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# THE RELATIVE TARIFF RATIO INDEX

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Prepared by Ron Sandrey

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NZ Trade Consortium Working Paper No. 7

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## The Relative Tariff Ratio Index

Ron Sandrey<sup>1</sup>

Measuring the real impact of border restrictions to trade is problematical. Measures such as the average tariff rate are partial in that they do not account for the trade chilling effects of high tariff rates which either render trade commercially non-viable or inhibit the flows. Thus, an index value such as the average tariff, and even the trade-weighted average tariff, will always understate the effect of restrictions. It therefore becomes difficult to analyse the trade-restricting effects of tariff quotas, whereby a quantity is imported at a (usually) low or even zero in-quota tariff rate and further imports (usually) curtailed by prohibitive out-of-quota tariff rates. Analysis is complicated further when the so-called second round effects, the suite of non-tariff barriers or measures (NTBs) such TBT/SBS barriers or anti-dumping measures, are considered. These measures operate to restrict trade when the first-round protection measures of the border tariff are reduced.

Examples abound where out-of-quota tariff rates reach several hundred percent. Following the Uruguay Round negotiations, and especially the conclusion of the Agreement on Agriculture, tariff quotas are only able to be operationalised by WTO members in the agricultural sectors and, on a transitional basis, under the Agreement on Textiles. Thus one would intuitively expect countries whose comparative advantage lies in agricultural (or textile and garment) products to be disadvantage *vis a vis* those economies largely exporting lower-protected industrial products.

The challenge is therefore to devise a partial trade index for measuring and comparing relative levels of tariff protection at the border. While the trade Index would essentially be a trade negotiators tool to measure relative levels between the two partners, it does need to be based upon a sound theoretical foundation. Such an index is the Relative Tariff Ratio (RTR) Index. The concept is to assume, in the first instance, that only the bilateral partners exist in the world and all trade from one is destined for the other. Using the applied tariff rates at the respective borders the average duty which would be faced under this assumption for each of the bilateral partners is assessed. The innovative concept of the RTR is in the handling of tariff quota regimes. Here the exports from one destination that would enter the bilateral partner to the quantity stipulated by the tariff quota is assessed at the in-quota tariff rate, with the balance assessed at the out-of-quota rate irrespective of the practicalities of such a possibility. Hence the trade-chilling effects of extreme tariff levels are explicitly taken into account, with the weighting being the exporter's current global export mix.

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The RTR is tariff based (and therefore not does take into account TBT/SBS barriers or other NTM's), and is a measure analogous to but distinct from the PSE/CSE suite<sup>2</sup>. This can be taken a stage further and “multilateralised” to a series of bilateral Indices, as shown below. It enables each country to establish a bilateral Index with trading partners which gets around the problem of high and prohibitive tariffs on some sectors. Changes in applied tariffs at either border would quickly show up in the Index as the ultimate “trade weighted” change.

Both the PSE/CSE suite and the RTR index have theoretical shortcomings, and are pragmatic rather than elegantly theoretical measures. Both, for example, largely ignore the effects of elasticities on trade flows should the protectionist measures be relaxed. The PSE/CSE ignores the decoupling effects<sup>3</sup> of supports, and effectively relegates all support measures to being of equal importance internationally; an assumption which is clearly questionable. However, the RTR clearly shows the weighting of a specific country's revealed comparative advantage as measured by its major export basket against each major partner's border protection, and can therefore claim some legitimacy by that linkage to trade theory.

In the final analysis we would expect there to be a positive correlation between the PSE/CSE measures and the RTR by sector. Where a domestic sector is highly protected there needs to be a twinning of this support with border protection to ensure that trade does not negate the objectives of domestic support. Tariff quota regimes are a common method of ensuring this border wall is high, hence the expectation of a correlation between the PSE/CSE and RTR measures. There is scope for future research here, although one is domestically based while the other (the RTR) is a specific border protection measure which can be extended to a ratio between bilateral partners based on relative tariff levels only.

