The Cost to Agriculture of Import Protection in New Zealand *,§

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*Paper presented to the Thirty-Third Annual Conference of the Australian Agricultural Economics Society, Lincoln College, Christchurch, New Zealand, 7-9 February 1989.

§Chiao was employed by MAFCorp Policy Services when the study was carried out. The views expressed are those of the authors and not necessarily those of the Ministry of Agriculture and Fisheries or The Treasury.

ACKNOWLEDGEMENTS

The authors wish to thank Veronica Jardine, Graeme Wells, and in particular, Richard Wallace, for their helpful discussions, suggestions, and comments on early drafts.

THE COST TO AGRICULTURE OF IMPORT PROTECTION IN NEW ZEALAND

1.0 Introduction

New Zealand has had one of the highest levels of industrial tariffs among the OECD countries (Federated Farmers of New Zealand, 1987). Protection to manufacturing industries which produce import competing goods is an implicit tax on exporters (Clements and Sjaastad, CS hereafter, 1984). Agriculture, as a major exporting sector, suffers consequently from the protective nature of the New Zealand trade policy.

Many researchers have studied the consequences of import protection. Pickford (1985 and 1987) examined the influence of market structure on the welfare changes. BERL (1985) reported the effects on general price levels and macro variables. The impact of import protection on sectoral cost structures, however, has not been explicitly addressed. In particular, the cost of protection to agriculture has not been well documented. Those formulating tariff policy have not had complete information about its impact on agriculture. Frequently, arbitrary assumptions of the "cost excess" have been used in calculating the effective rate of assistance to agriculture (Bushnell and Gibson, 1983; Taylor and Hayes, 1987; and Tyler, 1988). Although a stated justification of the supplementary minimum price (SMP) scheme was to compensate farmers for cost excesses due to protection to the manufacturing industries, there has been little evidence on the extent to which this goal was achieved. Furthermore the implications of the SMP have not been considered at all.

This study focuses on estimating cost excesses. These are defined as the extent to which input costs to an industry are raised as a result of tariff protection to other sectors. The impact of tariffs on the prices of imports, domestically produced importables, home goods and labour is not uniform. It depends on the degree of substitutability between imports and other inputs used in production. It is important to consider not only the on-farm cost excess but also the off-farm (eg. processing) cost excess. As foreign demand for New Zealand agricultural products is commonly characterised as being highly elastic (Scobie 1973), exporters are unable to adjust for higher input costs by raising the fob prices. Consequently, they tend to pass on the cost excess to farmers in the form of higher processing charges and lower farm-gate prices unless the cost can be absorbed through more efficient processing.

The study thus estimates cost excess on imports, importables, home goods and labour inputs used both on-farm and off-farm. The paper is organised as follows. The next section examines the cost excess on the price of imports, domestically produced importables, home goods and labour. The CS model is extended to allow for imperfect substitution between imports and importables in the section. A measure for the cost of protection based on an input-output table is proposed in Section 4. The methodology is then applied to estimate the cost of protection to New Zealand agriculture for 1981/82, 1983/84, 1985/86 and 1987/88. Agricultural subsidies are included in order to derive the net impact of protection on agriculture. Cost excesses due to

protection to both agricultural production and processing costs are examined. Section 5 presents the conclusions and highlights the limitations.

2.0 Identifying cost excess

Cost excess measures the extent to which the prices of inputs used by one industry are raised by the protection to import substituting industries in the form of tariffs and import licensing. In this study, inputs used by a sector are classified into exportables, imports, domestically produced importables, home goods, and labour. Tariffs directly raise the price of imports and indirectly, but not necessarily uniformally, the prices of other inputs. The magnitude of the impact on the prices of exportables, importables, home goods and labour depends on the substitutability in production between imports and these other inputs. Typically imports and domestically produced importables are good substitutes, suggesting that changes in the price of importables would follow closely from changes in tariffs. On the other hand because the nominal world prices of exportables are determined largely in international markets, tariffs are likely to have minimal impact on them for a small trading country. The price relationship between importables and home goods and wage rates has been extensively studied theoretically and empirically (CS, 1984; Jardine et al., 1988; Wong, 1988).

Price subsidies provided to exporting industries in order to compensate exporters for the cost excess due to import protection generate cost excesses for other industries. The studies cited also show the relationship between export subsidies and the price of home goods and wage rates. Subsidies, however, are not considered to have an impact on the price of importables, since exportables and importables are not regarded as substitutes. In addition to this differential impact on importables, protection and subsidies may impact differentially on the price of home goods and wage rates. The relative impact on the price of home goods will depend on the substitutability between imports and importables, between importables and home goods, and between exportables and home goods. Protection will induce relatively larger increase in the price of home goods and wage rates than subsidies if importables and home goods are close substitutes. Consequently there is a need to quantify all forms of cost excesses.

