NEW ZEALAND'S TRUE RATE OF PROTECTION[1]

In this article, prepared mainly by Alfred Wong and Ray Brooks, a measure of protection which allows for downstream price effects is estimated for New Zealand industries.

Executive Summary

An important aspect of the economic liberalisation programme in New Zealand during the 1980s has been the reform of industry assistance. Import tariffs and quotas and export subsidies have been reduced or even abolished in the drive to achieve a more efficient economy.

Although the reductions in tariffs and export subsidies and the abolition of import quotas mean that nominal rates of protection for import-competing and exporting industries have declined, the advantage to import-competing good producers and to exporters, after allowing for the impact of nominal protection on the domestic cost structure, need not have done so. To find out what benefit these two groups of traded good producers receive from protection, it is necessary to estimate their true rates of protection.

The true rate of protection measures the assistance received by a traded good producer after allowing for the flow-on effects to domestic prices of all tariffs, quotas and subsidies. If the price of an industry's output is boosted by protection to a greater extent than is the domestic cost structure, that industry receives a positive rate of true protection; a positive rate of true protection is called a true tariff if the industry is competing with imports and a true subsidy if the industry is an exporting industry.

True rates of protection are estimated in this article and compared with nominal rates of protection. It is found that even though the nominal rate of protection received by the import competing sector was reduced on average from around 28 per cent of the value of output in 1981/82 to around 21 per cent in 1987/88, the true rate of protection was much lower and remained unchanged at an average level of 3 per cent over the period. The export sector on the other hand suffered from a true implicit tax which has remained at around 11 per cent of the value of exporters' output throughout the 1980s.

These findings suggest that despite reductions in nominal tariffs, subsidies and import quotas throughout the 1980s, the average impact of industry assistance had not changed substantially by 1987/88. This outcome occurred because nominal rates of import protection and export assistance declined by similar percentage point amounts; of course, because nominal export assistance was much lower than nominal import protection in 1981/82, the percentage reduction in nominal export assistance has been much greater.

As a result of the lack of progress in reducing nominal rates of import protection in relation to nominal rates of export assistance, the import sector was still making gains from the protection regime in 1987/88, largely at the expense of the export sector. With nominal assistance to export industries now virtually eliminated but scheduled reductions in import protection still to occur, the export sector's position should improve over the next few years.

A major component of the economic liberalisation programme underway in New Zealand since the early 1980s has been the reform of industry assistance. Large reductions have been made in most import tariffs and, in July 1988, import quota licences were abolished for all goods except those subject to Industry Plans. Export subsidies have been virtually eliminated.

Even though nominal rates of protection[2] have declined markedly, there is no guarantee that the same can be said for 'true' rates of protection; the 'true' rate of protection is defined as the rate of assistance received by a traded good producer after allowing for the flow-on effects to domestic prices of all tariffs, quotas and subsidies.[3] In other words, even though nominal protection has fallen markedly, there is no guarantee that the prices of importables and exportables relative to home good prices have changed. Yet it is the prices of importables and exportables relative to home good prices which are relevant from the viewpoint of resource allocation.

So as to provide a more accurate assessment of industry assistance developments in the 1980s, true rates of protection are calculated in this article and compared with nominal rates of protection. It is found that both the true rates of import and export protection had changed little by 1987/88 and that exporters remained materially disadvantaged by industry assistance in New Zealand.

[1] A more technical discussion paper is available on request from the Economic Department.

[2] The nominal rate of protection for an import-competing (exporting) industry is equal to the tariff (subsidy) or tariff equivalent of an import quota as a proportion of the unassisted value of the output of the import-competing (exporting) industry.

[3] It should be noted that the true rate of protection is a distinct concept from the effective rate of protection. The effective rate of protection for an industry measures the increment in its value added, made possible by the tariff structure, as a proportion of the free trade value added. Only tariffs, quotas and subsidies on the industry's output and direct inputs are used to calculate the effective rate of protection. Thus, if a tariff raises the cost of an input used to produce an input for the industry concerned, there nevertheless will be no change in the effective rate of protection for that industry. The true rate of protection, on the other hand, captures these downstream effects.

Measuring True Protection

The economic model developed by Clements and Sjaastad (1984) is used in this article to measure true protection. The model describes a small open economy which produces and consumes two broadly classified goods, namely tradeables and home goods; the small economy assumption means that the international prices of imports and exports are given. Tradeables are goods which are traded internationally and are sub-divided into exportables and importables. Exportables consist of actual exports as well as export-type goods which are sold domestically. Importables consist of imports as well as goods produced domestically which are close substitutes for imports, i.e. import competing goods. Home goods are those goods which are prevented from being traded on the world market by transportation costs. Examples of home goods are services such as housing and haircuts, where the high cost of international transportation prohibits international trade.

