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Csaba Csáki
Theodor Dams
Diethelm Metzger
Johan van Zyl

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THE INCIDENCE OF INDUSTRIAL IMPORT PROTECTION ON AGRICULTURAL EXPORTS: A COMPARATIVE ANALYSIS WITH SPECIAL REFERENCE TO ZIMBABWE[1]

M Wiebelt

INTRODUCTION

Economists have repeatedly pointed to the high costs associated with industrial import protection. The question which ultimately bears the burden of trade restrictions, however, was given due attention only recently (e.g. World Bank, 1986, Part II). Quantitative results suggest that it is mainly the agricultural producer, particularly in the export-oriented subsectors, whose real-income position is eroded by trade control measures. Moreover, the incidence effects from indirect policies originating elsewhere in the economy seem to dominate the effects from direct agriculture-specific policies in many developing countries (e.g. Krueger et al., 1988). As a result, many direct interventions to help agricultural producers can only be viewed as an attempt to compensate for the negative real-income effects of indirect policies.

The purpose of this paper is: (1) to measure the impact of industrial import protection on the level and structure of incentives for total exports, total agricultural exports and individual agricultural export commodities in the Zimbabwean economy; and (2) to compare these results with those obtained for two other agriculture-based developing countries, namely Peru and Malaysia. Direct government intervention in agriculture has been very different in these three countries and the question arises whether the level and structure of protection is changed markedly by indirect policies.

The next section introduces the theoretical model used and explains the shifting principle. Estimates of the incidence parameters are presented and discussed. Subsequently, the estimates of the incidence parameters are combined with information on nominal protection rates for manufacturing and agricultural exportables to produce true subsidy rates. Finally, major results are summarized and conclusions drawn.

THE INCIDENCE OF PROTECTION: THEORETICAL CONSIDERATIONS

Following Dornbusch (1974) we consider a simple general equilibrium model for a small open economy which produces and consumes three types of final goods: exportables (X), importables (M), and non-traded goods (N). Since the economy is assumed to be a price taker on international markets, the domestic prices of both tradeables are determined by world market prices, the nominal exchange rate and trade taxes and subsidies. By contrast, the prices of home goods are determined by domestic supply and demand. However, the prices of home goods are influenced by trade policy, if home goods and traded goods are

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substitutable in production and/or consumption. In this case, the imposition of a tariff initially raises the domestic relative prices of importables in terms of both exportables and home goods. However, the shift in relative prices provides incentives to increase the domestic production of import substitutes. As a result, resources are diverted from home goods and exportables. At the same time, the change in relative prices induces consumers to shift their demand away from importables to home goods and exportables. In the sector producing home goods, the resulting excess demand places upward pressure on prices until they reach a new home-goods market equilibrium. These adjustments lead to a new equilibrium position for the economy, where:

- the domestic price of importables relative to the price of exportables has increased by the full amount of the tariff because the country cannot influence its foreign terms of trade;
- the domestic price of importables relative to the price of home goods has increased, but by less than the full amount of the tariff because the nominal price of home goods has also risen somewhat;
- the domestic price of exportables has fallen relative to both the price of home goods and that of importables.

As a result, only a certain proportion of protection is an advantage to producers of import substitutes, while the remainder is shifted on to exporters as an implicit tax. This means that the "true" tariff [(PM/PN)] is positive but falls short of the nominal tariff while the "true" subsidy [(PX/PN)] to exporters is negative. One could imagine a lot of substitutional relationships for tradeables and non-tradeables. To evaluate the incidence of protection is, therefore, up to our empirical analysis.

THE SHIFTING OF PROTECTION IN ZIMBABWE

Incidence parameters for Zimbabwe were estimated against the background of the theoretical considerations above. Since the incidence parameter (Ω) is defined as the elasticity of the price ratio between non-tradeables and exportables (PN/PX) with respect to the price ratio between importables and exportables (PM/PX), this gives us the following basic test equation:

$$\ln(PN/PX)t = \text{constant} + \Omega \ln (PM/PX)t + ut \qquad (1)$$

As shown by García (1981), this equation may be disaggregated as necessary to take account of several exportable and importable subsectors. Since estimations based on time-series data would violate the assumption of constant real income and of a balanced external account, income (Y) as measured by real GDP and the trade balance (BOT) have to be included as additional variables in the regression equations. There are then two basic equations to be estimated:

$$\ln(PN/PX)t = \text{constant} + \Omega \ln(PM/PX)t + \alpha\ BOTt + ß \ln Yt + ut \qquad (2)$$

and

$$\ln(PN/PXA)t = \text{constant} + \Omega_1 \ln(PM/PXA)t + \Omega_2 \ln(PXNA/PXA)t + \alpha\ BOTt + ß \ln Yt + ut \qquad (3)$$

where PXA is either the price index for individual agricultural export commodities (maize, coffee, cotton, tobacco, and beef) or an export-share-weighted price index for all agricultural exportables recognized and PXNA is an export-share-weighted price index for all other exportables not included in PXA.

