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Structural Adjustment and Agricultural Export Response in Latin America

Abstract: Expanding exports has been one of the principal goals of structural adjustment programs aimed at restoring external balance of payments equilibria in many developing countries. This paper analyzes agricultural export response for selected crops in 8 Latin American countries over the period 1961–1990 in an attempt to confirm the export-enhancing effects of structural adjustment. The results show that: (a) commodity and country disaggregation in estimation generates much higher export response elasticities than previously estimated; (b) variations in the real exchange rate have a dominant effect in stimulating export response, compared to commodity price changes; and (c) statistical tests confirm structural change in export response elasticities in over half of the equations estimated. Overall, the evidence suggests that stabilization and adjustment reforms have had a significant though non-uniform effect in stimulating agricultural export expansion in Latin America.

INTRODUCTION

Increasing exports as an intermediate step toward restoring external balance of payments equilibrium has been a central component of most economic stabilization and structural adjustment programs initiated in the 1980s and 1990s. Export promoting policies and programs have been particularly extensive in Latin America, where the largest proportion of adjustment lending has occurred (44 percent of adjustment lending in 1989, for example). Though agriculture's relative contribution to GDP declined in most Latin America countries prior to the 1980s, agriculture has maintained an important role in terms of export and employment generation and in providing 'the lead to the rest of the economy in the process of adjustment and economic recovery' (Chhibber, 1988).

This paper assesses agricultural export performance in response to changes in two key determinants of export supply — exchange rates and producer prices — which were influenced by structural adjustment programs of the 1980s. Export responsiveness is estimated for selected export crops in eight Latin American countries in the period through 1980. In each case, export response is estimated prior to the initiation of structural adjustment programs and for a longer time series incorporating the post-adjustment period. Changes in export responsiveness to price and exchange rate variation under both regimes are tested statistically. The results demonstrate the key role played especially by exchange rate policy in determining export responsiveness, as well as differing country and commodity experiences.

STRUCTURAL ADJUSTMENT AND AGRICULTURE IN LATIN AMERICA

Though experiences differed from country to country, the economic developments of the 1970s and early 1980s which precipitated the economic stabilization and structural adjustment programs of the 1980s are depressingly familiar: the collapse of the Bretton

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Woods Agreement and increased exchange rate variability; OPEC's formation and subsequent oil price shocks in the early and late 1970s; the flood of petro-dollars and increasing debt burdens assumed by many countries in the late 1970s; and finally, increases in real interest rates and threats of default in the late 1970s and early 1980s. The results of these developments are equally familiar: chronic inflation stimulated by oil and commodity price shocks and reinforced by lax or ineffective monetary and fiscal policy; depletion of international currency reserves; increases in debt service payments; and low or negative real economic growth caused by the above factors and exacerbated by the worldwide recession of the early 1980s.

In response to these developments, 13 Latin American countries engaged in economic stabilization programs with the IMF and structural adjustment programs with the World Bank in the period through 1990. Due largely to data constraints (discussed below), 8 of these countries are included in this analysis: Argentina; Bolivia; Brazil; Chile; Colombia; Costa Rica; Ecuador and Mexico. In these 8 countries, IMF loans amounting to 21.6 billion SDR's and structural adjustment loans totalling $9.0 billion were approved in the 1980–90 period (World Bank, 1990). These loans supported a wide variety of macroeconomic and sectoral reforms, including stricter monetary and fiscal policies, public sector reforms, privatization of public enterprizes, tax reforms, subsidy reduction and elimination, and, perhaps most importantly, devaluation of domestic currencies.

The effects of these reforms have varied widely from country to country. In spite of the goal of generating overall economic growth, real per capita GDP increased from 1980 to 1990 in only 2 of the 8 countries, Chile (3.8 percent) and Colombia (6.3 percent) (Table 1). Inflation abated in several countries (Bolivia, Costa Rica, Mexico), but remained at excessive levels in others (Argentina and Brazil, most notably). The terms of trade declined sharply in all 8 countries over the 1980s. Yet, in many countries, the macroeconomic preconditions for improved economic performance were created. Except for Brazil, each of the countries experienced a real devaluation over the late 1980s, making their exports more globally competitive. Export growth, in most cases, responded to these and other economic incentives by expanding at rates well above early 1980s levels (Table 1). Current account balances, in turn, responded in 7 of the 8 countries, registering improved performance by the end of the decade. Other details are provided in Markussen (1993).