The weakness of the RTR is that, as outlined, it ignores elasticity effects and substitution possibilities resulting from trade protection. The underlying assumption used is that all trade from one partner will be destined for the other bilateral partner. However, as outlined later, where

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<sup>2</sup> A similar concept examining the relative levels and therefore ratios of domestic protection in the agricultural sector is exemplified by the suite of measures associated with the Producer and Consumer Subsidy Equivalent (PSE/CSE) method<sup>2</sup>. These measures, which use border protection in part, have been refined and extended by the OECD to make the indicators “more consistent, transparent, useful and timely, and more pragmatic” (Agricultural Policies in OECD Countries: Background Information 1999”, COM/AGR/CA/TD/TC(99)22). The PSE is an indicator of the annual monetary value of the gross transfers from consumers and taxpayers to support agricultural producers expressed as a percentage of the value of agricultural production, with the value of that agricultural production measured at farm gate values. The CSE is a similar measure, but this time uses the value of gross transfers from consumers of agricultural products expressed as a percentage of the farm gate value of agricultural production. We emphasise that the Relative Tariff Ratio (RTR) index seeks to encompass the same qualities, and in particular the consistent, useful and pragmatic aspects of the PSE/CSE suite.

<sup>3</sup> Where decoupling refers to the degree to which the support to the agricultural sector influences agricultural output and therefore trade.

there are trade restrictions in the form of tariff quotas this assumption is redundant. An alternative, that sectoral exports to each partner are exported in the same percentage as the overall export percentage destined for that market will hold equally well when there are no quotas, and the example of Japanese exports to New Zealand is used later to demonstrate this.

In some counterfactual cases exports do not take place simply because of differences in international tastes and preferences. However, in these cases it could be argued that border protection would intuitively be low (given no strong domestic constituency) and therefore the specific sector would not unduly influence the outcome. An example is the export of sheepmeats from New Zealand to Japan. Sheepmeats are New Zealand's second most important single export line, and Japan is (along with the United States) New Zealand's second most important export destination. However, even though the duties at the Japanese border are zero, Japan was the destination for only 3.07 percent of total sheepmeat exports for the June 1999 year.

We would also be hesitant to extend the analysis of the Index to less and least developed economies. The income effects would make the assumptions unrealistic.

### The Applied Methodology

First, exports from an individual country are ranked by HS 4 tariff line in descending order of total exports to the world. The applied duties at the respective borders for each of these HS lines were then assessed from the respective Tariff Schedules of the main trading partners. Two questions are then asked:

- (a) What total amount of duty would the exporting country face at foreign borders if all its exports encompassed by each of the top HS 4 lines analysed went to that market (ie, if it was assumed, each time, that there was only one market); and, the reciprocal,
- (b) What total amount of duty would that specific country face at the border should it, under the same hypothetical assumption, export all of its main HS 4 export lines to the original exporting country?

Such an analysis should provide a useful index of the ratio of the applied tariff rates between the two sets of countries. It is a way of getting at the "trade chilling" effects of high and prohibitive tariffs at the borders. Where tariff quotas apply, the duty is weighted by the relevant in-tariff quota amounts and duty, and the "remaining" (usually theoretical) trade at the out of quota rate.

Note that the assumption is used that all the trade from the source to the destination country is used in the analysis, ie, there are only two countries in the world each time. If there are no tariff

quotas in a market (for example, New Zealand) then this extreme assumption does not need to hold. For example, only some 0.41 percent of total Japanese exports are destined for New Zealand, but the analysis is based upon all of the Japanese exports being sent to New Zealand. All that needs to hold is that the exports from Japan to the New Zealand take place at 0.41 percent for each particular HS4 digit code, as there are no quota restrictions at the New Zealand border. It is only where there are quotas, such as some New Zealand exports into Japan, that the hypothesis of all trade being destined to Japan needs to hold, thus meaning that the assumptions used are not as extreme as first suggested.

Analysis has been undertaken for the major exports from Australia, Canada, Chile, China, Indonesia, Japan, Korea, Mexico, Malaysia, New Zealand, Taiwan, USA and the EU into the markets of Japan, USA, Korea, Malaysia, New Zealand, the EU, Canada, Australia and Chile. This constitutes a very large percentage of the trade flows of interest to New Zealand.

#### Data Sources

For Australia, Canada, China, Indonesia, Japan, Korea, Mexico, Malaysia, New Zealand, Taiwan and the US 1998 calendar year export data was sourced from the World Trade Atlas<sup>4</sup>. For Chile, SITC data was obtained for 1996 and translated to HS codes, and for the EU 1998 calendar year HS4 data was obtained from the European Union.

The percentage of exports analysed varied from a low of 37.07 percent from the EU to a high of 84.34 percent from Chile. The all-country average is 49.74 percent. In general, the larger the economy the smaller the percentage of export trade is represented in about the thirty five main export lines. Table I below shows the base data used with the total exports, main exports analysed by US\$ million<sup>5</sup> and percentage of total exports.