In the Clements-Sjaastad model, the equilibrium prices (and quantities) of the above three kinds of goods are determined simultaneously in a general equilibrium framework. Consumer demand and productive resource allocation together ensure the equilibrium conditions through substitutability across the three markets. A tariff initially raises the price of importables from the free trade level. If home goods and importables are close substitutes (both in demand and supply) then the price of importables relative to home goods will tend to be fixed (i.e. the full cost of the tariff is passed through to the price of home goods and importables). The tariff therefore lowers the price of exportables relative to the prices of both home goods and importables and the real income generated in the exportables sector falls in terms of both home goods and importables. The tariff is then equivalent to a tax on exporters in that the full cost of the tariff falls on exporters.

On the other hand, if home goods and importables are not close substitutes (i.e. the full cost of the tariff is not passed on in the price of home goods), then the price of both home goods and exportables falls relative to that of importables, and the producers of home goods and exporters share the burden of the tariff.[4] For a graphical exposition of the effects of a tariff, see Box 1.

Clements and Sjaastad hypothesise that the proportional change in the price of home goods from the free trade level is a weighted average of the nominal rates of assistance to the import-competing and export sectors; the weights are determined by the degree of substitutability among importables, exportables and home goods. Thus if, for example, the weights are 70 per cent for the import-competing sector and 30 per cent for the export sector, a 10 per cent rate of nominal assistance for the import-competing sector will increase home good prices from the free trade level by 7 per cent. The same rate of assistance for the export sector, however, would only increase home good prices by 3 per cent. If both import-competing and export sectors received a 10 per cent rate of nominal assistance, home good prices would also be 10 per cent higher than free trade prices. In this instance, nominal protection would have no effect on relative prices or resource allocation; a free trade environment effectively would still prevail. For a formal exposition of the Clements-Sjaastad hypothesis, see Appendix A.

To obtain true rates of industry assistance, Clements and Sjaastad then calculate the change in the price of importable or export output relative to home good prices from free trade levels. For instance, if importable good prices relative to home good prices are 10 per cent higher than their free trade level, the importable sector is benefiting from a true tariff of 10 per cent. Conversely, if export good prices relative to home good prices are 10 per cent below the free trade level, the export sector is subject to a true subsidy of minus 10 per cent (i.e. a true implicit tax of 10 per cent).

An implication of this formulation is that the true rate of assistance will always be less than the nominal rate of assistance. If the nominal tariff is greater than the nominal subsidy, then the increase in the price of home goods from their free trade value will be greater than the subsidy to exportables but less than the tariff on importables because the increase in home good prices from free trade levels is a weighted average of the nominal tariff and subsidy. In this case, the true tariff will be positive, but less than the nominal tariff, and the true subsidy will be negative. Therefore, even though the nominal subsidy appears to provide an incentive for exporters to produce goods and services, the industry assistance regime actually increases the price of home goods by more than the price of exportables and the impact of protection is that the production of home goods and importables is favoured relative to the production of exportables.[5]

Estimates of True Tariffs and True Subsidies

To estimate true tariffs and subsidies it is necessary to have measures of the average nominal tariff and subsidy rate and an estimate of the weights used to calculate the increase in home good prices from free trade levels which results from nominal assistance.

The estimates of the average nominal tariff and subsidy rates used in this paper are based on Syntec Economic Services' estimates[6] (forthcoming) for individual industries in New Zealand. Syntec's estimates cover

[4] A weakness of the Clements-Sjaastad model is that it assumes that imports and import competing goods are identical, which may not be the case especially if the import is patented and cannot be duplicated domestically. In such a case, a tariff on imports is unlikely to lead to an equivalent increase in the price of importables.

[5] It might also be noted that the price of home goods relative to traded goods cannot change in this model. Thus, for example, an exchange rate depreciation would increase home good prices to the same extent as the prices of exports and imports.

TABLE 1
NOMINAL AND TRUE RATES OF ASSISTANCE FOR THE IMPORT-COMPETING SECTOR
(expressed as a percentage of unassisted output)

NZSIC	Industry	Weight[1]	Nominal Tariff (t)			True Tariff (t* = (t-d)/(1+d))		
			1981-82	1985-86	1987-88	1981-82	1985-86	1987-88
313 & 314	Beverage and Tobacco	.2	30	28	28	5	4	9
322 & 324	Clothing and Footwear	5.5	60	104	49	29	66	27
33	Wood and Wood Products	12.5	24	14	11	0	-7	-6
342	Printing and Publishing	8.2	19	11	10	-4	-10	-6
352-356	Chemicals[2], Petroleum & Plastics	15.0	23	22	18	0	-1	0
36	Non-Metal Minerals	7.5	12	12	11	-10	-9	-6
38	Machinery and Metals	44.5	31	28	25	6	4	6
39	Other Manufacturing	1.6	31	31	24	6	6	5
TOTAL		100.0	28	27	21	3	3	3

