The Developing Economies, XXXVI-2 (June 1998): 155–77

EFFECTS OF DOMESTIC POLICIES AND EXTERNAL FACTORS ON AGRICULTURAL PRICES: CASSAVA AND SOYBEANS IN INDONESIA

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I. INTRODUCTION

THIS paper examines the comparative influence of government policies and exogenous (mostly, external) factors in the evolution of the domestic prices of two major secondary food crops (*palawija*) in Indonesia during 1970–92, a period of significant developments in both the country's agricultural sector and macroeconomy. Cassava and soybeans represent interesting and, in some ways, contrasting cases of agricultural crop performance determined at least partly by the nature of domestic policies and by the trade orientation of the two crops.

It is generally recognized that "the policy stance towards *palawija* was one of neglect in comparison to the enormous efforts devoted to rice" (Piggot et al. 1993, p. 4). The unprecedented shortages in the world grains markets in 1973–74 accentuated the traditional concern in Indonesia about domestic food security, prompting a new drive toward self-sufficiency in rice, the primary food crop. Actively promoted by the government through output price support and input subsidies, production of rice increased by about 7 per cent annually on average from the mid-1970s to the mid-1980s. Rice self-sufficiency was attained in 1985, after which there have been reductions in the real producer price of rice and the level of input subsidies. Whether this represented a shift in policy stance and an effective encouragement to *palawija* production is uncertain. The question also arises on how the structure of price incentives within the *palawija* sector, i.e., among the various secondary food crops, has been affected. It needs to be seen if foodcrop diversification away from rice has been promoted efficiently, or if domestic price distortions have been introduced in the process.

The period 1975–92 also witnessed some major macroeconomic adjustments in

The valuable assistance of Clemen Gehlhar in data collection and processing is gratefully acknowledged. The author has benefited from comments by this journal's referees and by participants in seminars at the International Trade Commission (Washington, D.C.) and the Center for Agro-Socio Economic Research (Bogor, Indonesia).

Indonesia. The 1973–74 oil price hike and accompanying dramatic increases in the country's export earnings and public revenue fueled a rapid expansion of the national economy through the early 1980s, at which time earnings from crude oil and petroleum products contributed about two-thirds of total exports, one-fourth of GNP, and 70 per cent of government revenue. Since 1982, however, the oil sector has suffered from sharply declining real prices and earnings, reducing its importance as a predominant source of growth for the Indonesian economy. During the adjustment period 1982–85, inevitably one of slower growth,[1] major reforms in exchange rate management, fiscal and monetary policies, and trade policy were undertaken. The adjustment measures are widely considered to be supportive of agriculture (e.g., World Bank 1986), as is suggested by the 18 per cent increase in the agricultural terms of trade[2] from 1982 to 1989.

Interest in a comparative study of the effects of government policies on the domestic prices of cassava and soybeans derives in particular from their differing trade orientation. Since the mid-1975 dried cassava (*gaplek*) has been exported and soybeans imported in significant amounts. Exports of *gaplek*, going mostly to the European market, have been subject to licensing and export taxes, effectively reducing producer prices. On the other hand, importation of soybeans (and soybean meal) is a monopoly of the governmental agency, Badan Urusan Logistik (BULOG), which sells to private traders at higher than the import price, protecting therefore the domestic price from world market forces. These qualitative effects of sectoral interventions on the domestic prices of two major import-competing and export crops in Indonesia are consistent with the empirical findings from recent research on the policy bias against agriculture in developing countries (Schiff and Valdés 1992; Bautista and Valdés 1993).

Apart from sector-specific policies, the domestic price of a tradable good is also affected by economywide or macroeconomic policies through the real exchange rate (RER), which represents the price of tradable goods relative to nontradables. It is widely recognized that RER overvaluation is prevalent among developing countries, which acts as a tax on tradable goods production. Other things remaining the same, an RER depreciation enhances the price competitiveness of both exportables and importables. The foreign price also exerts a direct influence on the domestic price of a tradable good. Under the small-country assumption, the foreign price is exogenously determined, and hence is a nonpolicy factor.

Section II of this paper describes briefly the nature of Indonesia's agricultural trade regime and examines the comparative movements in the domestic prices of

[1] From 7.5 per cent in 1975–81, the average annual GDP growth rate fell sharply to 4.5 per cent in 1982–85, before rising to 6.4 per cent in 1986–92—based on annual GDP values in 1987 prices (World Bank 1995).

[2] Based on the implicit price deflators for agriculture and nonagriculture using national-income-accounts data.

cassava and soybeans vis-á-vis rice and the consumer price index (CPI) during 1970–92. The observed changes in the domestic prices of the two secondary food crops relative to the CPI are then decomposed, in Section III, into the corresponding changes in the following three components: (1) changes in the foreign price; (2) changes in the real exchange rate; and (3) changes in nominal protection and the marketing margin. Because the real exchange rate is itself determined causally by domestic policies and other factors, an estimating equation is developed in Section IV to provide an additional basis for isolating the effects of government policies on the domestic prices of cassava and soybeans. Section V examines the extent to which these two secondary food crops had been protected (or disprotected) by government policies, directly and indirectly, from world-market prices. The paper ends, in Section VI, with a brief summary of findings and some concluding remarks.

II. THE AGRICULTURAL TRADE REGIME AND RELATIVE CROP PRICES

Much of Indonesia's agricultural trade has been heavily regulated, and until recently, agriculture was unaffected by the trade policy reforms that began in 1985 (World Bank 1992, p. 84). The major policy instruments that restricted the international trade of agricultural products and influenced their domestic prices consist of tariffs, import licensing, export taxes and bans, and informal export quotas. The markets for a number of food products, particularly rice, have also been regulated through administered prices, ostensibly aimed at providing low food prices for consumers, protecting farm incomes, and counteracting what is perceived by the government as excessive world price instability.

The 1985 trade reform package reduced the number of tariff rates, lowered the ceiling on many tariff rates, and raised the number of import items with very low tariff rates. Even after such effort at rationalizing the tariff structure, however, a large number of products continued to be subject to import licensing requirements. Agricultural commodities on the "Restricted Goods List," most of which can be imported only by BULOG or by one of two state trading companies, represented 54 per cent of domestic production in 1986. The 1991 trade policy reforms, which focused on agriculture, effectively reduced to 30 per cent the share of agricultural production that continued to be subject to import licensing restrictions.

Import restrictions have continued to apply to soybeans, which serve to protect the domestic price from the international market. BULOG imports soybeans which are sold to domestic traders at prices generally much higher than the cost of importing. The nominal protection rate[3] for soybeans has been estimated to be relatively

[3] The equivalent term used below is "direct protection rate."

high; it averaged 45 per cent during 1985–87 (Gonzales et al. 1993), decreasing to 25 per cent in 1994 (Condon and Fane 1995).

