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Price elasticity *of Central American* agricultural exports

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The economies of the Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua) are largely dependent on four major traditional export products: bananas, coffee, cotton and sugar. The share of these products in total Central American exports, which is still close to 50%, only started to decline in the late 1980s. This paper explores the determinants of these four products' production trends, and the importance of non-price-related economic and social factors and of man-made and natural disruptions is fully acknowledged. However, an attempt is made to use the ECLAC-Mexico database to estimate the supply price elasticities for the four products over the 1960-1990 period, testing simplified linear regression models which include only output prices as the relevant explanatory variables. No significant statistical relations could be found between production and price in the cases of bananas and sugar, while cotton production appears to react to a certain extent only to year-to-year price changes. Supply elasticities could be calculated only for coffee, and they turned out to be quite low. The paper therefore concludes that the potential for export expansion in small, poor countries by means of orthodox policies affecting mainly macroeconomic prices should not be overestimated.

I

The role of traditional agricultural exports in the Central American economies

The Central American countries –Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua– are still heavily dependent on traditional agricultural exports, with bananas, coffee, cotton and sugar representing on average 57% of total exports for the region as a whole in the period 1980-1989. In no country was the figure less than 50%, and it was over 60% in Honduras and Nicaragua. The relative weight of the four products started to decline slowly only in the late 1980s, and for the first time in 1991 it was below 50% for the region as a whole (see table 1).

Traditional export products continue to be crucial to the Central American economies in spite of the fact that they constitute no exception to the general economic crisis which has been affecting the region since the early 1980s, owing both to unfavourable trends in international prices (with the exception of bananas) and to a lack of technical progress in production. During 1980-1989 the dollar value of total Central American exports declined on average at a yearly rate of 1.8%, and that of the four major traditional exports at 2.3% (see ECLAC-Mexico 1992b, table 30). The crisis was particularly acute for cotton, which all but disappeared as a source of foreign exchange, while exports of bananas were the only ones to grow during the decade, at an average rate of 4.4% in value. Cotton production declined precipitously, at an average rate of 12.8% per year, while that of the other products increased only marginally (0.8%, 1.2% and 1.8% for coffee, bananas and sugar cane respectively). In Nicaragua all four products experienced a decline in production, while only in Guatemala did the overall production volume increase substantially (see table 2).

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¹ These data come from the ECLAC database and preliminary production estimates for 1991, based on official figures. For further statistical evidence on the production trends of traditional agricultural exports in Central America, see ECLAC-Mexico (1992b).

TABLE 1
Central America: Relative weight of the four
traditional agricultural exports in total exports
(Percentages)

| | 1970- 1979 | 1980- 1989 | 1990 | 1991 |
|---|---------------|---------------|------|------|
| Bananas | | | | |
| Costa Rica | 23 | 23 | 23 | 26 |
| El Salvador ^a | ... | ... | ... | ... |
| Guatemala | 3 | 6 | 7 | 7 |
| Honduras | 29 | 33 | 45 | 43 |
| Nicaragua | 1 | 5 | 8 | 11 |
| <i>Central America as a whole</i> | 9 | 15 | 19 | 19 |
| Coffee | | | | |
| Costa Rica | 31 | 28 | 18 | 18 |
| El Salvador | 45 | 59 | 45 | 37 |
| Guatemala | 36 | 34 | 27 | 23 |
| Honduras | 25 | 24 | 22 | 20 |
| Nicaragua | 22 | 34 | 21 | 14 |
| <i>Central America as a whole</i> | 33 | 35 | 25 | 22 |
| Cotton | | | | |
| Costa Rica | ... | ... | ... | ... |
| El Salvador | 9 | 4 | ... | ... |
| Guatemala | 13 | 6 | 2 | 2 |
| Honduras | 1 | 1 | ... | ... |
| Nicaragua | 24 | 21 | 11 | 18 |
| <i>Central America as a whole</i> | 9 | 4 | 1 | 1 |
| Sugar | | | | |
| Costa Rica | 4 | 2 | 2 | 2 |
| El Salvador | 4 | 3 | 3 | 6 |
| Guatemala | 8 | 6 | 13 | 12 |
| Honduras | 1 | 3 | 1 | 2 |
| Nicaragua | 5 | 5 | 12 | 12 |
| <i>Central America as a whole</i> | 5 | 4 | 6 | 6 |
| Traditional agricultural export products | | | | |
| Costa Rica | 56 | 52 | 43 | 45 |
| El Salvador | 58 | 66 | 48 | 44 |
| Guatemala | 59 | 52 | 50 | 44 |
| Honduras | 55 | 61 | 69 | 64 |
| Nicaragua | 53 | 65 | 52 | 55 |
| <i>Central America as a whole</i> | 57 | 57 | 51 | 49 |

