rates depends on the tariff rate subject to negotiations. Such formulas are also known as harmonisation formulas since they also have the effect of reducing the dispersion of the applicable tariff rates.

7. In order to illustrate how the two different types of formulas work, a hypothetical tariff structure is assumed. The shape of the tariff structure takes into account the possibility of tariff peaks, escalation and high tariffs, although it should be pointed out at the outset that the definitions for each of these terms is specific to this paper (box 1).

BOX 1 HYPOTHETICAL STRUCTURE

For simplicity and for expositional purposes a hypothetical tariff profile is assumed for this paper. Only 25 lines are assumed in the tariff structure so that each line reflects one particular commodity. For example, line 1 is product 1. The tariffs are assumed to increase by 2.5 per cent starting from line 2. The tariff rate for line 1 is assumed to be 1 so that the highest tariff rate is for line 25, which is 60 per cent. Descriptive statistics for the hypothetical profile are provided in box table 1.

Box table 1 Summary Statistics of Hypothetical Tariff Profile

Mean	30.04
Standard Error	3.67
Median	30
Standard Deviation	18.3
Minimum	1
Maximum	60
Count	25

The structure also allows for alternative interpretations of key terms in paragraph 16 of the Doha Ministerial Declaration. For example, a commonly used definition of the term "tariff peak" is 15 per cent. For this profile, using this definition, all the lines between 8 and 25 would be defined as having a peak. For tariff escalation purposes, the approach used here is to assume one multiple production stage product, commodity 13, and one intermediate product, commodity 5. The reason for doing this is that a simple coefficient of tariff escalation can be calculated, which would be the ratio of the tariff in line 13 over the tariff in line 5. In this case the value is 3.0. A lower coefficient value would imply less escalation, since the tariff rate on the final product would be approaching the tariff rate of the intermediate product.

8. Over the various rounds of negotiations submissions by CONTRACTING PARTIES have not followed a common format, although they all have the same objective of reducing tariffs. Some proposals use the rate of reduction as the benchmark. For example, a specific number of 30 or 50 per cent is the specified reduction of the tariff for a particular line. Others have focussed on the final rate of duty, allowing for the necessary rate of reduction. Therefore, a benchmark, or point of comparison for the various approaches is required. In order to present the different approaches in a uniform manner this section uses the rate of reduction as the basis of the formula. That is the formula describes the percentage reduction that arises from the implementation of a particular proposal.

A. TARIFF INDEPENDENT MODALITIES

9. The defining feature of independent modalities is that they are not dependent, in anyway, on the initial tariff rate. What is important is simply the rate of reduction. For example, the most commonly cited independent modality is the one used for the Kennedy Round where "an across the board cut of 50 per cent would be used as a working hypothesis for the determination of the general rate of linear reduction" (Hoda, 2001; pg. 31).

10. Assume that the initial tariff rate prior to negotiations is given by t_0 and the final tariff rate resulting from the negotiations is t_1. The expression which relates the two tariff rates, where c is a constant parameter, would be:

$$t_1 = c(t_0) \tag{1}$$

11. The final tariff rate would necessarily depend upon both the parameter c and the initial tariff rate. The rate of reduction, however, is *independent* of the tariff rate. To see this, let R be the rate of reduction which is defined as:

$$R = \frac{t_1 - t_0}{t_0} \tag{2}$$

12. Substituting expression (1) into (2) will result in the following expression, which is independent of the initial tariff rate.

$$\begin{aligned} R &= \frac{c(t_0) - t_0}{t_0} \\ R &= \frac{t_0(c-1)}{t_0} \\ R &= c - 1 \end{aligned} \tag{3}$$

13. The rate of reduction in the original tariff rate depends only on the parameter c. The original tariff rate is *not* a determinant of the rate of reduction. All tariff rates will be reduced by the *same* amount.

14. To assess how this particular modality operates consider our hypothetical tariff profile assuming values for c that result in a 10, 25 and 50 per cent cut respectively as indicated by expression (3). Table 1 presents the original tariff profile and the resulting profile for the three different values of c.

15. Some of the key descriptive statistics of the old and new tariff profiles are also provided in table 1. They indicate that the formula results in a reduction in the overall average, minimum and maximum tariff rates. The impact on peaks and escalation, however, is quite limited. The number of peaks, even with a 50 per cent reduction is reduced by a relatively small amount and there is no impact on our pre-defined tariff escalation ratio. The latter result arises since all tariffs are cut in the same proportion, which would not change relative prices.

B. TARIFF DEPENDENT MODALITIES (HARMONISATION FORMULAS)

16. In contrast to the previous section where the rate of reduction is independent of the initial tariff rate, there is a whole class of formula based modalities that are a function of the initial tariff. The basic element of these formulas is that they aim to have higher reductions for higher tariffs. Hence, they can be called 'harmonising' formulas, since the overall dispersion of the tariff profile is reduced.

