PN-ABI-868

Commodity Exports, Economic Development and Policy

EXECUTIVE SUMMARY

The Commodity Problem, Goal Attainment, and Policies in Developing Countries

by F. Gerard Adams and Jere R. Behrman

For:

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT NUMBER: 931-11-995-057

International Primary Commodity Markets and Economic Development Project

Directed by: F. Gerard Adams and Jere R. Behrman
University of Pennsylvania

Wharton Econometric Forecasting Associates, Inc.

3624 Science Center
Philadelphia, Pa. 19104

(Revised December, 1980)

INTRODUCTION

This memorandum summarizes the results of a series of studies on The Commodity Problem and Economic Goal Attainment in Developing Countries. This project, directed by F. Gerard Adams and Jere R. Behrman, has been carried out at Wharton EFA, Inc., and the Economics Research Unit of the University of Pennsylvania during the 1978-1980 period. The memorandum notes only the high points of the extensive research carried out. The details are summarized in six extensive studies. These studies will be published as books by Lexington Books, a division of D.C. Heath, and will include:

T. Priovolos, The Commodity Problem and Goal Attainment: Ivory Coast and Coffee; (publication early 1981)

M. Lasaga, The Commodity Problem and Goal Attainment: Chile and Copper; (publication early 1981)

M. Nziramasanga and C. Obidegwu, The Commodity Problem and Goal Attainment: Zambia and Copper; (publication early 1981)

G. Siri, The Commodity Problem and Goal Attainment: Central America; (report completed, volume in process)

F. Gerard Adams and T. Priovolos, The Commodity Problem and Goal Attainment: Brazil and Coffee; (report in draft)

F. Gerard Adams and Jere R. Behrman, The Commodity Problem and Goal Attainment in Developing Countries: An Integrated Econometric Examination of Basic Policy Issues; (volume in process)

In addition, preliminary papers from this study have been published in journals and books and presented at conferences, including:

F. G. Adams, J.R. Behrman, R. Roldan, "Measuring the Impact of Primary Commodity Fluctuations on Economic Development: Coffee and Brazil," American Economic Review, 69:2, 1979, 164-168.

F. G. Adams and R. Roldan, "Econometric Studies of the Impact of Primary Commodity Markets on Economic Development in Latin America," in W. Labys, M. Ishaq Nadiri, and Jose Nuñez del Arco, eds., Commodity Markets in Latin American Development: A Modeling Approach, (Cambridge: Ballinger Pub. Co. and NBER, 1980).

F. G. Adams, J. R. Behrman, and M. Lasaga, "Commodity Exports and NIEO Proposals for Buffer Stocks and Compensatory Finance: Implications for Latin America," in W. Baer, C. Longo, and M. Gillis (eds.) Trade Prospects Among the Americas: Latin American Export Diversification and the New Protectionism, Bureau of Economic and Business Research of the University of Illinois, 1981 (also in Quarterly Review of Economics and Business and Estudios Economicos).

Other studies have been distributed in xerox including:

Jon Manger, "A Review of the Literature on Causes, Effects and Other Aspects of Export Instability", (a report of Wharton EFA Inc., for the AID Project on Primary Commodity Stabilization and Economic Development, May 1979.)

We expect in the next few months to prepare additional papers for publication in recognized journals.

Section 1 Overview

In recent years, international concern has once again turned to the "commodity problem", the impact of fluctuations and trends of primary commodity prices on the developing countries. Despite the considerable progress of some of these countries, many of them are still largely dependent on primary commodity markets for their principal export earnings. Consequently, their economies may be affected broadly and in important specific ways by what happens in world commodity markets. The commodity problem is a primary focus of the discussions between the industrial countries and their less affluent suppliers of primary commodities as is best illustrated, perhaps, in the negotiations surrounding the UNCTAD Integrated Commodity Program proposal. It is also clearly an important issue in the planning of developing countries' economic policies: the resources which should be directed into primary commodity production, the way in which participation in primary commodity markets should be organized, and the other internal micro policies and the macro stabilization and growth policies that should be adopted in light of commodity developments.

It goes almost without saying that policy must be based on knowledge. Yet, despite the central role of the commodity problem in international and national policy dialogues, there is little widely accepted and solidly based information on the impact of the commodity problem. There remains considerable controversy even as to the direction of the impacts of commodity price fluctuations, though there is more consensus on the effects of the secular trends in the terms of trade of commodities. The need for information

exceeds broad generalizations about the direction of effects. Economic goals comprise a variety of targets, i.e., growth, price stability, balance of payments equilibrium, distributive equity, etc., and the effects of the commodity problem on the attainment of these goals may differ greatly depending on the weight given to each target. It is important, consequently, to know the impacts of developments in world primary commodity markets on the commodity producing sector itself, on various dimensions of macroeconomic performance, on the tax receipts of the government, on the distribution of income, on the linkages to other industrial and service sectors of the economy, etc. The channels of impact must be identified and their operation traced over time. The quantitative dimensions of the impacts must be evaluated. The potentials for policy to deal with the commodity problem or with its effects must be considered. Only with such information, is it possible to evaluate the significance of the commodity problem on goal attainment of the producer countries. And only with such information can successful policies be planned and carried out on the international level and on the level of the producer countries.

