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How Non-Agricultural Import Protection Taxes
Agricultural Exports: A "True Protection"
Analysis for Peru and Malaysia*

by

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September 1989

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1. Introduction

For many years, economists have argued that agricultural and economic policies in developing countries discriminate against the agricultural sector [Lipton (1977), Schultz (1978)]. In more recent literature on agricultural protection, authors have increasingly focused on the measurement of this discrimination [Peterson (1979), Byerlee/Sain (1986), Krueger/Schiff/ Valdés (1988)]. Quantitative results suggest that it is mainly the agricultural export sector which suffers from agricultural and economic policies. Moreover, the indirect effects from non-agricultural policies seem to dominate the direct effects from agricultural policies in many developing countries [Schiff (1988), Krueger/Schiff/Valdés (1988)].

Often, the incentives for export agriculture are distorted indirectly by import-substitution policies for the manufacturing sector. The incidence effect of import protection in the manufacturing sector on agricultural exports is expressed by the concept of true protection.¹ This concept starts from the basic theoretical work by Dornbusch (1974). It was extended by Sjaastad (1980) and applied to the agricultural export sectors of Colombia [García (1981)], Zaire [Tshibaka (1986)], Nigeria [Oyejide (1986)], Mauritius [Greenaway/Milner (1986)], the Philippines [Bautista (1987) and Zimbabwe (Mlambo (1989))]. Until now, true protection analyses have concentrated on single countries rather than on making a comparison across countries. A comparative study is interesting, however, since agricultural export sectors have developed very differently in various countries. The question arises whether the differential performance is due to a different incidence effect of non-agricultural import protection on agricultural exports or to different levels of nominal protection. In order to answer this question, it is the objective of this paper to measure, compare and analyze the true protection of agricultural exports in two countries - Peru and Malaysia. In these countries, the agricultural export sectors have developed very differently.

The paper is organized as follows. The concept of true protection will be reviewed briefly in section 2. In section 3.1, a survey of import protection in the manufacturing sectors of Peru and Malaysia will be given and the differential performance of the agricultural export sectors will be outlined. In sections 3.2 and 3.3, econometric results will be presented which show the incidence of import protection in Peru and Malaysia. On the basis of the quantitative results, the question will be answered whether the differential taxation of the agricultural export sectors is due to a differential incidence of non-agricultural import protection or to a different magnitude of protection levels in the manufactured and the agricultural sectors. The total taxation of agricultural exports, arising from agricultural and non-agricultural policies, is calculated and compared for both countries. Finally, major results are summarized and policy conclusions are drawn.

2. The Concept of True Protection: Analytical Framework

The appropriate framework for analyzing the economywide repercussions of trade policies is provided by Dornbusch's (1974) general equilibrium model for an 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 traded goods (P_M , P_X) are determined by world market prices (P_M^* , P_X^*), the nominal exchange rate (E), import tariffs (t) and export subsidies/taxes (s):

$$P_M/P_N = (E/P_N)P_M^* (1+t) \quad (1)$$

$$P_X/P_N = (E/P_N)P_X^* (1+s) \quad (2)$$

Since our primary interest is on tariffs, we will assume s to be zero. Thus, the domestic relative prices between importables and exportables (P) in a tariff-ridden economy are linked to world market prices by

$$P = \frac{P_M}{P_X} = P^* \cdot T \quad (3)$$

where $P^* = P_M^*/P_X^*$ is the world market price ratio and $T=(1+t)$ is the tariff wedge. The exchange rate and the price of non-tradeables cancel out.

Equation (3) implies that the domestic prices of importables relative to exportables are fully determined by world terms of trade and any tariff wedge. The imposition of an import tariff initially raises the domestic nominal price of importables relative to both exportables [equation (3)] and home goods [equation (1)] by the amount of the tariff. However, this change in relative prices induces consumers to shift demand away from importables to home goods and exportables. It also provides incentives to increase domestic production of import substitutes. As a result, resources are diverted from 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 finally lead to a new equilibrium position for the economy where

- i) 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;
- ii) 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;
- iii) the domestic price of exportables has fallen relative to both the price of home goods and that of importables.

Hence, although the tariff has to be paid by importers, the ultimate price changes are such that part of the tariff is "shifted" on to the producers of exportables as an implicit tax borne in the form of diminished real income. The change in the price of exportables relative to home goods thus measures the extent of

the "true discrimination" of exportables. The greater the relative rise of the home-goods price, the larger the true discrimination of exportables. The rest of the ultimate burden falls on producers of home goods the price of whose products has fallen relative to importables. The extent of this decline determines the magnitude of the implicit subsidy to domestic producers of importables given by an import tax. It measures the "true protection" accorded to domestic import-substituting activities. The greater the relative fall of home goods the larger the true protection [Greenaway/Milner (1987, pp. 203 et seq.)]. Hence, the true protection concept emphasizes the "incidence" of trade policy measures.

These relationships can be formalized within the framework of the three-sector model of Dornbusch (1974) in which general equilibrium is implied by either the trade-account equilibrium or equilibrium in the home-goods market. Equilibrium in the home-goods market implies that home-goods demand equals home-goods supply:

$$D^N = S^N \quad (4)$$

where demand and supply are expressed as:

$$D^N = D^N (P_M/P_N, P_X/P_N) \quad (5)$$

$$S^N = S^N (P_M/P_N, P_X/P_N) \quad (6)$$

After differentiating and rearranging the market equilibrium condition it follows that:

$$(\eta_M - \epsilon_M) (\hat{P}_M - \hat{P}_N) + (\eta_X - \epsilon_X) (\hat{P}_X - \hat{P}_N) = 0 \quad (7)$$