Because of the importance of the agricultural sector in employment and GDP in many of these countries and the prominence of agricultural exports among tradable goods, macroeconomic and structural reforms such as currency devaluation have particularly important implications for this sector. In 6 of the 8 adjusting countries, agriculture's proportion of GDP increased over the 1980s. In 4 countries, agriculture's share of total country exports increased, while in the other 4 countries, the proportion of agricultural exports remained high, ranging from 15–20 percent (Brazil) to nearly 60 percent (Costa Rica). Real annual growth in agricultural exports between 1980–82 and 1990–92 averaged 9.1 percent across the eight countries, ranging from 3.6 percent in Brazil to 18.9 percent in Chile (Table 2). Clearly, the performance of agriculture has remained crucial in determining the outcomes of adjustment in both the tradable sector and the overall economy.

Recent Literature on Agricultural Export Response

A number of studies over the past decade have examined export behaviour as it relates to the structural adjustment policies of the 1980s. Hazell, Jaramillo and Williamson (1990) estimate price variability for 15 commodities and 22 countries and find that real exchange rates, domestic marketing arrangements and other government interventions have played a major role in buffering variability of price transmission to producers. They foresee increased export price variability arising from structural adjustment programs impeding the expansion of agricultural exports in many countries. Gersovitz and Paxson (1990) specify the conditions under which export response may differ from production response to output price changes.

Table 1 *Macroeconomic Indicators for Selected Latin American Countries*

	GDP per capita (1987 $)		Average annual inflation (%)		Real Effective Exchange Rate 1985=100
	1980	1990	1980-82	1989-91	1990
Argentina	2990	2170	142.5	2117.2	134
Bolivia	850	600	115.2	16.4	191
Brazil	2000	1820	94.8	1307.3	70
Chile	1580	1640	20.5	22.5	142
Colombia	1110	1180	26.0	28.4	160
Costa Rica	1740	1660	54.9	20.9	126
Ecuador	1310	1080	18.9	50.9	159
Mexico	1920	1750	52.4	22.8	107

	Terms of Trade (Index:1980=100)	Average Annual Growth in Exports (volume)		Current Account balance ($ million)	
	1990	1979-81	1989-91	1980	1990
Argentina	67	1.0	25.0	–4774	1789
Bolivia	74	–1.5	13.0	–6	–194
Brazil	82	19.8	11.1	–12 806	–2983
Chile	84	9.0	11.1	–1971	–790
Colombia	80	0.5	–3.9	–206	391
Costa Rica	70	4.5	4.2	–664	–514
Ecuador	66	–2.1	7.6	–642	–136
Mexico	70	18.1	21.2	–10 750	–5255

Source: ECLAC, *Economic Survey of Latin America*, various years; World Bank, 1992.

Several papers analyze export response under structural adjustment using variations of traditional supply response methodologies, though each of these studies is characterized by significant limitations. Bond (1985) estimates primary commodity export supply as a function of prices, exchange rates, and supply shifters. Results for Western Hemisphere food crops and agricultural raw materials demonstrate negative current period price elasticities of supply and very low one-period lagged supply elasticities (0.07 and 0.03,

respectively). The empirical results provide weak support for the author's claim that 'export supply in developing countries does indeed respond to improved price incentives', though rather more support for the conclusion that 'this evidence lends support to a developing country's use of the exchange rate as a policy tool to improve the trade balance' (p.227). Bond's analysis, though, omits the structural adjustment years of the 1980s.

Balassa (1988) estimates the response of agricultural export/output ratios in 16 sub-Saharan African countries though 1982. Like Bond, he finds that real exchange rates were a significant determinant of export response, particularly so for agricultural exports compared to exports of goods and services. Countries with 'market-oriented economies' are shown to have performed especially well. Belassa's analysis extends only through 1982, however, early in the structural adjustment process, and is confined only to African countries.

