Agricultural Exports of Developing Countries: Estimates of Income and Price Elasticities of Demand and Supply

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AGRICULTURAL EXPORTS OF DEVELOPING COUNTRIES: ESTIMATES OF INCOME AND PRICE ELASTICITIES OF DEMAND AND SUPPLY

N. Islam and A. Subramanian*

This paper provides new evidence on income and price elasticities of demand and supply of agricultural exports from developing countries, on the basis of (a) a consistent and fully specified supply and demand model, and (b) statistical estimation procedures not frequently used in the estimation of agricultural export functions. Estimates of price and income elasticities of demand for aggregate agricultural exports for all developing countries taken together — as distinct from individual exporting countries — are found to be low; moreover, export price as distinguished from non-price factors plays a relatively insignificant role in increasing export supply. Hence, an attempt by all developing countries to expand traditional agricultural exports with low price elasticity of demand may not yield rising earnings for all; but in fact may result in falling export revenues. Insofar as individual exports of all developing countries (not individual countries) are concerned, income and price elasticities of demand for such tropical commodities as tea, coffee, cocoa and bananas are also found to be low, except for new, non-traditional exports like pineapples. This indicates the importance of diversification of agricultural exports as a vehicle for their future growth.

Introduction

Much has been written about the need for appropriate price and exchange-rate policies for promoting agricultural exports of developing countries. The relative importance of price and non-price factors has been debated. Also relevant is the distinction between individual and aggregate agricultural exports in respect of their response to prices and other relevant policies. Although supply constraint rather than external demand constraint has often been considered an important factor in inhibiting the growth of agricultural exports of developing countries, much of the debate on these issues hinges on the adequacy of empirical evidence on the quantitative significance of various factors affecting supply and demand for agricultural exports. The magnitude of income elasticity of demand determines whether growth in developed countries can provide a boost to the exports of developing countries; the size of price elasticity of demand determines how shifts in export supply will affect

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export revenues; finally, the export supply function indicates the relative influence of relevant price and non-price factors and associated policies in stimulating the supply of exports.

The responsiveness of agricultural exports to price and income changes in export and world markets has been estimated in the past. Recent examples include works by B. Balassa, J. Reidel and M. J. Lord. However, price responsiveness of exports is often analysed without differentiating supply from demand response and many models do not specify supply and demand relationships clearly and separately. Nor is sufficient account taken of lags in the response of demand and supply to price changes.

This paper first specifies a model of supply and demand relationships for agricultural exports in clear and consistent manner. Secondly, it uses new data and a statistical estimation procedure which enables us to derive a set of efficient, unbiased and stable estimates of coefficients for the supply and demand functions.

Following Goldstein and Khan (1985, pp.1044-1050), the demand for developing country exports is held to depend on the incomes of importing countries (in our context the developed countries) and on the relative prices of the exports of developing countries in the markets of importing countries. Thus,

$$X^D = \alpha_0 + \alpha_1 Y^* + \alpha_2 (P_x - P^*) \qquad (1)$$

where X^D = demand for developing country exports

Y^* = combined real GNP of developed market economies in 1980 dollars

P_x = dollar unit values of developing country exports

P^* = price level (measured by the GNP deflator) of developed countries in dollars

$P_x - P^*$ = relative price of exports†

In this and all subsequent equations, all variables are expressed in logarithms. The expected signs are $\alpha_1 > 0$ and $\alpha_2 < 0$, where these measure respectively the income and price elasticity of demand for developing country exports.

Equation (1) assumes (a) imperfect substitution between the imported and domestic commodities in general, and (b) homogeneity of demand, which results in real income and relative price both appearing as independent variables. Thus, to the extent that developed countries also produce the commodities exported by the developing countries and compete with them, the

† A troubling feature of many specifications of export demand functions is the presence of a relative price term ($P_x - P_x^c$) where P_x^c is the price of competitor's exports (this applies only to a greater-than-two-country world). This term appears either *instead* of the one shown in equation (1) as in Goldstein and Khan (1976) or, *in addition* to it, as in Bond (1985). The term is an odd one because it constrains the response of demand to changes in the price of both goods to be identical and does not allow for imperfect substitution between imported products and domestic goods.