In this expression, η_i and ϵ_i represent the demand and supply elasticities for home goods with respect to the prices of importables and exportables. $\hat{}$ denotes a proportional change in a variable. Equation (7) can be expressed as:

$$\gamma_M (\hat{P}_M - \hat{P}_N) + \gamma_X (\hat{P}_X - \hat{P}_N) = 0 \quad (8)$$

where $\gamma_M = \eta_M - \epsilon_M$ and $\gamma_X = \eta_X - \epsilon_X$

are the elasticities of the excess demand for home goods with respect to the relative price of importables and exportables. From equation (3) it follows that

$$P_M/P_N = P_X/P_N P^* T. \quad (9)$$

For a small open economy, the world terms of trade are exogenously fixed, so that trade policy fully determines the relative price of tradeables. Assuming P^* to be constant, it follows that

$$(\hat{P}_M - \hat{P}_N) = (\hat{P}_X - \hat{P}_N) + \hat{T}. \quad (10)$$

Introducing equation (10) into (8), the incidence effect of the tariff on the exportable sector is given by

$$\hat{P}_X - \hat{P}_N = -\omega \hat{T} \quad (11)$$

where $\omega = \gamma_M / (\gamma_M + \gamma_X)$

is the incidence parameter which determines the extent of the shifting of the tax burden onto exportables. As shown by equation (11), the effects of a tariff will depend on the substitution possibilities between home goods and traded goods. This result is not surprising, since it is a basic principle of public finance that the incidence of a tax depends on the relative size of the supply and demand elasticities. It can be seen that $\omega = 1$ when $\gamma_X = 0$, that is, when the excess supply of exportables is perfectly inelastic, their price falls by the amount of the tariff. The incidence in this particular case falls totally on exporters. By contrast, when the excess demand of importables is perfectly inelastic ($\gamma_M = 0$ and, therefore, $\omega = 0$), the price of non-tradeables, too, remains unaltered. In this case the tax is shifted equally onto producers of exportables and home goods.

However, if home goods are substitutes for both tradeables, the tariff will increase the relative price of importables in terms of home goods while the relative price of exportables declines in terms of non-traded goods. Furthermore these price changes are less than proportionate to the tariff. A graphical description of the shifting principle is given in the Appendix.

3. The Quantitative Analysis: Implications of Non-Agricultural Import Protection in Peru and Malaysia for Agricultural Protection

3.1 The Pattern of Non-Agricultural Import Protection in Peru and Malaysia and the Differential Agricultural Export Performance

The major difference between the Peruvian and the Malaysian trade policy is that Peru stuck to import substitution over extended periods whereas Malaysia did not. Since the end of the 1950's, various Peruvian governments have emphasized industrial development and granted generous import protection to the manufacturing sector. The instruments of trade policy used are manifold and partly compensate each other.² Import protection for the manufacturing sector is based on import tariffs and non-tariff barriers to imports. Import tariffs vary widely across industries [Hanel (1987)] and over time [Franklin/Valdés (1989)]. In 1980, nominal import tariffs on consumer goods were highest with 62.2%, followed by import tariffs on construction material with 43.9%, industrial inputs (33.7%), industrial capital goods (33.2%), transport equipment (32.6%) and agricultural capital goods (29.2%). The average import tariff was particularly high in the 1970's when the Peruvian economy was strongly insulated from international markets. Non-tariff barriers to imports were cut down in a liberalization phase between 1980 and 1984, but a return to restrictive trade and exchange rate policies has led to a significant increase in non-tariff barriers since then. The percentage share of restricted and prohibited import categories has risen strongly since 1985. The major instruments of non-tariff protection are a comprehensive import licensing scheme and tech-

nical and sanitary norms. Imports of the manufacturing sector are further discriminated against by the multiple exchange rate system compared, e.g., with food imports. The Peruvian government uses various export promotion policies to offset unintended negative effects of import protection on exports. One important instrument, CERTEX, is supposed to increase non-traditional exports. A more favourable exchange rate is allowed for these exports as against traditional exports, especially agricultural exports.

In Malaysia, up to the mid-1960's industrial growth depended mainly on unassisted import-substitution, for which high tariff protection had not been necessary.³ The average nominal protection rate for manufactures in 1963 and 1965 was estimated at 11% and 13% [Power (1971)]⁴ and served mainly revenue purposes [Teh (1977)]. But, since then, Malaysia's protection structure has undergone rapid changes. In an attempt to speed up industrialization import tariffs, import licensing, duty exemption on essential inputs, drawbacks and refund of import duties and surcharges were provided on a wide range of products, including consumer goods, intermediates and capital equipment. The average nominal tariff rate for manufacturing rose to 24.8% in 1969 and 34.1% in 1973 [World Bank (1980)]. As a result, import substitution progressed rapidly, concentrating on non-durable and durable consumer goods. In 1973, 90% of non-durable and 95% of durable goods were produced domestically [Chee (1979)]. The first, "easy" stage of import substitution was nearly completed, and further expansion of import substitution became increasingly limited. Although the overall level of tariffs on manufactures was substantially higher in the 1970's than that in the 1960's, the level in the latter half of the 1970's was not higher than that in the early 1970's. Average nominal tariff rates were 29.4% and 31.4% in 1975 and 1977 respectively. The protection system is still in force, although the granting of tariff protection and import restrictions has been substantially curtailed. To a large extent, tariffs and quantity restrictions are applied on a case-to-case basis to industries which are considered in a position to supply the major portion of the domestic market, thus causing an inherent firm and trade bias in the protection system. In 1982,

the nominal tariff on total manufactures was 32.4%, with the tariffs on processed goods at 18.5%, construction materials 18.3% and transport equipment 35.3%.

After having almost completed the first phase of import substitution by the mid-1970's, export promotion was actively pursued. A major element of the export promotion system was to encourage the establishment of industries producing or assembling products for export in a special geographical zone. These industries operate in a free trade regime with minimal customs control and formalities. Besides the free trade zones, licensed manufacturing warehouses were allowed to be set up, enjoying similar facilities to those under the free trade zones. Another element in the export promotion strategy is the export refinancing scheme introduced in 1977. In addition, other concessions, including duty exemptions on imports of capital equipment or machinery and duty drawbacks, were given to further encourage the development of export-based manufacturing industries, although access to these incentives is not automatic.