This report summarizes the findings of an extensive project designed to study the relationship between export earnings in international commodity markets, the producing sector in the developing economy, and the performance of the producer country economy. We have stablished a framework of analysis using integrated econometric models of the world commodity markets, the producer countries, and the commodity producing sectors. We have illustrated its potential by examining the case of the market for coffee and

the economies of the producing economies in Brazil, Ivory Coast, and Central America and the case of the copper market with respect to the economies of Chile and Zambia. The approach has been primarily empirical and econometric. After a conceptual discussion of the relevant issues and model structures, our concern has been with putting quantitative dimensions on the effects. We have also been concerned with evaluating the need for and the potential of policy to deal with the commodity problem and its impacts on goal attainment in the developing commodity producing countries. These extensive results are discussed in detail in six volumes--one on each of the five countries under examination and a summary volume by the directors--that are being published in a series by Lexington Books, a division of D.C. Heath and a number of reports to AID (see the Introduction).

In this report, we try to summarize the results of the project. Our concern is with the channels of influence from the commodity market to the producing country economy, the quantitative dimensions of these influences and the resulting implications of the movements in commodity markets on the multiple dimensions of economic goal attainment in the producing developing countries.

Section 2 The Channels of Influence from Commodity Markets to the National Economies

The impacts from primary commodity export market fluctuations and secular trends to the producing economies must be examined in a structural framework. Reduced form approaches have produced inconclusive results, suffer from severe data and theoretical limitations, and fail to recognize

clearly the channels through which the impacts from commodity exports operate. Thus, it is not very satisfying to note that fluctuations of copper prices influence the performance of the Zambian economy without being able to specify whether the effects are through foreign earnings, tax revenues, capital investment, or employment or through all of these.

We do not repeat in detail the model structures which we have used. But it is useful to review the principal channels of influence from commodity markets to national goal attainment and to evaluate their relative importance.

We begin first by considering the points of contact between the three principal "actors" in the analysis: the international commodity markets, the primary producing sectors (micro sectors) and the macro economies of producer country economies.

Subsection 2.1 World Primary Commodity Markets

Our approach to world commodity markets, specifically the markets for copper and coffee, is predominantly from the perspective of competitive markets where supply and demand (including speculative demands for inventories) determine a world market price. This does not exclude, however, the possibility of investigating the role of particular countries in influencing the world market price. This influence may be through externally determined shifts in supply, like a frost in Brazil or a mine disaster in Zambia for example, or through explicit supply or export tax policy, as for coffee in Brazil. Moreover, it does not exclude the use of the model system as the framework for buffer stock analysis.

The relation between the commodity markets and the country economies is in determining the world price of the commodity, a price to which the local export price and the producer prices are linked. In conjunction with the production of the primary commodity and the quantity available for export, the price then determines the foreign exchange earnings from commodity exports. In the case of the coffee model, the model also sets the quantity which is exported, though the system can also be operated with exports determined by Brazilian conditions or policy decisions.

An important aspect of the interaction between the commodity market and the producer economy is the simultaneity of price determination with commodity production. This simultaneity is important particularly for major producer countries (e.g., coffee in Brazil).

Subsection 2.2 Primary Commodity Micro Sectors

The micro sectors are the commodity producing sector models for coffee or copper which we have included in each of our country systems. These sector models directly link the international commodity markets to the national economy. They vary greatly in importance, copper being almost the only industrial sector in Zambia and providing over 90 percent of export revenue whereas coffee is a relatively small and relatively declining sector in Brazilian agriculture though it continues to provide 10 to 15 percent of Brazilian export earnings. The study finds great diversity among the specialized export sectors of the various countries reflecting not only the differences between coffee production, a labor intensive tropical tree crop, and copper production, a capital intensive

mining product, but also differences in the ownership, control, and objectives of the commodity producers. These elements have to be taken into account, particularly since nationalization and some land redistribution have changed the organization of these sectors in recent years.

The empirical analysis of the sectors points particularly to a number of important conclusions:

1. Output response to price. In all of the micro sectors, output is responsive to price in the world market, but with relatively low elasticities, particularly in the short run. This is not altogether surprising since the short-run output potential is limited in copper by mining capacity and in coffee by the acreage in mature trees. Moreover, the price obtained by the producer is frequently very different from the world market price. For example, in Ivory Coast where the producer coffee price is tied to the producer price of cocoa and in Brazil where export taxes apply. The empirical data suggest that even if we allow for the time necessary for the planting and maturing of trees and the construction of new mines, the supply responses are inelastic. There are, of course, also important variations in output associated with harvest failures, strikes, political upheaval, etc.