The tariff schedules for each economy were used to obtain the applied border protection rates. The exception to this was the US, whose very complex Tariff Schedule necessitated using the WTO IBD CD Rom HS 4 tariff data for 1996. In some instances the translation of the specific tariffs into *ad valorem* tariffs is estimated. The tariff rates for wheat into Chile, whereby the tariffs vary from the standard 10 percent as a result of the application of the price band, was applied at the rate of 50 percent. For products in the WTO Agreement on Textiles imported into the US, the EU, Canada, Japan and Australia the applied schedule tariff rate was multiplied by three as

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<sup>4</sup> Global Trade Information Services, Web site: [www.gtis.com](http://www.gtis.com) for more information. The data was obtained directly from Global Trade Information Services.

<sup>5</sup> Except for the EU, which is shown in million ECU. Given the proximity of ECUs to the US dollar the translation has not been made. The result is that EU exports are effectively under-reported by a few percent, but the analysis remains valid.

there is no out-of-tariff quota rate. Similarly, for beef into Korea, the in-tariff quota rate was doubled to proxy the non-existent out of tariff quota rate. In all other cases where tariff quotas applied imports were assessed at the lower rate to the level of the in-quota tariff and then the out-of-quota tariff for the remainder. All duties are assessed at the MFN (non-preferential) rate, meaning that free trade agreement or developing country preferences are ignored. This creates an upward bias in some cases, but is necessary for comparative purposes. All calculations are done on a best-endeavours basis, with the most recent information available. However, there are some estimates, and the results must be viewed as provisional and indicative only.

<b>Table 1: Base data analysed</b>			
<b>1998 Trade Data</b>	<b>US\$ Mill</b>	<b>US\$ Mill</b>	<b>% exports</b>
<b>Source Exports</b>	<b>main ex</b>	<b>tot ex</b>	<b>sample</b>
Australia	37,469	55,909	67.02%
Canada	129,617	214,301	60.48%
China	73,218	183,746	39.85%
Indonesia	38,234	53,444	71.54%
Japan	212,610	388,223	54.76%
Korea	83,268	136,164	61.15%
Mexico	69,826	117,442	59.46%
Malaysia	54,170	73,604	73.60%
New Zealand	7,538	11,921	63.23%
Taiwan	64,855	110,206	58.85%
USA	324,237	680,474	47.65%
Chile	12,397	14,699	84.34%
EU	270,746	730,423	37.07%
<b>Av (wted)</b>	<b>1,378,185</b>	<b>2,770,557</b>	<b>49.74%</b>
Note: (a) the Chilean data is 1996			
(b) the EU data is in million ECUs, and therefore			
understated by around ten percent.			

## Preliminary Results

Table 2 shows the tariff rates which the main twelve APEC economies (and the EU) would face if, individually, all of their exports went, in total on a bilateral basis, to Japan, USA, Korea, Malaysia, New Zealand, the EU, Canada, Australia and Chile respectively.

<b>Table 2: Bilateral Tariffs faced if ALL exports went to each destination</b>									
<b>Source Exports</b>	<b>Average % Duties on Total Exports into:</b>								
	<b>Japan</b>	<b>USA</b>	<b>Korea</b>	<b>Malaysia</b>	<b>NZ</b>	<b>EU</b>	<b>Canada</b>	<b>Australia</b>	<b>Chile</b>
Australia	8.31	4.10	15.04	3.88	0.49	15.92	15.00	0.78	12.36
Canada	1.38	2.46	6.55	34.96	2.01	5.46	4.58	6.95	10.63
China	13.17	13.76	9.51	13.56	9.68	13.90	20.67	22.97	10.00
Indonesia	4.10	3.35	5.75	6.44	2.37	4.24	4.28	3.61	10.00
Japan	0.45	2.76	7.75	38.86	2.76	4.74	2.95	7.62	10.00
Korea	4.65	6.10	7.17	20.20	2.27	6.85	5.20	8.68	10.00
Mexico	1.21	4.47	9.02	31.75	3.95	7.18	4.43	8.00	10.00
Malaysia	1.35	1.93	6.84	4.99	1.43	3.82	1.34	2.23	10.00
New Zealand	80.44	24.42	53.85	2.83	1.12	45.04	63.23	3.00	10.00
Taiwan	4.55	6.31	8.11	7.47	2.91	6.47	5.06	8.00	10.00
USA	1.83	2.45	19.81	12.65	2.21	5.96	4.58	4.56	10.46
Chile	4.82	1.34	9.95	3.14	1.06	3.78	0.63	0.81	10.00
EU	1.41	3.20	7.63	25.96	2.96	4.24	2.80	5.91	10.00
<b>Av (wghted)</b>	<b>2.45</b>	<b>4.00</b>	<b>10.95</b>	<b>21.61</b>	<b>2.84</b>	<b>5.58</b>	<b>4.31</b>	<b>5.78</b>	<b>10</b>