Various authors have argued that a favourable treatment of the import-substituting manufacturing sector distorts the incentives so that they operate against agricultural exportables. Table 1 presents a comparative picture of agricultural development in Peru and Malaysia since the 1960's. It shows that the agricultural export sector performed far worse in Peru than in Malaysia. In Peru, the self-sufficiency ratio declined and Peru became increasingly dependent on food imports. Agricultural imports accounted for a rising share of Peruvian import expenditures. On the other hand, agricultural export earnings as a share of total export earnings dropped by more than 50% between 1963 and 1986. This implies that the contribution of agriculture to the trade balance worsened. The net contribution of agriculture to the trade balance was clearly positive in 1963, but in 1986 agricultural import expenditures were higher than agricultural export earnings by 181 mill.\$. At the level of individual agricultural export products, Table 1 shows how unsuccessful Peru was in world agricultural markets. Although the market share of Peruvian coffee increased somewhat, this was accompanied by a drastic loss

Table 1: Indicators of Agricultural Sector Development in Peru and Malaysia

Indicators	Magnitude	
	Peru	Malaysia
Share of agriculture in the gross domestic product:		
1965:	18%	28%
1986:	11%	19%
Contribution of agriculture to the trade balance (agricultural export earnings minus agricultural import expenditures):		
1963:	145.8 mill.\$	249.8 mill.\$
1986:	-181.0 mill.\$	1991.2 mill.\$
Share of agricultural export earnings in total export earnings:		
1963:	43.0%	54.0%
1986:	15.6%	23.8%
Share of agricultural import expenditures in total import expenditures:		
1963:	16.7%	32.5%
1986:	20.2%	12.1%
World market shares of important agricultural export products:		
	<u>Coffee</u>	<u>Rubber</u>
1963:	1.2%	34.5%
1986:	1.9%	41.9%
	<u>Fishmeal^a</u>	<u>Palm oil</u>
1963:	51.3%	19.9%
1986:	15.8%	64.4%
	<u>Cotton^b</u>	<u>Cocoa (beans)</u>
1963:	4.0%	0.0%
1986:	1.5%	6.1%

^a 1963: export earnings share in world export earnings, SITC no. 081.4(2); 1986: production share in world production (category "fish meal from oily fish"). - ^b SITC no. 263.1.

Source: World Bank (1988); FAO (a, 1988); Salazar/Velásquez/Málaga/González-Velásquez (1986); Ministry of Finance, Malaysia; own computations.

of market shares in the markets of its former major export markets. The fishmeal market share in 1986 was less than a third of its value in 1963. The cotton market share in 1986 was less than 40% of the market share in 1963.

Agricultural sector development in Malaysia was in two respects similar to Peru: the contribution of the agricultural sector to GDP diminished and the share of agricultural exports in total exports declined. This can be expected, however, from theory, as the role of the agricultural sector reduces in the course of economic development. All other indicators of Table 1 show a rather successful agricultural sector development in Malaysia. The net contribution of agriculture to the trade balance became increasingly positive over time. In the period 1963-86, the share of agricultural imports in total import expenditures became smaller in Malaysia. Beyond this, Malaysia realized remarkable gains in market shares on its major agricultural export markets. The market share in the world rubber market, which was already substantial in 1963 (34.5%), increased further. The market share in palm oil more than tripled between 1963 and 1986 and is now higher than 60%. A strong increase in the market share took place in cocoa, too, where Malaysia developed from a marginal exporter in 1963 to an important supplier in the world market.

3.2. Empirical Results for Peru

The incidence of import protection in the manufactured sector for agriculture will be quantified first for Peru. Sjaastad's incidence parameter ω is measured for the period 1970-85. By use of the methodology Garcia (1981) applied to Colombia, the function

$$\ln (p_N/p_X)_t = c + \omega \ln (p_M/p_X)_t + u_t \quad (12)$$

is estimated for Peruvian aggregate exports, and the disaggregated function

$$\ln (p_N/p_{XA})_t = c + \omega_1 \ln (p_M/p_{XA})_t + \omega_2 \ln (p_{XNA}/p_{XA})_t + u_t \quad (13)$$

for three agricultural export sectors: coffee, fishmeal and cotton. p_{XNA} (p_{XA}) is the price level of non-agricultural exports (agricultural exports), and u_t is the error term in the period t .

The basic models (12) and (13) which are often estimated in the true protection literature [Greenaway/Milner (1986, 1987)] suffered from significant positive autocorrelation.⁵ Theory suggests that this is due to an omitted-variables problem. The basic three-goods model which is used to derive the magnitude of the incidence parameter assumes that the trade balance is in equilibrium and that real income and the productive capacity of the country are constant [Dornbusch (1974); Sjaastad (1981)]. Clearly, these assumptions did not apply in Peru in the period under consideration. Hence, a balance-of-trade variable (BT) and a real-income variable (Y) are introduced additionally into the basic model. The extended econometric model is then

$$\ln (p_N/p_X)_t = c + \omega \ln (p_M/p_X)_t + \alpha_1 BT_t + \alpha_2 \ln Y_t + u_t \quad (14)$$

for total Peruvian exports and

$$\ln (p_N/p_{XA})_t = c + \omega_1 \ln (p_M/p_{XA})_t + \omega_2 \ln (p_{XNA}/p_{XA}) + \alpha_1 BT_t + \alpha_2 \ln Y_t + u_t \quad (15)$$

for the individual agricultural export sectors.

Price data are taken from Velásquez/Málaga/Gómez-Velásquez (1986) and are converted into a common currency, the Peruvian Inti, with exchange rate data from the IMF's International Financial Statistics. Table 2 shows the results of the estimates on the basis of models (14) and (15) and the data basis is revealed in Appendix 1.

The following major results can be derived from Table 2:

Table 2 - Incidence Effects of Import Protection on Exports and Agricultural Exports in Peru, 1970-85 (Calculation of Sjaastad's Incidence Parameter ω)^a

Independent Variables/ Test Statistics	Dependent Variables			
	Total Exports	Agricultural Exports: $\ln(p_M/p_{XA})$		
	$\ln(p_N/p_X)$	Coffee	Fishmeal	Cotton
Constant	7.58933 (1.40)	8.78759 (1.46)	7.98650 (1.33)	8.79097 (1.53)
$\ln(p_M/p_X)$	0.87519 (7.15)			
$\ln(p_M/p_{XA})$		0.87490 (4.74)	0.88236 (5.81)	0.84615 (5.14)
$\ln(p_{XNA}/p_{XA})$		0.11377 (0.74)	0.08611 (0.55)	0.05696 (0.34)
BT	$-0.63619 \cdot 10^{-4}$ (-1.54)	$-0.62299 \cdot 10^{-4}$ (-1.29)	$-0.56782 \cdot 10^{-4}$ (-1.26)	$-0.67601 \cdot 10^{-4}$ (-1.50)
$\ln Y$	-0.87459 (-1.40)	-1.03246 (-1.48)	-0.92920 (-1.34)	-1.01682 (-1.54)
ρ	0.91601 (8.84)	0.89593 (7.81)	0.91244 (8.64)	0.92268 (9.27)
\bar{R}^2	0.84	0.90	0.96	0.82
F	24.74	31.61	77.21	16.91
DW	1.48	1.41	1.31	1.42

^aValues in parentheses are t-values, ρ is the regression coefficient of the Cochrane/Orcutt procedure, \bar{R}^2 is the corrected coefficient of determination and F the F-value.