17. In this case the formula can be linear, or non-linear. It should also be noted that during the Tokyo Round a specific functional form of the non-linear formula was proposed by Switzerland. This formula is now commonly known as the Swiss formula and is treated separately in the subsection on non-linear formulas.

FIGURE 1 TARIFF INDEPENDENT MODALITIES: VARIOUS COEFFICIENTS

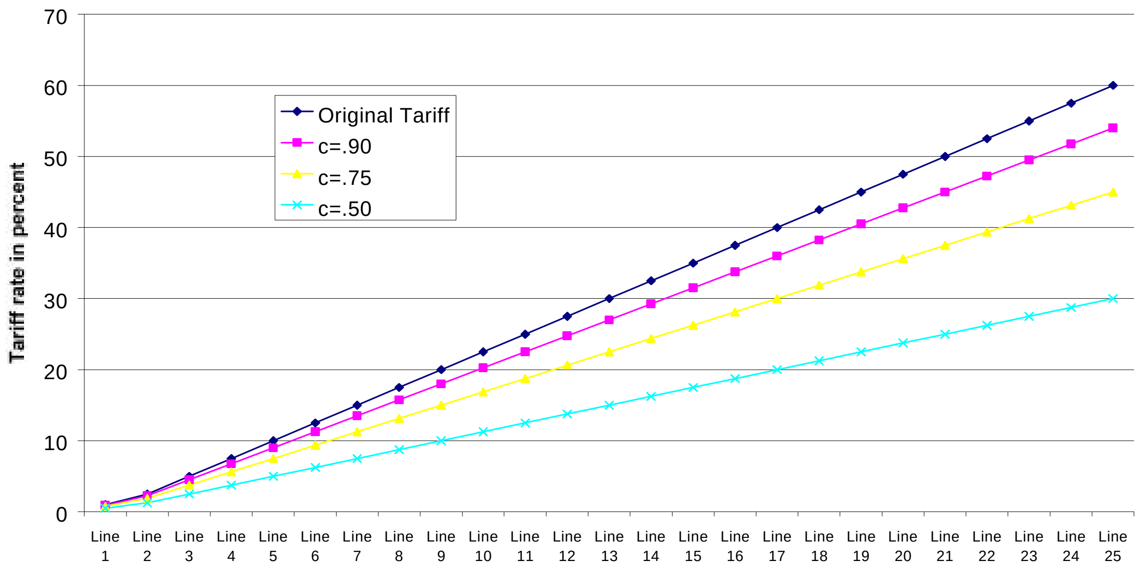


TABLE 1 TARIFF INDEPENDENT MODALITIES: VARIOUS COEFFICIENTS

	Original Tariff	Final Tariff (c=.90)	Final Tariff (c=.75)	Final Tariff (c=.50)	Rate of reduction (per cent)		
Line 1	1	0.90	0.75	0.50	10.00	25.00	50.00
Line 2	3	2.25	1.88	1.25	10.00	25.00	50.00
Line 3	5	4.50	3.75	2.50	10.00	25.00	50.00
Line 4	8	6.75	5.63	3.75	10.00	25.00	50.00
Line 5	10	9.00	7.50	5.00	10.00	25.00	50.00
Line 6	13	11.25	9.38	6.25	10.00	25.00	50.00
Line 7	15	13.50	11.25	7.50	10.00	25.00	50.00
Line 8	18	15.75	13.13	8.75	10.00	25.00	50.00
Line 9	20	18.00	15.00	10.00	10.00	25.00	50.00
Line 10	23	20.25	16.88	11.25	10.00	25.00	50.00
Line 11	25	22.50	18.75	12.50	10.00	25.00	50.00
Line 12	28	24.75	20.63	13.75	10.00	25.00	50.00
Line 13	30	27.00	22.50	15.00	10.00	25.00	50.00
Line 14	33	29.25	24.38	16.25	10.00	25.00	50.00
Line 15	35	31.50	26.25	17.50	10.00	25.00	50.00
Line 16	38	33.75	28.13	18.75	10.00	25.00	50.00
Line 17	40	36.00	30.00	20.00	10.00	25.00	50.00
Line 18	43	38.25	31.88	21.25	10.00	25.00	50.00
Line 19	45	40.50	33.75	22.50	10.00	25.00	50.00
Line 20	48	42.75	35.63	23.75	10.00	25.00	50.00
Line 21	50	45.00	37.50	25.00	10.00	25.00	50.00
Line 22	53	47.25	39.38	26.25	10.00	25.00	50.00
Line 23	55	49.50	41.25	27.50	10.00	25.00	50.00
Line 24	58	51.75	43.13	28.75	10.00	25.00	50.00
Line 25	60	54.00	45.00	30.00	10.00	25.00	50.00
Average	30.04	27.04	22.53	15.02			
Minimum	1	0.9	0.75	0.5			
Maximum	60	54	45	30			
Std. deviation	18.33	16.5	13.75	9.17			
Peaks (>15)	19	18	17	13			
Escalation t_{13}/t_5	3	3	3	3			