The exportable, importable, and home goods sectors are interrelated as the outputs of each sector are also used as inputs by the other sectors. For for some exporting industries a very high portion of their outputs are used as inputs by another industry before being exported. The final distribution of the cost excesses on vertically related industries is likely to be determined by demand and supply of both processed goods and raw materials and the degree of competition within the industries.

In agriculture, farmers are most likely to bear eventually the cost excess on the processing sector, as processors pass their higher costs back to farmers in the form of lowered farm-gate prices. Most farm outputs are further processed before being sold in international markets where the

demand is highly elastic (Scobie, 1973). Prices paid to farmers are the difference between the fob prices and processing charges. Any increase in processing charges due to protection will eventually be borne by farmers.[1] Thus, in order to derive the net cost to agriculture of import protection, one needs to consider both cost excesses to agricultural production and processing which tends to lower the prices paid to farmers.

To facilitate the analysis below, six types of cost excesses are defined as:
a) Direct on-farm costs: tariffs and import licensing premia on imported inputs used in farm production;
b) Quasi-direct on-farm costs: the corresponding price rises of domestically produced importables used on farms,
c) Indirect on-farm costs: rises in prices of home goods and labour employed on farms resulting from tariffs;
d) Direct off-farm costs: tariffs and import licensing premia on imported inputs employed between farm-gate and port;
e) Quasi-direct off-farm costs: the corresponding price rises of domestically produced importables used by the industries between farm gate port, and
f) Indirect off-farm costs: rises in prices of home goods and labour employed by processing industries between farm gate and port.
In order to derive total cost excess to agriculture, all types of both on- and off-farm cost excesses have to be considered.

Table 1: Cost Excess to Agriculture*

	Source of direct intervention			
	Import protection		Agricultural subsidies	
Element of cost excess	on-farm	off-farm	on-farm	off-farm
direct: imports	X	X		
direct: exportables				
quasi-direct: importables	X	X		
indirect: home goods	X	X	X	X
indirect: wage	X	X	X	X

*Because this study uses the Department of Statistics' input-output table where labour is treated as a primary input, wage and home goods effects are treated separately. However, following CS (1984), after imposing tariffs, wage rates are assumed to increase at the same rates as the price of home

[1] The output and employment effects are not considered.

goods.

2.1 Direct costs: tariffs and subsidies

The elements of nominal protection considered in this section include only tariffs and import license tender premia. SYNTEC (1988) computed the nominal tariff rates to be 20 percent, 19 percent and 14 percent for 1981/82, 1985/86 and 1987/88, respectively. Tariff represented 78 percent of total protection in 1981/82, rising to virtually 100 percent in 1987/88 due to the elimination of import licensing.

Hayes (1987) calculated the tax equivalent of direct on-farm costs of border protection on material inputs to agriculture. It was calculated as additional costs of inputs due to tariffs and import licensing premia. Three points should be noted when using the information. First, one important underlining assumption (not stated) is that imports and domestically produced importables were treated as perfect substitutes. Second, indirect costs on home goods and labour are not included. Third, Off-farm cost excesses have not addressed.

Table 2: Tax Equivalent of Direct on-farm Costs of Border Protection by Farm Type[1,2]

Year	Sheep and Beef	Dairy	Mixed Cropping
		(percent)	
1981/82	5	6	4
1985/86	7	8	5

[1]Material variable inputs to agriculture only and excluding capital inputs.
[2]Lowest, not average, successful tender premia were used, thus understating the actual tariff equivalent rates.

source: Hayes (1987).

Despite trade liberalisation and the gradual reductions in tariff rates, the direct on-farm costs due to protection appear to have actually increased by 2% between 1981/82 and 1985/86. Hayes suggested that this was due to marked increases in import license tender premia for products such as automobile parts which account for a large share of on-farm "repair and maintenance" expenditures. For example, for tyres and tubes the lowest successful tender premium had increased from 22 percent in 1981/82 to 69 percent in 1985/86 and the average successful tender premium from 31 percent to 70 percent (Hayes, 1987 p. 2).

2.2 Indirect costs on home goods and the wage rates

The price of home goods will rise resulting from tariffs and subsidies. Jardine et al. (1988) used a 3-sector (exportables, importables, and home goods) model to derive the Clement-Sjaastad incidence parameter (CS incidence parameter hereafter) and the equilibrium relative price relationship as

(1) $E(p_H/p_X) = w\, E(p_I/p_X)$,

where p_H is the price of home goods, p_I is the domestic price of importables, p_X is the price of exportables, w is the CS incidence parameter, and E is the logarithmic differential operator (eg. $Ex=d\ln(X)$). Equation (1) can be rearranged as

(2) $E(p_H) = w\, E(p_I) + (1-w)\, E(p_X)$.