Source: Trade and Economic Analysis Division. MFAT

For NZ, if all HS lines represented in the trade had gone to Japan, the average duty would be some 80.44 percent. This is dramatically higher than any other APEC economy into Japan; China (textiles) at 13.17 percent and Australia (coal, gold and iron) at 8.31 percent are the next highest into Japan. The New Zealand result is explained by the prohibitive out-of-tariff-quota rates which apply to dairy, New Zealand's main export. In contrast, the average tariff rate under this calculation from the US into Japan is under two percent, and the average into Japan is the lowest calculated (2.45 percent). This reflects the fact that non-tariff barriers are not taken into account in the Index.

Moving further across the table, the average tariff on New Zealand exports into Korea is 53.85 percent, again more than double any other APEC economy. Again, dairy is the reason. New Zealand faces fewer barriers on exports into Malaysia. The assessed duty under the assumptions used would be only 2.82 percent, the lowest of any APEC economy studied. Korea and Canada, both of whom export large amounts of vehicles and vehicle parts, face the highest duties. Similarly, New Zealand faces the highest level into Canada, of 63.23 percent. This is in dramatic contrast to the assessed tariff which New Zealand faces on its actual exports to Canada of these same top products to the world, where the actual rate is calculated to be a negligible 0.03 percent.

For duties into New Zealand, China faces the highest barriers (clothing), with Mexico at just under four percent the next highest. Note that New Zealand's tariffs are rapidly reducing and will be totally eliminated by 2006, four years ahead of the APEC target. Duties on Australian exports to NZ were assessed at the MFN (non CER preference) rate, and this shows that, in the absence of CER, if all Australian exports in the HS codes representing 67 percent of Australian exports were exported proportionally to NZ, the average duty payable would be less than one half of one percent. This, in part, explains the smooth transition of CER.



Each of the nine destinations includes an “own export” assessment, which indicates how each of the destination economies protects its own major exports sectors at the border. Here the range is from a low of 0.45 percent in the case of Japan to a high (ignoring Chile’s standard 10 percent) of 7.17 percent in the case of Korea. Only Canada protects its own exports at a level above the average of the nine economies examined.

Additional information on average tariffs can be gleaned from Table 2. Firstly, overall, the most protected market in the sample is Malaysia, with a weighted average tariff of 21.61 percent. This results from high tariffs on industrial goods, and vehicles in particular. Next is Korea, at 10.95, followed by Chile’s flat rate of (actually just over as a result of wheat price bands) 10 percent. On the analysis above, Japan is the lowest, and even lower than New Zealand’s average tariff rate assessment. Secondly, although not shown, the unweighted average faced by the economies studied can be calculated. Here New Zealand, with an unweighted average of 31.55 percent is double that of China’s 14.13 percent. Malaysia (3.77%) and Chile (3.95%) face the lowest rates. The other nine exporters are clustered between 4.90 (Indonesia) and 8.89 percent (Mexico). The New Zealand problem can be summed succinctly in one word: dairy.

#### The Index

From the data shown above RTR Index between the economies analysed can be derived, and is shown in Table 3 below. It is simply the ratio of the two relevant cells from Table 2 above, with one Index being the reciprocal of the other. It is read as follows, reading down the columns. For Canada, for every percentage point which Canada faces into New Zealand, New Zealand faces 31.39 into Canada, or an Index of 31.39:1.0. This is the figure of 63.23 for New Zealand into Canada divided by the figure of 2.01 for Canada into New Zealand. Conversely, the reciprocal for the New Zealand column, for every percentage point which New Zealand faces Canada faces 0.03 percentage points, or an Index of 0.03:1.0.