A more appealing and general specification would be:

$$X^D = \alpha_0 + \alpha_1 Y^* + \alpha_2 (P_x - P^*) + \bar{\alpha}_2 (P_x^c - P^*)$$

This specification allows for differing responses and a check for identical responses is easily made as a restriction $\alpha_2 = \bar{\alpha}_2$ in the above formulation.

relative price of the commodities produced at home ought also to enter the equation, with a coefficient $\alpha_3(>0)$ which can be expected to be different from α_2 if there is imperfect substitution between imported and domestically produced commodities.

$$X^D = \alpha_0 + \alpha_1 Y^* + \alpha_2 (P_x - P^*) + \alpha_3 (P_x^* - P^*) \qquad (1a)$$

$$\alpha_3 > 0, \quad \alpha_2 \neq -\alpha_3$$

where P_x^* = price of domestically produced commodities competing closely with developing country exports.

If domestic prices (P_x^*) are not available, P_x^* would have to be suitably modified in (1a) above.

Second, the dependent variable should ideally be the quantity of exports *from* developing *to* developed countries. In the absence of ready access to such detailed (direction of trade) data, particularly at disaggregated commodity level, total agricultural exports of developing countries, excluding fishery and forestry products, has been used as the dependent variable. If the directional (from developing to developed) export is either a multiplicative or an exponential constant of total exports then the parameters can be inferred.† If the above does not hold, then (1) will suffer from a specification error, biasing the estimates of coefficients.

These two points together imply that for tropical commodities where almost all exports go to developed countries and where developed countries do not produce significant quantities of them (the latter corresponding broadly to non-competing exports), equation (1) will provide better estimates than for commodities where either developing countries themselves account for a large share of imports or where developed countries are large producers of these commodities. (This is confirmed later by the better results obtained for individual tropical products).

The supply of exports from developing countries is considered to be a function of two sets of variables; first, export price and long-term trend factors including changes in technology and infrastructure, affecting long-term comparative costs of export supplies; second, short-term factors such as pressure of variation in domestic demand and sudden changes in domestic production, affecting short-term variations in the availability of export supplies from year to year. These two sets of variables have different implications for short- and long-term export policies.

$$\text{Thus: } X^S = \beta_0 + \beta_1 (P_x - P) + \beta_2 t + \beta_3 (S - \bar{S}) + \beta_4 (D - \bar{D}) \qquad (2)$$

where P = price level (measured by the GNP deflator) of developing countries in dollars.

† This can be seen as follows: let directional exports $\hat{X}_t = \delta X_t^d$ where δ is a known constant and X^d is total exports. A regression in logs of $X^d = g_0 + \alpha_1 Y^* + \alpha_2 (P_x - P^*)$ yields parameter estimates of α_1 and α_2 identical to (1); if $\hat{X}_t = X_t^\delta$, then the regression yields parameters equal to α_0/δ, α_1/δ, and α_2/δ.

$P_x - P$ = relative prices of exports

t = time trend

$(S-\bar{S})$ = supply shock measured as the deviation of actual production from trend

$(D-\bar{D})$ = demand pressure measured as the deviation of GNP from trend.

The relative price term in equation (2) is included to capture the relative profitability of producing the good for export. β_1 is thus the relative price elasticity of export supply, which is expected to be positive.

The time trend is included to take account of the factors such as factor supplies, infrastructure and factor productivity which cause the supply curve to shift over time. β_2 is expected to be positive (there could, of course, be secular shifts which work negatively as well).

The term $(S-\bar{S})$ is associated with the effect of random shocks in supply on exports, under the assumption that such shocks cannot affect the foreign price of the product. This is in accordance with a kind of 'vent-for-surplus' theory of exports in that export supply is driven by random variations in production mainly due to agro-climatic reasons, characteristic of agriculture in developing countries. β_3 is therefore expected to be positive. $(S-\bar{S})$ was obtained as the residuals from a regression of developing market economies' agricultural production on time.

Domestic demand pressure $(D-\bar{D})$ for exportables in developing countries increases the profitability of selling in the domestic market rather than in the export markets. When domestic income and, therefore, domestic demand rise above the trend level, there is an increase in the relative attractiveness of selling with domestic market as compared with the export market which, in any case, carries the perception of higher risks in the minds of producers or traders. As the pressure of domestic demand increases, resources tend to be diverted away from export production and long delays occur in deliveries for export market (see Goldstein and Khan (1985), p. 1061). $(D-\bar{D})$ was obtained as the residuals from a regression of developing economies' GNP on time. β_4 is expected to be negative.