Assume that the changes in p_I and p_X are due entirely to tariffs and subsidies and denote nominal tariff rates as t_M and nominal subsidy rate to exportables as s_E. Thus, $E(p_I) = t_M$ and $E(p_X) = s_E$[2]. Denoting $d=E(p_H)$, equation (2) can be rewritten as

(2') $d = w\, t_M + (1-w)\, s_E$,

which shows the rise in prices of home goods as a weighted average of import duty and export subsidies.

If the CS incidence parameter (w) is close to unity, home goods and importables are close substitutes. That is the percentage increase in the wage rate approximately equal the tariff rates. As exporters are price takers in international markets, tariffs are transmitted into an implicit tax on exportables in the form of an increase in nominal wage rate. A high CS incidence parameter indicates high implicit export tax. If on the other hand, the CS incidence parameter is close to zero, home goods and exportables are close substitutes. The wage increase due to tariff protection is approximately nil. Several country studies have suggested that this tariff-induced implicit export tax is relatively high, the estimated CS incidence parameter ranging between 0.53 and 0.95 (CS, 1984 p. 26).

Several recent studies have attempted to estimate the CS incidence parameters for New Zealand (Wong, 1988; Evans et al., 1987; Yeo, 1987). Lattimore (1986) assumed the incidence parameter for New Zealand to be 0.7. Yeo (1987) using the CS methodology estimated the parameter to be 0.78 for the 1978-86 period and 0.72 for the 1959-77 period. Wong (1988) estimated the incidence parameter to be 0.79 using 1950-87 data. Evans et al. (1987, p. 23) used vector autoregression and the general equilibrium models and concluded that the incidence parameter probably lies between 0.1 and 0.4, depending on the measure of home good price used, and the length of run

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[2]This implies that importables and imports are perfect substitutes. Thus the price of importables rises at the rate of tariffs. This assumption will be relaxed in Section 2.3.

being considered. They also estimated the CS single equation, and found an incidence parameter of 0.38, using CPI as the price of home goods.

It should be noted that the CS model consists of importables, exportables and home goods. Imports are not explicitly considered in the model. CS (1984), Choi and Cummings (1986), Jardine et al. (1988), Wong (1988), and Yeo (1987) all assume that imports and importables are perfect substitutes; ie. the price of importables rises by the tariff rates.

2.3 Quasi-direct costs on importables

Evans et al. (1987) and Parmenter (1986) showed that the degree of substitutability between imported and domestically produced importables might have major impact on the incidence of tariff protection. This section develops a model for the domestically produced import competing intermediate goods market which allows for imperfect substitution between imports and importables, analogous to the final home goods market model developed by CS (1984). A tariff-to-price-of-importables coefficient can then be estimated.

Let both the demand (D_I) for and the supply (S_I) of the domestically produced importables be functions of the prices of home goods, imports, and gross domestic product, (Y), all relative to the price of importables[3].

$$D_I = D_I(P_H/P_I,\ P_M/P_I,\ Y/P_I), \text{ and}$$

$$S_I = S_I(P_H/P_I,\ P_M/P_I,\ Y/P_I),$$

Taking log differentials both functions, the equilibrium condition is

$$(3)\quad E(P_I/P_H) = \phi\, E(P_M/P_H) + \tau\, E(Y/P_H).$$

Assuming constant Y and after rearranging, equation (3) becomes

$$(4)\quad E(P_I) = \phi\, E(P_M) + (1-\phi-\tau)\, E(P_H).$$

Substituting equation (2) into (4) and considering the case without subsidies [ie. $E(P_X)=0$], a formal linkage between the price of importables and imports is derived as

$$(5)\quad E(P_I) = \phi\, [1 - w(1-\phi-\tau)]^{-1}\, E(P_M).$$

Assuming $E(P_M) = t_M$, the nominal tariff rate, and let

$$\sigma \equiv \phi\, [1 - w(1-\phi-\tau)]^{-1}$$

be the tariffs-to-price-of-importables transmission coefficient, then,

$$(6)\quad E(P_I) = \sigma t_M.$$

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[3]The price of exportables is excluded, because it accounts for only a minor share of the cost of producing importables and little substitution between exportables and imports and importables are assumed.

This simply states that imposing a tariff at rate t_M will induce a σt_M rise in the price of importable. If $\sigma=1$ (importables and imports are perfect substitutes), then the original CS model applies.