<b>Table 3: RTR Index Between Trading Partners</b>									
Read Down <b>Canada</b> Column: for every percentage point which Canada pays into NZ, NZ pays 31.39 into Canada ie, the "RTR Index" for NZ into Canada is 31.39:1.0 - conversely, Canada to NZ it is 0.03:1									
Source	Australia	Canada	Japan	Korea	Malaysia	NZ	USA	Chile	EU
<b>Australia</b>	*	2.16	1.09	1.73	1.74	0.16	0.90	15.32	2.69
<b>Canada</b>	0.46	*	0.47	1.26	26.15	<b>0.03</b>	0.54	16.89	1.95
<b>Japan</b>	0.92	2.13	*	1.67	28.84	0.03	1.51	2.08	3.36
<b>Korea</b>	0.58	0.79	0.60	*	2.95	0.04	0.31	1.00	0.90
<b>Malaysia</b>	0.57	0.04	0.03	0.34	*	0.51	0.15	3.19	0.15
<b>NZ</b>	6.17	<b>31.39</b>	29.15	23.71	1.97	*	11.03	9.46	15.24
<b>USA</b>	1.11	1.86	0.66	3.25	6.55	0.09	*	7.81	1.86
<b>Chile</b>	0.07	0.06	0.48	1.00	0.31	0.11	0.13	*	0.38
<b>EU</b>	0.37	0.51	0.30	1.11	6.80	0.07	0.54	2.65	*

In general, a ratio of near one reflects an evenness in the respective tariff regimes; between Japan and Australia, for example. It does not reflect the levels of the tariffs, only their relative ratios; in this case, the numbers from Table 2 are 7.62 percent for Japan into Australia and 8.31 percent for Australia into Japan.

We again remind readers that the index reflects tariff barriers and the influence of quotas; non-tariff barriers are not taken into account. A reduction in tariff levels at either border, or an increase in in-tariff quota access volumes where applicable, would immediately be reflected in the index. These data are “best estimates” from the information available at the time, and thus may contain some errors, omissions and/or inaccuracies. One such omission relates to exports of New Zealand fish products, where, for example, quota exist for squid into the Japanese market and some species into the EU. These effects have not been quantified. Also, treatment of the MFA for the textile trade has been somewhat cursory in this study.

#### Application of the Index

While based on sound theoretical foundations, the major role of the RTR is as a means of summarising large amounts of data combining major trade flows and border tariff levels into a single and concise figure. This can be used in bilateral negotiations and talks to provide a valid and useful measure, expressed in a sound and sensible manner, of the relative barriers faced at the respective borders of the bilateral partners.

The potential dynamic applications of the RTR are important. Changes in applied tariff levels or the impact of relaxing the quantity levels of tariff quotas over time would immediately show up in the Index. In order to reduce the RTR and therefore the Index ratios between economies a reduction in the extremely high (several hundred percent) quota tariff levels would show up immediately. Whether or not this would stimulate trade is, of course, another matter, as either an increase in the quota quantity or a decrease in the out-of-quota tariff rate would show up as a reduction in the RTR but the effects on actual trade flows are likely to be different. It is only when the out-of-quota tariff rate is decreased to a level which enables trade to take place that a meaningful reduction can be said to have taken place. Conversely, an increase in the applied rates would also show up immediately in the RTR and therefore the bilateral index. However, the resource needs required to monitor the RTR on an annual basis should not be underestimated, although of course the data is all held by international institutions and an electronic update should be possible.

Sectorally the RTR shows the high levels of border protection faced by many agricultural products and textiles. In many sensitive agricultural sectors (rice) there are even higher levels of protection

that have not been picked up in the current RTR analysis. This is, of course, because international trade is restricted to the extent that rice, for example, does not feature in the main trading HS lines used. However, if the analysis was extended further to rice exporting countries such as Thailand this would change.

On a bilateral basis the RTR Index would be a useful way of measuring progress in a free trade agreement (FTA), and as a starting point for considering a bilateral FTA the Index highlights potential sectors of possible negotiating difficulty. The same principle would apply to the measurement of progress in a regional agreement. For example, under the Bogor Declaration of 1993 the members of APEC agreed to free trade by 2010 for the developed economies and 2020 for the developing economies. The analysis presented above suggests that in many cases there is a considerable distance to go to reach this goal.

Earlier in the paper it was considered that the RTR analysis may not be valid for examining border protection levels in developing countries. However, the concept is valid for examining exports from developing countries to the developed world. Indeed, in view of on-going discussions on tariff elimination for developing country exports to developed markets the RTR could well have a valuable role to play in analysing dynamic analysis of this “south to north” trade. Firstly, it would identify where the barriers are, and then secondly provide an empirical tool to analyse possible time-paths for any offer considered during the forthcoming WTO Round.

In the final analysis the RTR is potentially a sound and useful measure for providing an indication of the relative effects of border protection. If offers interesting dynamic possibilities should the measure be updated annually, although the resource cost involved in widening the scope of the bilateral matrix provided above and updating it must be recognised notwithstanding the scope to operationalise much of work. We consider that the measure has something to offer as simple yet powerful tool.