Wattleworth (1988) examines the collective effects of simultaneous export expansion among developing countries on selected export markets. He confirms the importance of the real exchange rate in accounting for export response, but uses output supply elasticities as a proxy for export supply elasticities, which he notes are often unavailable.

Finally, Islam and Subramanian (1989) estimate developing country agricultural export response as a function of a number of supply and demand-side variables influencing export behaviour. Their empirical results are mixed, with only variables representing a time trend and a dummy variable for oil price shocks consistently significant. In addition, the mixture of demand and supply-side explanatory variables raises questions as to whether the estimation equations are properly identified, while the time series used (1962–1983) yields few insights relevant to export behaviour under structural adjustment.

ESTIMATING AGRICULTURAL EXPORT RESPONSE FOR LATIN AMERICA

This paper analyzes agricultural export response in 8 Latin American countries in the period through 1990. The central question that is addressed and tested statistically is whether price and exchange rate changes accompanying structural adjustment have resulted in changes in export responsiveness due to the improved economic incentives created for producers and exporters. This hypothesis is tested by estimating export supply response equations for 22 country—commodity combinations, first, for periods prior to structural adjustment (unique to each country), and then, for complete time series extending through 1990. Chow tests are employed in each case to formally test for structural change in the estimated coefficients between the pre-adjustment and entire time series following the standard methodology outlined in Kennedy (1985).

The countries and commodities used in this analysis were chosen based on 3 criteria: first, data availability; second, that the export crops represented major exports of the country in question; and third, on enough time having elapsed since the initiation of structural adjustment for potential effects on exports to be realized. The result was the set of 22 country-commodity combinations given in Table 3. For 17 of these cases, crop exports increased between 1980 and 1990 (Table 2). Five other Latin American countries which had initiated stabilization and adjustment programs in the 1980s (Honduras, Jamaica, Panama, Uruguay, and Venezuela) were excluded.

Table 2 *Exports of Selected Latin American Countries, 1980–82 and 1990–92*

Country	Total Exports) (annual average)		Total Agricultural Exports (annual average)	
	1980–82	1990–92	1980–82	1990–92
Argentina ($ million)	5489	12 188	3771	7054
Maize ('000 tonnes)			957	4329
Soybeans ('000 tonnes)			268	3588
Wheat ('000 tonnes)			021	5807
Bolivia ($ million)	94	828	54	155
Coffee (tonnes)			5777	6069
Brazil ($ million)	14 093	32 841	6027	8553
Cocoa (tonnes)			130 763	95 566
Coffee (tonnes)			832 644	989 994
Soybeans ('000 tonnes)			1167	3265
Chile ($ million)	2715	9251	253	1431
Apples (tonnes)			191 719	374 711
Grapes (tonnes)			89 665	439 715
Peaches (tonnes)			10 587	73 279
Pears (tonnes)			26 402	112 147
Colombia ($ million)	2407	7022	1608	2439
Bananas ('000 tonnes)			766	1374
Coffee (tonnes)			573 734	827 197
Costa Rica ($ million)	637	1625	438	962
Bananas ('000 tonnes)			1022	1587
Cocoa (tonnes)			2068	519
Coffee (tonnes)			87 983	143 276
Ecuador ($ million)	1647	2858	374	891
Bananas ('000 tonnes)			1261	2494
Cocoa (tonnes)			26 217	51 410
Coffee (tonnes)			61 914	85 731
Mexico ($ million)	12 725	27 219	1014	2996
Coffee (tonnes)			159 308	208 378
Cotton (lint; tonnes)			160 037	45 792
Tomatoes (tonnes)			472 101	336 007

Note: Export values are real 1990–92 $.