1. Linear reduction formulas

18. The most basic linear formula is one which equates tariff reductions with the initial tariff. For example, where:

$$R = t_0 \tag{4}$$

19. The higher the initial tariff, the higher the rate of reduction. For example, for line 1, using our hypothetical tariff profile, the reduction would be 1 per cent since the tariff rate is 1 per cent. The final tariff, therefore, would be 0.99 per cent. Accordingly, for line 25 which has the highest tariff rate at 60 per cent, the final tariff would 24 per cent, representing a 60 per cent reduction of the 60 per cent tariff. The net effect of this approach is that higher tariffs will have larger reductions.

20. Equation (4) is a special case of a linear reduction formula where there is no intercept, nor any slope coefficient. The general functional form of a line is typically given as y=a +bx, where a is the intercept and b is the slope. Therefore, in equation 4 the slope coefficient is one, and the intercept is equal to zero.

21. Now consider the case where an intercept term of 50 is added. In this case, regardless of the level of the initial tariff there will at least be a 50 per cent reduction. Added to this reduction rate is a further reduction based on the level of the tariff as in equation (4). The new reduction formula in this case is:

$$R = 50 + t_0 \tag{5}$$

22. The additional term clearly results in a larger reduction. However, it should be noted that it also creates a upper bound for the final tariffs if the initial value is above 50. If the initial tariff is equal to 50, then R will be equal to 100. Therefore, the net effect of equation (5) is to reduce all tariff rates above or equal to 50 to zero (column 4 in table 2).

23. Yet another variant of this approach would be to increase the slope coefficient of t_0 in either equations (4) or (5). Consider increasing the reduction rate associated with to in equation (5) from 1 to 1.5. The new reduction equation in this case is:

$$R = 50 + 1.5(t_0) \tag{6}$$

24. In this case the net effect is to further increase the reduction rate of tariffs. All tariff rates equal to or above 35 per cent will be reduced to zero.

25. Figure 2 illustrates the impact of equations (4) – (6) on our hypothetical tariff profile. As indicated before, there are two points to note about this class of formulas. First, higher tariff will face higher cuts, as measured by the gap between the original tariff profile (straight) line and each of the other curves on the graph. As the initial tariff rate increases, the gap between the original tariff and the new tariff rate widens. Second, this gap, or cut is highest for the formulas with a slope coefficient that is greater than one, for a given intercept coefficient.

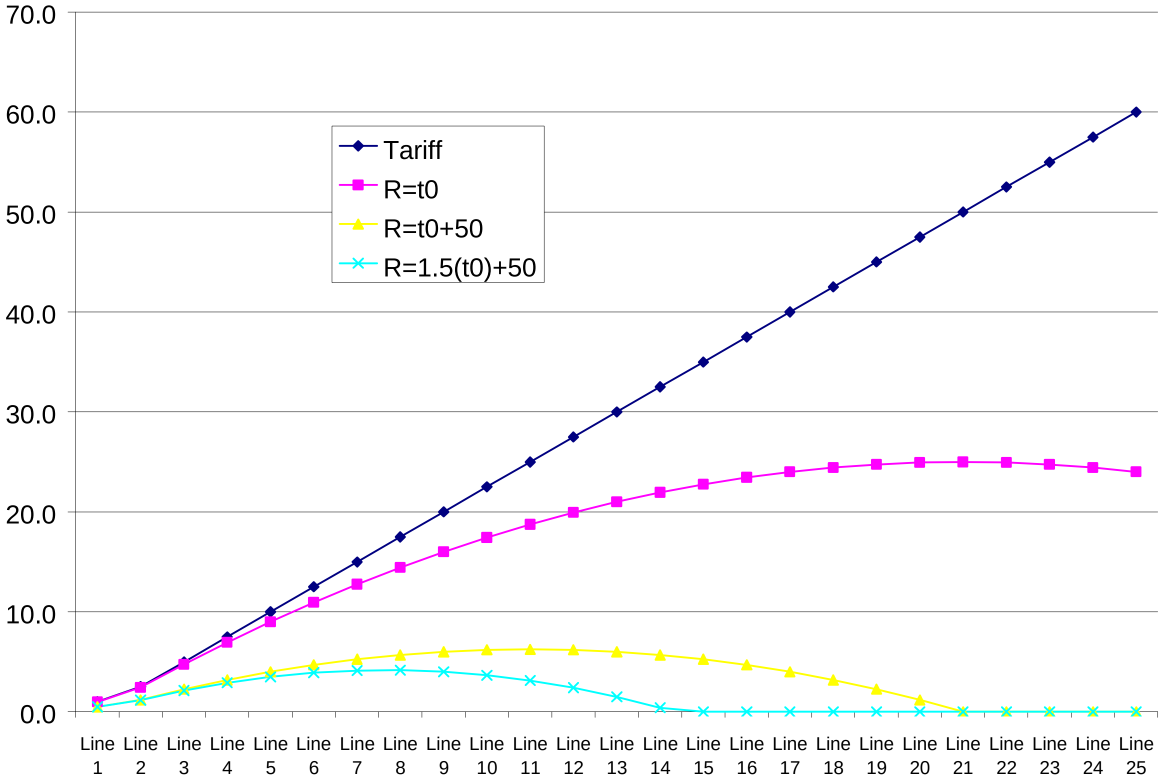
26. The summary statistics for these formulas are presented in table 2. In contrast to the case of a tariff independent formula, not only are the average, minimum and maximum reduced, but there is also an impact on the peaks and escalation. Equations (5) and (6) in particular have a significant impact. In both cases there are no tariff peaks as defined by the 15 per cent threshold and the relative