2.4 Incidence parameter with imperfect substitution between imports and importables

Since $E(p_I) = \frac{E(p_I)}{E(p_M)} E(p_M)$,

equation (2) can be rewritten as

$$= w\,\phi[1 - w(1-\phi-\tau)]^{-1} E(p_M) + (1-w)\,E(p_X).$$

Again, assuming that the changes in p_M and p_X are due entirely to tariffs and subsidies and denoting $d' \equiv E(p_H)$, then

$$d' = w\,\phi[1 - w(1-\phi-\tau)]^{-1} t_M + (1-w)s_E$$

$$= w\sigma\, t_M + (1-w)s_E$$

$$= w' t_M + (1-w)s_E,$$

where $w' \equiv w\,\phi[1 - w(1-\phi-\tau)]^{-1}$ is an incidence parameter which allows for imperfect substitution between imports and importables, in contrast to the more restrictive CS incidence parameter (w) which is based on an assumption that imports and importables are perfect substitutes (also see equation (2')).

The OLS method was used to estimate equation (3) using 1958-1977 data from the New Zealand Yearbooks[4]. Variables are defined as p_I, producer price for manufacturing; p_M, domestic price of imports used by manufacturing; p_H, price of home goods used by manufacturing; and Y, GDP.

$$(3') \quad E(p_I/p_H) = \underset{(0.081)}{0.7}\; E(p_M/p_H) + \underset{(0.083)}{0.28}\; E(Y/p_H).$$

(R^2=0.99, D-W=1.49, numbers in parentheses are standard errors.)

The results do not support the hypothesis that imports and importables are perfect substitutes. Were that the case, ϕ [or the coefficient on $E(p_M/p_H)$] would be 1.

For the purpose of illustration, the latter term of equation (4) is ignored since $(1-\phi-\tau)$ is only 0.02. The interpretation of the regression result from equation (3') is that a 10 percent increase in tariffs will result in a 7 percent increase in the price of importables.

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[4]Since data were in difference form, a difference equation, rather than a differential equation, was actually estimated.

We are not aware of other studies examining specifically the transmission from tariffs to the price of importables. One way to verify our estimate is to infer a value from the combined results of other studies. Two Australian studies provide an opportunity: CS (1984) and Dixon et al. (1982). CS found that the price of home goods would rise 0.7 percent resulting from a one percent increase in the price of importables, (CS incidance parameter, w=0.7), or

(7) $E(p_H) = 0.7\ E(p_I)$.

Dixon et al. (1982), using the ORANI model, found that the price of home goods would rise 0.5 percent resulting from a one percent increase in the tariff rates, or

(8) $E(p_H) = 0.5\ E(p_M)$.[5]

From (7) and (8) the increase in the price of importables due to a one percent increase in the tariff rates is 0.71, or

(9) $E(p_I) = 0.71\ E(p_M)$.

Consequently, a tariff increase of 10 percent will induce a 7.1 percent increase in the price of importables. This in turn corresponds to a 5 percent increase in the price of home goods and the wage rate. Thus, the incidence parameter allowing for imperfect substitution between imports and importables (w') is 0.5, while that assuming perfect substitution (w, the CS incidance parameter) is 0.7.

Our econometric results are compatible with the inference from combining two Australian studies in that the tariff-to-price-of-importables, ϕ, is estimated to be around 0.7 (where the second term in equation (4) is relatively small and can be ignored). Both this study and the inference resulting by combining the two Australian studies Dixon et al. (1982) and CS (1984) suggest that a 10 percent increase in tariff rates is likely to lead to a 7 percent increase inthe price of importables.

2.5 Summary

This section considered that tariffs may have different price impact on inputs. They are: (1) direct costs on imports, (2) quasi-direct costs on importables, (3) indirect costs on home goods and (4) indirect costs on wage rate. The magnitude of impact depends on the substitutability between imports and other inputs. Increasing input costs for both production and processing are likely to impinge on farmers.

The traditional CS model which assumes that imports and importables are perfect substitutes has been extended to allow for imperfect substitution. The econometric analysis showed that a 10 percent increase in tariff

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[5]They showed that wage rate increases by 2.12 percent as a result of a 4.2 percent increase in the price of imports due to a tariff increase (pp. 294-298).

rates would lead to a 7 percent increase in the price of importables. This study relies on other NZ studies for relationship between the prices of importables, home goods and wage rate. Thus, the CS incidence parameter is taken to be 0.7, suggesting a 10 percent increase in the price of importables will correspond to a 7 percent increase in the price of home goods and wage rates. Consequently, a 10 percent increase in tariff rate lead to a 4.9 percent increase in the price of home goods and wage rates.

3.0 Measures of cost of protection

This section develops a measure for the cost of protection using input-output data. This measure differs from the measure, "transfer matrix", developed by CS (1984) in that the CS approach only uses information about sectors' contribution to GDP.

One limitation of the CS transfer matrix is that it does not allow for transfers between the home goods sector and other sectors. To measure the cost of protection (transfer matrix), CS constructed a hypothetical scenario such that the price of home goods remained constant after imposing the hypothetical tariffs on importables and taxes on exportables. As the CS model is a real model and the price of home goods sector is chosen as a numeraire, the home goods sector is thus eliminated from the transfer matrix[6]. As a result the CS model excludes any transfers between home good sector and others.