Data on the dependent variables, annual export volumes, in each estimated equation were from FAO (1992). Data on annual producer prices were obtained from the SIAPA datbase on the International Institute for Cooperation in Agriculture (IICA), and were used in current and one period lagged forms. Exchange rates were calculated using data from the

International Monetary Fund (1990, 1992), based on Edward's (1989) standard definition of the real exchange rate. This calculation adjusts the nominal dollar exchange rate by the ratio of the wholesale price index in the USA to the consumer price index in the domestic economy to account for relative rates of inflation. In the results reported here, price and exchange rate variables were used in composite form as regressors; in other estimates (not shown), they were used singly. Both formats have been employed in the literature. A linear time trend, intercept dummy variables, and slope interaction variables were included as regressors in preliminary estimation equations but did not prove consistently significant. Further details regarding the variables, data, and tests for structural change are contained in Markussen (1993).

Table 3 *Countries, Crops and Years Analyzed*

Argentina	Bolivia	Brazil
Maize (1961–1990)	Coffee (1970–1990)	Cocoa (1966–1990)
Soybeans (1965–1990)		Coffee (1966–1989)
Wheat (1961–1990)		Soybeans (1970–1989)
Chile	Colombia	Costa Rica
Apples (1969–1990)	Bananas (1968–1990)	Bananas (1968–1990)
Grapes (1969–1990)	Coffee (1968–1990)	Cocoa (1968–1990)
Peaches (1968–1990)		Coffee (1968–1990)
Pears (1968–1990)		
Ecuador	Mexico	
Bananas (1968–1990)	Coffee (1968–1990)	
Cocoa (1968–1990)	Cotton (lint) (1968–1990)	
Coffee (1968–1990)	Tomatoes (1968–1990)	

The present analysis addresses a number of the limitations of previous research. First, by estimating the responsiveness of individual export crops in specific countries, the aggregation problem faced by Bond is overcome. Aggregation of crops in estimating export response not only obscures the effects on specific commodities, but can be expected *a priori* to generate a low aggregate elasticity of supply, given the substitution relationships commonly existing among agricultural commodities. (Conversely, as Lele 1992, argues, examining export response gives only one part of the story with respect to adjustment, given the substitution relationships that exist between crops for domestic consumption.) Second, the time series used in each country–commodity combination analyzed here ends in 1990, thus incorporating up to a decade's experience with structural adjustment, depending on the country. Finally, the analysis generates estimates of export supply response to changes in solely supply-side variables (prices and exchange rates), thus addressing the need for export supply elasticities identified by Wattleworth (1988) and avoiding the potential identification problems raised in the study of Islam and Subramanian.

Table 4 *Regression Results Using Composite Variable (Price and Exchange Rate)*

Country, and Initial Year of Adjustment	Crop	Pre-Adjustment			Whole Period			F-Statistic
		β	s	ε	β	s	ε	
Argentina (1983)	Maize	0.203	0.299	0.203	0.059	0.186	0.059	1.198
	Soybeans 3.176	2.038	3.176	3.015**	1.376	3.015	0.930	
	Wheat$_1$	−148.077	1803.930	−0.017	2249.440	1970.980	0.238	4.221***
Bolivia (1980)	Coffee$_1$	229.480	182.663	0.276	309.186	192.082	0.329	2.834
Brazil (1983)	Cocoa	0.198***	0.068	0.198	0.201***	0.051	0.201	0.362
	Coffee	−0.289***	0.045	0.289	−0.192***	0.048	−0.192	4.360***
	Soybeans	1.796***	0.561	1.796	1.734***	0.444	1.734	0.814
Chile (1985)	Apples$_1$	6.724***	1.716	0.780	10.854***	1.443	1.030	6.108***
	Grapes$_1$	2.044***	0.645	0.840	4.115***	0.818	1.090	19.999***
	Peaches$_1$	0.317***	0.062	0.815	0.802***	0.147	1.224	23.071***
	Pears$_1$	1.102***	0.128	0.900	1.626***	0.285	1.093	29.807***
Colombia (1985)	Bananas$_1$	104.746***	11.014	1.153	45.823***	8.219	0.602	6.359***
	Coffee$_1$	4.122	4.128	0.086	8.602**	3.282	0.200	3.378**
Costa Rica (1985)	Bananas$_1$	80.463	176.629	0.092	57.173	51.651	0.109	1.814
	Cocoa$_1$	−0.120	0.100	−0.161	−0.169**	0.079	−0.435	0.573
	Coffee$_1$	3.810	3.456	0.073	7.017*	3.536	0.166	6.769***
Ecuador (1986)	Bananas$_1$	−20.943	39.289	−0.044	88.345***	22.836	0.250	3.823***
	Cocoa	−0.412**	0.419	−0.412	−0.116	0.190	−0.116	4.759***
	Coffee$_1$	6.121***	1.607	0.394	7.306	1.158	0.503	1.534
Mexico (1983)	Coffee$_1$	3.560	2.390	0.127	4.568	2.757	0.163	5.360***
	Cotton	−0.583***	0.153	−0.583	−0.888***	0.200	−0.888	4.877***
	Tomatoes$_1$	29.973***	7.783	0.749	9.481**	3.501	0.271	1.595

