

INFLUENCE OF REFORMS AND STRUCTURAL CHANGES ON DOMESTIC AGRICULTURE

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ABSTRACT

Sri Lanka initiated unprecedented economic reforms and structural adjustment programs under the patronage of the World Bank and the IMF. The post-reform period is associated with substantial changes in trade and macroeconomic policies and is also characterized by a large influx of foreign capital. Trade liberalization was accompanied by exchange rate reforms. Policy reforms were directed at manufactured exports and consequently the manufacturing sector became the leading sector of the economy. The domestic agricultural sector (DAS) continues to play an important role in the Sri Lankan economy and it remains a vital sector for rural people. However, a slowdown in the growth of the DAS was observed while sector-specific policies to improve the agricultural sector seemed to be ineffective. The issue of the influence of trade and macroeconomic policies on the DAS is very important as it has an impact on economic growth and rural poverty. An econometric model was developed to evaluate the effect of the liberal economic policies on the DAS. The results of the study show clear links between trade and macro economic policies and domestic agriculture. The expansion of the services sector exerts negative influence on the DAS, offsetting the beneficial effects of investments on infrastructural development. The DAS sector responds well to the trade policy and exchange rate depreciations. The impact of the changes in economic environment on agriculture, resulted in falling returns, inducement of farm mechanization or led to de-agriculturalization. Greater emphasis has to be given to macroeconomic stability and to search for new adoptable technology in response to the changes in relative prices.

KEYWORDS: Domestic Agriculture, Economic Reforms, Supply Response.

INTRODUCTION

In response to the country's poor economic performances of the closed economic era from 1970 to 1977, Sri Lanka started unprecedented economic reforms and structural adjustment programs under the patronage of the World Bank and the IMF. The post-reform period is associated with substantial changes in trade and macro economic policies and is also characterized by a large influx of foreign capital. Trade liberalization was accompanied by exchange rate reforms, while sufficient fiscal and monetary restraints were put in place to prevent the appreciation of the real exchange-rate. Policy reforms were directed at manufactured exports and consequently the manufacturing sector became the leading sector of the economy.

However, the agricultural sector continues to play an important role in the Sri Lankan economy, contributing 25% to the foreign exchange earnings and employing more than 34% of the workforce (CBSL). It remains a vital sector for rural people, who account for nearly 77% of the population. Sri

Lanka's agriculture can broadly be classified into three sectors: Export-Agricultural (EA), Rice, and Import Competing Agricultural (ICA). The last two sectors together are also called the Domestic Agricultural Sector (DAS). The DAS is an important economic entity in Sri Lanka, contributing to about 10% of GDP (CBSL, 2004), providing 60% of agricultural employment and occupying 58% of the cultivated land. A slowdown in the growth of the DAS was observed during the 1990s, while sector specific policies to improve the agricultural sector seemed to be ineffective.

Public policies may influence incentives in all sectors of the economy or in a specific one. The development of the infrastructure, research and extension activities of the government generally provides non-price incentives for agriculture. The supply responses of the agricultural sector are the net effects of these general, sector specific and non-price incentives. Changes in the economic environment, trade and macroeconomic policies, strongly influence the agricultural sector and can alter the impact of sector specific policies. The tradable and non-tradable goods model is frequently used to investigate the effects of trade and macro economic policies (Dornbusch, 1973; Corden and Nearly, 1982; Corden, 1984). Tradable comprise all goods and services produced in an economy that are actually or potentially imported or exported. Non-tradables are the goods and services which do not cross country borders. The most notable difference between tradable and non-tradable arises from the process of price formation. In an open, dependent economy, the price of tradable is generally determined by world market prices, translated through the exchange rate into domestic market prices. The prices of non-tradables are determined by domestic supply and demand. Trade policy exerts a direct influence on the domestic prices of importable and an indirect influence on importable through the prices of non-tradables and wage rate. Wage increases will have a direct negative influence on tradables production and an indirect negative influence through the prices of non-tradables. An expansionary monetary policy increases the demand for tradable and non-tradable in different magnitudes. The public sector generally supplies and demands more non-tradables than tradables. Growth in government expenditures, therefore, increases both the demand and price of non-tradables. An increase in the price of non-tradables expands the supply of non-tradables and squeezes the supply of tradables. The issue of the influence of trade and macroeconomic policies on the DAS is very important, as it has an impact on economic growth and rural poverty. Further, the response of the agricultural sector is informative, because it shows how economic policy directives can unintentionally influence the growth of other sectors or the growth of the economy as a whole (Chibber, 1989). In the present study, therefore, an attempt was made to identify the influences of trade and macroeconomic policies as well as the expansion of the non-tradable sector, on the supply responses of the DAS.