Parmenter (1986) suggested that the relevant concept should be the change in net income of a sector arising from the tariffs and that a general equilibrium type model (eg. ORANI) would be an ideal vehicle for measuring such a concept. In fact, the previously extended CS model (section 2) can be used to develop a measure for the effects of trade policies on the net incomes of individual sectors.

An input-output framework could be used to measure the costs of protection to farmers by incorporating the CS incidence parameter (w) and the tariff-to-price-of-importables parameter (σ). We call this measure "true effective rate of assistance", TERA[7]. This measure differs from many existing calculations of effective rate of assistance which consider only the direct tariff and subsidy effect and ignore the indirect effect on the price of home goods (eg. SYNTEC 1988).

3.1 A proposed measure

We extend the CS 3-sector model by distinguishing imports (M) from domestically produced import competing goods (I) and this input-output model is given by:

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[6]There must be a numeraire in order to assess real transfers.

[7]This is a nominal measure, although a measure of true "real" effective of assistance rate can be developed by choosing a proper deflator, eg. GDP deflator.

$$\begin{bmatrix} x_E \\ x_I \\ x_H \\ M \end{bmatrix} = \begin{bmatrix} a_{EE} & a_{EI} & a_{EH} & 0 \\ a_{IE} & a_{II} & a_{IH} & 0 \\ a_{HE} & a_{HI} & a_{HH} & 0 \\ a_{ME} & a_{MI} & a_{MH} & 0 \end{bmatrix} \begin{bmatrix} x_E \\ x_I \\ x_H \\ M \end{bmatrix} + \begin{bmatrix} d_E \\ d_I \\ d_H \\ d_M \end{bmatrix}$$

where x_i is gross product; d_i is final demand for i; and a_{ij} is the amount of the ith commodity required to produce one unit of the jth commodity. The above input-output system can be rewritten in matrix notation as

$$X = AX + D, \text{ or}$$

$$(I-A)X = D.$$

Total production required to satisfy the final demand can be easily derived as

$$X = (I-A)^{-1}D.$$

The measure "true effective rate of assistance" is simply the ratio of the difference between assisted and unassisted operating surplus relative to the unassisted operating surplus. Operating surplus is derived by subtracting intermediate consumption, imports and wage from the value of gross product.

$$TERA_j = \frac{\pi_j' - \pi_j}{\pi_j},$$

where a prime (') denotes with assistance, so that π_j' and π_j are the jth sector's operating surplus with and without assistance, respectively,

$$\pi_j = x_j - \Sigma_i a_{ij}x_i - a_{Lj}L_j, \text{ and}$$

$$\pi_j' = (1+r_j)x_j' - \Sigma_i (1+r_i)a_{ij}x_i' - (1+r_L)a_{Lj}L_j'.$$

The difference between assisted and unassisted operating surplus of the jth sector is given by,

$$\pi_j' - \pi_j = r_j x_j - \Sigma_i r_i a_{ij}x_j - r_L a_{Lj}L_j,$$

where a_{Lj} is the labour coefficient in the jth industry, L_j is total labour employed by the jth industry, and r_j is a trade effect parameter taking

different values for different sectors.[8] The corresponding GDP's are given as

$GDP = \Sigma \pi_j + a_{Lj}L_j$, and

$GDP' = \Sigma \pi_j' + (1+r_L)a_{Lj}L_j'$, respectively.[9]

Let t_M denote the nominal tariff rate on imports; s_E the nominal subsidy rate for exportables; σt_M the effect of tariff on the price of domestically produced importables; and d' ($=E(p_H)$), the coefficient for effect of trade policy on the price of the home goods and the wage rates. From the previous section, $d' = w\hat{r}_L + (1-w)s_E$.

Using these definitions we can define the effect of trade policy in terms of the following table.

Table 3: Cost of protection matrix*

trade policy	Exportables	Importables	Home goods
<u>itemised cost excesses</u>			
Tariffs on imports	$t_M a_{ME} x_E$	$t_M a_{MI} x_I$	$t_M a_{MH} x_H$
Tariffs effects on importables	$\sigma t_M a_{IE} x_E$	$\sigma t_M a_{II} x_I$	$\sigma t_M a_{IH} x_H$
Effects on home goods	$d' a_{HE} x_E$	$d' a_{HI} x_I$	$d' a_{HH} x_H$
Effects on wage rate	$d' a_{LE} L_E$	$d' a_{LI} L_I$	$d' a_{LH} L_H$
Benefit from protection and subsidy	$s_E(1-a_{EE})x_E$	$\sigma t_M(1-a_{II})x_I$	$d'(1-a_{HH})x_H$

*The net impact of protection to a sector is the difference between benefit from protection and subsidy and the sum of all itemised cost excesses.