price of product 13 to product 5 is reduced from 3 in the original tariff schedule to 0.43 in the tariff schedule for equation (6).

TABLE 2 TARIFF DEPENDENT LINEAR REDUCTION FORMULAS: VARIOUS FUNCTIONAL FORMS

		Reduction Formula			Final Tariff		
	Original Tariff	$R=t_0$	$R=t_0+50$	$R=1.5(t_0)+50$	$R=t_0$	$R=t_0+50$	$R=1.5(t_0)+50$
Line 1	1.0	0.99	0.49	0.49	1.00	51.00	51.50
Line 2	2.5	2.44	1.19	1.16	2.50	52.50	53.75
Line 3	5.0	4.75	2.25	2.13	5.00	55.00	57.50
Line 4	7.5	6.94	3.19	2.91	7.50	57.50	61.25
Line 5	10.0	9.00	4.00	3.50	10.00	60.00	65.00
Line 6	12.5	10.94	4.69	3.91	12.50	62.50	68.75
Line 7	15.0	12.75	5.25	4.13	15.00	65.00	72.50
Line 8	17.5	14.44	5.69	4.16	17.50	67.50	76.25
Line 9	20.0	16.00	6.00	4.00	20.00	70.00	80.00
Line 10	22.5	17.44	6.19	3.66	22.50	72.50	83.75
Line 11	25.0	18.75	6.25	3.13	25.00	75.00	87.50
Line 12	27.5	19.94	6.19	2.41	27.50	77.50	91.25
Line 13	30.0	21.00	6.00	1.50	30.00	80.00	95.00
Line 14	32.5	21.94	5.69	0.41	32.50	82.50	98.75
Line 15	35.0	22.75	5.25	0.00	35.00	85.00	100.00
Line 16	37.5	23.44	4.69	0.00	37.50	87.50	100.00
Line 17	40.0	24.00	4.00	0.00	40.00	90.00	100.00
Line 18	42.5	24.44	3.19	0.00	42.50	92.50	100.00
Line 19	45.0	24.75	2.25	0.00	45.00	95.00	100.00
Line 20	47.5	24.94	1.19	0.00	47.50	97.50	100.00
Line 21	50.0	25.00	0.00	0.00	50.00	100.00	100.00
Line 22	52.5	24.94	0.00	0.00	52.50	100.00	100.00
Line 23	55.0	24.75	0.00	0.00	55.00	100.00	100.00
Line 24	57.5	24.44	0.00	0.00	57.50	100.00	100.00
Line 25	60.0	24.00	0.00	0.00	60.00	100.00	100.00
Average	30.04	17.79	3.34	1.5			
Minimum	1	0.99	0	0			
Maximum	60	3.75	6.25	4			
Std Deviation	18.33	7.84	2.39	1.68			
Peaks (>15)	19	17	0	0			
Escalation t_{13}/t_5	3.0	2.3	1.5	0.43			

FIGURE 2 LINEAR REDUCTION TARIFF INDEPENDENT FORMULAS: VARIOUS FUNCTIONAL FORMS



2. Non linear formulas

(a) General formulas

27. The simplest specification of a non-linear tariff dependent reduction formula is to simply square the initial tariff rate. That is to multiply equation (4) by the initial tariff.

$$R = (t_0)^2 \qquad (7)$$

28. This has the effect of increasing the reduction rate by a factor that is directly related to the initial tariff rate.[2] With equation (4) all tariff rates above 100 per cent would be reduced to zero. The specification in (7) will result in all tariff rates above 10 per cent being reduced to zero.