In the case of cassava, government intervention took the form of export taxes (5 per cent on *gaplek* chips until 1982) and licensing, which artificially lowered the producer price. Most notably, the ban on *gaplek* exports in 1973 pushed down sharply the domestic cassava price and discouraged investments in export facilities. Indonesia exports *gaplek* mainly to the European market. The primary link of the domestic cassava price is with the EC import price of *gaplek*, which is determined by its value as a substitute for high-priced European feed grains. Beginning 1982 EC import quotas on *gaplek* from Indonesia (and other exporters) were in effect. In some years Indonesian cassava production was not enough to meet domestic needs and the export quota.

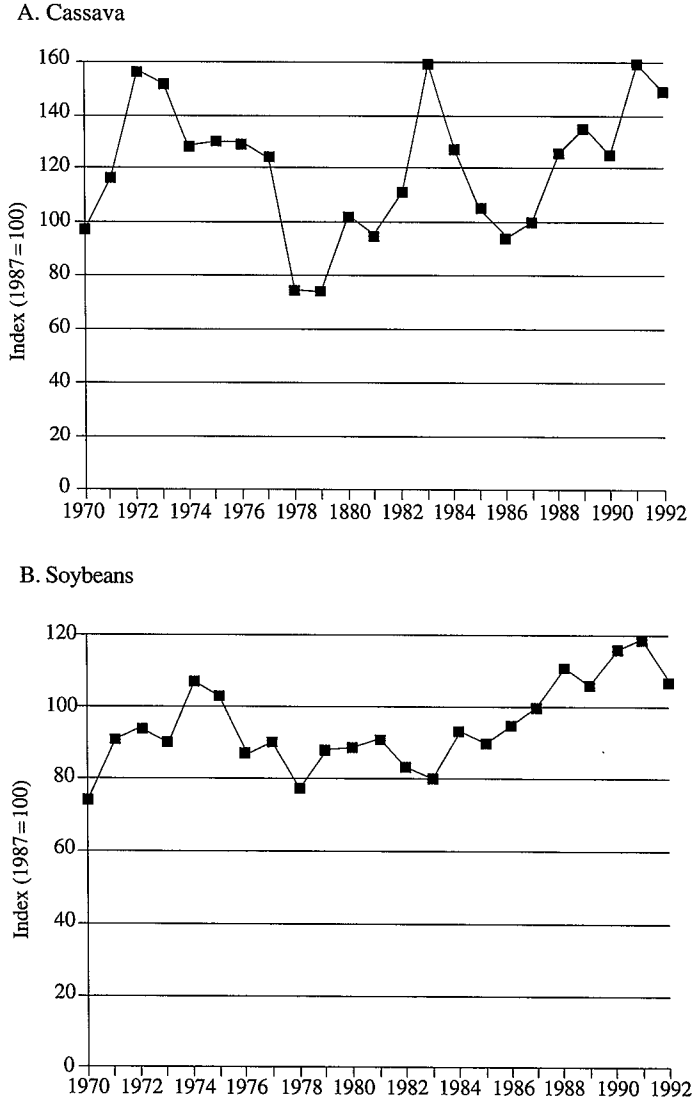
Figure 1 shows the time profiles of the wholesale prices of cassava and soybeans deflated by the wholesale price of rice in Jakarta over the period 1970–92. Four subperiods can be usefully distinguished that correspond to the major adjustments in the Indonesian economy indicated above: 1970–74, which immediately precedes the decade-long period of massive government support for rice; 1975–81, the oil-bonanza period; 1982–85, a period of macroeconomic disequilibrium and adjustment, representing as well the final approach to rice self-sufficiency; and 1986–92, a growth recovery period and reduced government assistance to rice producers.

Observed changes in the domestic prices of cassava and soybeans relative to rice over these subperiods are summarized in Table I. During 1975–85, as might be expected, agricultural prices turned more favorable to rice—to the relative detriment of both soybeans and cassava, the latter being hurt particularly during the oil-boom period 1975–81. Even after the attainment of rice self-sufficiency, the domestic price of cassava relative to rice continued to be lower in comparison to the pre-1975 subperiod. In the case of soybeans, the decline in its relative domestic price vis-á-vis rice was not substantial throughout the 1975–85 period (by only about 3 per cent). Moreover, during the macro-growth recovery and rice self-sufficiency period 1986–92, this relative soybean price even exceeded the corresponding price during the pre-1975 subperiod.

The foregoing findings do not imply a reduced price competitiveness for cassava producers since 1975, as is evident from Figure 2A. Only in the 1975–81 subperiod was the average domestic price of cassava deflated by the general price level (proxied by the CPI),[4] lower compared to that prevailing in the early 1970s (see Table II). Subsequently, cassava benefited from increasingly higher average prices—by 5.1 per cent in 1982–85 and 15.5 per cent in 1986–92. The price movements were of course more favorable for soybean producers. After only a slight

[4] Based on this measure, "price competitiveness" of a given product has to be viewed in relation to the production of other goods and services included in the CPI basket.

Fig. 1. Indices of Domestic Prices of Cassava and Soybeans Relative to Rice, 1970–92



reduction (by 2.4 per cent, on average) in soybean price relative to the CPI from 1970–74 to 1975–81, price competitiveness in soybeans improved by an average 4.1 per cent during the macroeconomic adjustment subperiod 1982–85 and, most strikingly, by 41.3 per cent during 1986–92. The latter period has seen therefore a

TABLE I

INDICES OF AVERAGE DOMESTIC PRICES OF CASSAVA AND SOYBEANS RELATIVE TO RICE, 1970–74 TO 1986–92

	Cassava	Soybeans
1970–74	100.0	100.0
1975–81	80.4	97.7
1982–85	96.9	94.7
1986–92	98.1	117.9

Source: Author's calculations based on wholesale prices of farm crops in Jakarta reported in Central Bureau of Statistics, *Statistical Yearbook of Indonesia* (Jakarta), various years.