This table will be used in empirical calculation of the cost of protection in the next section.

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[8] In calculating TERA, it is assumed that $x_j' = x_j$ and $L_j' = L_j$, for all j's. This assumption limits the TERA as a short-term measure as quantity is fixed.

[9] A GDP deflator can thus be developed and used to derive a measure for true real effective rate of assistance.

4.0 Computing the cost of protection

This section computes the cost of protection for 1981/82, 1983/84, 1985/86 and 1987/88. Nominal tariff rates and the nominal agricultural subsidy rates are considered first.

4.1 Nominal tariff rates

As shown from the top rows of Table 6, a major reduction in nominal tariff rates was carried out during 1987/88. Further reduction is likely as the tariff reduction programme has been implemented. The rates represent the sum of duty rates and licensing premia rates. However, this figure is likely to understate the actual protection, since the lowest successful bid, not average bid, was used to derive the licensing premia rate component. This understatement has become less serious as import licensing premia now only accounts for about one percent of the gross subsidy equivalent to manufacturing (SYNTEC 1988, p. 32).

4.2 Agricultural subsidies

One justification for providing subsidies to farmers is to compensate them for higher input costs imposed by protection provided to manufacturing industries. Only SMP and the stabilisation schemes run by producer boards are considered as price supports to agriculture in Table 4.[10]

The empirical estimates below present the direct, quasi-direct and indirect costs of tariffs and price subsidies for 1981/82, 1983/84, 1985/86, and 1987/88 years. Since these subsidies are assumed to have no effects on the price of tradeables paid by domestic industry users, there is no direct and quasi-direct cost of subsidies.

Table 4: Price support to agriculture

Year	SMP	Stabilisation	Total subsidies	Gross output[4]	Nominal rate of subsidy
		($ million)			percent
1981/82[1]	244	49	293	5230	6%
1983/84[2]	346	891	1032	6232	20%
1985/86[3]	65	351	416	6900	7%
1987/88[4]	0	0	0	7511	0%

[10] As the CS model only considered the effects of tariffs and price support on the home goods sector, how input subsidies affect the home goods sector (cost excesses) are unknown. Input subsidies were not used to derive the nominal subsidy rate. However, they would be considered as having impact on net income (see Table 7).

sources [1]Taylor and Hayes (1987) pp. 48-57.
[2]Taylor and Hayes (1987) p. 22.
[3]SYNTEC (1988).
[4]1981/82 and 1983/84, Input-Output tables, Dept. of Statistics; and 1985/86 and 1987/88, SONZA, 1988, MAF p. 66. subsidies included.

4.3 Data and parameter values

An input-output table was developed with the exportable sector decomposed into agriculture, processing and other exportables to facilitate calculating both on-farm and off-farm cost of protection in a vertically related framework is developed. The Department of Statistics' 25-sector input-output table was aggregated into 5 sectors. The agricultural and processing sectors remain as given. Other exportables include fishing and hunting, forestry and logging, and mining and quarrying. Importables include all manufacturing industries except processing (industries 6-13). The rest are treated as home goods (industries 14-25).

The Department of Statistics' input-output tables are available for 1981/82 and 1983/84 years. The input-output table for 1983/84 is used for 1983/84, 1985/86 and 1987/88 years. The nominal tariff rate to manufacturing in 1983/84 is assumed to be the same as 1981/82. The parameter (expressed in percentage term) used are presented in Table 5.

Table 5: Parameters used in computing cost of protection

Parameter	1981/82	1983/84	1985/86	1987/88
		(percent)		
Agricultural subsidy rate, (s_A)	6	20	7	0
Nominal tariff rate, (t_M)	20	20	19	14
Tariff-to-price-of-importables, (σ)	70	70	70	70
Price of importables to home goods, (w)	75	75	75	75
Change in price of importables, ($t_M\sigma$)	14	14	13	10
Change in price of home goods and wage, ($\sigma w t_M + (1-w)s_A$)	12	15.5*	12	7

*Confusion on the magnitude may arise, since price and wage freeze was in place in 1983-84, and one may argue that this is an overstatement. It should be noted that the figure represents the difference in change in the price of home goods between with and without assistance. The theoretical inflation difference between 1981/82 and 1983/84 attributable to agricultural subsidy is only 3.5% [(20-6)*0.25].