MATERIALS AND METHODS

Macroeconomic Environment and the Domestic Agricultural Sector

After the reforms in 1977, Sri Lanka achieved an impressive economic growth rate. The high growth rate in the GDP, together with relatively low population growth, raised Sri Lanka's per capita GDP to US\$ 1100 in 2004 from US\$ 273 in 1980 (CBSL). The share of agriculture in the GDP had declined from 33% in 1977 to 21% in 2001. The share of the manufacturing and services sector of the GDP expanded rapidly after 1977 (Figure 1). It became widely recognized that the fiscal policy of the government had profound effects on unemployment, total production, money and real income, and the price levels. Furthermore, the ability of agriculture to compete for resources is affected by trade and macroeconomic policies (Kruger *et al.*, 1988). The macroeconomic policies of the liberal Sri Lankan government were geared to reduce demand through fiscal and monetary policies and to induce a tradable supply of goods through trade and exchange rate policies. The proportion of the government expenditures to the GDP can be considered as an indicator of fiscal performance (Table 1). The ratio had been quite high (29% to 35 %), but it showed a slight decline by the end of the 1990s. Large budget deficits with high inflation can be considered as an indicator of rapid growth of the money supply. The monetary policy of Sri Lanka has been expansionary (Table 1). The post-liberalization period has also been characterized by higher inflation (Table 1). The influence of inflation on agricultural tradables and agricultural non tradables may not be equal. Increases in non-tradable prices and wage rates, more than the prices of tradable, can have an adverse effect on the production of agricultural importables and exportables. The ratio of domestic savings to GDP shows an increasing trend and this indicates an increase in income and also income stability (absorption). Nominal interest rates show a declining trend. However, interests rates have not changed with the changes in inflation rates and consequently, real rates of interest have improved (Table 1). The changes in the interest rates may have not affected the producers of the DAS, as the majority of agricultural producers of Sri Lanka depend on informal sources of financing at higher interest rates (CBSL, 1998).

A resource shift from agricultural importables to exportables can be expected if the depreciation of the exchange rate is accompanied by trade liberalization. The nominal exchange rates (NER) of Sri Lankan rupee depreciated against major trading currencies during the post-reform period (Figure 2). The effect of devaluation was price increases for the DAS; but is dependent on characteristics of the individual farm households. In the case of Sri Lanka, the majority of DAS farm households are net sellers (DCS, 2003). Thus, the changes in trade and macroeconomic policies may have strongly influenced the DAS. The Real Exchange Rate (RER) explains the incentives

to production and consumption (Dornbush, 1991). The RER is defined as the relative prices of the traded goods to non-traded goods. The post-reform period is characterized by an appreciation (decline) of RER for agricultural imports. The decline in RER indicates a reduction in competitiveness for the domestic production of importable. The rising difference between *RER* and *NER* indicates the ineffectiveness of macroeconomic policy instruments to contain the appreciation of RER (Figure 2).

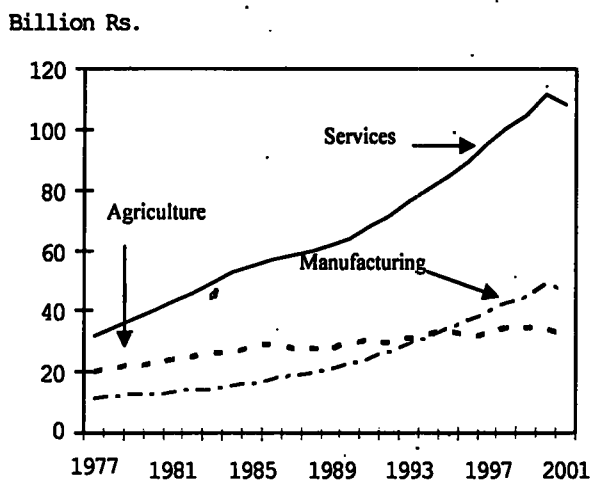


Figure 1. Sectoral Composition of GDP (Constant price 1982=100). Source: CBSL.