TABLE II

INDICES OF AVERAGE DOMESTIC PRICES OF CASSAVA AND SOYBEANS RELATIVE TO CPI, 1970–74 TO 1986–92

	Cassava	Soybeans
1970–74	100.0	100.0
1975–81	78.2	97.6
1982–85	105.1	104.1
1986–92	115.5	141.3

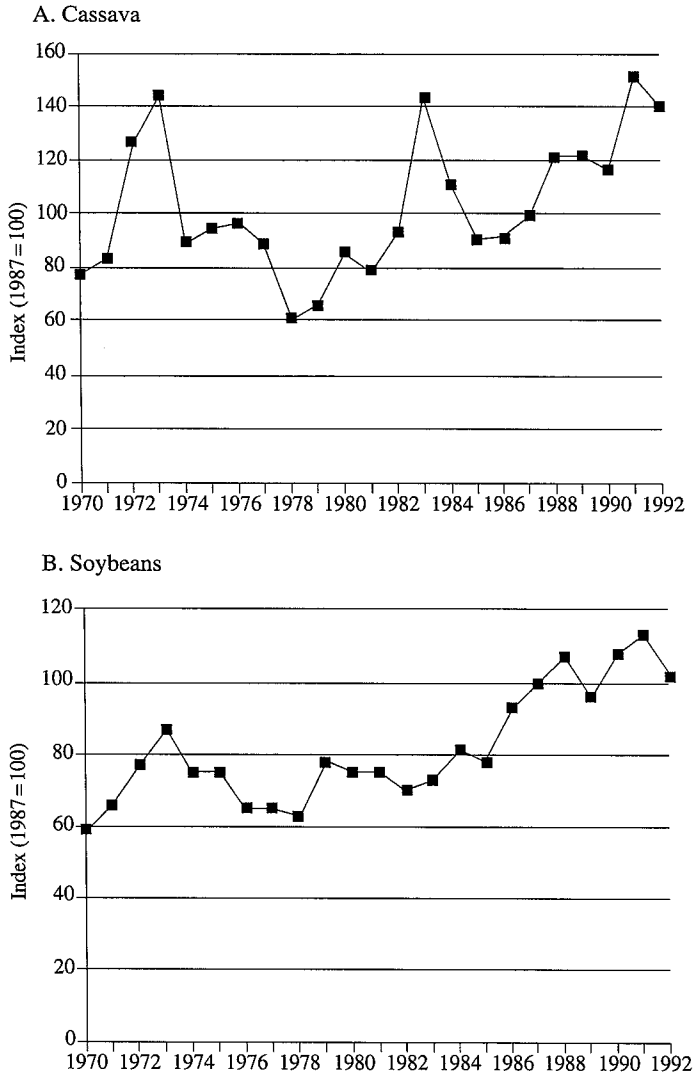
Source: Author's calculations based on wholesale prices of farm crops and CPI in Jakarta.

marked contrast in domestic price changes between the two major import-competing and export crops in Indonesia.

The importance of price incentives to Indonesian cassava and soybean producers is reflected in their comparative output performance. Average annual production of cassava and soybeans grew from 1970–74 to 1982–85 by 20 and 27 per cent, respectively [based on Food and Agriculture Organization (FAO) data]. Cassava output in 1986–92 increased by 16 per cent relative to 1982–85; in the case of soybeans, output growth was a dramatic 102 per cent, presumably influenced by the drastic rise in domestic soybean price as observed above. It is also striking that production of cassava expanded from 13.0 million tons in 1982 to 16.5 million tons in 1992, while that of soybeans grew much more rapidly—from 521,000 to 1,881,000 tons between those two years (based on Central Bureau of Statistics data). Because there are nonprice factors affecting agricultural supply (such as technology and weather), the observed changes in cassava and soybean output are of course not solely attributable to the behavior of relative crop prices.

To what extent have government policies been responsible for the differential changes observed above in the domestic prices of cassava and soybeans? Analytically, the relative price of any tradable good in a given period is the outcome of

Fig. 2. Indices of Domestic Prices of Cassava and Soybeans Deflated by CPI, 1970–92



several influences, including both policy and nonpolicy factors. In the latter category would be the international (border) price of the product in foreign currency, which is exogenously determined under the small-country assumption. In a hypothetical case of sustained deterioration in the international price of an agricultural

product, maintaining the relative domestic price of that product is not likely to be the best policy choice if the promotion of comparative advantage and efficiency of domestic resource use is a major policy objective. It is also necessary to point out that the domestic price of a tradable good is influenced by the real exchange rate. The latter can be affected by the country's external terms of trade (see below), which is outside the control of policymakers.

III. A DECOMPOSITION ANALYSIS

For purposes of policy analysis, it is useful to decompose the evolution of the relative domestic price of a tradable good over a given period into factors determined by government policies and by exogenous (including world market) developments. A framework for analyzing the evolution of the relative domestic prices of cassava and soybeans in Indonesia is developed below, distinguishing between the effects of changes in domestic policies from those of world price movements and other exogenous factors affecting relative prices of agricultural crops.[5]

Let P_t denote the domestic (producer) price of the commodity (cassava or soybeans) in Indonesian rupiah (Rp) in year t, and P_t^*, the corresponding foreign (border) price in U.S. dollars in which most international transactions in primary products are denominated (Bautista and Riedel 1982). By definition,

$$P_t = P_t^* E_t T_t (1 + m_t), \tag{1}$$

where

E = nominal exchange rate (in Rp/U.S.$),

T = nominal protection coefficient; equal to $1 - t_x$ for cassava (t_x is the implicit export tax rate), or $1 + t_m$ for soybeans (t_m is the implicit tariff rate), and

m = the "marketing margin" (including transport cost and normal profits) that makes P and P^* comparable.

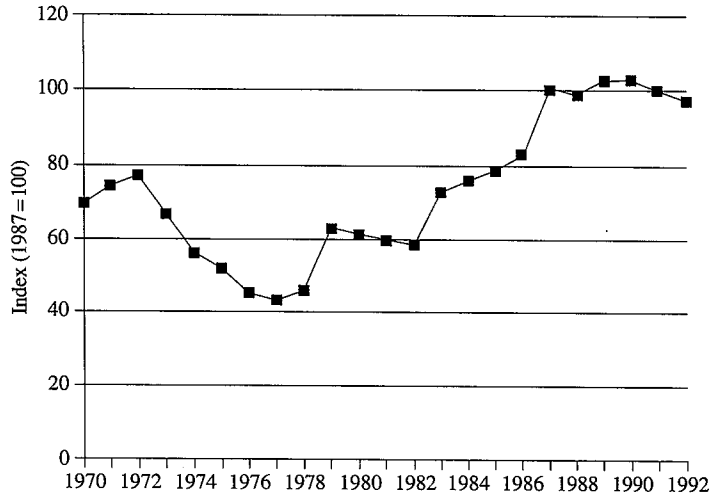
It is of course not the nominal price but the relative price of the product that affects producer behavior. We consider here the evolution of the producer prices of cassava and soybeans relative to the consumer price index, i.e., $p_t = P_t/CPI_t$. Equation (1) can be written

$$p_t = p_t^* RER_t T_t (1 + m_t), \tag{2}$$

where p_t^* is P_t^* deflated by the general level of foreign prices, proxied here by the U.S. wholesale price index (WPI_{us}), and RER_t ($= E_t WPI_{us,t}/CPI_t$) is the real

[5] Instead of farmgate prices, on which time-series data are not available, we follow other investigators (e.g., Gonzales et al. 1993, pp. 55–60) in representing the producer prices of cassava and soybeans by their wholesale prices in Jakarta. Under the assumption of constant marketing margins, price changes in the wholesale market will be transmitted fully to the farm.