The supply-shock variable and the demand-pressure variable (especially the latter) could be correlated with the relative price variable. To that extent there may be estimation problems (discussed later), but on theoretical grounds all three variables need to be included separately.

The starting point for the estimation of equations (1) and (2) is an autoregressive distributed lag (ADL) formulation since relationships between economic variables are necessarily dynamic. Two important factors that lead to dynamic relationships are adjustment costs and expectations about the future course of variables. At the same time, however, to the extent that economic theory does not specify the lag structure of this dynamic process, the ADL formulation is a natural choice.

In this paper, models with lagged dependent variables are called distributed-lag models, whereas those with lagged variables, both dependent and independent, are called autoregressive distributed-lag (ADL) models. The distributed lag is one formulation of the restrictive version of the general ADL model.

Because of its profligate parameterisation and the presence of multicollinearity, an ADL formulation in unrestricted form is likely to yield

inefficient estimates of individual coefficients. Hence a more parsimonious parameterisation which includes a limited number of lags, i.e. restricted ADL, is attempted. However, to ensure that this parameterisation (which is essentially a series of coefficient restrictions) is a valid one, it is tested against the unrestricted ADL model.

The indexes of statistical adequacy of the estimation procedure which were used are: (1) a test for absence of autocorrelation in the error process; (2) a test for the validity of the instruments used, wherever instrumental variables are employed in the estimation procedure; and finally, (3) a test for the stability (over time) of the parameter estimates through parameter-stability tests.

The Model for Estimation

Recasting equations (1) and (2) in unrestricted ADL form, the following equations result. For the choice of length of lags of the unrestricted ADL model, it is generally recommended to use a lag length of 4-5 for quarterly data and 2 for annual data (Henry *et al* (1984)). Since we use annual data, a lag length of 2 is used in estimation.

$$X_t^D = \alpha_0 + \alpha_{11} Y_t^* + \alpha_{12} Y_{t-1}^* + \alpha_{13} Y_{t-2}^* + \alpha_{21}(P_x - P^*)_t + \alpha_{22}(P_x - P^*)_{t-1} + \alpha_{23}(P_x - P^*)_{t-2} + \alpha_{31} X_{t-1}^D + \alpha_{32} X_{t-2}^D \qquad (1^*)$$

$$X_t^S = \beta_0 + \beta_{11}(P_x - P)_t + \beta_{12}(P_x - P)_{t-1} + \beta_{13}(P_x - P)_{t-2} + \beta_2 t + \beta_{41}(S - \bar{S})_t + \beta_{42}(S - \bar{S})_{t-1} + \beta_{43}(S - \bar{S})_{t-2} + \beta_{41}(D - \bar{D})_t + \beta_{42}(D - \bar{D})_{t-1} + \beta_{43}(D - \bar{D})_{t-2} + \beta_{51} X_{t-1}^S + \beta_{52} X_{t-1}^S \qquad (2^*)$$

Equations (1*) and (2*) are the so-called structural relationships; if an equilibrium condition of the form $X_t^D = X_t^S = X_t$ is imposed, then the reduced forms can be derived. For export quantity, this is:

$$X_t = O_0 + O_{11} Y_t^* + O_{12} Y_{t-1}^* + O_{13} Y_{t-2}^* + O_{21}(P_x - P^*)_{t-1} + O_{22}(P_x - P^*)_{t-2} + O_{31}(P_x - P)_{t-1} + O_{32}(P_x - P)_{t-2} + O_4 t + O_{51}(S - \bar{S})_t + O_{52}(S - \bar{S})_{t-1} + O_{53}(S - \bar{S})_{t-2} + O_{61}(D - \bar{D})_t + O_{62}(D - \bar{D})_{t-1} + O_{63}(D - \bar{D})_{t-2} + O_7(P - P^*)_t + O_{81} X_{t-1} + O_{82} X_{t-2} \qquad (3)$$

where $(P - P^*)_t$ = ratio of GNP deflators of the exporting and importing countries. In a purchasing power parity sense, $(P - P^*)_t$ can be considered as a real exchange rate.

A similar reduced form for P_x can be derived. In equation (3) the O's are functions of the various structural parameters in (1*) and (2*). One important point needs to be made. If equation (3) is estimated in its unrestricted ADL form, the correct price variable to enter the right-hand side are the current $(P - P^*)$ and lagged values of $(P_x - P^*)$ and $(P_x - P)$†.