29. Given the significant difference in the impact between equations (4) and (6), another approach has been to amend (7) to reduce its impact by deflating the amount of the reduction. This can be accomplished by dividing equation (7) by some factor. Consider the following specifications, which divide equation (7) by a constant, resulting in equation (8) and dividing (7) by a constant plus the original tariff rate (equation (9)).

---

[2] Except where the initial tariff rate is less than or equal to 1.

$$R = \frac{(t_0)^2}{20} \tag{8}$$

$$R = \frac{(t_0)^2}{20 + t_0} \tag{9}$$

30. The results of these specifications are illustrated in figure 3 and table 3. The most significant impact arises from the implementation of equation (7). This has the overall effect of reducing virtually every tariff line to zero. The overall average is only 0.41 and there are no peaks, nor is there an issue with tariff escalation in our defined products since the tariff rate for the intermediate and final product are equal to zero. On the other hand, equation (9) has a minor impact on the overall number of peaks and the escalation ratio. Peaks are reduced by one line, and the escalation ratio is reduced to 2.54 from 3.0.

FIGURE 3 NON LINEAR TARIFF DEPENDENT FORMULAS: VARIOUS SPECIFICATIONS

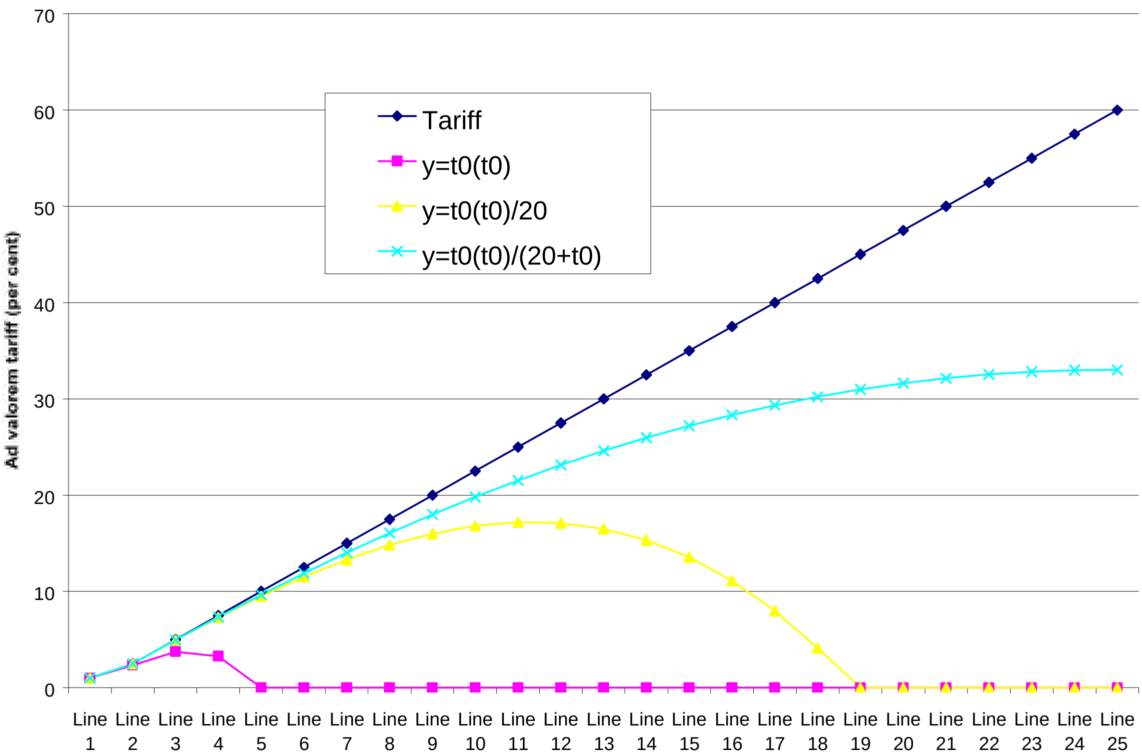


TABLE 3 NON LINEAR TARIFF DEPENDENT FORMULAS: VARIOUS SPECIFICATIONS

	Reduction rate (Per cent)				New Tariff		
	Original Tariff	$R=t_0(t_0)$	$R=t_0(t_0)/20$	R= $t_0(t_0)/(20+t_0$	$R=t_0(t_0)$	$R=t_0(t_0)/20$	R= $t_0(t_0)/(20+t_0)$
Line 1	1.00	0.99	1.00	1.00	1.00	0.05	0.05
Line 2	2.50	2.34	2.49	2.49	6.25	0.31	0.28
Line 3	5.00	3.75	4.94	4.95	25.00	1.25	1.00
Line 4	7.50	3.28	7.29	7.35	56.25	2.81	2.05
Line 5	10.00	0.00	9.50	9.67	100.00	5.00	3.33
Line 6	12.50	0.00	11.52	11.90	100.00	7.81	4.81
Line 7	15.00	0.00	13.31	14.04	100.00	11.25	6.43
Line 8	17.50	0.00	14.82	16.07	100.00	15.31	8.17
Line 9	20.00	0.00	16.00	18.00	100.00	20.00	10.00
Line 10	22.50	0.00	16.80	19.82	100.00	25.31	11.91
Line 11	25.00	0.00	17.19	21.53	100.00	31.25	13.89
Line 12	27.50	0.00	17.10	23.12	100.00	37.81	15.92
Line 13	30.00	0.00	16.50	24.60	100.00	45.00	18.00
Line 14	32.50	0.00	15.34	25.96	100.00	52.81	20.12
Line 15	35.00	0.00	13.56	27.20	100.00	61.25	22.27
Line 16	37.50	0.00	11.13	28.33	100.00	70.31	24.46
Line 17	40.00	0.00	8.00	29.33	100.00	80.00	26.67
Line 18	42.50	0.00	4.12	30.22	100.00	90.31	28.90
Line 19	45.00	0.00	0.00	30.98	100.00	100.00	31.15
Line 20	47.50	0.00	0.00	31.62	100.00	100.00	33.43
Line 21	50.00	0.00	0.00	32.14	100.00	100.00	35.71