2. Linkage of employment to output. The short-run response of employment in the commodity producing sector with respect to output is relatively inelastic. This means that employment is less volatile than output, though the long-run response of employment to changes in output tends to come closer to an unit elastic one. There is no direct linkage between

variations in price and employment. Thus, variations in primary commodity earnings do not translate fully into variations in employment except to the extent that they involve changes in production, but even in that case the short-run response is not large.

3. Wage and non wage income. Wage rates are tied in some cases to primary commodity earnings, for example, in Zambia and Chile. But here too, the response of wage rates to earnings is relatively insensitive and has time lags. The consequence of this and of the previous point is that wage income is considerably less volatile than are the movements of the value of production or of the value of exports. This has important distributive consequences in that the non wage component of income, which includes returns to capital and taxes, shows considerable volatility with respect to the movements of price and value of production and exports.

4. Other direct linkage effects. The primary commodity sector has perceptible direct linkage effects with other sectors, particularly transportation services, trade construction and, in some cases, the domestic industrial sector. It is not clear from our empirical work that these linkages can be considered an important "engine" of economic development since the primary commodity sectors require only limited quantities of conventional inputs from the local economy. With respect to highly technical labor and materials, they draw on imports and sometimes expatriate workers (especially for production of some minerals).

5. Leading sector role. Particularly with respect to wages, the primary commodity sector may serve as a leading sector. This is apparent in

Zambia and Chile, where the wage decisions for copper influence wages in other sectors, and thereby the labor market and population movements.

6. Tax receipts and earnings of government owned industry. The empirical work shows the important role of the primary commodity sector as a source of government revenues. In part, this reflects the direct taxes imposed which appear in the public treasury; in part it represents the earnings of government from its ownership interest. In the case of Brazil and Chile, it used to include the exchange rate differential for coffee exports or domestic inputs for copper production. In more recent years it has included the receipts from the coffee fund "contribution quota" and the earnings of the coffee stabilization funds. All of these are highly sensitive to the revenues from the exports of coffee and so show considerable volatility.

7. Foreign exchange. In all cases considered, the primary sector is an important contributor to the total earnings of foreign exchange and to the instability of these earnings. Exports are determined by exportable production (after allowing for domestic consumption in the case of coffee) less public or private inventory accumulation. The value of foreign exchange earnings then depends on the quantity exported times the price, but the latter is itself influenced by production and exports if the system is linked with a world commodity model. The empirical results suggest that the role of primary commodity production as a supplier of foreign exchange is important in all the countries considered and that this sector's exports account for a good deal of the variation in aggregate foreign

receipts for all of the project countries. Furthermore, variations in foreign exchange cause related variations in the monetary base.

Subsection 2.3 Macroeconometric Models

The macroeconometric models of the producing countries serve two purposes in the structure of this project:

1. to accept the linkages from the micro sector model and to translate these into macroeconomic impacts; and
2. to allow for the operation of general policies, both passive and active.

The models are designed to incorporate the structural characteristics of the producing economies. This means that the models encompass Keynesian demand-side elements as well as supply-side considerations which often dominate the simplified models of developing economies. This is particularly important since the micro sectors interact with the macro economy both from the demand and the supply sides. The macro model must also describe the effects on other aspects of goal attainment: the impacts on inflation and balance of payments equilibrium, and the effect on income distribution. At this juncture, it is important to note also that the models are able to capture feedback mechanisms, from the micro sector, to the macro economy, and subsequently, back to the micro sector.

With regard to policy, we make an important distinction. Passive policy is that response of government which represents a natural endogenous response to changes in conditions. Some typical examples are the expansion of government spending with an increase in government revenues or the

expansion of the money supply due to balance of payments surpluses. Active policy represents explicit policy actions intended to offset occurrences in the economy. For example, an increase in export taxes on coffee at a time when the world coffee price is rising. The distinction is arbitrary to some extent but, it is an important distinction since it is unrealistic to do policy simulations without including passive policies. On the other hand, it is useful to see what governments could do explicitly in the way of policy actions in the attempt to offset the deletrious aspects of the commodity problem. We have structured our models to encompass passive policies, and to allow "policy handles" for simulation studies of the potentials for active policy intervention.

The Channels of Influence

In surveying different commodities and different economies it is difficult to generalize the magnitude of the effects. Before we attempt to do so we will draw some generally applicable conclusions as to the principal channels through which the fluctuations and trend movements in the primary commodity markets are translated to the level of the developing country economy and its ability to attain its objectives.