The regression equations were estimated on the basis of annual data for 1966-87. Initially, ordinary least squares (OLS) techniques were used. For all equations estimated

there was, however, evidence of positive autocorrelation. In each case, therefore, the model was re-estimated using the Cochrane/Orcutt iterative procedure. The major results can be summarized as follows (Table 1):

Table 1
Estimates of the incidence parameter Ω for total exports, total agricultural exports and individual agricultural exports in Zimbabwe, 1966-1987[a]

Independent variables /Test statistics[b]	Dependent variables						
	Total exports	Total agricultural exports	Individual agricultural exports				
	ln(PN/PX)	ln(PN/PXA)	Maize	Coffee	Cotton	Tobacco	Beef
Constant	1.1720 (0.44)	2.1089 (0.92)	-2.4387 (-1.96)	1.1224 (0.40)	1.9645 (0.77)	1.8961 (0.79)	2.4351 (1.16)
ln(PM/PX)	0.7598 (5.46)						
ln(PM/PXA)		0.6451 (5.28)	0.6525 (5.12)	0.7588 (4.95)	0.6471 (4.54)	0.6755 (5.34)	0.4315 (2.88)
ln(PXNA/ PXA)		0.0669 (0.95)	-0.1103 (-0.65)	0.2372 (1.66)	0.1049 (0.81)	0.1263 (1.38)	0.1191 (1.05)
BOT	-0.1254·10-3 (-0.72)	-0.6764·10-4 (-0.45)	0.2975·10-4 (0.20)	-0.1271·10-3 (-0.67)	-0.2166·10-3 (-1.28)	-0.4293·10-4 (-0.27)	0.1897·10-4 (0.13)
ln Y	-0.0518 (-0.19)	-0.1527 (-0.65)	0.3174 (2.11)	-0,0467 (-0.16)	-0.1194 (-0.47)	-0.1329 (-0.54)	-0.2192 (-0.98)
Rho	0.9558 (14.90)	0.9583 (15.37)	0.7908 (5.92)	0.9551 (14.77)	0.9626 (16.29)	0.9570 (15.11)	0.9481 (13.70)
R^2	0.58	0.80	0.67	0.93	0.69	0.90	0.51
F	10.17	21.48	11.13	66.56	12.32	46.85	6.28
DW	1.59	1.79	1.82	1.59	1.81	1.73	1.78

[a] PXA is either the price index for individual agricultural export commodities or is constructed as a weighted export price index for the five individual export commodities where the respective earnings in 1980 are used as weights. Analogous, PXNA is an export price index for all other exports not included in PXA. The building material price index was used as a proxy for price movements of home goods.

[b] Values in parentheses are t-values, Rho is the regression coefficient of the Cochrane/Orcutt procedure, R^2 is the corrected coefficient of determination, F the F-value and DW the Durbin-Watson-statistic.

Source: Own computations based on data given in Wiebelt (1990).

From the values of Ω, it can be concluded that a major proportion of the incidence of commercial policy interventions designed to protect the importables may be shifted to the export sector in the form of an implicit export tax. As an example, the estimate of Ω for total exports suggests that the share of incidence borne by the exportable sector is 76 percent. In general, this implies that Zimbabwe's home goods and importables are fairly close substitutes

in both consumption and production whereas the relationship between home goods and exportables is weak. It also reflects that Zimbabwe's exportables are fairly inelastic in supply. Hence, they tend to absorb a large proportion of the tariff incidence in the form of reduced rents to the fixed factors of production.

Within the agricultural export sector estimates of the incidence parameter vary between 0.43 for beef and 0.76 for coffee with those for maize, cotton and tobacco at around 0.65. The results for beef contrast with the findings of Mlambo (1989) and can be explained by differences in the data base used. Whereas Mlambo used export price indices (Mlambo, 1989:255, Table 6, footnote) we relied on producer prices, since these are the prices which determine producers' decisions. As clearly shown by Rukovo (1990), nominal protection is high for beef. This explains the large discrepancy between Mlambo's estimate of 0.88 and our estimate of 0.43. Obviously, beef producers (mostly large-scale commercial farmers) are aware of the eroding effect of increasing home-goods prices and successfully lobbied for higher nominal subsidies to compensate for disprotection by commercial policy.