Line 22	52.50	0.00	0.00	32.54	100.00	100.00	38.02
Line 23	55.00	0.00	0.00	32.82	100.00	100.00	40.33
Line 24	57.50	0.00	0.00	32.97	100.00	100.00	42.66
Line 25	60.00	0.00	0.00	33.00	100.00	100.00	45.00
Average	30.04	0.41	8.02	21.67			
Minimum	1	0	0	1			
Maximum	60	3.75	17.9	33			
Std. deviation	18.33	1.06	6.82	10.52			
Peaks (>15)	19	0	6	18			
Escalation t_{13}/t_5	3	0	1.74	2.54			

(b) Swiss Formula

31. Another formulation of this type of formula is the well known Swiss formula. This was initially proposed during the Tokyo Round of negotiations and adopted by some developed countries. The specification of the formula is as follows, where a is simply a coefficient.

$$t_1 = \frac{at_0}{a + t_0} \tag{10}$$

32. The formula has the property of being a function of both the initial tariff and the coefficient, which can be negotiated. To see this equation (10) can be rearranged so that it is in a form that it can be compared easily to the other formulas that have been presented in this paper (see annex for the transformation). The end result is given as equation (11) which shows that the as a increases the rate of tariff reduction decreases.[3]

$$R = \frac{t_0}{a + t_0} \tag{11}$$

33. Since the value of the coefficient is critical to the effectiveness of the formula to reduce tariffs, four values have been chosen: 5, 10, 15 and 50.[4] As the constant increases is a smaller overall reduction on the key descriptive statistics. When a is equal to 5 the average is 3.89, the tariff escalation is 1.29 and there are no tariff peaks. However, when a is equal to 15 the average increases to 8.8, there are no peaks, but the escalation coefficient rises slightly to 1.5. In the final case where a is equal to 50, there is still a significant cut in the overall average, but the number of peaks drops to 16 from 19. Furthermore, despite the tripling of the value of a the escalation coefficient is only 1.7. The results in table 4 and chart 4 illustrate these points.

34. Overall, however, the general impact of the Swiss formula is similar to that of equations (7)-(9) as can be seen by comparing the results in figures 3 and 4. Again, the gap between the original and final tariff profiles widens as the original tariff rate increases indicating that the cuts are greatest for the higher tariffs. Figure 5 illustrates this point graphically. It also shows that the percentage cuts are non linear and vary with the tariff.

[3] As the denominator increases the whole fraction decreases.
[4] Hoda (2001) notes that 14 and 16 were used during the Tokyo round by some members.