Source: ECLAC-Mexico, 1992b, table 30.

^a Three points (...) indicate a relative weight of less than 1%.

TABLE 2

Central America: Growth rates of production and exports of bananas, coffee, cotton and sugar ^a
(Percentages)

| | Production | | | | Exports | | | |
|-----------------------------------|------------|-----------|-------|-------|-----------|-----------|-------|-------|
| | 1970-1979 | 1980-1989 | 1990 | 1991 | 1970-1979 | 1980-1989 | 1990 | 1991 |
| Bananas | | | | | | | | |
| Costa Rica | 2.1 | 3.5 | 8.1 | 5.6 | 12.3 | 3.7 | 13.9 | 20.7 |
| El Salvador | ... | ... | ... | ... | ... | ... | ... | ... |
| Guatemala | 3.3 | -1.2 | 4.0 | 1.7 | 3.9 | 7.5 | -1.0 | -7.1 |
| Honduras | 1.8 | -0.2 | -4.2 | -7.0 | 12.1 | 4.0 | 4.2 | -9.1 |
| Nicaragua | 20.5 | -2.1 | 7.4 | 8.9 | 41.0 | 9.6 | 34.5 | 5.9 |
| <i>Central America as a whole</i> | 2.5 | 1.2 | 3.2 | 1.1 | 11.9 | 4.4 | 8.1 | 3.5 |
| Coffee | | | | | | | | |
| Costa Rica | 2.3 | 3.6 | 13.1 | -6.1 | 17.6 | 1.6 | -14.3 | 8.5 |
| El Salvador | 3.7 | -1.5 | -7.6 | -1.6 | 22.2 | -9.3 | 1.6 | -13.5 |
| Guatemala | 3.0 | 1.0 | 4.8 | -2.5 | 17.6 | -2.2 | -16.8 | -11.1 |
| Honduras | 8.9 | 3.9 | 14.9 | -11.5 | 25.2 | -0.9 | -5.2 | -14.3 |
| Nicaragua | 4.0 | -2.9 | -35.5 | 45.6 | 19.5 | 1.0 | -20.8 | -48.1 |
| <i>Central America as a whole</i> | 3.8 | 0.8 | ... | -2.7 | 20.1 | -3.8 | -10.8 | -10.2 |
| Cotton | | | | | | | | |
| Costa Rica | 16.7 | 20.4 | ... | -50.9 | 2.5 | ... | ... | ... |
| El Salvador | 2.4 | -19.9 | -24.1 | -15.0 | 15.9 | -40.4 | 62.5 | 23.1 |
| Guatemala | 11.3 | -11.8 | -8.0 | 8.8 | 24.6 | -18.8 | -9.7 | -12.2 |
| Honduras | 17.7 | -15.6 | -1.5 | -64.7 | 29.7 | -25.1 | ... | ... |
| Nicaragua | -14.1 | -11.7 | 20.6 | -5.7 | 16.5 | 1.0 | 12.9 | 28.9 |
| <i>Central America as a whole</i> | 2.6 | -12.8 | 0.5 | -0.3 | 19.6 | -15.9 | 1.7 | 12.7 |
| Sugar | | | | | | | | |
| Costa Rica | 2.3 | -1.5 | 11.1 | 7.9 | 17.1 | -10.3 | 69.9 | 17.3 |
| El Salvador | 8.6 | 0.6 | 21.9 | 13.5 | 16.1 | 1.3 | 34.4 | 72.9 |
| Guatemala | 10.0 | 5.4 | 12.5 | 4.7 | 21.6 | 3.2 | 66.0 | -7.6 |
| Honduras | 7.1 | -0.8 | 8.8 | 8.1 | 30.6 | -10.6 | 11.8 | 22.8 |
| Nicaragua | 1.4 | -0.8 | 16.8 | -3.4 | 8.0 | 4.0 | 31.6 | -19.0 |
| <i>Central America as a whole</i> | 6.1 | 1.8 | 13.7 | 5.9 | 17.2 | -0.7 | 53.8 | 1.2 |