A useful classification is to consider the direct effects and then the indirect effects. The direct effects represent the immediate impact on the micro commodity sector, and the indirect effects comprise the feedback and the passive policy responses. Active policy must be considered separately.

In all cases, it is essential to view the process of reaction to changes in the commodity market, and the transmission to the macro economy as occurring dynamically over time. The empirical evidence points to gradual adjustments and lag processes, which make the immediate effects altogether different from the adjustment over time in many cases.

Direct Channels

The direct channels of influence are not only dependent on the nature of the commodity, but also on the operation of the economy and on the linkages between the domestic sector and the world commodity market.

The initial linkage is the relationship between the world commodity market and the producer country primary commodity sector. Linkages are from the world price to the local export price to the domestic product price. Along this channel the impact may be amplified or reduced. In the case of Brazil, it appears that fluctuations in the world coffee market have an amplified impact on the price received by coffee producers, whereas in the case of Ivory Coast the management of the coffee producer price tends greatly to stabilize the fluctuations.

Of course, movements in price do not translate proportionately into changes in revenues, but in the absence of fluctuations in production in the producer country, movements in revenues are dominated by movements in price.[1] The direct impact of changes in revenues falls disproportionately on non wage income. This follows from the less than proportionate

[1]The countries studies which are listed in the Introduction consider movements in production as well as price. We concentrate here only on price changes.

adjustment of employment to output; indeed, if there is no change in production there is no change in employment. Moreover, in those cases where there is an impact of revenue or price on wages--for example, in Chile and Zambia--the effect is less than proportional and lagged. As a consequence, the dominant channel is through the revenue flow to non wage income, either profits of the producers or receipts of government or both.

Since the product is sold in world markets there is also a direct impact on earnings of foreign exchange.

There are also direct requirements for inputs of services, raw materials, and construction. The statistical analyses suggest that these impacts are more pronounced in the economies where the primary commodity sector obviously is dominant, for example, Zambia or to a lesser extent, the Ivory Coast. But they are also present in the larger, more diffuse economies.

Indirect Channels

The indirect channels comprise private demand responses, private supply responses, and the passive policy channels, which may have some demand and some supply consequences.

While the private demand effects are the most intuitively obvious channels, they are not always the most important. The typical demand linkage would be the flow of wage income into consumer demand. But as we have noted, the dominant impact of fluctuations in earnings from primary commodities is

likely to be, at least initially, on non-wage income. While the latter appears in the consumption function of several of the macro models, it carries a much lower propensity to consume than does the income from wages. Interestingly, the demand effect may be much higher to the extent that the non wage component of commodity earnings takes the form of government tax receipts. The concept of passive policy response in the form of public spending from public revenues suggests that the public propensity to spend is high, approaching unity. Some of the expenditure goes into public sector consumption, and some appears in the form of public investment. In Brazil, for example, induced public investment in infrastructure improves the supply potential of the agricultural sector. In any case, government receipts and expenditures represent an important channel of influence in most of the models.

Another important channel operates through the foreign balance. The countries differ somewhat in the response of imports to foreign exchange availabilities. In the relatively closed economies, Brazil or Chile in the period before Pinochét, foreign exchange availabilities represent a significant constraint on imports, so that foreign exchange earnings are quickly transformed into added imports. On the other hand, in the Ivory Coast, a very "open" economy, the foreign exchange constraint does not appear to be binding so there is little responsiveness of imports to foreign exchange earnings. But on tbe other hand, in the Ivorian case, there is a powerful link between income and imports. This has significant consequences not only for the foreign exchange balance itself, but also

for the monetary sector. The linkage here is through the effect of the balance on current account on the monetary base, assuming again a passive monetary policy. But the impact is not necessarily from an increase in the value of commodity exports to a more favorable balance on current account and an increase in the monetary base since the response of imports to greater foreign exchange availabilities may exceed the growth of exports. In other words, the linkage from changes in export revenue to money supply is clear, but the direction depends on the response of imports. The more constrained are imports by the availabilities of foreign exchange, the greater the likelihood of a significant import response and the less the impact on money supply.

A similar phenomenon occurs, but in the opposite direction, with respect to government expenditures. Increased government receipts may translate into a reduced deficit (or even a surplus) causing a reduction in the monetary base in the absence of active policy. But the impact may be largely offset by increased purchases. In that case, the Keynesian demand side effect is reinforced by the impact of the increased monetary base.