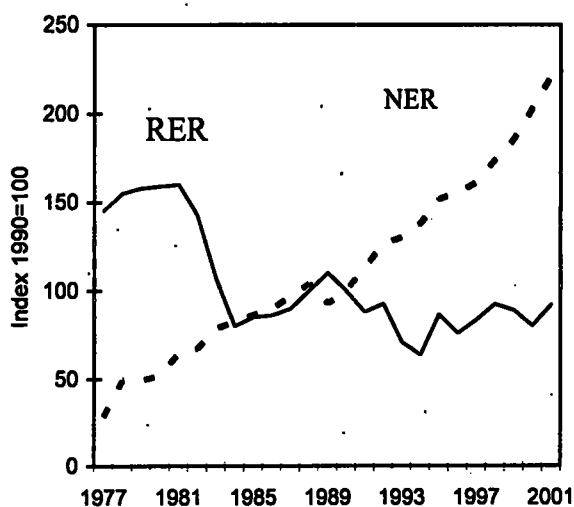


Figure 2. Real and Nominal Exchange Rates.

Source: NER- CBSL, Real exchange rates: Estimated using data in CBSL. Notes: NER= Nominal Exchange rate, RER (Real Exchange Rate)= P_T/P_N , where P_T and P_N are price indices of tradables and non-tradables respectively.

Table 1. Fiscal and Monetary Policy Indicators (percentages).

Indicators	Period				
	1977-81	1982-86	1986-91	1991-95	1996-01
Government expenditure/GDP	37.5	35.5	35.9	32.9	29.1
Money supply growth (M2)	32.0	16.0	16.6	18.0	12.5
Interest rate (deposit)-nominal	12.8	11.8	11.4	12.9	9.7
Interest rate (deposit)-real	-0.9	-0.8	-0.3	3.3	2.5
Interest rate (lending)-nominal	13.8	20.0	19.3	19.3	16.0
Interest rate (lending)-real	0.3	7.7	7.7	9.6	8.8
Domestic saving/GDP	14.0	13.9	12.8	15.4	18.1
Inflation	16.2	9.6	9.8	9.8	12.5

Source: Calculated from annual data in CBSL. Notes: Real interest rate = $(1+i)/(1+P^*)-1$; where i is deposit interest rate, P^* is inflation rate. M2= broad money supply includes M1(coins, paper currency, other currency) plus all kinds of saving and time deposits.

Increased labor productivity, availability of inputs, capacity utilization, and direct foreign investment are core factors behind the growth of the manufacturing sector (Havrylyshyn, 1990; Wignaraja, 1998). However, local linkages to the manufacturing sector were confined to primary inputs and services (Dias, 1987; Wignaraja, 1998). After the policy reforms, labor force participation in the manufacturing and service sectors has been increasing, while in agriculture, it has remained steady over the past two decades (CBSL, 2001). The wage rate (real and nominal) of the DAS has been increasing and it can be considered as an indicator of higher labor movement from the DAS to the fast growing sectors of the economy. Although the quantity of employment in the manufacturing sector has increased, the quality of employment has been identified as being of a particularly low standard and poorly paid (Rodrigo, 1994).

Supply Responses of Rice and Import Competing Agricultural Sectors

The subsistence nature of the DAS sector has largely disappeared and the commercialization of domestic agriculture has increased with the expansion of market economic policies (CBSL, 1998). Agricultural policy continued to evolve in the direction of government withdrawal from the DAS and policies were directed to enhance private sector involvement in the DAS. With these changes, the producer price of agricultural products is largely determined by the world prices, exchange rate and trade policies. Investments in irrigation substantially increased from the late 1970s to the early 1990s (Kikuchi *et al.*, 2002). The major portion of the investments for irrigation was