Source: ECLAC-Mexico, 1992b, tables 21 and 30.

^a Growth rates of exports refer to their value in current dollars.

^b Three points (...) indicate that growth rates are not applicable because levels of production and exports were zero or insignificant.

II

The relevance of non-price factors

The ECLAC Subregional Headquarters in Mexico recently carried out a study on the situation and prospects of traditional agricultural exports in Central America (see ECLAC-Mexico, 1992b). The study focused, among other topics, on the evolution of production and its main determinants.

Production changes were caused by a number of economic and non-economic factors, many of which are not quantifiable or even comparable with the others. Military conflicts disrupted economic life in rural areas for long periods of time in El Salvador and Nicaragua and, to a lesser extent, in Guatemala. Weather conditions affected production in various ways which cannot be explained on the basis of rainfall statistics nor the existing incomplete historical information on the frequent natural disasters.

Moreover, several other social and economic non-price factors affected production trends as well. The effective availability of credit and the controls on its utilization, more than interest rates, determined to a large extent farmers' ability and willingness to

carry out the various activities which have to be performed in the course of the cultivation cycle and to engage in investment aimed at increasing their productive capacity. Ill-conceived reforms in trade, fiscal and market arrangements, as well as other legal, physical and infrastructural constraints on internal transport and trade, limited the market value and liquidity of export crops and hence the incentives to produce them. The availability of labour and the supply of basic manufactured products in many rural areas were severely curtailed by the military conflicts, reducing the real purchasing power of farmers' monetary balances and thus production incentives.² Uncertainty on property rights contributed in some countries to discourage investments in new productive facilities and even in the maintenance of existing ones.

Man-made ecological disruptions, the scope of which cannot be adequately measured, also played a role, the most serious of them being the long-term fertility loss caused by the excessive use of pesticides and other chemicals in cotton cultivation.

III

A simplified model

Notwithstanding the recognized importance of non-price factors, an effort was made to use information from the ECLAC-Mexico data base, covering the 1960-1990 period, to test the very general hypothesis that there might be a positive correlation between producer prices and production levels.

A number of studies have been carried out since the late 1940s on price responsiveness in agriculture, with particular reference to smallholders' behaviour and to the African continent. For instance, positive but moderate supply elasticities were found by Maitha (1969) and Ady (1968) for coffee, in Kenya and Uganda respectively, and by Olayide (1972) for cotton in Nigeria. The results of these and several other studies—many of which failed to establish significant correlations between production and prices—were commented by

Helleiner (1975), who concluded that, while they helped to disprove the myth of generalized "irrational" or "non-economic" behaviour on the part of smallholders, the findings also demonstrated the limited justification for focusing exclusively on producer prices, as well as the complexity of farmers' decision-making patterns. More recently, the theoretical and policy-oriented debate has continued, fed by diverging interpretations of new empirical findings. Balassa (1990), Berg (1989) and Bond (1983), among many others, have emphasized the