This discussion leads directly to the impact through the effect of money supply in these systems. This is an important channel in many of these models through the inflationary potential which originates in growth of the monetary base. Thus, in many of the countries considered, with the striking exception of the Ivory Coast, improvements in the value of commodity exports translate to a significant extent into accelerated inflationary pressures. Inflation is also influenced by labor costs

and exchange rates. While exchange rates are largely exogenous in the models considered here,[2] labor costs are an important ingredient. The linkage is not only through productivity, but also through the role of wages in the primary commodity sector on the other sectors of the economy. Wages in copper are a dominant factor in the determination of wages elsewhere in Zambia, for example, but not in the Ivory Coast where wages influence migration patterns.

Section 3 Impact of Commodity Market Fluctuations on Goal Attainment

The main issue is how the movements in primary commodity markets affect the ability of the producer economies to achieve their economic objectives. The evaluation of this question in quantitative terms has been the purpose of our studies. We summarize and, if possible, generalize the results in this section.

The goals to be attained have been considered in detail in the project. They include not only the traditional focus in the developing world on economic growth, but also other considerations such as price stability, equity in the distribution of income, balance of payments equilibrium, and utilization of productive capacity. The attainment of these goals is influenced by the producer country's participation in primary commodity markets in various ways. The aim of our simulations of the world commodity market--micro--macro systems is to evaluate the impact of fluctuations and secular trends in commodity markets on the various dimensions of goal attainment.

---

[2]The impact of commodity export values on exchange rates may be a very important channel but determination of exchange rates is outside the scope of most of the models considered here.

Simulations were carried out assuming one-time changes in the commodity price as well as similar changes on a sustained basis. The results of these simulations are evaluated in comparison to a base simulation, lacking the price change. These simulations are conveniently summarized in Table 1. The table shows the impacts for the average of the first five years after the disturbance. In the first column are shown the consequences of a 10 percent one-time drop in the price of the commodity. In the second column are shown the results of offsetting the 10% drop with a 10% increase, in other words, the asymmetrical effect between a decline in price and an increase in price. Columns three and four show the impact of a sustained 10% drop in commodity prices, column 3 summarizing the average over the years 1 to 5 and column 4 for the years 6-10. While there is divergence between the countries and the commodities, we observe that there are some significant patterns of response. On the basis of Table 1 we summarize some of these patterns here.

Growth and Capacity Utilization Impact

Growth and capacity utilization of commodity price changes are in the direction anticipated in all but a few exceptional cases. A reduction in price reduces GDP and, almost but not quite symmetrically, increases in the commodity price tend to increase GDP. The macro economic impact, not surprisingly is closely related to the share of the primary commodity sector in the economy. Therefore, there is very little perceptible impact on Brazilian GDP in percentage terms, but not in absolute

terms, from the coffee sector. On the other hand, in Chile and Zambia where the dependence on copper is far greater, the impact on GDP is much more apparent. However, the effect of lower coffee price on the Ivory Coast appears remarkably small, considering the importance of the product, a result of the fact that the Ivorian coffee producers are substantially isolated from the world coffee market by a stabilization board.

A sustained price change has a substantially greater and growing impact than a one-time reduction. In part this simply reflects the nature of output determination in these industries, with output responses spread over a long time period after the change in price. Thus, a 10 percent lower price reduces GDP by 1.8 percent during the first five years and by 3.1 percent during the following five years in Chile. Impacts in Zambia and El Salvador are comparable. On the other hand, even in the long term, the impact on Brazilian growth is hardly perceptible and the effect on Ivory Coast GDP is small at first, rising to minus 1.0 percent during the second five years as the effect of low coffee prices on the stock of mature trees becomes effective.

There is no question that conditions in the world coffee market feed through to macroeconomic goal attainment. One time shifts in prices as well as secular shifts have effects on activity and growth beyond the sectors in which they occur. What is not so clear is whether there is potential or actual impact from fluctuations in commodity prices on growth. Some evidence is provided by the offset of symmetrical up and down price simulations. That evidence suggests that over a cycle the impacts on GDP tend to cancel out. Such a result was sustained in other simulations, reported in the specific country studies, which indicate

little if any impact of commodity price fluctuations on the growth aspect of economic performance, with the exception of the case of Ivory Coast. This should not be taken to mean, however, that price fluctuations impose no costs on the producing economies. There are clearly dislocation or adjustment costs other than those measured in the growth of aggregate GDP. And it can be argued that stable commodity prices would permit the development and implementation of investment plans in ways which our models, based on an unstable world, do not measure.

The results above are also supported by the impact of changes in commodity prices on investment. Again, the importance of the commodity in the economy and the dependence on investment on the commodity earnings are significant considerations. Again, the strongest effects, are apparent for the copper countries. Chilean investment is reduced by 0.9 percent with a one time 10 percent decline in copper prices. In Zambia the 2.5 percent impact is even greater. In these countries not only do copper earnings play an important role in investment, but there are direct linkages between activity in the copper market and investment. A noticeable asymmetry appears in the case of Chile where a reduction in price has a greater negative impact on investment than does the positive effect of an increase in price.