TRUE PROTECTION OF IMPORTS AND EXPORTS

A number of studies have endeavoured to estimate shift parameters using the type of methodology described above. A summary of results from a study on Malaysia and Peru (Herrmann et al., 1990) together with findings for Zimbabwe (Wiebelt, 1990) is presented in Table 2. In both studies extensive experiments were carried out in order to explore the sensitivity of the incidence parameters with respect to alternative model specifications.

Table 2
Inter-country comparison of estimates of the incidence parameter

Range of the incidence parameter	Country		
	Zimbabwe 1966-87	Malaysia 1960-85	Peru 1970-85
Total exports	0.66 - 0.82	0.78	0.72 - 0.92
Total agricultural exports	0.53 - 0.70		
Individual agricultural exports			
- Maize	0.57 - 0.76		0.55 - 1.07
- Coffee	0.65 - 0.84		0.64 - 1.05
- Cotton	0.59 - 0.68		
- Tobacco	0.55 - 0.73		
- Beef	0.29 - 0.47		0.57 - 1.01
- Fishmeal			
- Rubber		0.68 - 0.86	
- Palm oil		0.91 - 1.03	
- Cocoa		0.75 - 1.12	

Source: Compiled from Wiebelt (1990) and Herrmann et al. (1990).

It can be seen that the incidence parameters are fairly stable across different model specifications in all three countries. They are generally high with the proportion of import protection which is shifted to total exports varying from 66% to 82% in Zimbabwe and from 72% to 92% in Peru. For individual agricultural exports, they are generally higher than 0.5 and even lie around 1 in various models for Malaysia and Peru. The studies consistently indicate, in fact, that a substantial proportion of the protection conferred on import-substituting activities is shifted in the form of an implicit export tax.

As shown by Greenaway & Milner (1987) and Greenaway (1989), estimates of the shift parameters can be combined with information on nominal import tariffs and nominal export subsidies to calculate "true tariff rates" and "true subsidy rates".

Thus, the true tariff rate t* is defined as:

$$t^* = PM / PN = (1+t) / (1+d) - 1 = (t-d) / (1+d) \quad (4)$$

and the true subsidy rate s* is analogously given by:

$$s^* = PX / PN = (1+s) / (1+d) - 1 = (s-d) / (1+d) \quad (5)$$

where:

$$d = PN = \Omega PM + (1-\Omega) PX \quad \text{or} \quad d = \Omega t + (1-\Omega)s \quad (6)$$

In equations (4) to (6), d is the proportional change in the home-goods price and t and s refer to the nominal tariff rate and nominal subsidy rate respectively.

From equation (6) it follows that the proportional increase in the price of home goods following trade restrictions is composed of two elements: that part of the increase shifted on from the rise in the price of importables due to the tariff [Ωt] and that part of the increase shifted on from the rise in the domestic price of exportables due to the subsidy [$(1-\Omega)s$]. Since our primary interest is in the effects of tariffs on manufacturing at given export subsidies, we will assume PX to be zero. Thus equation (6) reduces to $d = \Omega t$. (7)

Clearly, if importables and home goods are perfect substitutes ($\Omega=1$) then $d=t$ and $t^*=0$ whereas the sign (and value) of s* is ambiguous. In this case importables enjoy no true protection relative to home goods. Exports are truly discriminated against if nominal tariffs exceed nominal subsidies. If on the other extreme, importables cannot replace home goods in production and consumption ($\Omega=0$), then $d=0$ and $t^*=t$ and $s^*=s$.

Rukovo (1990) provides details on nominal taxes and subsidies for three Zimbabwean agricultural exportables (maize, beef and cotton) and Herrmann et al. (1990) and Aziz (1990) compiled similar information on the most important agricultural exportables in Peru and Malaysia. It is interesting to combine this information with average tariff rates (or total import charges) for total manufacturing as computed by Erzan et al. (1989) to generate estimates of true protection for the three countries. The results, together with the nominal tariff and subsidy rates as well as the shift parameters used, are reported in Table 3.