In our analysis we estimated the structural forms (1*) and (2*) using the instrumental variables (IV) method. The results are compared with those obtained from ordinary least-squares estimation procedures.

† If lagged values of $(P - P^*)$ are used, then this amounts to a set of coefficient restrictions, viz: $O_{21} = -O_{31}$ and $O_{22} = -O_{32}$. Setting $O_{21} = -O_{31}$ yields in equation (3), $O_{21}((P_x - P^*)_{t-1} - (P_x - P)_{t-1}) = O_{21}(P - P^*)_{t-1}$ which is the one period lagged $(P - P^*)$. Similarly for the second lag.

Data

Data on aggregate developing country agricultural exports, both aggregate and individual commodities (quantities and unit values), were obtained from FAO's AGROSTAT data base. Data on aggregate incomes (in constant dollars) and GNP deflators of developed and developing countries were obtained from the UN National Accounts Statistics. In all our analyses the data pertain to market economies only, both developed and developing, excluding centrally planned economies.

Estimation Results

We first examined the structural equations (1*) and (2*) for *total* agricultural exports of developing countries over the period 1962-1983.

Our preferred estimates for the export demand function were:†

$$X_t = 4.81 + 0.43\,X_{t-1} + 0.365\,Y_t^* - 0.02\,(P_x - P^*)_t - 0.05\,DUM_t \quad \text{(D1)}$$
$$(1.95)\ (2.20) \qquad (3.16) \qquad (0.173) \qquad (1.83)$$

$$R^2 = 0.951,\ \hat{\sigma} = 0.03,\ F = 73.01$$
$$Z_1 = 4.10,\ Z_2 = 4.18$$

and

$$X_t = 2.66 + 0.44\,X_{t-1} + 0.33\,Y_t^* + 0.12\,(P_x - P^*)_{t-1} - 0.060\,DUM_t \quad \text{(D2)}$$
$$(1.15)\ (2.33) \qquad (2.84) \qquad (1.15) \qquad (3.31)$$

$$R^2 = 0.953,\ \hat{\sigma} = 0.029,\ F = 71.69$$
$$Z_1 = 4.59,\ Z_2 = 0.17,\ Z_3 = 1.27$$

The figures in brackets are t statistics and DUM_t is a dummy variable for oil shocks which takes on a value of 1 for 1974, 1975, 1979 and 1980 and a value 0 for all other years. R^2 and F are conventionally reported statistics. $\hat{\sigma}$ refers to the standard error of the equation. Z_1 is the Lagrange multiplier statistic to test the autocorrelation in error. Z_2 is the Lagrange multiplier statistic to test the validity of the instruments used in the simultaneous equation procedure. Z_3 is the Chow stability statistic to test the structural change during the sample period‡.

† Instruments used: Y_t^*, Y_{t-1}^*, X_{t-1}, DUM_t and RP_{t-2}^*.

‡ Under the null hypothesis of no autocorrelation, Z_1 is distributed as χ^2 with 2 degrees of freedom (Engel (1984)). Under the null hypothesis that the error is uncorrelated with the instruments (i.e. no simultaneous equation bias) Z_2 is distributed as χ^2 with degrees of freedom equal to (K - k1) where K is the total number of predetermined variables in equations (1) and (2) and k1 is the number of jointly endogenous *plus* the number of predetermined variables included in the equation. The order condition for identification of the simultaneous equation system is that k1 < K (Hausman (1984)). The other index of statistical adequacy (Z_3), the Chow test (See Maddala (1977)), relates to the stability of parameters over time. To check for structural change that may have occurred during the recent world economic downturn (after 1980) the preferred model was re-estimated for the period 1962-1979. Thus Z_3, the Chow parameter stability statistic is distributed as F(4,20-h) under the null hypothesis of no instability in the equation; h refers to the number of parameters estimated in the preferred equation.