from foreign aid (CBSL, 1998). Public investments in rural infrastructure development projects (land development, housing, roads, electricity and water, among others) and poverty alleviation programs increased during the post reform period (CBSL). The agricultural investments in Sri Lanka have been rice biased and the continuous promotion of rice is considered irrational due to the bleak export prospects and the poor economic situation of rice farmers. A major change in agricultural policy occurred during the late 1970s with the promotion of ICA crops. The ICA sector is concerned with the production and marketing of pulses, coarse grains, chilies, onions, potatoes and sugar, among others. Clear distinctions exist between the Rice and ICA sectors in land use type (lowland and upland); labor usage, returns to capital and net returns (Table 2). The changes in the output of rice and ICA during the period 1977-2001 are presented in Figure 3. Rice output shows a clear upward trend in production during the period 1977-85 and shows large fluctuations after the mid 1980s (Figure 3). The real producer price of rice (Figure 4) shows a decreasing trend, while the real wage rate of the DAS displays an increasing trend (Figure 5). In the case of the rice sector, the negative influences of a decreasing real producer price and increasing wage rates may have been offset by investments in research and development, land development and irrigation. The output of ICA showed an increasing trend during the 1980s, despite declining real price levels (Figures 2 and 3). This indicates the influence of declining real wage levels and non-price incentives (research and development, extension services and irrigation). The mechanization of rice production has been increasing during the post reform period while the ICA has largely remained a labor intensive sector (Table 2). The labor usage in rice production decreased by about 40%-50 % during the period 1978 to 2001 (DOA).

Table 2. Net Returns, Returns to Capital and Labor Usage of Rice and ICA Production.

<i>Commodity</i>	<i>Net returns*¹(Rs/ac)</i>	<i>Returns to Capital</i>	<i>Labor Usage*²(Mandays/ac)</i>
Rice	12,000	2.2	33
ICA			
Chili	50,000	2.7	123
Onion	38,000	1.9	212
Potatoes	49,000	1.7	148
Pulses	15,000	3.7	52
Corn	24,000	7.7	52

Source: Department of Agriculture (Sri Lanka). Cost of Cultivation of Agricultural Crops 1999/2000.

Notes: ICA=Import Competing Agricultural Sector, *1= Net returns excluding family labor, *2= Labor usage includes family labor.

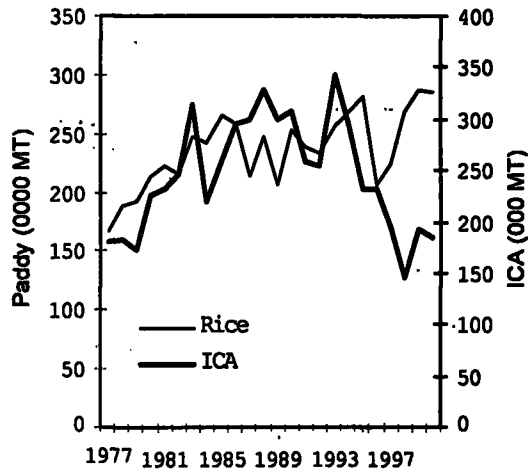
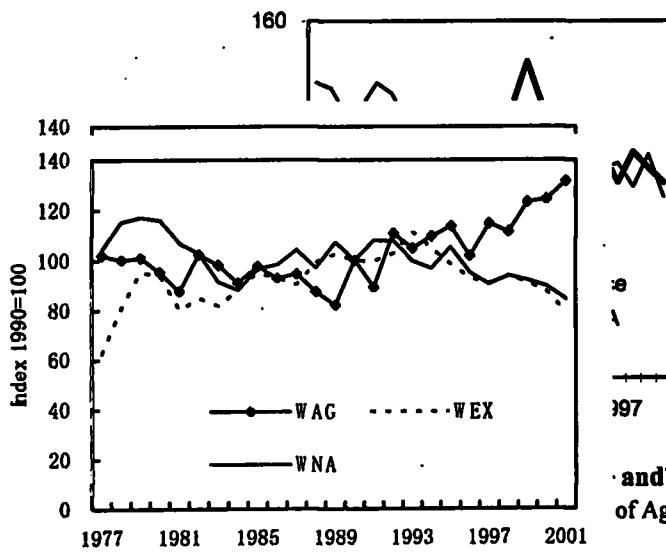


Figure 3. Output of Rice and Import Competing Agricultural Products.

Source: CBSL and Department of Agriculture, Sri Lanka.



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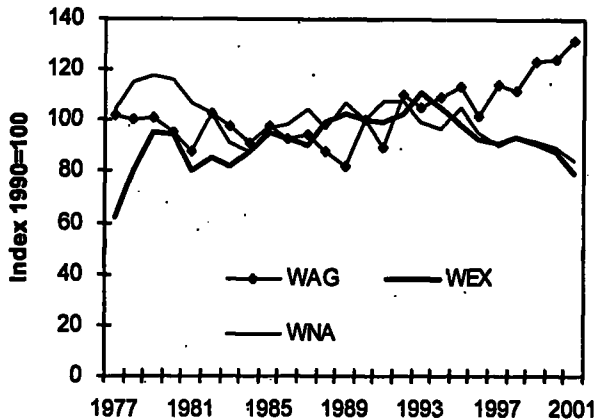


Figure 5. Real Wage Rates.