Notes: *, **, *** denote statistical significance at 10 percent, 5 percent and 1 percent levels, respectively. $_1$ linear regression; all others in double logarithmic form.

Source: Markussen, 1993.

EMPIRICAL RESULTS

Export response equations were estimated for each commodity–country combination and, in each case, for two time periods: 1961 (or another proximate initial year) through the year prior to the initiation of stabilization and or adjustment programs, and then for the entire time series through 1990. Equations were estimated by OLS, adjusted for autocorrelation wherever necessary. A seemingly unrelated regression (SUR) approach was not followed due to the different years in which adjustment programs were initiated across countries, and thus the different time series estimated.

Due to the number of equations estimated, the full set of regression estimates is not reported here, but is discussed in detail in Markussen, 1993. Table 4 summarizes the estimated coefficients, standard errors, and elasticities derived using the composite price and exchange rate variable specification, similar to Bond and Wattleworth. The estimates, however, are generally much stronger. Several negatively signed elasticities are estimated, though these are mostly for perennials, whose price response behaviour is considerably complicated than that for annual crops. However, it is clear that disaggregation of agricultural exports at the individual crop level generally results in export supply elasticities which are higher, in some cases much higher, than the low elasticities reported by Bond. In addition, in 15 of 22 cases, the export elasticity increases in the sample period including adjustment years, compared to the pre-adjustment period. In 11 of those cases, the change is statistically significant using a Chow test.

When variables representing exchange rates and prices are included separately as regressors (not shown), the econometric results are somewhat weaker and include more negatively signed coefficients (particularly for the price variables for perennials). Two conclusions are evident, however. First, the responsiveness of exports to changes in the real exchange rate, particularly for the longer sample period incorporating the post-adjustment years, tends to dominate responsiveness to price changes. Second, Chow tests confirm structural change in fewer cases, in part reflecting the more limited explanatory ability of this specification compared to use of the composite price-exchange rate variable.

CONCLUSIONS

This analysis builds on previous research by estimating agricultural export response under structural adjustment for 8 Latin American countries, disaggregated at individual country and commodity levels, for years extending through 1990. The results permit several conclusions. First, disaggregation at the country/commodity level results in much higher export response elasticities — with respect to both price and exchange rates — than those previously estimated (e.g. Bond). Second, real exchange rate variation is shown to dominate variations in commodity prices in determining export supply response. There appear to be significant returns to macroeconomic reforms which include currency devaluation and increase economic incentives for producers and exporters. Third, structural change in export responsiveness after the initiation of adjustment is confirmed in well over half the cases in which a composite variable (incorporating price and real exchange rate effects) is the primary explanatory variable.

These results suggest that exchange rate and price reforms under structural adjustment are, in many cases, having their intended effects in stimulating agricultural exports. One qualification to this conclusion is that since many countries had previously experienced

seriously overvalued exchange rates, the effects of initial large-scale currency devaluations in stimulating exports may overstate the effects to be expected from subsequent or continuing devaluations.