On the national level, it is interesting to note that the true effective rate of assistance to manufacturing has in fact increased from 10% in 1983/84 to 19% in 1987/88, despite that the nominal tariff rate had been reduced from 20% to 14%. (Input-output tables for the selected years and the true effective rate of assistance are available from the authors.) This arises because the reductions in cost excess due to the price of home goods

Table 6: Cost to agriculture of trade policies[1]

	1981/82		1983/84		1985/86		1987/88	
Nominal protection rate (%)	20		20		19		14	
Nominal subsidy rate (%)	6		20		7		0	
	onfarm	off-farm	onfarm	off-farm	onfarm	off-farm	onfarm	off-farm
itemised cost excesses								
Direct: tariffs ($ m)	34	53	60	60	58	58	44	44
Quasi-direct: importables ($ m)	90	43	101	51	94	48	75	38
Indirect: home goods ($ m)	86(11)	99(12)	134(43)	137(44)	107(16)	109(16)	65(0)	67(0)
Indirect: wage ($ m)	48(6)	116(15)	69(22)	157(51)	55(8)	126(19)	34(0)	77(0)
Total cost excesses ($ m)	258(17)	311(27)	364(65)	405(95)	314(24)	341(35)	218(0)	226(0)
Output price support ($ m)	296	0	1038	0	408	0	0	0
Input Subsidies								
Interest concessions ($ m)	131	0	160	0	243	0	170	0
fertiliser subsidy ($ m)	48	0	41	0	13	0	0	0
Total output and input supports ($)	475	0	1239	0	664	0	170	0
Net benefit ($ m)	217	-311	875	-405	350	-341	-48	-226
True eff. rate of assistance[2] (%)	12	-43	61	-33	18	-29	-2	-22
Total net on- and off-farm benefit ($ m)	-94		470		9		-274	
True eff. rate of assistance[3] (%)	-5		25		0.4		-11	

[1]Numbers in parentheses are the cost excesses on home goods or wage attributable to agricultural price support.
[2]Calculated as net benefit divided by the corresponding operating surplus.
[3]Calculated as the sum of net on-farm and off-farm benefits divided by (on-farm operating surplus + cost excesses on the processing sector), ie. assuming that farmers bear both on- and off-farm costs of protection.

and wage rate following the removal of agricultural subsidies more than offset the reduction in protection level. This result suggested that the speed and sequencing of trade liberalisation has not been neutral as far as agriculture and manufacturing are concerned. Table 6 summarises the cost and benefit to agriculture of trade policies. All itemised cost excesses were calculated using formula in Table 3. The following section elaborates the major results.

4.4 Major results for agriculture

(i) The cost excesses on agriculture resulting from tariff protection, (calculated by substracting cost excesses due to price support to agriculture from total cost excesses in Table 6), have been high (Table 7). These cost excesses divided by total expenditures on inputs can be viewed as an implicit input tax arising from import protection. In 1981/82, about 7 percent of total on-farm input expenditures can be regarded as input tax. This is similar to Philpott's finding that a complete removal of protection would only have lowered exporters' costs by about 5 percent (1986, p. 5). However, this 5 or 7 percent cost excess represents a much higher percentage of total operating surplus. Furthermore, when the off-farm component is added, the total cost excess is about 16 percent of on-farm input spending, a very significant tax on farmers. This tax fell down to 12 percent in 1987/88 following the reduction in nominal tariff rates.

Table 7. Cost excesses on agriculture of import protection

	1981/82		1983/84		1985/86		1987/88	
	on-farm	off-farm	on-farm	off-farm	on-farm	off-farm	on-farm	off-farm
Cost excesses ($ million)	241	284	299	310	290	306	218	226
Implicit input tax (%)	7	9	8	8	7	8	6	6
Total implicit input tax (%)	16		16		15		12	

(ii) The indirect costs arising from increases in the price of home goods and labour are as significant as the direct and quasi-direct costs on imports and importables. The direct and quasi- on-farm costs of protection account for less than 6 percent of total intermediate input cost. Hayes (1987) using a representative farm approach and accounting data, computed the cost excess on material inputs to agriculture to be around 5 percent. It can be shown in 1981/82, if the tariff-to-price-of-importable transmission coefficient is unity, the quasi-direct on-farm cost (importables component) would be 122 million [(731)-(731/1.2)][11]. The direct and quasi-direct on-

[11] See 1981/82 input-output table associated with no-protection in Appendix, p. 28.

farm costs of protection would be 6% [(122+34)/2599, where 2599 is total intermediate input (including imports) costs excluding tariffs], broadly consistent with the Hayes figure.

The share of indirect costs of import protection in total on-farm input expenditure can be derived similarly. It is found that total indirect costs are greater than the sum of direct and quasi-direct costs for processing industry, while the two are about the same for farming. This arises as farming is capital intensive and uses relatively more importables and imports and processing sector is less capital intensive, using relative more labour and home goods.