Fig. 3. Real Exchange Rate Index, 1970–92



exchange rate in year t. This empirical measure of the real exchange rate is a rough approximation of that used in theoretical discussions representing the foreign price of tradable goods, expressed in domestic currency, relative to the price of nontradable goods. Noting that an *RER* increase (decrease) represents a real depreciation (appreciation), it is remarkable that the Indonesian government was able to sustain a depreciating *RER* that more than doubled from 1975–77 to 1989–92 (see Figure 3).

Taking natural logarithms on both sides of equation (2) and then taking first differences, we have

$$\Delta \ln p_t = \Delta \ln p_t^* + \Delta \ln RER_t + \Delta \ln T_t + \Delta \ln (1 + m_t), \tag{3}$$

where Δ is the first difference operator. Equation (3) shows that any observed change in the relative domestic price over a given period can be decomposed into four components: (1) the change in its border price; (2) the change in real exchange rate; (3) the change in (direct) nominal protection; and (4) the change in marketing margin.

Changes in government policies are usually associated with components (2) and (3). The latter is completely determined by shifts in sectoral trade and pricing policies, while the former is jointly determined by changes in macroeconomic or economywide policies and in such exogenous factors as the external terms of trade (see below). Moreover, component (4) is at least partly determined by government policies, since transport cost between the farmgate or wholesale market and the port

(border) is a function of public infrastructure expenditures and fuel subsidies/ taxes. Finally, component (1) cannot be considered to be policy determined since Indonesia has had little or no monopoly power in the international trade of either cassava or soybeans.

The last point merits further discussion. Indonesia exports (dried) cassava mainly to the European market, which has been dominated by Thai exports; "since 1971, domestic cassava prices have been largely determined by European grain prices," according to Falcon et al. (1984, p. 180). In 1982 the EEC set import quotas for all *gaplek* suppliers. Indonesian exports were initially limited to 500,000 tons, increasing to 825,000 tons in 1986. It has been shown that only in three years during 1982–92 was the Indonesian quota filled; in some years, cassava was even imported from Thailand and reexported to the EEC (Suharno 1995). The small-country assumption appears valid, therefore, for cassava. In the case of soybeans, monopoly power for Indonesia in the international market can easily be ruled out, considering that its annual imports (in volume terms) have been less than 2 per cent of world trade (based on FAO data).

The annual values of $T_t(1 + m_t)$ in equation (2) can be calculated from time series data on wholesale and border prices when expressed in the same currency. It is not possible, given existing data, to separate out for each period the changes in nominal protection and in marketing margin. Considering that the latter, conceptually, should reflect the normal (competitive) profits rather than actual profits, the assumption commonly used in the analysis of the evolution of agricultural prices is that the marketing margin m_t remains constant over time (e.g., Quiroz and Valdés 1993). Alternatively, the nominal protection variable T_t can be interpreted to include the effects on the producer price arising from government policies that determine transport cost and other transaction costs incurred in moving the tradable product from the farmgate or wholesale market to the port, in which case it is reasonable to still associate the third term in the right-hand side of equation (3) with changes in direct (sector-specific) government interventions. In either case, the last term (pertaining to the marketing margin) is set equal to zero.

Changes in the real exchange rate, as a component in the decomposition of the changes in relative domestic price, can be associated with the shifts in macroeconomic policies that represent indirect price interventions of the government. Whether the real exchange rate in Indonesia has also been subject to the influence of the external terms of trade and other exogenous factors will be addressed below.

Calculated changes in the relative producer prices of cassava and soybeans from one subperiod to the next, and their decomposition into the three main components as identified above, are presented in Table III.

1970–74 to 1975–81. The oil boom was accompanied by a decline in the foreign price of each crop and a substantial appreciation of the real exchange rate. The latter, a well-known Dutch disease symptom, occurred despite the higher nominal

TABLE III

DECOMPOSITION OF CHANGES IN AVERAGE DOMESTIC PRICES OF CASSAVA AND SOYBEANS, 1970–74 TO 1986–92

	1970–74 to 1975–81	1975–81 to 1982–85	1982–85 to 1986–92
Cassava:			
Changes in relative domestic price	−24.6	29.6	9.4
Changes in relative foreign price	−7.7*	−23.7	16.5
Changes in real exchange rate	−26.9	29.9	31.2
Changes in sectoral protection	10.0	23.4	−38.3
Soybeans:			
Changes in relative domestic price	−7.4	6.5	30.6
Changes in relative foreign price	−12.4	−37.2	−12.2
Changes in real exchange rate	−26.9	29.9	31.2
Changes in sectoral protection	31.9	13.8	11.6

Source: Author's calculations. Changes in sectoral protection (including any changes in marketing margins) are obtained residually from equation (3) in the text.
Note: The entries are one hundred times the calculated changes in natural logarithms of the variables which, therefore, approximate the percentage changes from one subperiod to the next.
* Based on 1974 (not 1970–74) data.

exchange rates in 1975–81 than in 1970–74 (averaging 510 and 401 rupiahs per U.S. dollar, respectively). However, sectoral policies "leaned against the wind," increasing the nominal protection for cassava and soybeans; in the former case, the *gaplek* export ban in 1973 "broke the price link with Europe" (Falcon et al. 1984, p. 175), artificially lowering cassava producer price for that year. Nevertheless, domestic prices of both crops decreased.

1975–81 to 1982–85. There was an even more severe deterioration of the foreign prices of the two crops during the subperiod of macroeconomic disequilibrium and adjustment. However, the real exchange rate depreciated significantly and sectoral protection for both crops continued to increase. Presumably, the reduced transport costs associated with the continuing road improvements and increased supply of vehicles since 1970 contributed to the price benefits for cassava and soybean producers. The overall effect on relative domestic prices was a substantial increase for cassava and a slight increase for soybeans.

1982–85 to 1986–92. During the growth-recovery subperiod the foreign price of soybeans continued to decline while that of cassava increased. There was again a substantial real exchange rate depreciation. Despite an accompanying sharp reduction in sectoral protection, the domestic price of cassava increased, albeit modestly. On the other hand, sectoral policies continued to raise the sectoral protection for soybeans, leading to a marked increase in its domestic price.