Source: Calculated from data obtained from CBSL and Department of Agriculture, Sri Lanka.
 Notes: WAG= Wage rate of the DAS, WEX= Wage rate of export agricultural sector, WNA= Wage rate of the non-agricultural Sector.

The framework used here embraces the idea that changes in agricultural performance occur as a response to changes in the economic environment. Three types of agricultural commodities are considered in the formulation of the model: agricultural exportables, agricultural importables and agricultural non-tradables. The agricultural sector's interaction with other sub-sectors of the economy occurs through the price levels of tradable and non-tradables. It is reasonable to expect that the changes in economy had an influence over the supply of agricultural tradables and the price of agricultural non-tradables. The price of agricultural importables, price of agricultural exportables, capital formation in agriculture, agricultural wage rate, technological changes and price of agricultural non-tradables are considered as the determinants of the supply responses of rice and ICA sectors. The price of agricultural non-tradables and agricultural wage rate is assumed to be determined endogenously depending on the domestic demand and supply conditions. The impact of the expansion of non-tradables sector on tradables agriculture is implicitly understood by the relationship between supply response and price of agricultural non-tradables. Price of agricultural non-tradable is assumed to be determined by price of agricultural importables, price of non-agriculture, price of agricultural exports, wage rate of agriculture, expenditure and technological changes. A decrease in real expenditure relative to the real income causes demand for non-tradables to decrease. This requires a decrease in the price of non-tradable in order to eliminate excess supply of non-tradables.

Most of the manufacturing industries are heavily concentrated in two districts (or a single province) around Colombo, mainly due to the presence of better infrastructure. The non-agricultural sector of Sri Lanka, therefore, is considered as a separate, single sector in the analysis of supply responses. The price of non-agricultural products is assumed to be determined exogenously from the rural economy and the supply of non-agricultural goods is expected to be independent of the prices of agricultural tradable.

The changes in rural expenditure are expected to have an impact on production of tradables through the prices of non-tradables. The aggregate rural expenditure is expressed as a function of price of agricultural importable and exportable, agricultural wage rate, government expenditure and the technological change. The government expenditure can have direct and indirect effects on rural expenditure. The direct effects are the benefits of poverty alleviation and rural employment programs. The indirect effects arise from investments in agricultural research and extension, infrastructure development, health and education. The demand for non-tradables increases with an increase in expenditure. It is expected that changes in the labor market will be reflected by changes in wage rates. Price of agricultural imports and exports, wage rate of non-agricultural sector, price of non-agricultural goods and technological changes are considered as determinants of agricultural wages. The non-agricultural wage rate is included to capture any pervasive effect on wage formation in the agricultural sector. The changes of these variables are shown in Figure 6.

The agricultural supply generally responds to past prices. In the empirical model, the lagged price is included to distinguish the effect of price on agricultural supply. The model has a simultaneous component and three endogenous variables (rural expenditure, agricultural wage rate and price of agricultural non-tradable). All the variables in the equation are expressed as relative prices using the price of agricultural exports as a numeraire.

¹ The following model is applied to determine the supply responses of the DAS and the impacts/interaction of other variables mentioned above.

$$Y_{AM} = f_1(P_{AM}, P_{AN}, P_{AX}, W_{AG}, K_{AG}, T) \dots\dots (1) \quad P_{AN} = f_2(P_{AM}, P_N, P_{AX}, W_{AG}, E, T) \dots\dots\dots$$

$$E = f_3(P_{AM}, P_{AX}, W_{AG}, G, T) \dots\dots\dots (2) \quad W_{AG} = f_4(P_{AM}, W_{NA}, P_{AX}, P_{AN}, P_N, T) \dots\dots\dots (4)$$

Where: Y_{AM} =Supply of Agricultural tradables, P_{AM} =Price of Agricultural importables, P_{AX} = Price of Agricultural exportables, W_{AG} = Wage rate of Domestic agriculture, W_{NA} = Wage rate of Non- agriculture, P_{AN} =Price of