1 Percentage of the unassisted value of output of individual industry to total.
2 Excluding industrial chemicals.

TABLE 2
NOMINAL AND TRUE RATES OF ASSISTANCE FOR THE EXPORT SECTOR
(expressed as a percentage of unassisted output)

NZSIC	Industry	Weight[1]	Nominal Subsidy (s)			True Subsidy (s* = (s-d)/(1+d))		
			1981/82	1985/86	1987/88	1981/82	1985/86	1987/88
111 & 112	Agriculture	27.3	8	10	1	-12	-11	-14
311 & 312	Food Manufacturing	37.1	9	7	5	-12	-13	-11
321 & 323	Textiles and Leather	6.5	25	38	18	1	12	0
341	Paper and Paper Products	8.6	17	16	14	- 6	- 6	- 4
351	Industrial Chemicals	4.8	7	8	7	-14	-12	- 9
37	Basic Metals	5.5	7	7	6	-14	-13	-10
113, 12, 13, 23 and 29	Other Export Activities[2]	10.2	0	0	0	-19	-19	-15
TOTAL		100.0	10	10	5	-11	-11	-11

[1] Percentage of the unassisted value of output of individual industry to total.
[2] Fishing and hunting, forestry and logging, and mining and quarrying.

[6] Syntec Economic Services estimate the nominal rates of assistance on the basis of the following assumptions:

(a) perfect substitution between domestic and foreign goods of the same description;
(b) infinitely elastic supply for a country's imports and infinitely elastic demand for its exports;
(c) production relationships between inputs and outputs are not affected by the structure of assistance.

For industries where these assumptions may be critical the estimates need to be interpreted with caution.

The nominal rates of assistance for the manufacturing industries were calculated by relating the detailed tariff items (at a 7 digit level) to the New Zealand Standard Industrial Classification (NZSIC) 5 digit level for manufacturing industries from the Department of Statistics 1981/82 Census of Manufacturing. The quantitative import restrictions, tariffs and subsidies were converted to an estimated gross subsidy equivalent and the nominal rate of assistance was estimated as the ratio of the gross subsidy equivalent to the unassisted value of output of the industry.

Estimates of the nominal rates of assistance for agriculture were made by Syntec Economic Services by aggregating all forms of assistance to meat, wool and dairy farming; these categories of farming constituted around 65 per cent of agricultural output in 1981/82. Estimates of the nominal rate of assistance to other agricultural activities were unavailable and were therefore assumed to be zero. Similarly estimates of the nominal assistance to other non-agricultural and non-manufacturing exporters were unavailable and were therefore assumed to be zero. The nominal subsidy to exporters is therefore likely to be understated.

the gross subsidy equivalent of all import barriers (i.e., tariffs and import licensing) and all export assistance (such as supplementary minimum prices to farmers and export tax incentives) for various industries. Average weighted nominal rates of assistance to the import competing and export sectors have been derived from these estimates and are presented in tables 1 and 2; the weights to calculate these averages are based on the values of output of the industries concerned,

where output is valued at world prices (i.e. prices exclusive of nominal tariffs and subsidies).

Agriculture, fishing and hunting, forestry and logging, mining and quarrying, and manufacturing are classified as the tradeables sector and the rest of the economy as the home goods sector. Within the tradeables sector, primary and export manufacturing industries make up the export sector. Primary industries include agriculture, fishing and hunting, forestry and logging, and mining and quarrying. Export manufacturing industries comprise food manufacturing, textiles, leather, paper and paper products, industrial chemicals and basic metals. The remaining manufacturing sector is the import-competing sector. See Appendix B for the details of industry classification.

The average nominal rate of protection for the import competing sector is estimated to have dropped from 28 per cent in 1981/82 to 21 per cent in 1987/88, as the Government's import liberalisation programme began to take effect (see table 1).[7] Meanwhile, the average nominal rate of assistance for the export sector fell from 10 per cent in 1981/82 to only 5 per cent in 1987/88 (see table 2), as the Government abolished supplementary minimum prices and phased out the export incentive schemes.

The weights (i.e. the substitutability relationship among the three goods) used to calculate the increase in home good prices from free trade levels as a result of nominal assistance must be statistically estimated. Because the two weights sum to one, there is only one weight to estimate; the other will be determined residually. This weight is called the incidence parameter (ω) and is normally taken to be the weight for nominal import protection. The hypothesised relationship also means that ω measures the proportional increase (from free trade levels) in home good prices relative to export prices resulting from a proportional increase (from free trade levels) in import prices relative to export prices. It is this formulation which is actually used to obtain an estimate of ω.