As pointed out above, the real exchange rate is a function of both policy and nonpolicy factors, the latter including the foreign terms of trade. Therefore, the contribution of external developments to the observed changes in domestic prices of cassava and soybeans goes beyond the changes in foreign prices of the two crops. In the following section, we investigate quantitatively the exogenous and policy-related determinants of the real exchange rate. The separate effects of the two sets of variables affecting the real exchange rate, which can be reinforcing or offsetting, are then incorporated into the decomposition of the changes in the relative domestic price of each crop to derive the net contributions of external shocks and of changes in government policies between specific subperiods during 1970–92.

IV. ATTRIBUTING REAL EXCHANGE RATE AND DOMESTIC PRICE CHANGES TO POLICY AND EXOGENOUS FACTORS

The real exchange rate plays an intermediary role in transmitting the price incentive effects of trade and macroeconomic policies to tradable goods production. It is of course the real exchange rate, rather than the nominal exchange rate (which the government can control directly), that is relevant in the assessment of the relative profitability of tradable goods.

In an accounting sense, movements of the real exchange rate are due to movements of the nominal exchange rate, foreign prices (exogenous to the small country), and the general level of domestic prices. Because domestic prices are affected by nominal exchange rate changes (to an extent determined by the accompanying fiscal and monetary policies), there is no one-to-one correspondence between the nominal and real exchange rate.

Behaviorally, changes in the real exchange rate are explained in the theoretical literature (see, e.g., Edwards 1989) in terms of at least four variables. These are: the country's external terms of trade, trade policies, the current account balance, and the nominal exchange rate.

The terms of trade. If export prices fall relative to nontradable goods while import prices remain constant—hence, the terms of trade deteriorate—, the supply of nontradables will increase. At the same time the demand for nontradables will decrease due to both reduced income and the substitution toward exportables. Therefore, the price of nontradables will decline and the real exchange rate will depreciate (based on the above measure, increase) to eliminate the excess supply

and restore equilibrium in the nontradable goods market. If the deterioration in the terms of trade arises from an increase in import prices, supply of nontradables will decrease as resources are drawn toward the production of importables. Moreover, the induced income and substitution effects on demand will be in opposite directions. If the (positive) substitution effect is stronger, the real exchange rate will appreciate (Dornbusch 1980). The greater is the influence of import prices on the terms-of-trade change and the lower the substitutability between nontradables and importables in consumption, the more likely will an appreciation of the real exchange rate result from a deterioration in the terms of trade (Bautista 1987).

Trade policies. An import quota or tariff (export subsidy) raises the domestic price of importables (exportables), which encourages their domestic production and induces lower consumption, leading to a decrease in imports (an increase in exports). Resources are reallocated toward the tradable goods sector away from nontradable goods production. The reduced supply of and increased demand for nontradables result in an increase in their price and hence in a decrease in the real exchange rate. It is well known, for example, that the adoption of import-protection policies to promote industrialization has helped sustain an overvalued exchange rate in many developing countries. In contrast to the terms-of-trade variable, this determinant of the real exchange rate is within the control of policymakers.

The current account. The expected relationship between the current account balance and the real exchange rate is positive. A deficit in the current account implies an excess demand for foreign exchange, and its accommodation through reserve drawdowns or capital inflows serves to defend an artificially low (overvalued) real exchange rate. For many developing countries in which the domestic capital market is underdeveloped and not integrated to the world financial system (in part due to government restrictions on private capital movements), the current account balance can be considered a policy variable, determined largely by macroeconomic policies including foreign borrowing policy.

The nominal exchange rate. There is wide agreement in the literature that while changes in the nominal exchange rate can affect the short-run behavior of the real exchange rate, they will not have a long-run effect (Edwards 1989). The real exchange rate being a relative price variable, its long-run level is not likely to be influenced by nominal variables.[6] However, in the short run, a change in the nominal exchange rate may facilitate the adjustment of the real exchange rate to the changes in real variables. Without accompanying measures addressing the "fundamentals" (e.g., liberalizing the trade regime, reducing the gap between national income and expenditure), a nominal devaluation will not lead to a sustained real

[6] Some authors (e.g., Turnovsky 1987) have argued that a systematic relationship between the nominal and real exchange rates is possible if there is wage indexation.

devaluation; it may only raise the general price level without changing relative prices in the economy.

Based on the foregoing considerations, the following specification of the real exchange rate equation for Indonesia is adopted:[7]

$$\ln RER = f(\ln TOT, CA, \ln TRP, \Delta \ln E, YEAR), \tag{4}$$

where *TOT* is the external terms-of-trade index, *CA* is the current account balance as a ratio of GDP (expressed in per cent), *TRP* is the trade policy variable represented by $(1 + t_m^0)/(1 - t_x^0)$, t_m^0 is the implicit tariff rate for all imports, t_x^0 is the implicit tax rate for all exports, and the other variables (*E* and *RER*) are as defined earlier. The trend variable (*YEAR*) has been added to take account of such influences as shifting consumption and investment expenditures between tradable and nontradable goods over time.

Note that the nominal exchange rate is entered as a first difference, which is meant to reflect the short-run character of its influence on the real exchange rate. *TRP* is calculated as an index (1987 = 1.00) from the implicit tax rates t_m^0 and t_x^0 based on: (1) national income accounts data on value of imports and exports, respectively, of goods and non-factor services—at current and constant prices; and (2) unit-value indices of imports and exports for Indonesia. Concerning the *CA* variable, relatively large amounts of "official transfers" appear in the Indonesian current account for some years. The measure used for *CA* in our empirical analysis is the "current account balance before official transfers" (based on World Bank data), assumed to be the more sustainable component of the current account.

Annual data for the observation period 1970–92 are used in estimating equation (4) by the Ordinary Least Squares (OLS) method. To deal with possible simultaneity bias, the "instrumental variable technique" is applied, replacing the observed values of *CA* by predicted values based on a regression on the other variables appearing in the right-hand side of equation (4) together with money supply and fiscal deficit (divided by GDP). The source of basic data used in the regressions is the World Bank (1995, pp. 356–59). The Cochran-Orcutt iteration procedure is used to correct for first-order autocorrelation. The "best" estimated equation is:[8]

[7] The logarithmic function is used in equation (4) to simplify the substitution of the expression for the real exchange rate into equation (3). The explanatory variables *CA* and *YEAR* are expressed in index form for ease of coefficient interpretation; thus, the coefficient estimate for *CA* would represent the rate of *RER* appreciation/depreciation arising from a change in *CA* of 1 percentage point.