Over a long period, the effect of sustained changes in price is considerably greater particularly in the case of Zambia where a 10 percent reduction in the price of copper results ultimately in a more than 10 percent (13.9 percent in the second five years) decline in investment. This points to the dependence of Zambia on copper earnings and the magnified volatility of these earnings with respect to the price of copper. The impact on GDP growth is considerable, of course.

The coffee producing countries are again less affected, with very little aggregate impact on Brazil, a country which is not very dependent on coffee earnings for investment.

Economy-Wide Prices

The impact on overall prices operates through a number of channels as we have outlined above. There is, some diversity of impacts, particularly in terms of the dynamic adjustment over time. Initially, the effect of a reduction of the commodity price is negative, reflecting the translation of an adverse impact on the balance of payments on the money supply through the passive monetary policy channel. Note that the impact is much smaller in Ivory Coast because of the offsetting action of the stabilization fund. What is striking is that particularly for Chile and Ivory Coast there is a catchup--the initially lower prices are offset by higher prices in subsequent years and the long term effect of a reduction in commodity prices is not necessarily negative. Indeed, in Brazil and Chile, the effect is positive over a five year period. Part of the mechanism of explanation is the offset of the monetary impact by the structural, unit labor cost, phenomenon. The reduced GDP causes a decline in productivity with a consequent increase in labor costs since wages are sticky. With some time for adjustment, this effect in certain countries dominates the monetary impacts caused through the balance of payments and the public deficit. Another part lies in the great sensitivity of imports and of government deficits to the availability of foreign exchange and government revenues from the commodity sectors. If these are quite responsive, changes in them can dampen considerably the impact on the monetary base of the original movements in the international

commodity prices and earnings from commodity exports.

The effect of a sustained decline in commodity prices, tends to be negative (except in the case of Chile) so that repeated negative impacts on the balance of payments cumulate in reductions in the money supply and these tend to dominate other impacts on the price level. With respect to the question of asymmetry, it appears that the upward and downward price effects are similar except in the case of Brazil where it seems that the net effect of a positive and negative change in prices is a positive impact.

Income Distribution

Because of data inadequacies, we generally have not been able to surmount the difficulties in the related computable "general equilibrium" model literature regarding the representation of individual household income distribution effects. To represent the links through strong fixed coefficient assumptions as in most of this literature obviously is not very fruitful. Therefore, although we experiment with some more extensive representations in some models (e.g., Ivory Coast), we focus on the factoral dimension (e.g., wage versus non-wage income) and on the sectoral dimension (particularly regarding relatively poor agriculture).

The effect of a price reduction in commodities tends to be favorable to the wage share in the short run in view of the more volatile direct commodity production sector response of non wage income from commodity production in most cases. But there are offsets from the macroeconomic impacts. Thus, we find that in the short run the impact in Chile and Brazil is to increase the wage share of GDP though Zambia shows a somewhat sur-

prising reduction. In Ivory Coast, the offsetting operations of the stabilization fund account for the small effect. Since the focus of much of the immediate effect is in the commodity producing sector itself, the imperceptible short run effect in Brazil is not surprising given the relatively small size of the coffee sector.

Over the longer run however, the lower price of commodities, if sustained, reduces the activity in these major producing sectors and the consequence turns out to be lower employment and, in some instances, lower wage rates and a lower wage share. This is a very clear impact, particularly in Ivory Coast where a 10 percent lower coffee price ultimately reduces the share of wages in GDP by more than 10 percent. In Zambia, where copper is very important, we do not observe the effect as clearly. In the first five years of a sustained reduction in copper prices, the share of wages declines, partly as a consequence of effects on employment and partly as a result of the impact on the wage rate and on the non wage components. But over the longer term, the decline in other sectors of the economy is even greater so that the wage share is moderately increased, though, of course, out of a smaller aggregate GDP. We also note that although increases in the terms of trade generally improve goal attainment in the producing countries, the impact on the wage share generally is regressive (and vice versa).

The impact of price changes on the share of agriculture in GDP depends on the one hand, on the direct impact affecting the coffee sector or the copper sector, and on the other, on the effect on non-agricultural GDP. Both in Chile and Zambia, since the direct impact is on copper, a reduction in copper prices has a positive effect on the share of agriculture. This impact is moderate in the case of a one-year price change, but it

amounts to two or three percent in the case of a sustained change reflecting the downward adjustment of commodity production in response to price as well as the feedbacks which predominantly affect the non-agricultural sectors. Of course, in the coffee producing countries the dominant tendency is the opposite. A reduction in the coffee price tends to reduce the share of relatively poor agriculture despite some negative indirect effects on the rest of the economy.