² In many rural areas in Nicaragua, for instance, during most of the last decade, rationing of basic products, internal trade disruptions due to the armed conflicts and hyperinflation dramatically reduced small farmers' incentives to increase their monetary incomes.

importance of farmers' supply response to prices even in very traditional contexts. On the other hand, Helleiner, Lele, Lipton and Mellor are among those who argue against over-reliance on price policies, while advocating comprehensive, long-term agricultural and export-enhancing strategies (see, for instance, Gbetibouo, Lele and van de Walle, 1989; Lipton, 1987; and Mellor, 1990). The latter's position appears to have been strengthened by most of the evidence which became available in the 1980s, as recognized for instance by the World Bank (1990).

In the case of traditional export products in Central America, as well as in other studies of the same kind, a complete model should have included the cost of inputs and –when appropriate– the prices of competing crops, as the standard micro-foundation of price-responsiveness is that farmers engaged in the production of export-oriented crops seek to maximize profits against the background of the existing production constraints.³ This was not possible, however, due to the limited coverage of the available data,

which do not include complete series for the prices of inputs and of alternative outputs which might compete with the four traditional agricultural products for the use of the land.⁴ As a matter of fact, the data base does include an aggregated index of the price of grains, which can compete with cotton for the use of flat, irrigated lands; however, preliminary attempts to use grain prices as explanatory variables in the cotton models showed that their influence, though of the right sign, was not statistically significant. As far as input prices are concerned, the limited data available for the 1980s show a strong upward trend (see table 3) which certainly played a major role in discouraging production, especially in the case of cotton, the most input-intensive of the four traditional crops.

Taking into account the incomplete availability of data, we decided to test very simplified linear regression models, which include only product prices as the relevant explanatory variables, whose influence on production can be modified in some cases by exchange rate variations or civil strife.

TABLE 3

Central America: indexes of input costs in four Central American countries^a

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|--------------|------|------|------|------|------|------|------|------|------|------|------|
| Costa Rica | | | | | | | | | | | |
| Fertilizers | ... | ... | 100 | 84 | 107 | 129 | 124 | 122 | 133 | 133 | 138 |
| Herbicides | ... | ... | 100 | 77 | 120 | 138 | 158 | 374 | 157 | 172 | 195 |
| Insecticides | ... | ... | 100 | 91 | 105 | 131 | 143 | 145 | 176 | 195 | 216 |
| El Salvador | | | | | | | | | | | |
| Fertilizers | 100 | 121 | 130 | 103 | 121 | 105 | 183 | 171 | 161 | 169 | 184 |
| Guatemala | | | | | | | | | | | |
| Fertilizers | ... | ... | ... | ... | 100 | 122 | 149 | 168 | 188 | 195 | 202 |
| Pesticides | ... | ... | ... | ... | 100 | 122 | 150 | 177 | 272 | 255 | 238 |
| Honduras | | | | | | | | | | | |
| Insecticides | 100 | 115 | 132 | 146 | 144 | 148 | 149 | 149 | 157 | 151 | 271 |
| Herbicides | 100 | 136 | 133 | 139 | 135 | 127 | 129 | 124 | 127 | 171 | 286 |
| Fertilizers | 100 | 119 | 121 | 122 | 107 | 101 | 99 | 91 | 92 | 115 | 190 |

Source: ECLAC-Mexico, 1992b, table 22.

^a The price indexes for the product groups reported in this table are simple averages of the price indexes for single products.

³ As is well known, the validity of the profit maximization assumption itself is limited by a number of factors, among which the following may be mentioned: the prevalence of incomplete and asymmetric information, contributing to complex and non-homogeneous expectation-building mechanisms on the part of different categories of producers; the possibility that small farmers may adopt a partial subsistence orientation, leading to

zero or below-market evaluation of the price of family labour; and the cultural or prestige-oriented attachment to traditional crops on the part of wealthy landowners.

⁴ An example is constituted by the price of cattle, which (together with expectations on the availability of export market outlets) can be relevant for investment decisions affecting coffee production.