The incidence parameter (ω) has been estimated using data for export, import competing and home goods prices over the period 1977-1988; results are presented in Appendix C. The best statistical results were obtained when allowance was made in the equation being estimated for the slow adjustment of relative prices; a one-quarter lagged dependent variable was included in the equation. The mean of the estimates of the long-run incidence parameter is 0.77, which suggests that around 77 per cent of the increase in the price of an import (due to a tariff or other forms of protection) is passed on to the equilibrium price of home goods. Of this increase, an average of 90 per cent occurs in the same quarter in which the tariff is increased.

Substituting the estimate of the incidence parameter ω (from Appendix C), and the nominal tariff and subsidy rates from tables 1 and 2 into the hypothesised relationship between home good prices and nominal protection gives the long-run proportional margin (d) for home good prices over their free trade levels in 1981/82, 1985/86 and 1987/88 (see table 3).

TABLE 3
THE IMPACT OF PROTECTION ON THE PRICE OF HOME GOODS

	Nominal Tariff t	Nominal Subsidy s	Proportional Margin of Home Good Prices Over Free Trade Levels $d = \omega t + (1-\omega)s$
1981/82	.28	.10	.24
1985/86	.27	.10	.23
1987/88	.21	.05	.18

As shown by the estimates of d in the above table, the protection structure in the 1980s had the long-run effect of making the price of home goods respectively 24 per cent and 23 per cent higher than under free trade in 1981/82 and 1985/86 and 18 per cent higher in 1987/88.

Using the above estimates of d, the true tariffs and true subsidies were calculated and are presented in the last three columns of tables 1 and 2. The true tariffs and subsidies suggest that throughout the 1980s New Zealand import competing firms received a true rate of protection of about 3 per cent of their output while exporters were subject to an implicit tax of approximately 11 per cent. The true tariff is much lower than the intended protection and the harmful impact of protection on the export sector is far more substantial than is widely recognised.

As can be seen in tables 1 and 2, the relative true rates of assistance within the sectors concerned are little changed from the nominal rates. The clothing and footwear industry remains the most highly protected industry using the true tariff as an indicator. Owing to their relatively low nominal rates of protection, industries such as the wood and wood products industry receive a zero or even negative true tariff (i.e. an implicit tax). In the export sector all industries, except the textiles and leather industry, are subject to an implicit tax.

Note, however, that the estimates of the true tariffs and subsidies for individual industries are only approximate because the impact of the increase in the price of home goods need not be the same for all industries. Nevertheless, the higher

[7] It is interesting to note how widely nominal rates assistance varied between industries in this sector. Clothing and footwear industries remained the most highly protected while the wood products, printing and publishing and non-metal industries were the least protected.

Box 1

A GRAPHICAL EXPOSITION OF THE EFFECTS OF A TARIFF

The geometric exposition, used by Dornbusch (1974) to analyse the general equilibrium effects of protection, is presented in this box.

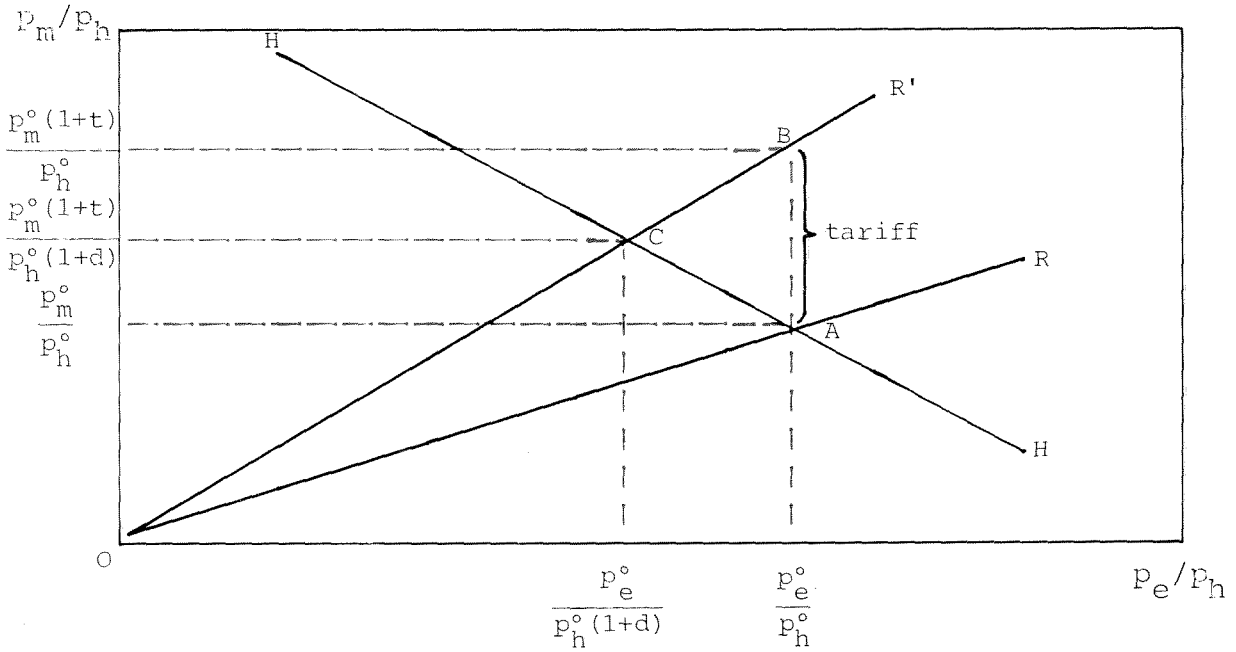
In Figure 1, the vertical axis measures the relative price of importables to home goods while the horizontal axis measures the relative price of importables to exportables. The schedule HH is constructed by taking different values of one of the two relative prices and deriving the resulting equilibrium for the other relative price. Consequently, HH represents the equilibrium pairs of relative prices. HH can be labelled the home goods schedule as the market for home goods clears at all points along HH. Since the equilibrium relative prices along HH clear the market for home goods, by Walras' Law the market for tradeables also clears. It should be noted that points to the right of HH correspond to a trade surplus while points to the left correspond to a trade deficit. The slope of the home goods schedule reflects the substitutability of home goods with tradeables.