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DISCUSSION OPENING — Paulo F. Cidade de Araujo *(University of Sao Paulo, Brazil)*

Markussen and Lee undertake the important, challenging and worthwhile task of investigating the effect of structural macroeconomic adjustment processes on the agricultural exports of selected crops and countries in Latin America. Their main tool is a regression analysis of exports against a variable constructed from the exchange rate and producer prices over the period from the 1960s to 1990. Their statistical results seem to indicate that there exists a mixed result, at best. Roughly half of the parameters estimated are non-significant and some are significant in the 'wrong' direction. The same applies to the test of structural change.

Unfortunately, the theoretical and empirical models used are not presented in the paper. This precludes a deeper analysis of specific issues and I would like to keep this discussion

on general problems only. Two main questions arise from the paper. First, does it indicate that the export of agricultural commodities in Latin American countries is not responsive to economic variables? Second, do the macroeconomic adjustment plans undertaken by several Latin American countries have a positive impact on the agricultural exports? I would like to claim that these are complex questions and that the study presented gives a partial view of the whole picture. I will limit my consideration to two main points.

First, it seems to me that exports of a given crop in a given country are determined by several economic and exogenous variables which cannot be summarized by the exchange rate and the producer prices. Ceteris paribus, it is reasonable that exports do respond to exchange rate devaluation. However, their response to producer prices is less clear. Instead, export/international prices of that commodity seems to be more appropriate. And, if that country is dependent on the international markets in terms of agricultural inputs then the exchange rate net effect is not that clear, exante (however, the above price effect is!). Adding their effect in a composed variable may make the analysis difficult.

If the crop considered faces an important domestic market, then the effect of exchange rate and international prices may be influenced by the performance of the country's economy. This is an important issue when dealing with adjustment processes. They usually have strong effects on the macroeconomic environment which influences the domestic demand.

In the specific case of perennials, it is well known that due to their biological characteristics, the output does not respond significantly in the short run. In these cases, it seems difficult to believe that the model used can capture the real effect of exchange rate and prices on the exports. More than half of the cases are of this type of crop.

Second, there are several exogenous variables that affect the incentives for exporting in Latin American countries. In the specific case of Brazil, exports of the crops considered (coffee, cocoa and soybean) have been significantly controlled by the government. Export taxes and quotas have been imposed and altered quite considerably in the period analyzed. Many of these interventions were implemented in response to (or as part of) changes in the macroeconomic environment!

More recently, there seems to exist a trend of processing these commodities in the producer countries and exporting processed products and byproducts. This is the case of coffee and soybean in Brazil. It seems reasonable to suspect that the effect of them may explain part of the difficulties faced by the researchers in this area.

Coming from one of the countries considered in the study, I understand how hard it is to overcome difficulties related to good data and reliable information regarding export procedures and government policies. However, I'd like to praise their effort and encourage both authors in further deepening their study.

GENERAL DISCUSSION — Ian Jarratt (*Queensland Department of Primary Industries, Australia*)

The Kennedy, von Witzke and Roe paper was considered by the discussion opener to be very relevant because the effects of the GATT agreement will be significantly influenced by exchange rates. The use of 1990 data was questioned. It was agreed that 1994 weights should be used to reflect changes in policies. The PPF will change over time. John Freebairn questioned the exogenous exchange rate assumption but it was defended as the grounds of the likely limited influence of agricultural exchange rates.

The discussant for Burfisher, Robinson and Theirfelder's paper considered that the assumptions for the Stolper–Samuelson theory were not met by NAFTA and the conditions in the USA and Mexico. It was emphasized that NAFTA does not provide for labour mobility. The main factor influencing this in part of NAFTA will be capital mobility and this should be the main focus of analysis.

The opener for Lee and Markussen's paper noted that the results were mixed because the study deals only with some of the influences on export volumes and there are major data availability problems. Issues raised included: the influence of exchange rates on farm input prices, the importance of domestic demand for some commodities, the effects of exogenous variables such as export taxes/quotas and policies to encourage processed exports. The special situation of perennial and storable crops was also highlighted as a problem for modellers. However, the study was considered useful. William Amponsah also contributed to the discussion.