IV

Structural differences among the four traditional export products

The results confirmed the *a priori* expectations. It proved impossible with reasonably simple models to obtain statistically significant econometric correlations between prices and production for bananas and sugar in any country. This negative result was to be expected for these two products, because their nominal prices, both in domestic and international markets, constitute wholly inadequate profitability indicators.

As is well known, in the banana business profitability and production decisions are essentially dependent on the strategies of a few transnational corporations, which effectively control world markets all the way from the plantation to the distribution networks in the industrialized countries.⁵ It is logical to assume that, in a collusive or oligopolistically competitive fashion, the corporations fix international prices according to their perception of demand trends in the major markets, while they see farmgate prices on plantations as little more than internal accounting prices, so that producer prices and production targets for individual banana-growers are also determined by the transnational corporations. National producers in some Latin American countries have created independent trade channels in a few cases, but they control too small a share of the world market to avoid acting as price takers too. Furthermore, although to a lesser extent than for other traditional agricultural products, industrialized countries' discriminatory import and trade policies also help to complicate the relationship between the various prices prevailing in Europe, the United States and other developed areas and producers' expectations and behaviour in Central and South America, Africa and Asia.⁶

This latter factor is considerably stronger in the case of sugar. World markets are fragmented and distorted by government interventions on the part of the main developed countries, which, besides protecting very heavily their own growers and refiners, discriminate unilaterally among sugar exporters from the developing world by means of national quotas and arbitrary purchasing prices.⁷

Moreover, the technical features of the banana and sugar industries are such that their annual production levels are determined mainly by large infrastructural investments carried out in the past in a discrete fashion and for strategic long-term purposes.⁸ This constitutes a further rigidity factor and makes it even more difficult to explore econometrically the relationship between prices and production.

On the other hand, in the cases of coffee and of cotton, production and trading activities are not vertically integrated, at least in Central America. Although large landowners traditionally play a very important role, a significant share of production is supplied by small and medium farmers, especially in the case of coffee. Moreover, even the large coffee and cotton producers are mostly Central American nationals and act as price takers when selling to the world markets, which are controlled by transnational trading corporations based in the developed countries.⁹

Statistically significant results, consistent with *a priori* knowledge of their production and marketing features, were obtained in most Central American countries for coffee and in Guatemala and El Salvador for cotton.

⁵ Moreover, during the last decade this oligopolistic situation has been very unstable, with frequent takeovers, entries and exits from the market adding a further element of instability to the relationship between production and prices.

⁶ See, for instance, Ellis (1984), López (1986), U.N.-ECOSOC (1989), Martínez Cuenca (1991), OECD (1991) and UNCTAD (1992).

⁷ See, for instance, UNCTAD (1990, 1992), ECLAC-Mexico (1992a), Viatte and Cahill (1991) and Davenport (1988).

⁸ See, for instance, Brown (1987), López (1986) and U.N.-ECOSOC (1989).

⁹ See, for instance, UNCTAD (1992).

V

Empirical analysis¹⁰

1. Coffee

In principle, prices should affect coffee production through their influence on plant sowing and renewal decisions, with a 5-6 year cycle, and on pruning, fertilization and other annual activities.¹¹ Actually, however, no statistically significant relation could be found between production and prices when the latter were lagged by 5 or 6 years. This negative result might suggest (apart from the inadequacy of the data base) that major investments in coffee plantations depend on economic –and possibly social– factors different from the price of the grain.

On the other hand, in all countries but Nicaragua, satisfactory results were found using as explanatory variables the prices lagged by one year in logarithmic regressions which also included one or two lagged endogenous terms. For Costa Rica, Guatemala and Honduras domestic (producer) prices in dollars¹² were used as explanatory variables, while for El Salvador the best fit was obtained with the world price and the exchange rate as two separate explanatory variables.¹³ The exchange rate coefficient has the expected (negative) sign, indicating in principle a positive effect of devaluations on coffee production.