[8] Other regression results (including those with a lagged *RER* adjustment a la Koyck-Nerlove) proved less satisfactory, considering standard statistical criteria and the economic implications of the magnitude and signs of the coefficient estimates.

$$\ln RER = -41.4 - \underset{(0.090)}{0.382}\ln TOT + \underset{(0.014)}{0.029}CA - \underset{(0.226)}{0.644}\ln TRP + \underset{(0.211)}{0.499}\ln E + \underset{(0.005)}{0.016}YEAR, \quad (5)$$

$$R^2 = 0.789, \; Rho = 0.245,$$

where the numbers in parentheses are the standard errors of the coefficient estimates, R^2 is the adjusted coefficient of determination, and *Rho* is the autoregressive coefficient.

All the estimated coefficients are significant (at the 5 per cent level), and have the expected signs. Notice the negative coefficient for the terms-of-trade variable—presumably related to the volatility of the world price of oil, Indonesia's most important export product, which dominated the changes in the external terms of trade during the observation period. That the coefficient of $\Delta \ln E$ proved to be highly significant supports the hypothesis of a short-run influence of the nominal exchange rate on the *RER*: About 50 per cent of a nominal devaluation is translated into real devaluation within one year. The latter can be sustained beyond the first year by any one or a combination of the following: (1) the external terms of trade decline; (2) trade restrictions are reduced; and (3) macroeconomic policies promote an improvement of the current account. The first is outside the purview of domestic policy. With respect to the second, a 10 per cent decline in *TRP* will lead to a 6.4 per cent increase in *RER*. Thirdly, a 1 percentage point rise in *CA* (reduction in the current-account deficit) will yield an *RER* depreciation of 2.9 per cent.

The estimated coefficients in the *RER* of equation (5) can be used to distinguish the effects of government (macroeconomic and trade) policies (influencing *CA*, *TRP*, and *E*) from those of the other determinants of the real exchange rate. The calculated contributions of "policy-related" and "exogenous" factors to the observed *RER* changes from one subperiod to the next during 1970–92 are shown in the top part of Table IV. It is worth noting that domestic policies served to accentuate the effects of changes in the external terms of trade and other exogenous developments during each of the three subperiods. The large *RER* appreciation induced by the oil boom during 1975–81 is seen to have been reversed in the subsequent macroeconomic adjustment as exogenous factors and (more significantly) government policies contributed to a near 30 per cent *RER* increase.[9] The real exchange rate was further depreciated by slightly more than 30 per cent in 1986–92

[9] This is consistent with the assessment in Thorbecke (1992, p. 23) that "Indonesia responded (to the drastic decline in oil revenues) quickly and relatively forcefully with measures that included devaluations, significant reductions in government expenditures, and policies that liberalized both internal markets and external trade."

TABLE IV

DECOMPOSITION OF CHANGES IN THE REAL EXCHANGE RATE AND IN RELATIVE DOMESTIC PRICES OF CASSAVA AND SOYBEANS INTO EXOGENOUS AND POLICY-RELATED FACTORS, 1970–74 TO 1986–92

	1970–74 to 1975–81	1975–81 to 1982–85	1982–85 to 1986–92
Real exchange rate	−26.9	29.9	31.2
Exogenous factors	−25.5	5.7	15.8
Policy-related factors	−1.4	24.2	15.4
Relative cassava price	−24.6	29.6	9.4
Exogenous factors	−33.2	−18.0	32.3
Policy-related factors	8.6	47.6	−22.9
Relative soybean price	−7.4	6.5	30.6
Exogenous factors	−37.9	−31.5	3.6
Policy-related factors	30.5	38.0	27.0

Source: Author's calculations, based on the estimated equation (5) and Table III as described in the text.

Note: The entries are one hundred times the calculated changes in natural logarithms of the variables which, therefore, approximate the percentage changes over the indicated subperiods.

relative to the preceding subperiod, with exogenous and policy-related factors being almost equally influential.

The top part of Table IV provides the additional information necessary to derive an alternative decomposition of the changes in relative domestic prices of cassava and soybeans that differentiates between the changes due to policy and nonpolicy (exogenous) factors. Such decomposition is given in the lower part of Table IV, which in effect substituted out the "changes in real exchange rate" in Table III with their policy-related and exogenous determinants as shown in the upper portion of Table IV.

The observed changes in the relative domestic price of cassava are seen to have resulted from the offsetting effects of exogenous and policy-related factors. The substantial price decline from 1970–74 to 1975–81 was caused chiefly by exogenous influences, mitigated by domestic policies to only a small extent. In the next subperiod there was a further negative effect of exogenous factors on the cassava price which however was more than compensated for by more favorable government policies. Finally, during 1986–92, the relatively small rise in the domestic price of cassava from the preceding subperiod was the outcome of a marked improvement in exogenous factors but which was negated to a significant extent by government price interventions.

In the case of soybeans, improving the price competitiveness for domestic producers was evidently being promoted by government policies regardless of the con-

current exogenous influences. However, owing to the deep price cuts induced by unfavorable nonpolicy developments during 1975–81 and 1982–85, it was only in the most recent subperiod that soybean producers enjoyed a (markedly large) price increase.

It would appear therefore that, after self-sufficiency in rice was achieved and at a time of rapid economic growth, Indonesian policymakers did not give equal attention to the price competitiveness of the two major *palawija* crops, favoring the import-competing soybean over the export-oriented cassava producers.

V. RELATIVE CROP PRICES UNDER ALTERNATIVE POLICY REGIMES

The foregoing analysis has focused on the factors that determined how the relative domestic prices of cassava and soybeans changed during 1970–92, making an assessment of the separate contributions of government interventions and exogenous factors. It examines what had actually happened, not what might have happened under a different set of government policies. In this section we address the question of how the relative product prices would have adjusted to the removal of incentive biases arising from sector-specific and economywide policies.

It is useful to distinguish between government interventions that affect relative agricultural prices (1) directly, i.e., policies aimed specifically at the agricultural sector, and (2) indirectly, i.e., those aimed at other production sectors (in particular, manufacturing) and macroeconomic policies that influence agricultural prices through the real exchange rate. They are referred to here simply as "direct" and "indirect" interventions. For any given year, the "actual" policy regime can then be compared with two counterfactual policy regimes: (1) "sectoral free trade," in which there is an absence of direct interventions; and (2) "economywide free trade," in which there is an absence of total (direct and indirect) interventions.