According to these figures, the true tariff on importables ranges between 2.4% for Zimbabwe and 5.5% for Peru, if only tariffs are recognized. When total import charges, i.e. tariffs plus para-tariffs (customs surcharges and surtax, stamp tax, other fiscal charges and tax on foreign exchange transactions) are considered, true tariffs vary from 3.3% for Malaysia to 8.1% for Peru. In all three countries true protection of manufactures is much lower than nominal protection. This follows because importables and home goods are close substitutes. In this case home-goods prices increase drastically, thereby undermining true protection of imports. This may provide one explanation of the widespread tendency for protection of importables to increase over time. If true protection is less than nominal protection, this provides a motive for pressing for further protection.

Table 3
Estimates of true tariffs and true subsidies for Zimbabwe, Malaysia and Peru, 1985 (percent)

Tariff/Subsidies[a]	Shift parameter (Ω)	Country		
		Zimbabwe	Malaysia	Peru
Nominal tariff on manufacturing (t)[b]		10(28)	16(17)	41(71)
Shift parameter (Ω)		0.74	0.78	0.82
True tariff (t*)		2.4(6.0)	3.1(3.3)	5.5(8.1)
Nominal subsidy (s)[c]				
- Maize		12		
- Beef		146		
- Cottton		-17		-76
- Rubber			-8	
- Palm oil			-2	
- Cocoa			0	
- Coffee				-53
True subsidy (s*)[d]				
- Maize	0.67	-5.0(-5.7)		
- Beef	0.38	137.0(122.3)		
- Cotton(Zimbabwe/Peru)	0.64/0.85	-22.0(-29.6)		-82.2(-85.0)
- Rubber	0.77		-18.1(-18.7)	
- Palm oil	0.97		-15.2(-15.9)	
- Cocoa	0.94		-13.1(-13.8)	
- Coffee	0.81			-64.7(-70.2)

a True tariffs and true subsidies are calculated on the basis of an unweighted average incidence parameter calculated from the extreme values given in Wiebelt (1990) and Herrmann et al. (1990).

b The nominal tariff rate is an unweighted average tariff rate for total manufactures as calculated by Erzan et al. (1989); in parentheses, average total import charges.

c Nominal subsidy rates for Zimbabwe and Malaysia are taken from Rukovo (1990) and Aziz (1990) respectively. They are based on export parity prices by accounting for internal marketing and transport margins. Crude nominal subsidy rates for Peru based on actual farmgate prices and border prices were calculated by Herrmann et al. (1990). Information on nominal protection rates for coffee and tobacco in Zimbabwe and fishmeal in Peru was not available.

d Unweighted nominal subsidy rates for the period 1984/85-1985/86.

Source: Own computations based on Erzan et al. (1989), Rukovo (1990), Herrmann et al. (1990), Aziz (1990) and Wiebelt (1990).

If total import charges are considered, the true subsidy rates on individual Zimbabwean exports range from -5.8% to 122.3%, depending on the value of the shift parameter and the value of nominal duties or subsidies on exportables. Other things being equal, s* will increase as Ω falls. To give an example, if both maize and beef are nominally subsidized by 12%, this would lead to a higher true subsidy for beef (+1.2%) than for maize (-5.7%). This follows immediately from the dampening effect of a smaller omega on the non-tradeables price.

In Zimbabwe, disprotection from a 10% import tariff on manufactures is insufficient to offset protection granted to maize and beef by nominal subsidies. In other words, where agricultural exports are nominally subsidized, they are also truly subsidized. For cotton, which is nominally taxed, true discrimination is higher than nominal discrimination. The case where the implicit tax is at a maximum is that which pertains to maize. This follows immediately from the relatively high shift parameter, which means that non-tradeables prices for maize producers rise to a greater extent. In this case, protection brought about by export subsidies is diminished strongly by nominal protection of manufacturing imports. In fact, maize exports are truly discriminated if total import charges on manufactures are taken into account.

From the results for Zimbabwe, one can conclude that the prevailing average tariff rate for total manufacturing has only a minor impact on agricultural incentives. Low nominal import tariffs together with similar incidence parameters for the three agricultural exports mean that the level and structure of protection in the agricultural sector is not profoundly affected by import tariffs. However, the picture changes drastically, if para-tariffs on imports are also taken into account. Even where the apparent intent (as judged by nominal subsidies) is to promote exports, as in the case of the maize, the negative impact of indirect protection is large enough to lead to overall taxation.