¹⁰ Only the main results of the study are given in this section.

¹¹ At the end of the production year, all past investment decisions are sunk costs, and coffee producers generally try to carry out harvesting activities in full even under very adverse market conditions. As harvesting costs constitute the lion's share of annual production costs in a normal year, the short-term responsiveness of production to prices is correspondingly diminished. However, international prices are currently so depressed that it is quite possible that, especially in remote mountainous areas, harvesting costs might exceed on-farm selling prices. According to preliminary reports, this has actually happened in various Central American countries with the 1991/92 coffee crop.

¹² The implicit assumption is that producers, instead of focusing on the amount of local currency they receive, see the dollar value of their earnings as the measure of their real purchasing power. This behaviour may be due to their interest in purchasing investment or consumer goods and services which can only be bought with hard currency (inside or outside the country), and/or to their habit of anticipating the inflationary outcomes of devaluations.

The short and long-term elasticities of coffee production with respect to price –and, in the case of El Salvador, with respect to the exchange rate too– are presented in table 4. Short-term elasticities are low, suggesting that policy measures aimed at increasing the producer price in real terms –for instance, through subsidies, lower net taxation, multiple exchange rates or even overall devaluation– in order to promote production growth would have positive, but limited effects.¹⁴ As far as long-term elasticities are concerned, they are presented mainly for the sake of the formal completeness of statistical information. Actually, their informative value is quite modest, because the existence of a positive correlation between production and price could be proved only in the short term.

TABLE 4
Central America (four countries): Elasticities of coffee production with respect to prices^a and exchange rates

| | Price | | Exchange rate | |
|-------------|------------|-----------|---------------|-----------|
| | Short term | Long term | Short term | Long term |
| El Salvador | 0.1386 | 0.2014 | -0.1908 | -0.2886 |
| Guatemala | 0.1513 | 0.3721 | | |
| Costa Rica | 0.0779 | 0.7853 | | |
| Honduras | 0.1931 | 0.8915 | | |

^a Price elasticities refer to the domestic producer price in dollars for Costa Rica, Guatemala and Honduras, and to the international price for El Salvador.

¹³ This regression specification, however, shows a low R^2 (0.633). Alternative specifications including a dummy variable (WAR) were also tried for the years 1980-1990. These regressions did not perform well, and the coefficients and t-ratios of the dummy variable were extremely low. This negative result suggests that the war did not significantly affect coffee production in the 1980s. In contrast, the WAR dummy proved significant in the case of cotton production.

¹⁴ Of course, this observation is only valid when market conditions are approximately "normal". In the present situation, with international coffee prices so low that many producers are actually experiencing net losses, government subsidies can be considered as a necessity in order to avoid a general collapse of the sector.

2. Cotton

Acceptable results for cotton were found only in the cases of El Salvador and Guatemala, using simple dynamic models where the (short-term) production growth rate is regressed on the (short-term) rate of growth of prices.

In reality, general dynamic regressions with the level of production on the left side and the lagged values of production and prices on the right side – as in the case of coffee – were run in the first place, and their results pointed toward a specification in first difference. The model was therefore modified in order to allow an estimate of the correlation between the growth rates of the variables.

The original one-year-lagged model was $P = f(P_{t-1}, p_t, p_{t-1})$, which could be expressed by the following log-linear equation:

$$(1) \quad \log(P) = C + a \log(P_{t-1}) + b_1 \log(p_t) + b_2 \log(p_{t-1}),$$

where

P = Production

p = Price.

Introducing the restriction $b_1 = -b_2 = b$ and subtracting $\log(P_{t-1})$ from both sides, we get the more restricted model:

$$(2) \quad \log(P) - \log(P_{t-1}) = C + (a - 1) \log(P_{t-1}) + b [\log(p_t) - \log(p_{t-1})],$$

or

$$(3) \quad \dot{P} = C + (a - 1) \log(P_{t-1}) + b \dot{p}$$

where \dot{P} and \dot{p} are growth rates.