The relative domestic price of cassava or soybeans corresponding to the actual and sectoral free-trade regimes can be represented, respectively, by $P_1 = P_a/CPI$ and $P_2 = P_b/CPI$ where P_a is the actual nominal price, P_b is the border-price equivalent at the official exchange rate (E), and CPI is the consumer price index. By definition, the "direct protection rate" (DPR) is the proportionate excess of the actual producer price from the border-price equivalent (adjusted for quality, transport, and other marketing costs) evaluated at the official exchange rate; that is,

$$DPR = \frac{P_1 - P_2}{P_2}, \tag{6}$$

where a negative DPR indicates that P_2 is greater than P_1, in which case there is direct price "disprotection" or taxation.

Domestic relative prices of tradable agricultural products are influenced not only

by sector-specific policies but also by trade and economywide policies that affect the real exchange rate. Thus, import restrictions to protect domestic industry and expansionary macroeconomic management have caused significant real exchange rate overvaluation in many developing countries, indirectly penalizing tradable goods production. The relative price under the policy regime of economywide free trade can be represented by $P_3 = P_b^*/CPI^*$, where P_b^* is the border price evaluated at the "equilibrium" exchange rate (E^*), and CPI^* is the consumer price index with the tradable goods component calculated at border prices using the equilibrium exchange rate.

The equilibrium exchange rate is defined here as the exchange rate that would have prevailed under conditions of current account balance and unrestricted foreign trade. It follows closely the Krueger et al. (1988) definition, and associates the equilibrium exchange rate with the economywide free-trade regime. To estimate the equilibrium real exchange rate RER^*, we make use of the estimated equation (5), imposing the required conditions that the current account is in balance and that there are no trade restrictions (t_m^0, $t_x^0 = 0$)—i.e., setting the policy variables CA and $\ln TPR$ (TPR is the total protection rate) equal to zero. The divergence of the actual RER for each year from the corresponding RER^* so estimated is the rate of exchange rate distortion,

$$RERD = \frac{RER - RER^*}{RER^*}, \tag{7}$$

where, by definition, $RER^* = E^* WPI_{us}/CPI^*$.

The "total protection rate" is the proportionate excess of the actual domestic price from the border-price equivalent evaluated at the equilibrium exchange rate, that is,

$$TPR = \frac{P_1 - P_3}{P_3}. \tag{8}$$

A measure of the differential between total and direct protection is given by the "indirect protection rate" (IPR), represented here by

$$\begin{aligned} IPR &= TPR - DPR(P_2/P_3) \\ &= \frac{P_2 - P_3}{P_3}, \end{aligned} \tag{9}$$

which indicates also the difference between the border-price equivalents evaluated at the official and equilibrium exchange rates. It is readily seen that IPR is equal to the rate of exchange rate distortion $RERD$ in equation (7), since $P_2/P_3 = RER/RER^*$.

We make use of the DPR estimates derived in Gonzales et al. (1993, p. 63) for cassava and soybeans at the Jakarta wholesale market for the years 1985, 1986, and

TABLE V

DIRECT, INDIRECT, AND TOTAL PROTECTION RATES FOR CASSAVA AND SOYBEANS, 1985–87

(%)

	1985	1986	1987
Direct protection rate (*DPR*):			
Cassava	−1	−35	−40
Soybeans	44	31	61
Indirect protection rate (*IPR*):			
Cassava	−22	−25	−20
Soybeans	−22	−25	−20
Total protection rate (*TPR*):			
Cassava	−23	−51	−52
Soybeans	12	2	29

Source: Gonzales et al. (1993, p. 63) for *DPR* estimates. Author's calculations for others. *IPR* is equal to the rate of real exchange rate distortion (*RERD*) as derived in the Appendix. *TPR* is calculated using equation (8).

Note: Marketing margins used in *DPR* estimates are based on survey data for 1986.

1987, based on 1986 data on marketing and handling costs between the wholesale market and major port. As shown in Table V, cassava was subject to negative direct protection in all three years, markedly so in 1986 and 1987. By contrast, direct government interventions in the soybean market had a positive bias, raising significantly the domestic wholesale price relative to the border-price equivalent in each of the three years. Under a regime of sectoral free trade, cassava producers would have benefited from a higher price of their product during 1985–87, especially in 1986 (by 35 per cent) and in 1987 (by 40 per cent); at the same time soybean producers would have faced a lower product price, especially in 1987 (by 61 per cent).

The negative indirect protection rate shown in each year indicates the extent of policy-induced real exchange rate overvaluation, ranging from 20 to 25 per cent,[10] which acted as a tax on the two crops (and other tradable goods). Finally, the bottom part of Table V shows that the total protection rate was negative for cassava but positive for soybeans in each of the three years. Under an economywide free-trade regime, the domestic price of cassava would have been higher than the actual price by 42 per cent on average during 1985–87; on the other hand, the domestic soybean price would have been lower by 14 per cent.

[10] The indirect protection rate of −16 per cent is used in Gonzales et al. (1993, p. 63) for each year during 1985–87 based on an estimated *RER* overvaluation for 1986. The latter takes account of the effect of trade restrictions but not of the current-account deficit (which ranged from 2.2 to 5.1 per cent of GDP during 1985–87).

VI. SUMMARY AND CONCLUSION

This paper has examined the changes in domestic prices of cassava and soybeans in Indonesia, as well as their policy and nonpolicy determinants, over the period 1970–92. The related issue of price bias induced by sectoral and economywide policies is also addressed using estimates of nominal protection rates for the two crops in 1985–87.

The findings of the study can be summarized as follows:

- Although relative crop prices favored rice over cassava and soybeans during 1975–85 when rice self-sufficiency was actively being promoted by the Indonesian government, price competitiveness (represented by the ratio of domestic product price to the CPI) of the two secondary food crops was not severely impaired and indeed even improved toward the end of the period relative to the early 1970s. During 1986–92 there were further increases in the domestic relative price of cassava and more significantly of soybeans.
- The improving domestic price of cassava during 1986–92 was helped by a rising foreign price of cassava and a marked depreciation of the real exchange rate. However, these positive effects were nullified to a large extent by the price reductions induced by sector-specific policies. In the case of soybeans, positive changes in the real exchange rate and increased sectoral protection combined to increase substantially the domestic price during 1986–92 even in the face of a declining foreign price of soybeans.
- The real exchange rate had a significant, if not a predominant, influence on the changes in domestic prices of the two major (and tradable) secondary food crops in Indonesia.[11] Also notable is the sustained depreciation of the real exchange rate following the end of the oil boom, which contributed heavily to the marked improvement in the price competitiveness of cassava during 1982–85 and of soybeans during 1986–92.
- Domestic policies exerted a strongly negative effect on the observed change in domestic cassava price during 1986–92. It was more than offset, however, by the positive effect of exogenous factors. By contrast, the substantial increase in domestic soybean price in the same subperiod can be attributed almost solely to favorable domestic policies.
- The magnitude of the price bias arising from economywide policies (equivalently,

[11] In this sense, it is a valid statement that the agricultural price environment in Indonesia "is defined to a large extent by macro price policies and not just by commodity and sectoral policies" (Timmer 1989, p. 60). However, in terms of the relative contribution to the price bias (i.e., the disparity between domestic and foreign prices), macroeconomic policies were a less important source, at least during 1986–87 (see below).

from real exchange rate overvaluation) in 1986 and 1987 for either crop was much less than that from sector-specific policies. This differs from the more dominant effect of indirect interventions generally found in developing countries. Moreover, the domestic cassava price was reduced by both sectoral and economywide policies; by contrast, the overall effect of government interventions on the domestic price of soybeans was significantly positive. This pattern of price bias conforms to the general finding that agricultural pricing policy in developing countries favors import-competing relative to export-oriented products.