Source: Own computations. p_N , p_M , p_X and p_{XA} are taken from Appendix 1. p_{XNA} is constructed as a weighted export price index for copper, oil and zinc where the respective export earnings shares in 1979 are used as weights. The sources of the raw data are given in Appendix 1.

1. The calculation of Sjaastad's incidence parameter ω indicates for Peruvian aggregate exports as well as for agricultural exports that price-raising policies on the import side induce a relatively strong taxation of the export sector. All the calculated incidence parameters are high and range above 0.8. They are statistically different from zero in all cases.
2. The point estimates of the incidence parameters can be interpreted as follows: an increase of the price ratio between importables and exportables by 1%, e.g. due to an import tax on manufactured products, raises the price ratio between non-tradeables and exportables by 0.88%. If the price ratio between importables and coffee exports rises by 1%, the price ratio between non-tradeables and coffee exports increases by 0.87%. The incidence parameters for fishmeal and cotton are of the same order: 0.88 and 0.85 respectively. What do these high parameters mean? They imply that import protection, e.g. for manufactured products, is followed by a price increase for non-tradeables which is nearly as large as the price rise for importables. The price of exportables, however, remains unaffected. Thus, the terms of trade worsen for export production as opposed to the production of non-tradeables and import substitutes. This implies that agricultural exports experience strong negative effects from the Peruvian import-substitution strategy for manufactured goods.
3. The relative price between importables and exportables is the most important explanatory variable of the relative price between non-tradeables and exportables in Peru. This holds true for total exports and agricultural exports. If beta coefficients are calculated, e.g. for coffee, it is, at 0.66, highest for the price ratio between importables and coffee exports. This means that a 1 standard deviation change in this explanatory variable causes a 0.66 standard deviation change in the dependent variable. The beta coefficients of the other explanatory variables are clearly lower in absolute terms, with -0.40 for the income variable, 0.14 for the price ratio between non-agricultural exportables and coffee exports, and -0.10 for the balance-of-trade variable. The corresponding

beta coefficient for the relative price between importables and exportables is 0.83 for total exports, 0.94 for fishmeal exports and 0.75 for cotton exports. This is in each case higher than the beta coefficient of the other explanatory variables.

4. The goodness of fit is satisfactory for all regression models in Table 2. The corrected coefficients of determination are higher than 0.8 in each case.

Various authors have stressed the importance of the specification of the econometric true-protection model for the magnitude of the incidence parameter [Meester (1986); Smeets (1989)]. Therefore, extensive experiments were carried out with alternative specifications of explanatory variables and alternative models. The export price index for non-agricultural goods was calculated with different weights, explanatory variables of the basic model were taken out or additional variables introduced, and we tested for different lags. Table 3 shows some results which indicate how specification is important for the computed incidence parameters.

It can be seen that the incidence parameters are fairly stable across different model specifications. They are generally high and range between 0.72 and 0.92 for total Peruvian exports. For agricultural exports, they are in all specifications higher than 0.55 and lie around 0.9 or 1 in various models. Given the results of the sensitivity analysis, it seems safe to conclude that total exports and major agricultural export goods bear the major burden of import protection in Peru. They are significantly more heavily taxed than the non-tradeable sector. Import protection drives up non-tradeable prices whereas the prices of exportables remain basically unaffected.

Table 3 - Sensitivity Analysis on the Incidence Parameter ω , Peru 1970-85^a

Model ^b	Point Estimates of the Incidence Parameter			
	Total Exports	Coffee	Fishmeal	Cotton
<u>Model 1:</u> Basic model	0.87519 (7.15)	0.87490 (4.74)	0.88236 (5.81)	0.84615 (5.14)
<u>Model 2:</u> Smaller model (no balance-of-trade and no income variable)	0.92270 (7.71)	1.07362 (6.76)	1.01096 (7.15)	1.04583 (6.63)
<u>Model 3:</u> Smaller model (no income variable)	0.86086 (6.66)	0.92234 (5.74)	0.91803 (6.84)	0.93393 (6.19)
<u>Model 4:</u> Different speci- fication of p_{XNA} (weights of 1973)	-	0.55488 (2.02)	0.57309 (2.59)	0.64193 (3.46)
<u>Model 5:</u> Different speci- fication of p_{XNA} (weights of 1985)	-	0.92514 (2.91)	0.78572 (3.64)	0.87761 (3.74)
<u>Model 6:</u> Different speci- fication of the income var- iable (lagged one period)	0.82223 (6.11)	0.90561 (4.34)	0.90477 (5.42)	0.89587 (4.77)
<u>Model 7:</u> Introduction of a lagged endogenous var- iable	0.71888 (5.12)	0.92559 (4.88)	0.72974 (4.91)	0.85479 (5.24)

^aValues in parentheses are t-values. For the definition of Sjaastad's incidence parameter ω , see text. - ^bThe basic model (Model 1) is the model shown in Table 2. All models, except Model 7, were corrected for autocorrelation with the Cochrane/Orcutt iteration procedure. Model 7 is estimated for the period 1973-85.

Source: Own computations with data presented in Appendix 1.

3.3 Empirical Results for Malaysia

The methodology applied to Peru is now used to quantify the incidence of import protection for Malaysia in the period 1960-85. The two functions (12) and (13) are estimated for aggregate exports and for three main agricultural export sectors in Malaysia. As the relevant income data in the period before 1970 were not available, the estimation is limited to the basic models (12) and (13).

The series of price indices for importables and exportables are taken from the IMF's International Financial Statistics and the non-traded goods index is from Jenkins/Lai (1989) as well as the Bank Negara Malaysia's Quarterly Economic Bulletin. The results of the estimates of the basic models are shown in Table 4 and the data basis appears in Appendix 2.