Equation (2) could be estimated for Guatemala and El Salvador, adding the dummy variable WAR in the latter case (with value 1 in the period 1980-1990 and 0 in the other years). *t*-ratios for the price variable VARPRINAL and test statistics are satisfactory, although R^2 statistics are low (just over 0.5 for Guatemala and below 0.4 for El Salvador), reflecting the limited role of prices in explaining the evolution of production.

The coefficients of the variable VARPRINAL ($\log(p_t) - \log(p_{t-1})$), which can be interpreted as short-term elasticities of the growth rates of production

with respect to the growth rates of producer prices, are 0.4635 for El Salvador and 0.7556 for Guatemala, and they appear to suggest a strong short-term positive correlation between price changes and sowing decisions.

A possible explanation of producers' behaviour is that, in contrast to coffee plantations, the land suitable for cotton cultivation is flat and is also suitable for other crops, such as grains. Producers must decide every year if they are going to cultivate cotton – an option which implies a substantial short-term investment – or an alternative crop. Thus, year-to-year cotton price changes might significantly affect production in the short term.¹⁵

Coefficients and *t*-ratios for the lagged endogenous variable LPROAR (-1), which can be interpreted as reflecting the influence of long-term factors on production variations, were high and significant in the case of Guatemala but low and insignificant in the case of El Salvador. To check the hypothesis that long-term economic factors not related to producer prices have significantly different effects on cotton production in Guatemala and El Salvador, control regressions were also run for both countries dropping the variable LPROAR (-1). The regression fit, compared to the base case, worsened dramatically in the case of Guatemala, but only marginally in that of El Salvador. These results appear to indicate that the lack of political stability in El Salvador helped to restrict the behaviour of producers to the very short term, while their counterparts in Guatemala were able to plan their production strategies better, at least to a certain extent.

Finally, it may be noted that for El Salvador, the dummy variable WAR is significant and has a high negative coefficient (-0.33), reflecting the disruptive effect of the war on cotton production.

¹⁵ This explanation is also supported by producers' practical experience, as commented by Alfredo Gil Spillari of the Guatemalan National Cotton Council at a seminar on the current situation and future prospects of traditional agricultural export products, held at ECLAC-Mexico on 10-11 December 1992. Such an argument does not rule out the existence of a positive correlation between production and prices in the long run, which might be reflected in the coefficients of the lagged endogenous variable and in the explanatory power of the regressions, together with the influence of other variables affecting the evolution of production. As a matter of fact, the value of R^2 , though acceptable, is lower than 0.8 in the case of Guatemala. For El Salvador, R^2 is higher, but the values of Durbin's *h* and Ramsey's RESET test statistics are high and only marginally acceptable, suggesting possible autocorrelation and mis-specification problems.

VI

Summary and conclusions

This exercise shows that, in the case of traditional agricultural exports in Central America, the response of production to price stimuli is not very important, and in some cases could not be statistically confirmed.

These results invite caution in assessing the merits of standard adjustment-cum-liberalization programmes in small, poor countries with a traditional, rigid and undiversified export structure, as market-induced shifts in production cannot be expected to be sizeable, at least in the short/medium run.¹⁶ The weakness of price factors points to the importance of complementing the adjustment effort and fostering

modernization and diversification, for example through specific industrial policies aimed at earmarking the bulk of additional imports for selected sectors with a recognized potential for export expansion.

(Original: English)

¹⁶ Similar conclusions have been reached by various recent studies (see, for instance, Daniel, Green and Lipton (1985); Aziz (1990); Lipton (1987); Mullor-Sebastian (1990); Taylor (1988), and World Bank (1990). See also Brinkman and Gabriele (1992). In the case of Costa Rica, in particular, an econometric exercise based on data for the 1980s showed that exports as a whole tend to be price inelastic, and thus export subsidies do not constitute an efficient policy instrument (Hoffmeister, 1991, p.19).

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