An important conclusion is that, after the attainment of rice self-sufficiency, Indonesian policies have not promoted *palawija* production on a "level playing field." The observed heavy protection to soybeans reinforces the argument that domestic production has been encouraged, given the existing technology, beyond what is desirable from a national-interest point of view (Napitupulu and Rasahan 1992). The observed price bias against cassava may indicate a potentially significant impediment to the general expansion of agricultural exports,[12] most importantly of nontraditional export products. The latter is likely to be a key ingredient in agricultural diversification and in the structural transformation of the national economy.

[12] Beyond the relative price effects of domestic policies, quantitative restrictions in the importing countries (such as the EC quotas on *gaplek* imports)—to the extent that they are binding for specific country suppliers—can also hinder growth of agricultural exports.

REFERENCES

Bautista, Romeo M. 1987. *Production Incentives in Philippine Agriculture: Effects of Trade and Exchange Rate Policies*. Research Report, no. 59. Washington, D.C.: International Food Policy Research Institute.

Bautista, Romeo M., and James Riedel. 1982. "Major Currency Realignments and the Terms of Trade in Developing Countries." *Journal of Development Economics* 10, no. 2: 227–43.

Bautista, Romeo M., and Alberto Valdés, eds. 1993. *The Bias against Agriculture: Trade and Macroeconomic Policies in Developing Countries*. San Francisco: ICS Press for the International Center for Economic Growth and the International Food Policy Research Institute.

Condon, Timothy, and George Fane. 1995. "Measuring Trade Deregulation in Indonesia." Paper presented at the Conference on Building Success: Maximizing the Gains from Deregulation, held in Jakarta, April.

Dornbusch, Rudiger. 1980. *Open Economy Macroeconomics*. New York: Basic Books.

Edwards, Sebastián. 1989. *Real Exchange Rates, Devaluation, and Adjustment in Less Developed Countries*. Cambridge, Mass.: MIT Press.

Falcon, Walter P.; W. O. Jones; and S. R. Pearson. 1984. *The Cassava Economy of Java*. Stanford, Calif.: Stanford University Press.

Gonzales, Leonardo A.; Faisal Kasryno; Nicostrato D. Perez; and Mark W. Rosegrant. 1993. *Economic Incentives and Comparative Advantage in Indonesian Food Crop Production*. Research Report, no. 93. Washington, D.C.: International Food Policy Research Institute.

Krueger, Anne O.; Maurice Schiff; and Albert Valdés. 1988. "Agricultural Incentives in Developing Countries: Measuring the Effect of Sectoral and Economywide Policies." *World Bank Economic Review* 2, no. 3: 255–71.

Napitupulu, Togar A., and Chairil A. Rasahan. 1992. "The Effects of Trade and Price Policies on Agricultural Diversification in Indonesia." Paper presented at the International Food Policy Research Institute seminar on Southeast Asian Agriculture in Transition: Implications for Food Policy, held in Jakarta, September.

Piggot, R. R.; K. A. Parton; E. M. Treadgold; and B. Hutabarat. 1993. *Food Price Policy in Indonesia*. Canberra: Australian Centre for International Agricultural Research.

Quiroz, Jorge, and Alberto Valdés. 1993. "Agricultural Incentives and International Competitiveness in Four African Countries: Government Interventions and Exogenous Shocks." In *Agricultural Policy Reforms and Regional Market Integration in Malawi, Zambia, and Zimbabwe*, ed. Alberto Valdés and Kay Muir-Leresche. Washington, D.C.: International Food Policy Research Institute.

Schiff, Maurice, and Alberto Valdés. 1992. *The Political Economy of Agricultural Pricing Policy*. Vol. 4, *A Synthesis of the Economics in Developing Countries*. Baltimore: Johns Hopkins University Press for the World Bank.

Suharno, Paimin. 1995. "The Dynamic Structure of Demand for Cassava in Indonesia and Its Implications for Policy." Ph.D. diss., University of the Philippines at Los Baños.

Thorbecke, Erik. 1992. *Adjustment and Equity in Indonesia*. Paris: Organisation for Economic Co-operation and Development.

Timmer, C. Peter. 1989. "Indonesia: Transition from Food Importer to Exporter." In *Food Price Policy in Asia: A Comparative Study*, ed. Terry Sicular. Ithaca: Cornell University Press.

Turnovsky, Stephen J. 1987. "Optimal Monetary Policy and Wage Indexation under Alternative Disturbances and Information Structures." *Journal of Money, Credit and Banking* 19, no. 2: 157–80.

World Bank. 1986. *World Development Report, 1986*. Oxford: Oxford University Press.

———. 1992. *Indonesia, Agricultural Transformation: Challenges and Opportunities*. Washington, D.C.: World Bank.

———. 1995. *World Tables, 1995*. Baltimore: Johns Hopkins University Press.

APPENDIX TABLE

CALCULATING THE RATE OF EXCHANGE RATE DISTORTION, 1985–87

	1985	1986	1987
(1) *TRP*	1.321	1.238	1.243
(2) ln*TRP*	0.278	0.213	0.218
(3) $-0.644\ln TRP$	−0.179	−0.137	−0.140
(4) *CA*	−2.23	−5.12	−2.99
(5) $0.029CA$	−0.065	−0.148	−0.087
(6) $\ln(RER/RER^*) = (3) + (5)$	−0.244	−0.285	−0.227
(7) RER/RER^*	0.783	0.752	0.797
(8) $RERD = [(7) - 1.00] \cdot 100$	−21.7	−24.8	−20.3

Source: Based on the estimated equation (5) and observed values of *TRP* and *CA*.
Note: The rate of exchange rate distortion (*RERD*) is in per cent.