The major estimation results as indicated in Table 4 are as follows:

1. The estimates of Sjaastad's incidence parameter ω indicates that import protection imposed substantial taxation on the Malaysian export sector, similar to the case for Peru. The calculated incidence parameters range from 0.67 to 0.91, with the palm oil sector heavily burdened by import protection of the manufactured sector.
2. As can be seen in Table 4, the point estimates of the incidence parameters indicate that an increase of the price ratio between importables and exportables raises the price ratio between non-tradeables and exportables by 0.78%. The incidence parameters vary among the export crop sectors. The incidence parameter for the rubber sector is the lowest, with the price ratio between non-tradeables and rubber exports rising by 0.68% if the price ratio between importables and rubber exports increases by 1%. The results for palm oil, on the other hand, indicate that the price ratio between non-tradeables and palm oil exports increases even more strongly, by 0.91%, due to a 1% increase in the price ratio between

Table 4 - Incidence Effects of Import Protection on Exports and Agricultural Exports in Malaysia, 1960-85 (calculation of Sjaastad's incidence parameter ω)^a

Independent Variables/ Test Statistics	Dependent Variables			
	Total Exports: $\ln(P_N/P_X)$	Agricultural Exports: Rubber	Exports: Palm Oil	$\ln(P_N/P_{XA})$ Cocoa
Constant	0.21687 (1.01)	0.40125 (1.20)	0.20839 (0.91)	0.38916 (1.53)
$\ln(P_M/P_X)$	0.77905 (2.39)			
$\ln(P_M/P_{XA})$		0.67642 (1.82)	0.91311 (4.06)	0.79064 (3.25)
$\ln(P_{XNA}/P_{XA})$		0.41341 (1.15)	0.32723 (1.08)	0.39854 (1.21)
ρ	0.92503	0.91985	0.92655	0.91504
\bar{R}^2	0.86	0.84	0.85	0.97
F	153.9	63.6	70.54	361.7
DW	1.29	1.93	1.48	1.76

^a Values in parentheses are t-values, ρ is the regression coefficient of the Cochrane/Orcutt procedure, \bar{R}^2 is the corrected coefficient of determination and F the F-value.

Source: Own computations with data presented in Appendix 2. The export price index for tin was used as a proxy for P_{XNA} .

importables and palm oil exports. Similarly, the incidence parameter for cocoa is high at 0.79%. In general, the incidence effects of commercial policy in Malaysia, such as a tariff on imports, fall to a large degree on exportables, with some agricultural export crops being more negatively affected by the protection on the manufacturing sector. The imposition of a tariff resulted in a price increase for non-tradeables which is close to the price increase for importables. The analysis suggests that the net effect of the policy intervention in Malaysia is somewhat similar to the Peruvian case. It would operate as an export tax and induce resources away from the export sector to the import-substitution activities. While the strategic objective of the Malaysian policy is on export promotion, this would imply that the policies introduced may not have the desired effect.

3. The statistical results are fairly good, with satisfactory goodness of fit for the models regressed. The Cochrane/Orcutt procedure was used to reduce the problem of autocorrelation. The corrected R^2 exceeded 84% in all cases.
4. We experimented with alternative specifications of the explanatory variables and the basic model. A balance-of-trade variable was introduced, and a weighted average of the export price index of tin and petroleum was used as a proxy for non-agricultural goods. The income variable was also added, but only covers the period 1970-85. A lagged income variable was also introduced. The results are shown in Table 5. The results indicate severe problems of multicollinearity when the income variable is added and should be treated with caution. Except for the models with the income variables, all others performed satisfactorily. The \bar{R}^2 values are high and the incidence parameters do not change significantly. The incidence parameters for total Malaysian exports range around 0.78. For agricultural exports the parameters lie above 0.67 in all cases, which supports the contention that the Malaysian export sectors bear the major burden of import protection.

Table 5 - Sensitivity Analysis on the Incidence Parameter ω , Malaysia 1960-85^a

Model ^b	Point Estimate of the Incidence Parameter			
	Total Exports	Agricultural Exports Rubber Palm Oil Cocoa		
Model 1: Basic model	0.77905 (2.39)	0.67642 (1.62)	0.91311 (4.06)	0.79064 (3.25)
Model 2: Larger model (with balance of trade as additional variable)	0.77586 (2.33)	0.69000 (1.85)	0.90947 (4.04)	0.75116 (2.33)
Model 3: Larger model (with balance of trade and income variables) ^c	1.48309 (7.18)	1.14795 (4.54)	1.17820 (4.77)	1.09341 (5.51)
Model 4: Different specification of P _{XNA}	0.77905 (2.39)	0.86102 (3.89)	1.02981 (3.16)	1.11570 (3.54)
Model 5: Different specification of the income variable (lagged one period) ^c	1.53051 (7.61)	1.19878 (4.65)	1.25044 (3.48)	1.19849 (5.77)

^a Values in parentheses are t-values. - ^b The basic model (Model 1) is the model shown in Table 4. - ^c The models cover only the period 1970-85.

Source: Own computations with data sources as indicated in Table 4.

3.4 A Comparison of Peru and Malaysia with Regard to Explicit, Implicit and Total Taxation on Agriculture

The incidence parameters estimated for Peru and Malaysia indicate the extent to which a one percent tariff distortion in the manufacturing sector is shifted on to producers of agricultural exportables. When multiplied by the prevailing tariff rate for manufactures, they provide an estimate of the implicit tax rate on these agricultural products. However, implicit taxation constitutes only one part of total output taxation. In order to evaluate whether a particular agricultural activity is protected or discriminated against, those measures which directly affect agricultural output prices have to be taken into account. An estimate of nominal taxation is provided by the negative of the nominal rate of protection. It measures the tax/subsidy rate which can be manipulated by government and therefore indicates the intended or explicit taxation/subsidization of agricultural products. Taken together, implicit taxes and explicit taxes or subsidies indicate total or net taxation of agricultural output (TTR). Formally, this implies:

$$TTR_i = NTR_i + \omega NPR_M \quad (16)$$

where NTR_i is the negative nominal protection rate (NPR_i) of a particular agricultural export commodity, ω is the incidence parameter and NPR_M is the average import tariff on manufactures. NTR_i is positive if the commodity is nominally taxed; negative if it is subsidized.