TABLE 4 IMPACT OF THE SWISS FORMULA: VARIOUS COEFFICIENTS

		Tariff				Percentage Cut			
	Original Tariff	a=5	a=10	a=15	a=50	a=5	a=10	a=15	a=50
Line 1	1.00	0.83	0.91	0.94	0.98	16.67	9.09	6.25	1.96
Line 2	2.50	1.67	2.00	2.14	2.38	33.33	20.00	14.29	4.76
Line 3	5.00	2.50	3.33	3.75	4.55	50.00	33.33	25.00	9.09
Line 4	7.50	3.00	4.29	5.00	6.52	60.00	42.86	33.33	13.04
Line 5	10.00	3.33	5.00	6.00	8.33	66.67	50.00	40.00	16.67
Line 6	12.50	3.57	5.56	6.82	10.00	71.43	55.56	45.45	20.00
Line 7	15.00	3.75	6.00	7.50	11.54	75.00	60.00	50.00	23.08
Line 8	17.50	3.89	6.36	8.08	12.96	77.78	63.64	53.85	25.93
Line 9	20.00	4.00	6.67	8.57	14.29	80.00	66.67	57.14	28.57
Line 10	22.50	4.09	6.92	9.00	15.52	81.82	69.23	60.00	31.03
Line 11	25.00	4.17	7.14	9.38	16.67	83.33	71.43	62.50	33.33
Line 12	27.50	4.23	7.33	9.71	17.74	84.62	73.33	64.71	35.48
Line 13	30.00	4.29	7.50	10.00	18.75	85.71	75.00	66.67	37.50
Line 14	32.50	4.33	7.65	10.26	19.70	86.67	76.47	68.42	39.39
Line 15	35.00	4.38	7.78	10.50	20.59	87.50	77.78	70.00	41.18
Line 16	37.50	4.41	7.89	10.71	21.43	88.24	78.95	71.43	42.86
Line 17	40.00	4.44	8.00	10.91	22.22	88.89	80.00	72.73	44.44
Line 18	42.50	4.47	8.10	11.09	22.97	89.47	80.95	73.91	45.95
Line 19	45.00	4.50	8.18	11.25	23.68	90.00	81.82	75.00	47.37
Line 20	47.50	4.52	8.26	11.40	24.36	90.48	82.61	76.00	48.72
Line 21	50.00	4.55	8.33	11.54	25.00	90.91	83.33	76.92	50.00
Line 22	52.50	4.57	8.40	11.67	25.61	91.30	84.00	77.78	51.22
Line 23	55.00	4.58	8.46	11.79	26.19	91.67	84.62	78.57	52.38
Line 24	57.50	4.60	8.52	11.90	26.74	92.00	85.19	79.31	53.49
Line 25	60.00	4.62	8.57	12.00	27.27	92.31	85.71	80.00	54.55
Average	30.04	3.89	6.69	8.88	17.04				
Minimum	1	0.83	0.91	0.94	0.98				
Maximum	60	4.62	8.57	12	27.27				
Std. Dev	18.33	0.97	2.10	3.15	8.02				
Peaks (>15)	19	0	0	0	16				
t_{13}/t_5	3	1.29	15	1.7	2.25				