Agricultural non-tradables, P_N =Price of Non-Agricultural goods, E = Rural Expenditure, K_A = Capital Formation in Agriculture, G = Government Expenditure, T =Technological change

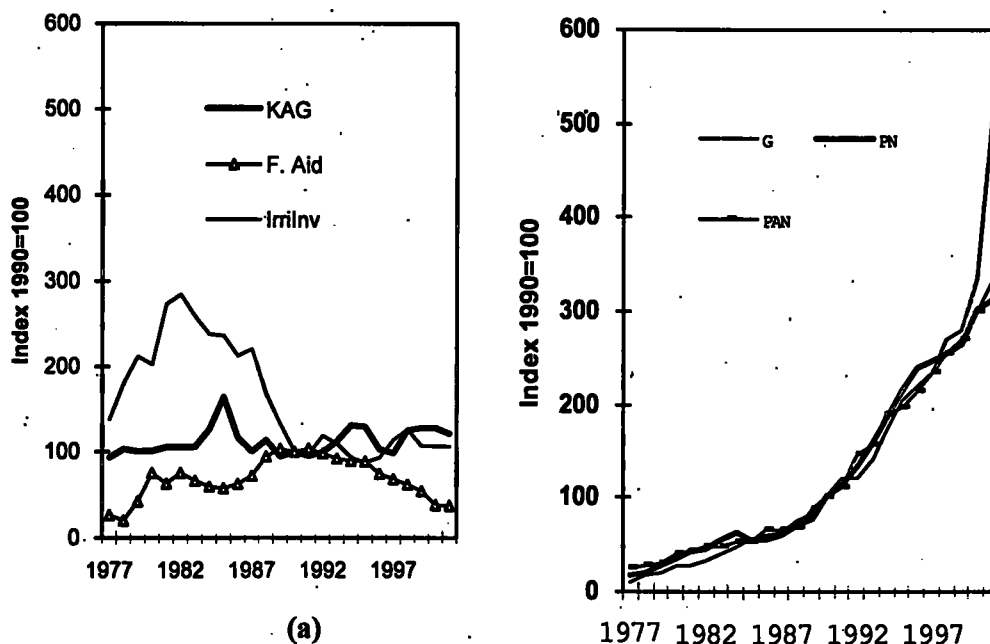


Figure 6. Changes in Economic Variables (Index 1990=100): 1977-2001.

Source: Calculated from data obtained from CBSL and Department of Agriculture, Sri Lanka. Notes: (a) KAG=Investment in land development, F.Aid= Foreign aid, IrrInv= Investments in irrigation, (b) G=Government expenditure, PN =Price of non-agriculture, PAN=Price of agricultural non-tradables.

Devaluation, with sufficient fiscal and monetary restraints, reduces expenditure. The reduction of expenditure causes the relative price of non-tradable to decline (Dornbush, 1973). Furthermore, the real wages would fall if the nominal wage rate does not adjust proportionally to the rate of exchange.

Data and Model Estimation

The model described above is applied separately to rice and the ICA sectors using annual data from 1977-2001. The price of agricultural non-tradable is approximated from the agricultural service price index. Rural expenditure is based on the household income and expenditure survey of Department of Census and Statistics, Sri Lanka. The price of non-agricultural goods is defined as a function of price indices of tradable (P_T) and non-tradable (P_{NT}) in the non-agricultural sector: $P_N = \alpha P_T + (1 - \alpha) P_{NT}$, where α is the share of value added to the tradable, non-agricultural sector related to the value added to the entire non-agricultural sector. P_T is approximated from a price index of imports (non-agricultural goods) and P_{NT} is approximated

from a GDP price deflator of the non-agricultural sector. Double log functional forms are used for all equations in the system. Fisher's ideal price and quantity indices are used to aggregate prices and quantities. The data were collected from various publications of the Central Bank of Sri Lanka (CBSL), the Department of Agriculture (Sri Lanka), the Department of Irrigation (Sri Lanka), and the World Bank. The model is over-identified in the order condition while identified in the rank condition.