The two estimates for the export supply function were:†

$$X_t = -23.74 + 0.70(S-\bar{S})_{t-1} + 0.05(P_x-P)_{t-2}$$
$$(9.97) \quad (1.54) \qquad (0.51)$$
$$+0.02t - 0.12(D-\bar{D})_t - 0.05\,DUM_t \qquad \text{(S1)}$$
$$(24.00) \quad (0.87) \qquad (3.96)$$

$$R^2 = 0.980, \hat{\sigma} = 0.063, F = 137.00$$

$$Z_1 = 3.66, Z_2 = 4.54, Z_3 = 0.29$$

$$X_t = -24.28 + 0.01X_{t-1} + 0.74(S-\bar{S})_{t-1} + 0.09(P_x-P)_{t-2}$$
$$(6.10) \quad (0.021) \qquad (1.63) \qquad (0.82)$$
$$+0.02t - 0.15(D-\bar{D})_t - 0.06\,DUM_t \qquad \text{(S2)}$$
$$(4.9) \quad (1.12) \qquad (4.02)$$

$$R^2 = 0.981, \hat{\sigma} = 0.060, F = 110.99$$

$$Z_1 = 2.66, Z_2 = 5.72, Z_3 = 0.196$$

The preferred restricted models were those that satisfied three diagnostic tests — an absence of first order autocorrelation, an appropriateness of the instruments used, and no evidence of structural breakdown after 1980 — and were arrived at after testing alternative combinations of lag structures. Only the results of preferred models are presented above; hence they do not include all the variables and lags mentioned in equations (1*) and (2*). A comparison of individual estimates with the unrestricted ADL estimates provides a test for the validity of estimates in the chosen forms of the equations.

Interpretation

Table 1 shows the long-run elasticities from the preferred models as well as unrestricted ADL models. The export demand equations reveal that the income elasticity is well determined and robust to changes in the specification. When the export demand equation was estimated using OLS, the preferred and the unrestricted equations yielded income elasticities equal to 0.56 and 0.57, respectively. These confirm the robustness of the estimates. Although the coefficient of the price elasticity is of wrong sign in two cases, it is statistically insignificant. In a preferred supply equation (S1), all the coefficients have the correct sign, apart from the relative price term. Hence it can be said that much of the variation in export supply is explained by time trend and other non-price factors such as the supply shock term, and the oil dummy.

However, unlike the export demand equation, the preferred export supply equation is not very robust to changes in the specification as revealed by a comparison of elasticity coefficients for preferred and unrestricted equations (Table 1). The trend coefficient is robust; the supply shock term has the same sign but shows a large variation in size; the other two coefficients change sign. All three equations also show that the contribution of the relative price term in explaining export supply variations is very small.

The overall results thus appear mixed. The two clear conclusions which emerge are, first, the low income elasticity of demand for developing country exports, and second, the relatively insignificant role of price as opposed to non-price factors in explaining export supply.

† Instruments used: Y_t^*, Y_{t-1}^*, $(S-\bar{S})_t$, X_{t-2}, $(D-\bar{D})_t$, t, and DUM_t.

The persistently wrong (but insignificantly so) sign of the price elasticity of demand can possibly be explained in the light of the specification errors discussed earlier. Furthermore, the aggregate price elasticity of demand for agricultural exports is likely to be small since possibilities of substitution in demand in response to relative price changes between agricultural and non-agricultural products are limited. An equally important explanation could be the significant levels of non-price-related protectionist barriers in developed country markets facing developing countries' exports in cereals, feedstuffs, etc., which constitute a large proportion of their agricultural exports. In the presence of such quantitative barriers, it is not surprising that relative price effects are poorly measured or estimated.

Table 1 Export Demand and Supply Elasticities

Export Demand	*Income*	*Price*
Unrestricted	0.633	+0.363
Preferred (D1)	0.640	−0.035
Preferred (D2)	0.589	+0.214

Export Supply	*Price*	*Time Trend*	*Domestic Demand Pressure*	*Domestic Supply Shocks*
Unrestricted	−0.001	0.015	0.74	1.47
Preferred (S1)	+0.05	0.02	−0.12	0.70
Preferred (S2)	+0.091	0.02	−0.15	0.75

Source: Authors' computations from equations (D1), (D2), (S1) and (S2).

Export Demand Functions for Individual Commodities

The demand functions were estimated for five individual commodities, i.e., coffee, cocoa, tea, bananas and plantains, which are traditional tropical exports, and for pineapples and tomatoes, two relatively new non-traditional exports. The demand functions for these commodities were specified in the same way as the aggregate demand function, although it is recognised that the commodity markets may not operate exactly the same way in all cases. Export supply functions were not estimated because of the lack of data on prices facing producers of these commodities. The findings are presented in Table 2, and the implied income and price elasticities in Table 3.

Several features of these results are worth noting. First, the results at the disaggregate level are superior to those obtained for total agricultural exports. All the income elasticities are well determined. For 4 out of the 6 commodities the relative price term is of the right sign and statistically significant. Except for tea, where there is evidence of second-order autocorrelation, the preferred models for all commodities meet three diagnostic tests.