Foreign Position

In all of the countries, a one time reduction in the international commodity prices reduces earnings from the commodity, overall export earnings, and foreign exchange reserves. However, the countries vary considerably in how vulnerable they are to such foreign exchange reductions. During the sample period, Chile and Brazil were relatively susceptible to foreign exchange cuts and Zambia was becoming increasingly susceptible. Generally, the more susceptible economies have policy responses that economize on foreign exchange utilization in such a case by, for example, increasing quantitative restrictions on imports. Of course, if the commodity price reductions are sustained long enough, even the more open and less foreign exchange constrained economies like Ivory Coast and El Salvador have to introduce policy measures to accommodate to the new relation of lower commodity export prices.

Other Simulations

This brief summary does little justice to the results of a large number of other simulations which are reported in the various studies comprising this project. Such simulations include a variety of studies measuring the impact of variations in production, one-time variations

attributable to the varieties in coffee yields or to labor troubles in copper and longer-term increases and decreases in production which may result from the development of coffee lands or the development of new mining investments. The simulations also include stochastic simulations measuring the impact of price variability over a period of time, calculations of the competitive impact of alternate crops such as cocoa in Ivory Coast, alternative scenarios on export determination for Brazil, mixed development strategy scenario simulations for Ivory Coast, Zambia and Chile, simulations related to the trade interactions between the countries of the Central American Common Market, etc. The reader is referred to the individual studies listed in the Introduction for the rich results from the variety of simulation exercises that were carried out as a part of this project. The reader should also refer to these underlying studies to find the basis for results reported above some of which may appear at first glance to differ from a priori expectations.

Section 4 Passive and Active Policy Impacts

The study shows that what we have termed passive policy provide an important channel, in many cases the most important channel, for the transmission of commodity market phenomena to the macro economy. The passive policy channels are not just simplifying behavioral assumptions of the econometric model. In many instances, behavior of the nublic sector does follow certain patterns which represent passive responses to changes in the economic environment. And these responses are incorporated in the passive policy channel. A most important one, of course, is the response of public expenditure to the loosening (or tightening) of the budget constraint as additional (less) tax revenue or public enterprise profits

are translated into public expenditures for consumption and investment. The money supply response to the public budget deficit (surplus) and to the foreign exchange deficit falls into the same category of passive policy, and a third category includes the foreign sectors policy response like those discussed above.

This is not to say that passive policy may not be offset at least partially by active policy steps. In many cases, active policy incorporates measures different from, and often opposite to, a passive policy. For example, neutralization of foreign exchange earnings from commodity exports represents a direct active response to offset the monetary expansion associated with the increased earnings from commodity exports.

Moreover, in principle at least, active policy need not be limited to such direct policy responses. More general policies may be used. For example, active fiscal, tax, and monetary policy may be used to offset the impact of movements in primary commodity markets on real and/or nominal stability. Likewise tax, income and price policies can be used to offset undesired distributional outcomes. And in theory, various policy instruments can be combined to more nearly achieve desired goals--although lags and uncertainty complicate actual policy formulation substantially.

Section 5 Policy Alternatives and Goal Achievement

Various policy alternatives are available to deal with the effects of commodity exports on the producer country economy. We cannot here, discuss in detail the various patterns of policy alternatives considered in the underlying country-commodity studies. We have considered three

types of policies: those focusing on the producing sector itself, those concerned with the international commodity market and those focusing on the macro economy. All these approaches offer potentials, but the quantitative dimensions of their effects vary depending on the economy, on the role of the commodity in that economy, and on the passive policies in force.

In this study we have been able to examine a limited selection of active policy measures, particularly of a broad macroeconomic type. On this basis we come to several important conclusions regarding the effectiveness of active policy.

First, the abilities of the various countries to make use of active policy vary greatly. This potential is quite limited in the open economies, for example, Ivory Coast and Central America, or in these dominated by the commodity sector, like Zambia, for example. Other economies, where commodity markets play a smaller role or where the economy has a great degree of self-containment, may be able to exercise effective active policy measures to offset the impacts of change originating in world commodity markets. Thus, possibilities for macro policies in Ivory Coast are limited, in view of the open character of that economy, whereas the passive policy of the stabilization board offsets some of the impact of fluctuations on the world coffee market. In Brazil, on the other hand, even though the fluctuations in the coffee market are amplified by micro policy, macro policies may effectively offset the impacts particularly since the coffee sectro represents a small part of the economy.

Second, although general policies can be used to offset any one negative effect of changes in commodity markets, generally they also

change attainments of the other goals--and sometimes in negative respects. The set of policy instruments is not sufficiently great nor are the policies sufficiently available or powerful in most cases to permit simultaneous attainment of the various goals of the producer country economy. Their impact is complicated not only by the simultaneous nature of the economic systems but also by the lags in response. The net effect of using such active policies to try to offset the commodity market changes is difficult to anticipate and to control, even without external stochastic shocks.