RESULTS AND DISCUSSION

The results of the model estimated for rice and ICA sectors are given in Tables 3 and 4 respectively. In general, signs of the coefficients are in accordance with the theoretical expectations. The preliminary estimate showed that the variable technology (time trend) (T) is not statistically significant. Thus, it is dropped in the final estimation. Capital formation in agriculture during the period of investigation has had a higher effect on supply responses. The lagged prices have significant influences over the supply responses and it indicates the farmers' expectation of stability based on past prices. An increase in government spending significantly increases rural expenditure. The estimated equations confirm the significant positive relationship between wage rate and the price of non-tradable. Table 5 presents the direct and indirect impacts on supply responses due to changes in selected variables. The total effect equals the sum of these impacts on supply responses. The direct effects are the partial influences on supply response. The indirect effects arise when variables significantly stimulate the other variables in the system. Both sectors respond robustly to tariff increase. An increase in import price by 10% will increase the supply of rice and ICA by 3.9% and 3.7% respectively (Table 5). The change in the price of ICA does not show a significant influence on prices of agricultural non-tradables, agricultural wage rate and rural expenditure, and therefore, no indirect effect arises in relation to the price change. In case of rice, the change in price significantly influences the rural expenditure and thus, the total effects (0.38) are less than the direct effects (0.39) (Table 5). Simulating the impact of the exchange rate depreciation is based on the assumption that fiscal and monetary instruments work effectively to maintain the expenditures, and the nominal wages remain unchanged. A 10% depreciation of the exchange rate increases the supply responses of rice and ICA by 1.8% and 6.3% respectively. The total effect of the exchange rate depreciation indicates more elastic supply responses (0.32 and 1.17) due to positive influences of the indirect effects. The depreciation of exchange rate, thus, has a significant influence on supply responses if the trade and macro-policies allow changes in the exchange rate to be passed on to the producers. The changes in fiscal expenditure show a negative effect on both sectors. The price of agricultural non-tradables, wage rate of agriculture and price of non-agricultural goods have a significant

negative influence on the supply response of rice and ICA, while the influences are greater in ICA supply than those of rice (Table 5).

Table 3. 2SLS Estimates of the Model: Rice Sector.

Var.	Const	P_{AgM}	P_{AgM-1}	W_{Ag}	W_{NA}	P_{AgN}	P_N	E	K_{Ag}	G	T	R^2
Y_{AgM}	0.47** (2.2)	-	0.39*** (4.1)	-0.18* (-1.8)	-	-	-	-	0.77*** (22.3)	-	7.72*** (2.8)	0.97
W_{Ag}	-0.77* (-1.9)	-0.01 (-0.6)	-	-	-0.01 (-0.1)	0.70*** (3.2)	0.39*** (2.7)	-	-	-	-	0.96
P_{AgN}	0.34** (4.1)	0.04 (0.4)	-	0.62*** (5.6)	-	-	0.36*** (2.4)	0.23*** (2.8)	-	-	-	0.92
E	-0.79* (-1.7)	0.26* (1.6)	-	0.13 (1.0)	-	-	-	-	-	0.35** (5.3)	-	0.91

Notes: Figures in parentheses are t values. ***, **, * = Significant at 1%, 5% and 10% levels respectively. P_{AgM} = Price of agricultural importables (rice), P_{AgM-1} = Lagged price of agricultural importables (rice), W_{Ag} = Wage rate of domestic agriculture, W_{NA} = Wage rate of non-agriculture, P_{AgN} = Price of agricultural non-tradables, P_N = Price of Non-Agricultural goods, E = Rural expenditure, K_{Ag} = Capital formation in Agriculture, G = Govt. expenditure, T = Technological change.

Table 4. 2SLS Estimates of the Model: Import Competing Sector.

Var.	Const	P_{AgM}	P_{AgM-1}	W_{Ag}	W_{NA}	P_{AgN}	P_N	E	K_{Ag}	G	T	R^2
Y_{AgM}	-1.78*** (-9.0)	-	0.37*** (4.9)	-0.63*** (-4.8)	-	-	-	-	0.92*** (24.0)	-	14.31*** (4.9)	0.97
W_{Ag}	0.30* (1.6)	-0.19 (-0.2)	-	-	-0.12 (-0.5)	0.64* (1.8)	0.47* (1.7)	-	-	-	-	0.84
P_{AgN}	0.35*** (4.2)	0.18 (0.3)	-	0.60*** (4.5)	-	-	0.38*** (3.2)	0.25*** (5.7)	-	-	-	0.92
E	-0.59* (-1.9)	-0.17 (-0.2)	-	0.25* (1.9)	-	-	-	-	-	0.45** (13.9)	-	0.90

Notes: Figures in parentheses are t values. ***, **, * = Significant at 1%, 5% and 10% levels respectively. P_{AgM} = Price of agricultural importables (ICA), P_{AgM-1} = Lagged price of agricultural importables (rice), W_{Ag} = Wage rate of domestic agriculture, W_{NA} = Wage rate of non-agriculture, P_{AgN} = Price of agricultural non-tradables, P_N = Price of Non-Agricultural goods, E = Rural expenditure, K_{Ag} = Capital formation in Agriculture, G = Govt. expenditure, T = Technological change.