Second, most of the parameters are robust when estimated for different time periods (such as 1962-79 and 1962-83) as well as when different estimation procedures are followed. Except for coffee, the OLS estimates and IV estimates are very similar and preferred IV estimates reported in Table 3 are similar to the unrestricted ADL estimates.

Implications

The evidence presented in Table 3 suggests that, for tropical traditional commodities, the income and price elasticities of demand are low and almost

Table 2 Regression Estimates in Demand Equations for Six Agricultural Products (1962-83)

Commodity	Estimation Procedure	Lagged Dependent Variable (X^D) t-1	t-2	Income t	t-1	t-2	Relative Price t	Others (Relative Price of Tea)	Intercept	R^2	$\hat{\sigma}$	F	Z_1	Z_2	Z_3
Coffee	IV					.47	−.27		7.91	.673	.058	17.5	5.09	2.73	.048
						(5.77)	(3.15)		(6.48)						
	OLS					.41	−.18		8.76	.744	.052	24.7	5.37		
						6.96	(4.25)		(9.69)						
	IV					.60	−.31	.14	5.74	.683	.059	11.48	11.9	2.11	
						(4.58)	(3.2)	(1.56)	(2.79)						
Cocoa	IV			.18			−.19		11.25	.362	.064	4.83	5.48	1.11	.73
				(1.64)			(2.48)		(6.79)						
	OLS			.28			−.28		9.64	.673	.059	17.51	4.09		
				(3.2)			(5.8)		(7.06)						
Banana & Plantain	IV					.58	−.40		5.90	.932	.047	116.6	3.56	5.34	1.40
						(11.64)	(4.53)		8.15						
	OLS					.58	−.39		5.89	.933	.047	117.6	3.50		
						(11.8)	(4.74)		(8.16)						
Tea	IV		−.30			.67	.10		6.89	.934	.031	74.82	7.05	1.94	1.72
			(1.31)			(4.86)	(1.59)		(5.38)						
	OLS					.50	.06		5.54	.929	.031	109.92	7.53		
						(12.3)	(1.44)		(8.55)						
Pineapple	IV	.73			.43		−.72		−4.01	.931	.093	72.11	4.56	2.78	.57
		(2.58)			(1.02)		(1.68)		(1.29)						
Tomatoes	IV					1.53	.17		11.72	.893	.126	70.53	7.98	1.70	.99
						(4.39)	(.38)		(2.18)						

Table 3 Demand Elasticities for Selected Commodities

Commodity	*Parameter*	*Preferred Estimates**	*Unrestricted Estimates†*
Coffee	Income	.47	.44
	Price	−.27	−.17
Cocoa	Income	.18	.36
	Price	−.19	−.42
Banana & Plantain	Income	.58	.70
	Price	−.40	−.30
Tea	Income	.52	.54
	Price	.06	.09
Pineapple	Income	1.59	2.16
	Price	−2.67	−.35
Tomatoes	Income	1.63	1.71
	Price	.17	−.26

Source: Computed from Table 2.
* Elasticities computed from preferred IV estimates in Table 2.
† Elasticities computed from unrestricted ADL estimates.

certainly less than unity. Thus a slowdown in the income growth in developed countries will have a proportionately small influence on export performance. Equally, however, the pull of developed countries in expansionary situations is also small.

Even if, for individual developing countries, the price elasticity of export demand may be high, elasticity is low for the developing countries taken together, so that simultaneous action by all or many developing countries in reducing prices, or in increasing supply, results in a movement along an inelastic aggregate demand curve, with damaging repercussions for export revenues. Indeed, the decline in commodity prices during the early 1980s may be due less to the income downturn in the North than to over-expansion of aggregate export supply due to a variety of reasons, including the necessity to boost revenues to service large amounts of outstanding debt. In view of the low price elasticity, this led to a drop in prices and revenues. The conflict between individual and collective action for the promotion of agricultural exports of developing countries needs serious recognition.

Finally, it is worth contrasting the results for traditional and non-traditional commodities. The latter exhibit high income elasticities and one commodity — pineapples — even a high price elasticity of demand. Insofar as it is possible to generalise from this admittedly limited evidence, one lesson seems to be the need for developing countries to rely progressively less on traditional commodities and increasingly to diversify towards non-traditional agricultural exports.

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