The slope of the ray OR shows the internal price of importables relative to exportables (p_m/p_e), which is the same as the given world terms of trade under free trade. The initial equilibrium in the economy is at the intersection of OR and HH (point A). Thus, in the free trade environment the equilibrium relative prices are p_m°/p_h° and p_e°/p_h°.

Any form of import protection (including quantitative restrictions) has the effect of rotating the ray OR anti-clockwise to OR'. For instance, a tariff t will raise the internal price of importables relative to exportables by the amount t to $p_m^\circ(1+t)/p_e^\circ$. Initially the economy moves to B where the relative price of importables to home goods also rises by the amount of the tariff, i.e. $p_m^\circ(1+t)/p_h^\circ$. However at B a trade surplus emerges and there is an excess demand for home goods. The situation requires the price of home goods to rise, say by an amount d, to clear both markets. The new equilibrium is at C where the price of importables relative to home goods is $p_m^\circ(1+t)/p_h^\circ(1+d)$ whereas the price of exportables relative to home goods is $p_e^\circ/p_h^\circ(1+d)$.

The relative price of importables does not increase by the full amount of the tariff as the price of home goods also increases, i.e. the 'true' rate of tariff is less than the nominal tariff. The price rise for home goods is the mechanism which reduces exports so that trade balance equilibrium can be restored following the tariff induced reduction in imports.

Figure 1
Tariff and Relative Prices



price of home goods reflect higher wages as well as a wide range of other costs (Clements and Sjaastad, 1984) and would largely have a rather indiscriminatory effect on all industries of the economy. Hence, the true rates for individual industries are at least indicative.

Despite the fact that the nominal rates of protection have been reduced over the 1980s the true tariffs and true subsidies have remained almost unchanged. The nominal rate of assistance to the import competing sector fell from around 28 per cent in 1981/82 to around 21 per cent in 1987/88 but the true rate of assistance still remained at 3 per cent over the same period.

The nominal rate of assistance to the export sector fell from 10 per cent in 1981/82 to around 5 per cent in 1987/88, with the true implicit tax on exporters little changed at 11 per cent over the same period. Again, the true rate of subsidy did not fall in spite of a lower nominal rate because the reduction in protection (especially the decline in the nominal rate of import protection) also reduced the price of home goods over the period.

Two important lessons may be drawn from the New Zealand experience in the 1980s. First, exporters benefit from lower rates of nominal import protection through lower prices for home goods; similarly, import-substitute producers benefit from lower rates of export assistance through lower home good prices. Secondly, the economic consequences of nominal tariffs and subsidies may be quite different from their apparent effects. In the New Zealand case, exporters were still in receipt in 1987/88 of nominal assistance equal to approximately 5 per cent of their output and yet they were actually subject to a tax of 11 per cent. Import protection policies in New Zealand really do disadvantage exporters.

Partly in recognition of the burden placed on exporters by import protection, the Government is continuing to reduce nominal rates of import protection. These reductions will lower the extent to which home good prices exceed their free trade levels and in so doing, will enhance exporters' profitability.

Conclusion

Nominal rates of import protection and export assistance can give quite misleading signals about the impact of protection policies on the import-competing and export industries because the downstream effects of protection on home good prices are ignored. In New Zealand's case, even though significant cuts in average nominal rates of import protection have been made during the 1980s, little has changed overall in the true rate of protection for import-competing industry and the true rate of tax on exporters; it must be acknowledged, however, that some import-competing industries would have lost more protection than is suggested by the true protection measure because falling nominal rates of assistance would not have reduced their input prices by as much as home good prices.