(III) Off-farm costs are found to be as significant as on-farm costs (Table 7). In absolute value terms, the on-farm cost of protection is less than off-farm cost of protection. If the export demand for New Zealand agricultural products is relatively elastic, then the fob prices of agricultural products are unlikely to change due to import protection. Increases in processing charges will be passed on to farmers in the form of higher processing charges. Examining the cost to agriculture of import protection in isolation (without reference to the cost to processing sector) will inevitably understate the actual cost of protection to farmers.
(iv) The total agricultural assistance (price supports, interest concession and fertiliser subsidies) was less than the amount necessary to completely compensate for the cost to agriculture of import protection (except in 1983/84 the year subsidies peaked and minimal in 1985/86). The high cost of protection to farmers provided some justification for price supports. The bottom half of Table 6 shows whether the price supports were sufficient to compensate farmers for the cost of import protection. For the off-farm cost of protection, the processing sector appears to be severely disadvantaged by both protection to manufacturing and subsidies to farmers. the true effective rate of assistance to processing sector ranging between -22 and-43 percent[12].

As previously argued, it is reasonable to assume that the cost of protection to processing sector is eventually borne by farmers. To only report the on-farm cost of protection is likely to significantly understate the actual cost of protection to farmers. The last two rows of Table 6 show the impact on farming by assuming that off-farm cost of protection is borne by farmers. The results are significant. Only in 1983/84, when more than $1 billion dollar was paid through the SMP, stabilisation schemes, fertiliser subsidies and interest concession were farmers compensated for the cost of protection and provided farmers with "true" assistance. The true effective rate of assistance to agriculture in 1983/84 was down from 61 percent if off-farm costs were all absorbed by processing firms, to 26 percent if off-farm costs were all absorbed by farmers in the form of higher processing charges. For 1981/82 and 1987/88, the assistance was not sufficient to cover both on-farm and off-farm costs of protection.

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[12]However, it should be noted that agriculture's operating surplus includes remunerations to farm operators while that for processing and other sectors are net of all remunerations.

5.0 Conclusions

This study has presented measures of the extent to which the prices of inputs used in agriculture are raised by the protection to manufacturing industries in the form of tariffs and import licensing.

Tariff protection impacts directly on the price of imports, quasi-directly on the price of domestically produced import competing goods (importables), and indirectly on the prices of home goods and labour. The magnitude of impact depends on the substitutability between imports, importables, home goods and labour. This study extended the Clement-Sjaastad model (1984) by allowing for imperfect substitution between imports and importables. It was found that a 10 percent increase in tariff protection would induce a 7 percent increase in the price of importables, rather than an identical 10 percent as assumed by similar studies based on the Clements-Sjaastad model.

A measure of true effective rate of assistance has been developed using an input-output table framework. However, in calculating this measure, gross production of each sector was assumed unchanged after the removal of tariffs. This assumption constrained the measure to be a short-term effect of tariffs.

Agricultural subsidies were included to derive the net effect of tariff protection, since subsidies inevitably impose cost excess on home goods and labour employed by all industries. Both the on-farm and off-farm (processing) costs of import protection were estimated. The off-farm costs of protection are unlikely to be passed to foreign consumers since demand for New Zealand agricultural products is typically elastic. Consequently, processors will tend to pass their increased cost to farmers through lower farm-gate prices, unless processing efficiency can be improved. Farmers are the eventual bearers of the off-farm cost of protection.

The major findings of this study are:

(1) The recent complete removal of agricultural subsidies accompanied by more gradual reduction in tariff protection, has increased the true rate of assistance to manufacturing from 10 percent in 1983/84 to 19 percent in 1987/88. The study found that the reduction in cost excess to manufacturing due to the complete removal of agricultural subsidies was more than offsetting the reduction in tariff assistance. This indicated the current speed and sequencing of trade liberalisation has been far from being neutral. It has tended to favour manufacturing at the expense of agriculture.

(2) The net cost to agriculture of protection has been high, representing an implicit input tax (cost excess) to farmers. The on-farm implicit input tax was calculated to be 7 percent, off-farm implicit input tax 9 percent, totaling 16 percent in 1981/82. The corresponding figures for 1987/88 are 6 percent on-farm and off-farm implicit input tax, totaling 12 percent, as the result of nominal tariff rate reducing from 20 percent to 14 percent.

(3) The indirect cost of protection is significant. The on-farm indirect costs on home goods and labour inputs are as great as direct cost on imports and importables, while the indirect cost is greater than direct cost for the processing industry.

(4) The off-farm cost of protection is greater than on-farm cost of protection (average 7 percent vs 8 percent of total on-farm input costs), suggesting that to assess cost of protection to farmers, one should not examine the farm level alone.

(5) The subsidies provided to farmers had been found to be less than the total on-farm and off-farm costs of protection, with the exception of 1983/84 the year subsidies peaked (The net benefit in 1985/86 was minimal). Agriculture was a net beneficiary of the trade policy during only 1983/84.

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