FIGURE 5 TARIFF PROFILES USING SWISS FORMULA: VARIOUS COEFFICIENTS

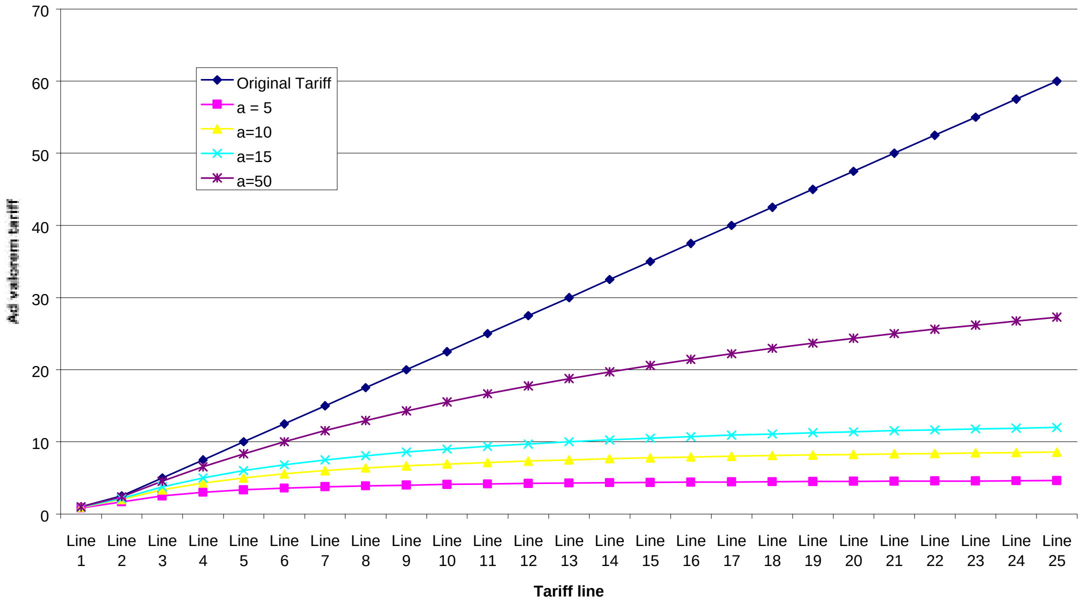
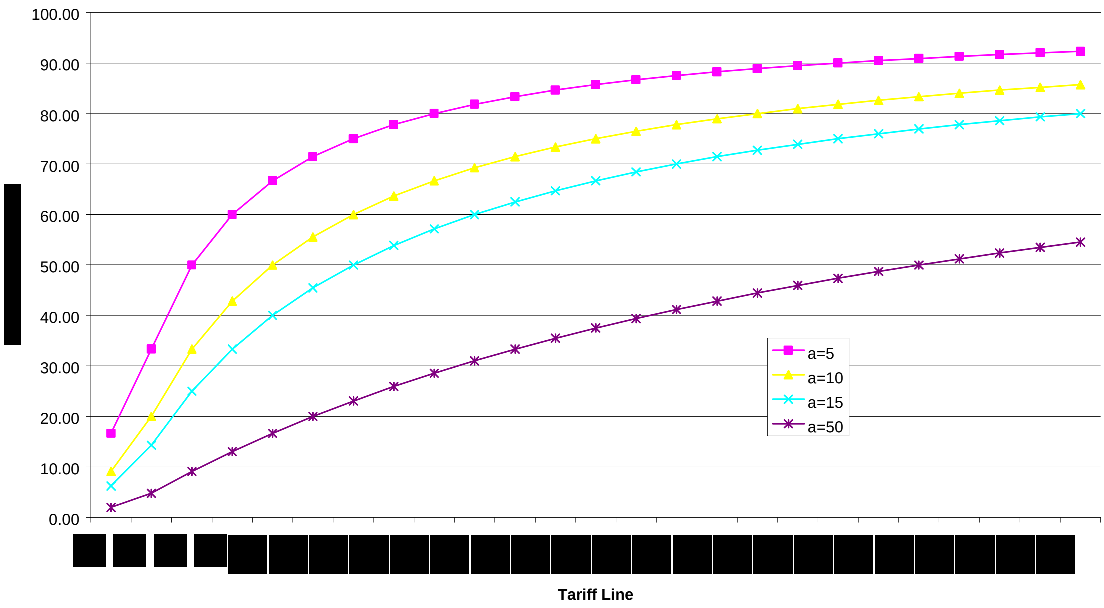


FIGURE 5 PERCENTAGE CUTS USING SWISS FORMULA: VARIOUS COEFFICIENTS



IV. RELATED ISSUES: EXCEPTIONS AND STAGING

35. An important element of the effectiveness of a particular formula based modality, regardless of the formula, is the coverage. The previous sections assumed full coverage of the selected modality. This is not necessarily case. Indeed, as noted by Hoda (2001) a formula approach is always applied with exceptions. Examples of types of exceptions that are used include are specific sectors that can be excluded

36. Another important element to the implementation of the different types of formulas is the staging of the reductions. In response to a situation where the application of one particular formula may not suit a member, it is possible to stage the implementation of the formula. For example, as noted by Hoda (2001), some members have proposed a particular formula with different stages of implementation.

V. REFERENCES

Hoda, A. (2001), *Tariff Negotiations and Renegotiations under the GATT and WTO: Procedures and Practices*, Cambridge: Cambridge University Press

ANNEX TARIFF REDUCTIONS AND THE SWISS FORMULA

Let t_1 be the final tariff, t_0 the initial tariff. The Swiss Formula is given as:

$$t_1 = \frac{at_0}{a+t_0} \tag{A.1}$$

The difference between the new tariff and the old tariff is:

$$\begin{aligned} t_1 - t_0 &= \left(\frac{at_0}{a+t_0}\right) - t_0 \\ &= \frac{at_0 - t_0(a+t_0)}{(a+t_0)} \\ &= \frac{at_0 - t_0 a - (t_0)^2}{(a+t_0)} \\ &= \frac{-(t_0)^2}{(a+t_0)} \end{aligned} \tag{A.2}$$

The rate of reduction is given as:

$$R = \left|\frac{t_1 - t_0}{t_0}\right| \cdot 100 \tag{A.3}$$

Substituting A.2 into A.3 gives us:

$$\begin{aligned} R &= \left|\frac{\frac{-(t_0)^2}{(a+t_0)}}{t_0}\right| \cdot 100 \\ &= \left|\frac{-(t_0)^2}{(a+t_0)t_0}\right| \cdot 100 \\ &= \left|\frac{t_0}{a+t_0}\right| \cdot 100 \end{aligned} \tag{A.4}$$

____