Turning to an analysis of the protection structure in Malaysia and Peru, the following picture emerges:

- With the exception of cocoa in Malaysia, both countries directly tax their main export crops. The magnitude of the tax, however, is much higher in Peru than in Malaysia. In Peru, farmgate prices for coffee and cotton are 53% and 76% below border prices. By contrast, direct taxation of agricultural exportables in Malaysia is fairly moderate, ranging from 8% for rubber to 2% for palm oil.
- In Malaysia, the average nominal protection rate for manufacturing was about 17% in 1985. With incidence parameters of 0.77, 0.97 and 0.94 for rubber, palm oil and cocoa respectively, the corresponding true subsidy rates are -19%, -16% and -13%. In every case, indirect discrimination exceeds direct discrimination brought about by export taxes. As can be seen from Table 3, even in years where the apparent intent (as judged by low or zero direct taxation) was not to discriminate against agricultural exportables, the negative impact of indirect protection was large enough to lead to strong overall taxation. In spite of zero direct taxation for cocoa, the true tax rate was 13%. Similarly, palm oil carried a tax burden of 16% in 1985, instead of explicit taxes of only 2%.
- Import protection averaged about 71% in Peru in 1985. Given the incidence parameters of 0.81 for coffee and 0.85 for cotton, the prices of non-tradeables for these sectors following from the average import tariff increased by 58% and 60% respectively. Thus, manufacturing protection places an additional heavy burden on export crops. The true tax rates falling on coffee and cotton producers average 70% and 85% when the implicit tax component is accounted for. Of the total tax rates for coffee and cotton, around 25% and 10% can be traced back to indirect discrimination via protection of manufactured products.

Summing up, the results show that direct and indirect policies are important in all three countries. Direct government intervention in producer prices has generally been favourable to agricultural production in Zimbabwe. However, import tariffs are largely shifted on to producers of exportables, either because home goods and importables are fairly close

substitutes or because agricultural exportables are fairly inelastic in supply. As a result, true subsidy rates are much lower than nominal rates. In Malaysia and Peru, agricultural exports are discriminated against by both direct and indirect policies. In Malaysia, implicit taxation via import protection exceeds explicit taxation by sector-specific measures. The degree of taxation is highest in Peru due to a higher nominal protection rate for the manufacturing sector and high nominal discrimination against agricultural export crops. Together with high import tariffs for manufactures, the high incidence parameters in Peru lead to high indirect taxes on Peru's main agricultural exportables.

SUMMARY AND CONCLUSIONS

It was the objective of this paper to elaborate the implications of import protection in the non-agricultural sector for agricultural exports in a comparative study of Zimbabwe, Malaysia and Peru. To estimate the effect on prices of a system of tariffs and subsidies on imports and exports, a simple general equilibrium model incorporating importables, exportables and home goods was used and different protection measures were calculated and compared. The major results that emerge from our analysis can be summarized as follows:

- The empirical results obtained for Zimbabwe, Malaysia and Peru confirm experiences gained in other studies on the subject. In particular, they underline the importance of macroeconomic repercussions of commercial policy for the agricultural sector. The estimates of the incidence parameters indicate that the degree of shifting the burden of commercial policies onto exporters is high in all three countries. This implies that the impact of a tariff on imports falls almost entirely on producers of exportable agricultural products.
- Similar incidence parameters do not mean, however, that the discrimination of the agricultural sectors is similar across the three countries. The nominal protection rates for the manufacturing sector and the agricultural export crops matter, too. Peru, the country with a poorly performing agricultural export sector, protected its manufacturing sector much more strongly than Zimbabwe and Malaysia and taxed its agricultural export crops more heavily. This implies that the true discrimination of agricultural export crops is clearly higher in Peru than in Malaysia and Zimbabwe.
- Direct government intervention in agriculture in Zimbabwe has been favourable to maize and beef producers whereas cotton exports have been discriminated against during the period of investigation. Similar incidence parameters for the three agricultural exportables mean that the structure of protection in the agricultural sector has not been affected profoundly by indirect protection. However, total import charges on manufacturing have been rather high, thereby placing a heavy indirect tax burden on agricultural exports.

The analysis suggests that the more successful performance of agricultural exports in Malaysia and Zimbabwe can be explained by the smaller degree of direct and indirect taxation due to lower negative or high positive protection coefficients rather than by lower incidence parameters. Given the high and similar incidence parameters in all three countries, policy makers have to focus on the modification of the relevant nominal protection rates if they want to improve the performance of their agricultural export sectors. Nominal protection rates of manufactured goods would have to fall and those for agricultural export crops would have to increase.

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