With nominal export assistance now very low but nominal import protection still relatively high, there is considerable scope for exporters to benefit from further cuts in nominal rates of import protection. Planned reductions in rates of import protection over coming years will help to enhance further the profitability of exports.

APPENDIX A

THE CLEMENTS-SJAASTAD MODEL

The relationship between the price of home goods and import and export protection is hypothesised as follows –

(A1) $d = \omega t + (1-\omega)s$

where:

- d is the proportional change in the price of home goods,
- t is the weighted average tariff equivalent of all forms of import protection as a proportion of the value of unassisted output,
- s is the weighted average of all forms of export subsidies as a proportion of the value of unassisted output, and
- ω is the incidence parameter $0 \leq \omega \leq 1$.

Equation (A1) says that the proportional change in the price of home goods is a weighted average of the nominal tariff (t) and nominal export subsidy (s). If ω takes the extreme of 1, home goods and importables are such close substitutes that the price of one in terms of the other cannot change and d=t. If ω takes the other extreme of 0, home goods and exportables are close substitutes and d=s. In reality, however, ω is likely to lie between these two extreme cases.

By adjusting the initial tariff or subsidy rate for the increase in the price of home goods (d) we can obtain 'true' tariffs and 'true' subsidies defined as:

$$t^* = \frac{\frac{p_m^o(1+t)}{p_h^o(1+d)} - \frac{p_m^o}{p_h^o}}{\frac{p_m^o}{p_h^o}}$$

$$= \frac{1+t}{1+d} - 1$$

$$(A2) = \frac{t-d}{1+d}$$

$$s^* = \frac{\frac{p_e^o(1+s)}{p_h^o(1+d)} - \frac{p_e^o}{p_h^o}}{\frac{p_e^o}{p_h^o}}$$

$$= \frac{1+s}{1+d} - 1$$

$$(A3) = \frac{s-d}{1+d}$$

where:

- t^* = true tariff rate
- s^* = true subsidy rate
- p_m^o = free trade price of importables
- p_h^o = free trade price of home goods
- p_e^o = free trade price of exportables

APPENDIX B

INDUSTRY CLASSIFICATION

In this appendix we classify outputs of all industries in the system of national accounts into three broad categories: exportables, importables and home goods. Goldstein, Khan and Officer (1980) and Goldstein and Officer (1979) suggest that goods produced by industries which have a high ratio of external trade to domestic trade (or to output) be regarded as tradeables; conversely, goods produced by industries which have a low ratio should be classified as home goods. Following this rule we classify agriculture, fishing and hunting, forestry and logging, mining and quarrying, and manufacturing as the tradeables sector; and the rest of the economy as the home goods sector.

It should be noted that there is no ideal way of classifying any economy's output into tradeables and home goods. Moreover, it is almost impossible to set a critical level for the ratios of external trade to domestic trade to determine whether it is high or not. Ambiguities do exist in classifying some industries such as transport, storage and communication. The classification above, however, mainly follows what Goldstein, et al. (1979, 1980) suggested (see also Choi and Cummings', 1986, and Williams', 1988, classifications and the same problem that they discussed.)

In fact it is even harder to divide the tradeables into exportable and importable categories. The problem arises when one compares the ratio of imports to output with that of exports. As a rule of thumb goods produced by an industry which has its imports ratio higher than its exports ratio are likely to be importables and the vice versa for exportables.

Under the existing protection structure, however, it is highly possible that the imports ratios are biased downwards. Thus, strictly following this rule will exaggerate the size of the export sector. Therefore, we use only the ratios of exports to total sales (defined as the ultimate disposition of industry output minus stock change) as a guideline.

In table B1 these ratios are computed for the NZSIC 3-digit industries within the tradeables sector. A critical level of 0.30 is chosen to classify the tradeables industries. According to this rule, those industries with a ratio higher than 0.30 belong to the exportables category, and the remaining the import-competing sector. Note that the industries classified as import-competing all have ratios well below 0.30. As can be seen, primary and

TABLE B1

RATIOS OF INDUSTRY EXPORTS TO TOTAL SALES FOR THE TRADEABLES SECTOR

NZSIC	*Industry*	*Ratio*
111	Agricultural Products	.66
112	Agricultural Services	.63
113	Hunting and Trapping	.52
12	Forestry and Logging	.40
13	Fishing	.34
23 & 29	Mining and Quarrying	.32
311	Food Manufacturing Except Feeds	.56
312	Feeds for Animals and Fowls	.50
313	Beverage Manufacturing	.11
314	Tobacco, Cigars and Cigarettes	.01
321	Manufacturing Textiles	.50
322	Manufacturing Clothing	.08
323	Leather and Leather Products	.49
324	Manufacturing Footwear	.04
331	Wood and Wood Products	.10
332	Furniture and Fixtures	.05
341	Paper and Paper Products	.42
342	Printing and Publishing	.18
351	Industrial Chemicals	.37
352	Other Chemicals	.16
353	Petroleum Refineries	.18
354	Petroleum and Coal Products	.15
355	Rubber Products	.16
356	Plastic Products	.23
361	Pottery, China and Earthenware	.15
362	Glass and Glass Products	.17
369	Other Non-Metallic Products	.08
37	Basic Metal Industries	.36
381	Fabricated Metal Products	.14
382	Machinery	.16
383	Electrical Apparatus and Repairs	.11
384	Transport Equipment	.12
385	Scientific and Measuring Equipment	.15
390	Other Manufacturing Industries	.11