Hence, the total tax or subsidy rate is determined by

- i) the magnitude of the import tariff,
- ii) the size of the shifting parameter, and
- iii) the extent of nominal protection.

The regression results of the basic models [Table 2 and 4] suggest that the shifting of the tax burden is nearly the same in Peru and Malaysia and differs only slightly across different agricultural exportables. Thus, differentials in agricultural

protection between both countries and between agricultural products within each country are mainly attributable to differential import tariffs and nominal protection. This is confirmed by the different tax rates reproduced in Table 6.

1. With the exception of the subsidization of cocoa in Malaysia in 1982, 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 on average 62% and 71% below border prices.⁶ By contrast, direct taxation of agricultural exportables in Malaysia is fairly moderate, ranging from 21% for rubber⁷ to 6% for palm oil and 5% for cocoa. Moreover, export taxation for Malaysia's main export crops decreased during the period of investigation, whereas it remained nearly constant at high levels in Peru.⁸
2. Import tariffs averaged about 43% in Peru between 1979 and 1985. Given the estimated average incidence parameters of 0.875 for coffee and 0.846 for cotton, the implicit taxes on these commodities following from the average import tariff are 38% and 36% respectively. Thus, manufacturing protection places an additional heavy burden on export crops. The total export taxes falling on coffee and cotton producers are as high as 100% for coffee and over 100% for cotton when the implicit tax component is accounted for. Of the total tax rates, around 40% can be traced back to indirect discrimination via protection of manufactured products.
3. In Malaysia, the average nominal protection rate for manufacturing is about 32% in the period 1979 to 1983. With average incidence parameters of 0.676, 0.913 and 0.791 for rubber, palm oil and cocoa respectively, the corresponding implicit tax rates amount to 22%, 29% and 25%. Except for rubber around 1980, indirect discrimination exceeds direct discrimination brought about by export taxation. As can be seen from Table 6, even in years where the apparent intent (as judged by low or negative direct taxation) was not to dis-

Table 6: Explicit, Implicit and Total Taxes on Main Agricultural Exports in Peru and Malaysia, 1979-1985 (percent)^a

Crop/Taxes	1979	1980	1981	1982	1983	1984	1985
	Peru ^b						
Coffee							
Explicit	59	58	64	75	70	56	53
Implicit	38	38	38	38	38	38	38
Total	97	96	102	113	108	94	91
Cotton							
Explicit	81	74	73	70	72	52	76
Implicit	36	36	36	36	36	36	36
Total	117	110	109	106	108	88	112
	Malaysia ^c						
Estate Rubber							
Explicit	30	29	21	12	14	n.a.	n.a.
Implicit	22	22	22	22	22		
Total	52	51	43	34	36		
Smallholder Rubber							
Explicit	32	30	22	13	15	n.a.	n.a.
Implicit	22	22	22	22	22		
Total	54	52	44	35	37		
Palm Oil							
Explicit	10	7	6	3	2	n.a.	n.a.
Implicit	29	29	29	29	29		
Total	39	36	35	32	31		
Cocoa							
Explicit	4	9	11	-9	6	11	n.a.
Implicit	25	25	25	25	25	25	
Total	29	34	36	16	31	36	

^a Implicit taxes are calculated on the basis of the incidence parameters given in Tables 2 and 4 by applying nominal protection rates (NPR) of 43% and 32% for the Peruvian and Malaysian manufacturing sector respectively. The NPR for Peru is computed as an unweighted average from data given in Banco Central de Reserva del Perú (a). For Malaysia an unweighted average NPR is calculated using data provided by Bank Negara Malaysia. - ^b Information on nominal protection rates for fishmeal exports were not available. Explicit tax rates for coffee and cotton are computed on the basis of FAO (a) and unpublished data on production value and production of Grupo Analisis Politica Agricola [GAPA] (1987). All underlying nominal protection coefficients are crude NPCs, i.e. actual farmgate price divided by border price. - ^c NTRs for estate rubber, smallholder rubber and palm oil are taken from Jenkins/Lai (1989); for cocoa, NTRs for 1979 to 1982 are computed from the World Bank (1984). All underlying protection coefficients are based on export parity prices by accounting for port handling and internal marketing and transport margins. NTRs for cocoa for the years 1983 and 1984 are crude estimates based on farmgate and border prices given in Senftleben (1988). n.a. = not available.

criminate against or even to protect commodities, the negative impact of indirect protection was large enough to lead to overall taxation. In spite of a subsidy of 9% for cocoa in 1982, the total tax rate was 16%. Similarly, palm oil carried a tax burden of 32% and 31% in 1982 and 1983, instead of explicit taxes of only 3% and 2%.

Summing up, the results show that direct and indirect taxation of agricultural exports is important in Peru and Malaysia. The degree of taxation is much higher in Peru due to a higher nominal protection rate for the manufacturing sector and a higher nominal discrimination against the 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. This strengthens the negative impact brought about by high direct taxation. In Malaysia, implicit taxes exceed explicit taxes. Here, too, import tariffs are largely shifted on producers of exportables, either because home goods and importables are fairly close substitutes or because agricultural exportables are fairly inelastic in supply.

4. 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 Peru and Malaysia. The incidence effect of non-agricultural import protection on agricultural exports was measured and the magnitude of direct and indirect taxation was compared. The analysis was based on the true protection approach. After a brief review of the concept and the differential performance of the agricultural export sectors in both countries, the analysis provided the following major results:

1. The empirical results obtained for Peru and Malaysia 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 exports is high in Peru as well as in Malaysia. The point estimates of Sjaastad's ω are highly significant and range in all model specifications above 0.5, in some cases even above 0.9. This implies that the impact of a tariff on imports falls almost entirely on producers of exportable agricultural products.

2. Similar incidence parameters do not mean, however, that the taxation of the agricultural export sectors in Malaysia and Peru is of a similar magnitude. 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 Malaysia and taxed its agricultural export crops more heavily than Malaysia. This implies that the explicit and the implicit tax on agricultural export crops is clearly higher in Peru than in Malaysia. It is remarkable that this result was even found in the period 1979-85, which included years of liberalization in Peru.