Third, macro policy measures are not likely to effectively offset sustained secular shifts in the international commodity markets. Eventually, the deficits (surpluses) build up enough so that foreign exchange movements cannot be sterilized or that fiscal or monetary policy measures become counter-productive in respects to issues other than those concerned with their commodity market impacts.

With respect to policies on the commodity sector level, we can distinguish between those that can be carried out independently of a world market impact and those which do affect the world market, i.e., the ones where the producer country has market influence.

In the absence of a perceptible effect on the world market, the producer country policies can have substantial impact both in the stabilization of its revenues (or those of its producers) or in changes in supply potentials. In this study we have explored many of these possibilities. The effect of the price stabilization for coffee producers in Ivory Coast is particularly notable. The stimulus of increased producer price on production of coffee in Ivory Coast for example, is also notable, as are the effects of additional investment in the copper industry in Chile and Zambia. Of course, the potentials

of internal commodity sector policies are constrained by the availability of resources in the case of investment in copper mining for example, and by the competition of other uses of the land in the case of coffee.

The situation becomes considerably more complex when the country has market influence. In most of the cases studied we found that moderate fluctuations in the producer country had only moderate influence on the world market price, though such influence cannot be ignored. This is perhaps because policy simulations of commodity supply are not of the large magnitudes that would come from natural disasters such as mine collapses in copper or frosts in coffee. It would appear from the studies carried out here that only limited gains can be sought by the producer countries through impact on the relevant world commodity market, while substantial scope for domestic intervention into the commodity sector exists and such intervention has potentials both from the point of view of stabilization and from the point of view of secular trends.

Finally, with respect to the operation of the world commodity market stabilization, this study did not consider at length the operation of buffer stock stabilization schemes on a worldwide basis, though many simulations assumed stable prices and considered the impact on the countries' economies. As we have noted the impact of stabilization on growth itself is not clear but more stable commodity prices obviously have payouts in greater stability in the producer economy and in some instances in the level of investment. This would suggest that cost benefit calculations of participation in worldwide commodity price stabilization schemes need to take into account the broader impacts of stabilization on producer country goal attainment.

The management of macro and micro policies poses difficult challenges for the producer countries, particularly those which are dependent on one or two primary commodities for the bulk of their foreign exchange earnings. The potentials of these policies to ameliorate the undesirable impacts of instability and adverse secular trends vary greatly between the producer countries. Our work would suggest that policy responses embodying various kinds of policy must be considered in evaluating the impact of commodity markets on producer country goal achievement. Macro and micro policies must be taken into account in making recommendations for commodity policy management. Indeed, they must be part of an integrated policy program.

TABLE I

Some Summary Percentage Changes in Goal Attainment of Developing Country Producers Induced by One Period and Sustained Changes in International Commodity Prices[a]

		One Period Shock		Sustained Shock	
		10% Drop	10% Symmetrical	10% Drop	
		(avg. yrs. 1-5)	(avg. yrs. 1-5)	(avg. yrs. 1-5)	(avg. yrs. 1-5)
GDP					
	Chile	-.8	-.1	-1.8	-3.1
	Zambia	-.4	.0	-1.9	-2.8
	Brazil	.1	.1	- .0	- .2
	Ivory Coast	-.1	.0	- .1	-1.0
	El Salvador	-.6	.0	-2.0	-3.6
INVESTMENT					
	Chile	-.9	-.5	-1.7	-2.8
	Zambia	-2.5	-.1	-10.3	-13.9
	Brazil	.1	.3	- .0.	.0
	El Salvador	- .4	.0	-1.2	- 2.2
PRICES					
	Chile	.9	-.2	- .7	7.9
	Zambia	-1.2	.0	-5.1	-4.0

table 1 cont'd

		One Period Shock		Sustained Shock	
		10% Drop (avg. yrs. 1-5)	10% Symmetrical (avg. yrs. 1-5)	10% Drop (avg. yrs. 1-5)	(av. yrs. 1-5)
	Brazil	- .4	- .9	- .8	-4.9
	Ivory Coast	- .1	.1	- .4	-1.3
	El Salvador	- .2	.0	- .8	- .9
AGRICULTURAL SHARE IN GDP					
	Chile	.7	.1	1.6	3.2
	Zambia	.3	.0	1.7	2.4
	Brazil	- .0	- .1	- .1	- .1
	Ivory Coast	---	---	- .1	- .6
WAGE SHARE IN GDP					
	Chile	.2	.7	- .5	-2.8
	Zambia	- .4	.0	- .8	1.0
	Brazil	.0	.1	.1	.2
	Ivory Coast	- .1	.0	- .6	-11.0

[a]The percentages in this table are based on a comparison of base simulations without the price shocks and otherwise identical simulations with the price shocks.