Source: The ratios are computed from Department of Statistics' (1983) Table 13 Ultimate Disposition of the Output of 128 Industries.

Total sales = Grand total of disposition – stock changes. Breakdowns into NZSIC 3-digit are not available for the above NZSIC 2-digit industries.

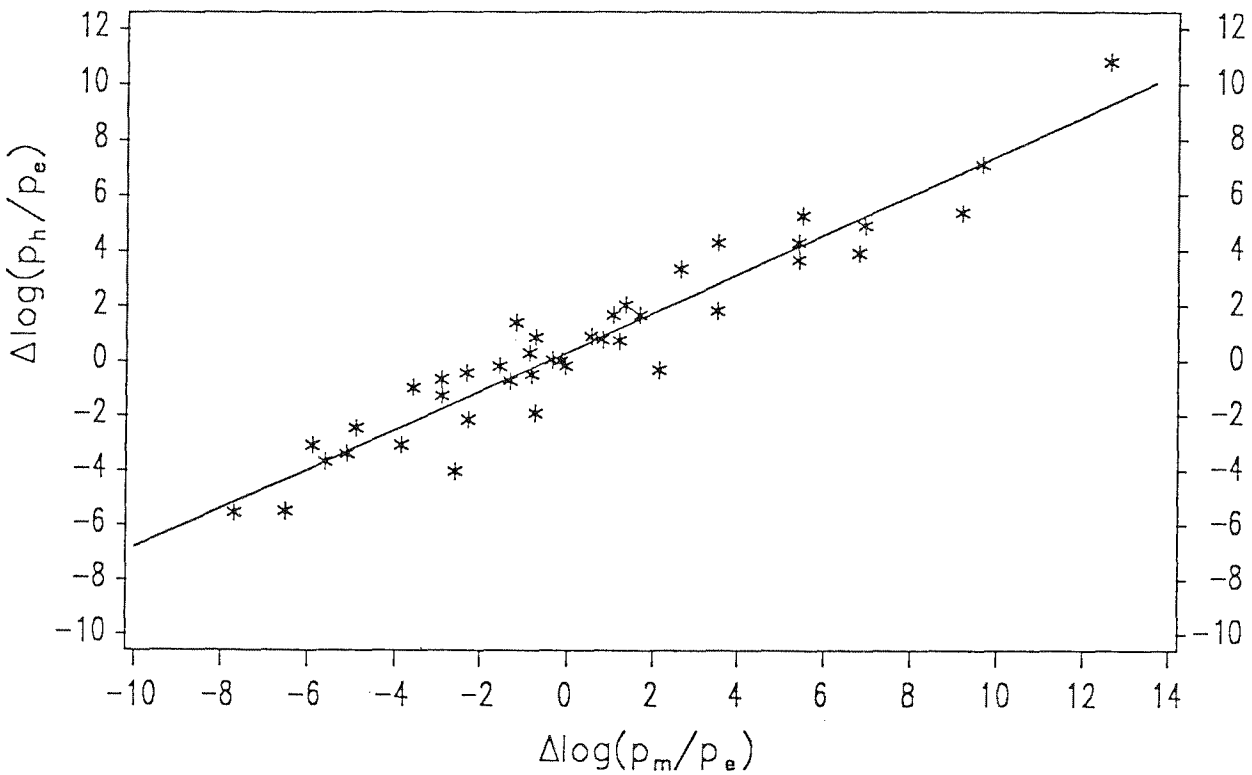
TABLE C1
ORDINARY LEAST SQUARES ESTIMATES OF THE INCIDENCE EQUATION
NEW ZEALAND: DECEMBER 1977 – MARCH 1988

$$\Delta\log(p_h/p_e)_t = \alpha + \omega'\Delta\log(p_m/p_e)_t + \lambda\Delta\log(p_h/p_e)_{t-1} + \varepsilon_t$$

(Standard errors in parentheses)