The analysis suggests that the more successful performance of agricultural exports in Malaysia can be explained by the smaller degree of direct and indirect taxation due to lower nominal protection coefficients rather than by lower incidence parameters. Given the high and similar incidence parameters in Peru and Malaysia, 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. This is especially important for Peru, where agricultural export crops have become less competitive in the world market. Nominal protection rates of manufactured goods would have to fall and those for agricultural export crops would have to increase.

Notes

- 1 Of course, other concepts were also used in the literature to analyze the intersectoral linkages of import protection. Another branch of the literature applied the concept of effective protection in a partial-equilibrium framework [e.g. Bertrand (1980) on Thailand; Cuddihy (1980) on Egypt; Gotsch/Brown (1980) on Pakistan; Reza (1980) on Argentina; Bovet/Unnevehr (1981) on Togo]. The advantages of the true protection concept compared with a partial-equilibrium application of effective protection are summarized in Greenaway/ Milner (1987). Another approach comes from the World Bank's project on "The Political Economy of Agricultural Pricing Policies". The real-exchange rate effects of general macroeconomic policies are calculated there and the price effects of direct and indirect agricultural policies are compared. For a comparative analysis of 18 countries, see Schiff (1988) and Krueger/Schiff/Valdés (1988). Published country studies include Aviliez/Finan/Josling (1988), Greene/Roe (1989) and Jansen (1988). Other studies on the role of macroeconomic policies for agricultural incentives are based on computable general equilibrium models [e.g. Amranand/Grais (1984) for Thailand, Michel/Noël (1984) for the Ivory Coast and Wiebelt (1989) for Peninsular Malaysia].
- 2 For an overview of import protection in the manufactured sector of Peru, see Hanel (1987).
- 3 For an overview of the incentive system and policies for the manufacturing sector in Malaysia, see Hoffmann/Tan (1980).
- 4 Estimates are for Peninsular Malaysia only and are based on domestic input-output coefficients as against free-trade input-output coefficients.
- 5 Therefore, the t-values of the incidence parameters in Model 2 of Table 2 have to be regarded with some caution, even after using the Cochrane/Orcutt procedure.
- 6 Nominal protection rates for fishmeal were not available.
- 7 Differences in direct taxation of estate and smallholder rubber are attributable to research and replanting cesses which are actual transfer payments by smallholders to the future, and can be redeemed through adopting new technology and replanting.
- 8 See Herrmann (1989) and Jenkins/Lai (1989) for a description of the evolution of protection of export crops and food crops in Peru and Malaysia since the 1960's.

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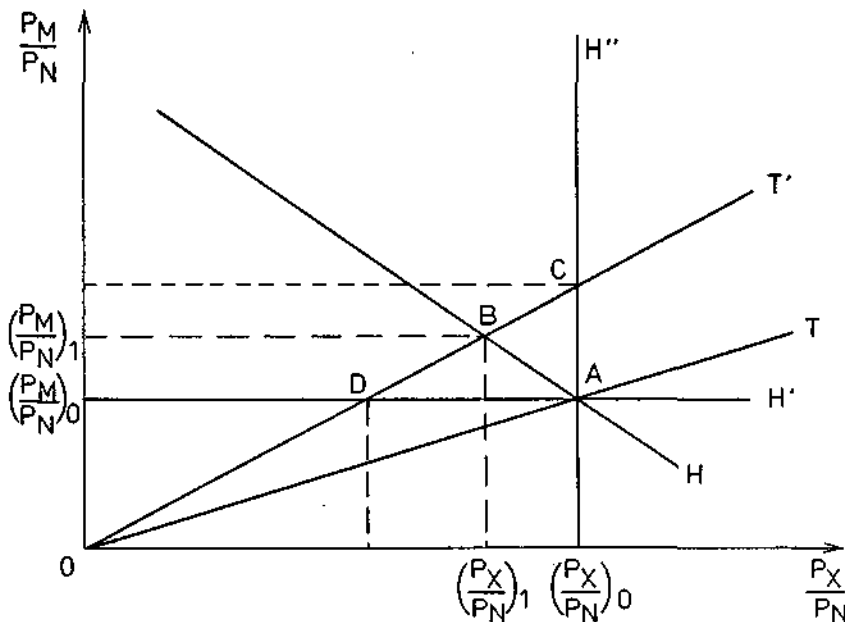
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Appendix: The Effects of Trade Taxes on Relative Prices

Figure 1 illustrates the shifting principle. The two rays through the origin represent the relative prices between importables and exportables in the free-trade (OT) and tariff-ridden (OT') situation respectively. The three H-schedules correspond to the three substitutability assumptions made above. For each case the corresponding schedule represents alternative price ratios for tradeables and home goods which clear the home goods market. It is also the locus of price combinations along which trade equilibria are attained. Points below and to the left of the H-lines are points of excess supply and trade deficits, points above and to the right indicate excess demand and trade balance surplus. The schedule H' (H'') represents equilibria where P_M/P_N (P_X/P_N) remains unaltered and P_X/P_N (P_M/P_N) decreases (increases) when a tariff is introduced. Thus, if the economy's situation is represented by H' a tariff will be shifted totally onto exporters, whereas along H'' the tariff is equally shifted on to exporters and producers of home goods. The intermediate case is represented by equilibria along H. The schedule is negatively sloped, reflecting the assumption that home goods can be substituted for both exportables and importables.

Figure 1: The Effects of Trade Taxes on Relative Prices



For this latter case, assume that a tariff is introduced. The imposition of the tariff initially raises the domestic relative price of importables in terms of both exportables and home goods by the amount of the tariff. The economy moves to point C. At that point, however, there is an excess demand for non-tradeables and a corresponding trade-balance surplus. To attain equilibrium, non-tradeables have to appreciate both in terms of importables and exportables. In Figure 1 such a real appreciation is indicated by a move to the left along OT'. The new equilibrium is at point B. At that point, the price of exportables relative to home goods has fallen whilst the price of importables relative to home goods has increased. As can be seen from Figure 1, the steeper the H-schedule the smaller the discrimination against exporters. However, exporters will always be penalized by tariffs because their price is fully determined on the world market and shifting possibilities do not exist.