Table 5. Supply Responses (*) of Rice and Import Competing Agriculture of Sri Lanka: 1977-2000.

Policy Change	Direct Effect		Total Effect	
	Rice	ICA	Rice	ICA
Trade policy (Increase of Tariff)	0.39	0.37	0.38	0.37
Exchange rate depreciation	0.18	0.63	0.32	1.17
Increase of Government expenditure	-	-	-0.01	-0.04
Increase in price of non-agriculture	-	-	-0.29	-0.44

Notes: (*) Supply responses are in elasticity. ICA: Import competing agriculture. (-) = No significant direct effect.

The absorption level of Sri Lanka's economy has been increasing after the economic reforms. The rise in absorption levels increases the demand for non-tradable. This spending effect shifts the demand curve and therefore, increases the price of non-tradable. It increases the supply of non-tradables and wage rates of the DAS. Lower prices for importables may pull resources out of importables to the production of exportables or to non-tradables production. Export-agricultural crops are perennials and require specific climatic conditions. Therefore, a shift of resources from the DAS to export agriculture cannot be expected. The possibility of developing new export agricultural products is mainly limited by transportation costs. Consequently, the expansion of the non-tradable sector reduces the domestic supply of importable.

The changing economic environment may have reorganized the agricultural sector. Changes in resource endowment, which is reflected in higher wage rates and higher non-tradable prices and the relatively lower price of tradable, induce capital-intensive production. In such an environment, relatively labor intensive (ICA) sectors tend to contract while capital intensive sectors (rice) tend to expand (Rybczynski, 1955). The supply levels of rice and ICA in respect to the changes in the economic environment show Rybczynski effects. The government has been urged to protect the DAS but how can the Sri Lankan government achieve such an objective? Taxing agricultural or manufactured exports will have adverse effects on the external competitiveness of exports. An increase in tariff is one of the options and both sectors respond fairly well to tariff increases.

CONCLUSIONS

Using data from 1977 to 2001, a simultaneous equation model was developed to evaluate the impact of trade and macroeconomic policies on Sri Lanka's DAS performance. Technological development and capital formation in agriculture have significantly contributed to the growth of the DAS. The results of the policy simulation suggest that trade policies, exchange rates, government expenditures and the price of non-agricultural goods have a significant influence on the DAS. An increase in government expenditures has a negative impact on the DAS's supply responses. The incentives provided to the development of the non-agricultural sector have an indirect negative effect on the DAS and this can offset the beneficial effects of infrastructure development. Therefore, in order to achieve sustainable development in the DAS, strong emphasis should be given to maintaining macroeconomic stability and importance should be given to promoting balanced growth in different sectors of the economy. Unequal growth may reduce the profitability of farming and contribute to de-agriculturization or the adoption of capital intensive production techniques. The two sub sectors of the DAS responded differently to the changing economic environment. The

rice sector may have responded to the changes by shifting to capital intensive techniques. Due to its intrinsic nature, such a move may have not occurred in the ICA sector and consequently, the ICA sector's response to the changes remains strong. Hence, the changes in the economic environment indirectly favor rice production and this could have a negative impact on the rural sector in terms of farm income, employment and efficient use of resources. The long-run impacts of the changing economic environment on the DAS would be the reduction of employment due to adoption of capital intensive techniques and an increase of incidences of poverty due to the reduction in economic profitability and employment. Trade policy can be used to promote the DAS sector of Sri Lanka without adverse price effects on other sectors. However, a detailed investigation is required to identify the optimal (pareto-optimal) level of protection for the DAS. This study also indicates the necessity of creating an innovative research system to develop adoptable new technology in response to changes in relative prices. Some caveats need to be made with respect to the analysis. The analysis is based on the high level aggregations. The available reliable data does not facilitate further disintegration or application of more comprehensive analytical methods.

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