Equation	Price indices	Constant α	Short-run incidence parameter ω'	Lagged variable coefficient λ	Long-run incidence parameter $\omega=\omega'/(1-\lambda)$	$\bar{R}^2$	LM Test Statistic
(1)	p_e: Export Price Index p_h: PPI based	.262 (.178)	.723 (.038)	.057 (.049)	.767	.908	.140
(2)	p_e: Export Price Index p_h: CPI based	.341 (.224)	.698 (.047)	.101 (.062)	.776	.857	4.880
(3)	p_e: PPI based p_h: PPI based	.251 (.154)	.686 (.034)	.120 (.047)	.780	.923	1.239
(4)	p_e: PPI based p_h: CPI based	.361 (.203)	.660 (.045)	.114 (.063)	.746	.863	4.937

Figure C1
Relative Price of Home Goods to Exportables
Against Relative Price of Importables to Exportables:
New Zealand, December 1977 – March 1988



export manufacturing industries make up the export sector. Primary industries include agriculture, fishing and hunting, forestry and logging, and mining and quarrying. Food manufacturing, textiles, leather, paper and paper products, industrial chemicals and basic metals are identified as export manufacturing industries. The remaining manufacturing sector produces importables.

APPENDIX C

ECONOMETRIC ESTIMATES OF THE INCIDENCE PARAMETER (ω)

Econometric estimates of the incidence parameter (ω) are presented in this appendix. The relationship between relative prices is derived by Clements and Sjaastad as:

$$(C1)\ (\hat{p}_h - \hat{p}_e) = \omega\,(\hat{p}_m - \hat{p}_e)$$

where p_i represents the absolute price of good i (i=e for exportables, m for importables and h for home goods) and the symbol $\hat{}$ denotes a proportional change in the price variable concerned. The incidence parameter can be obtained by econometric estimation of equation (C1) with time series data. The following proxy price series were used:

Price of exportables:
(1) Export price index (all goods).
(2) Adjusted producers price index – for industries defined as exporters in table 2. (The PPI's for each industry were weighted using the output of each industry as weights to derive an aggregate price index).

Price of importables:
(1) Adjusted producers price index – for industries defined as import competing in table 1.

Price of home goods:
(1) Adjusted producers price index (to exclude the importables and exportables defined in tables 1 and 2 respectively).
(2) Adjusted consumers price index (to exclude importables and exportables where possible).

(Source of price index data: Department of Statistics)

The data are quarterly from December 1977 to March 1988 (42 observations before differencing). The combinations of the two alternative exportables price indexes and the two alternative home goods price indexes generate four sets of data.

The plot of $\Delta\log(p_h/p_e)$ against $\Delta\log(p_m/p_e)$ for the adjusted producer price index measures of exportable, importables and home goods is presented in Figure C1. Figure C1 shows that the observations scatter around a positively sloping straight line as expected.

Several versions of equation (C1) were estimated using ordinary least squares regression analysis. The best statistical results were found when a one-quarter lagged dependent variable was added to allow for the slow adjustment of the relative prices. Including an intercept (α) and a disturbance term (ε_t), the final equation estimated was:

$$(C2)\ \Delta\log(p_h/p_e)_t = \alpha + \omega'\Delta\log(p_m/p_e)_t + \lambda\Delta\log(p_h/p_e)_{t-1} + \varepsilon_t$$

The specification in (C2) gives rise to a distinction between a short-run value of the incidence parameter ω' and a long-run value $\omega = \omega'/(1-\lambda)$ where λ is the coefficient of the lagged dependent variable. The results are given in table C1. The estimate of ω' is highly statistically significant and lies between 0.66 and 0.72. The estimate of λ is quite small, which implies that the speed of adjustment is fast, i.e. the gap between equilibrium and actual values is almost eliminated each quarter. The long-run ω falls in an even narrower range from 0.75 to 0.78. The $\bar{R}^2$ values are all near .9 indicating a very good fit of the equations, especially given that the data are in first difference form. The Lagrangian Multiplier test statistics TR^2 are all substantially lower than the $\chi^2(4)$ value of 9.488 at the 10 per cent level, and thus the joint hypothesis that the first four autocorrelation coefficients are zero cannot be rejected. The stability of ω is impressive in spite of different sets of price data, indicating that the results are robust. The mean of the estimates of (long-run) ω is approximately .77, which suggests that about 77 per cent of the protection incidence is borne by exporters in New Zealand.

Estimates of ω surveyed by Clements and Sjaastad for other countries are not significantly different from the above estimate of .77 for New Zealand. Amongst the estimates of ω reported by Clements and Sjaastad were the following: Chile .55; Uruguay .53; Argentina .57; El Salvador .70; Brazil .70; Columbia .95; and Australia .70. Although a value of .77 seems a little higher than the average of other countries, Lattimore (1986) has assumed a value of ω equal to .70 applicable to New Zealand and a recent paper by Wells, Evans and Philpott (1988) also concludes, from single equation and applied general equilibrium estimation, that the incidence parameter should not differ markedly from .70 for New Zealand.

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