Appendix 1: Data Base for the Regression Analyses on True Protection in Peru, 1970-85^a

Year	Price of Non-tradeables (P_N)	Price of Im-portables (P_M)	Price of Ex-portables (P_X)	Price of Agricultural Exportables (P_{XA}) (1973=100)			Price of Non-agricultural Exportables (1973=100)			Trade Balance (BT) (Mill.\$)	Gross Domestic Product in 1980 Prices (Mill. Intis)
	(1)	(2)	(3)	Coffee (4)	Fishmeal (5)	Cotton (6)	Copper (7)	Oil (8)	Tin (9)		
1970	76.1 ^b	78.3 ^c	63.3	91.4	41.0	57.6	68.7	48.3	60.0	+335	3540.6
1971	77.7 ^b	79.3 ^c	57.1	77.4	38.6	65.1	53.7	67.2	57.3	+159	3721.5
1972	89.5 ^b	86.3 ^c	61.2	82.2	36.4	69.6	54.0	62.1	71.8	+133	3939.2
1973	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	+79	4183.4
1974	114.0	127.4	122.5	118.4	81.2	150.2	100.3	220.7	147.3	-405	4470.2
1975	140.2	161.4	83.7	107.4	54.6	115.8	68.2	174.1	187.3	-1097	4576.1
1976	195.0	220.6	143.9	311.4	107.8	220.8	113.1	271.6	268.6	-675	4729.1
1977	276.7	355.4	208.2	817.6	213.4	332.7	139.5	434.5	303.6	-422	4715.9
1978	465.5	707.4	408.2	1154.5	410.0	621.6	283.6	937.9	509.1	+304	4633.5
1979	789.3	1217.0	853.1	1779.5	542.1	1007.0	588.8	2569.8	930.0	+1722	4832.1
1980	1233.5	1769.7	1479.6	2125.8	310.6	1188.5	905.3	4400.0	1338.0	+826	4971.8
1981	2172.0	2610.9	1778.6	2250.9	1189.7	1569.1	997.5	6281.9	2424.5	-553	5123.3
1982	3410.0	4025.7	2571.4	4177.6	1455.2	1862.7	1397.8	9534.5	3945.5	-428	5168.9
1983	7600.4	7347.2	6320.4	7873.5	3985.3	4357.2	3594.4	18688.8	9891.1	+293	4549.6
1984	16842.5	15752.9	12038.8	19514.4	7512.2	12921.7	6606.3	39336.6	23816.8	+1007	4765.9
1985	46055.5	43442.6	34701.0	63444.3	16209.5	36390.0	20920.4	113009.9	65820.0	+1097	4842.4

^a All price series are expressed in Intis. The export price series were converted into Intis with exchange rate data from IMF (1987). The price of non-agricultural exportables, P_{XNA} , in Tables 1 and 2 is calculated as a weighted price index for copper, oil and zinc. Export earnings for the three products from Salazar/Velásquez/Málaga/Gómez-Velásquez (1986), pp. 68-69 are used as weights. In the basic model of Table 2, the weights are the respective earnings shares in 1979: 0.4562 for copper, 0.4292 for oil and 0.1145 for zinc. - ^b Data on P_N were only available for the period 1973-85. Data for 1970-72 were constructed by assuming that P_N experienced the same percentage growth in the period 1970-73 as wages and salaries in the private sector. Wage data are taken from Salazar/Velásquez/Málaga/Gómez-Velásquez (1986), p. 25. - ^c Data on P_M for 1970 to 1972 are derived from Banco Central de Reserva del Perú (1974), p. 26.

Source: Columns (1), (2) and (4) to (9): Calculated with data from Salazar/Velásquez/Málaga/Gómez-Velásquez (1986); column (3): Calculated with data from IMF (1987); column (10): Salazar/Velásquez/Málaga/Gómez-Velásquez (1986), p. 61; column (11): IMF (1987).

Appendix 2: Data Base for the Regression Analysis on True Protection in Malaysia, 1960-85

Year	Price of Non-tradeables (p_N) (1980=100) (1)	Price of Im-portables (p_M) (1980=100) (2)	Price of Ex-portables (p_X) (1980=100) (3)	Price of Agricultural Exportables (p_{XA}) (1980=100)			Price of Non-agricultural Exportables (p_{XNA}) (1980=100)		Trade Balance (BT) (Mill.\$) (9)	Gross Domestic Pro- duct in 1980 Prices (Mill. Ringgit) (10)
				Rubber (4)	Palm Oil (5)	Cocoa (6)	Tin (7)	Petroleum (8)		
1960	58	37	42	77	54	28	33	9.8	276	n.a.
1961	58	37	36	59	55	22	31	9.4	173	n.a.
1962	56	36	35	55	51	20	32	9.4	110	n.a.
1963	57	36	33	51	53	21	33	9.4	93	n.a.
1964	57	36	35	48	56	22	29	8.3	89	n.a.
1965	58	36	37	49	66	17	32	8.3	170	n.a.
1966	59	36	35	46	56	21	35	7.8	181	n.a.
1967	59	36	32	38	54	22	39	7.8	155	n.a.
1968	60	37	30	37	49	26	39	7.5	210	n.a.
1969	60	37	35	49	45	35	40	7.0	526	n.a.
1970	61	37	34	40	63	30	42	7.1	349	14557
1971	62	40	31	33	63	25	42	8.2	225	15588
1972	64	42	29	30	48	24	29	8.8	129	17052
1973	66	49	37	53	72	35	32	11.7	652	19047
1974	71	69	57	57	131	60	53	35.8	224	20631
1975	75	73	49	44	79	53	45	37.9	256	20796
1976	79	74	58	64	80	71	53	40.9	1464	23201
1977	82	76	64	65	103	141	74	43.3	1519	25000
1978	86	78	65	74	110	131	81	41.0	1593	45373
1979	91	83	85	89	113	125	97	58.8	3157	49615
1980	100	100	100	100	100	100	100	100.0	2406	53308
1981	109	114	97	83	104	73	91	114.2	-100	57009
1982	113	114	91	64	82	62	84	107.5	-753	60395
1983	118	109	87	79	92	72	85	92.6	432	64170
1984	124	106	91	72	135	91	82	88.6	2981	69151
1985	127	105	82	60	98	85	83	86.9	3577	68443

Source: Column (1) is taken from Jenkins/Lai (1989) except for 1984 and 1985 which is computed from basic data provided in Bank Negara Malaysia; column (2) to (10) are taken from IMF (1987).