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Macroeconomic Policy Reforms, Poverty, and Nutrition:

Analytical Methodologies

Per Pinstrup-Andersen
editor

CORNELL FOOD AND NUTRITION POLICY PROGRAM
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FOREWORD

Most developing countries are currently involved in macroeconomic policy reforms. While the primary purposes of these reforms usually are to remedy imbalances on the foreign exchange accounts and facilitate future economic growth, the implications for income distribution, poverty, and the living standards of the poor are likely to be significant. Some policy reforms will be advantageous for some groups of low-income households and disadvantageous for others. In order to protect the poor from undesirable deteriorations in their standard of living, it is important to understand how various policy reform programs affect the various groups of poor households. However, policy-relevant information on this matter is scarce.

The Cornell Food and Nutrition Policy Program (CFNPP) is currently undertaking research to provide additional information of immediate relevance for the design and implementation of reform programs that pay explicit attention to the effects on the poor. An overview of the most important conceptual relationships and reviews of available empirical evidence were presented in earlier papers, e.g. Pinstrup-Andersen (1987, 1988, and 1989). In a previous CFNPP Monograph, Scobie (1989) provided a comprehensive review of the most critical issues and proposed a research strategy to obtain the necessary information. This work is further extended into the development of a quantitative analytical methodology by Sarris in a forthcoming CFNPP monograph.

The above efforts provide guidance for empirical analyses of the effects of structural adjustment on the poor in nine African countries funded by the Africa Bureau of the Agency for International Development and AID country missions. A regional analysis of the fiscal and exchange rate reforms and their impact on the poor in Africa has just been completed by the project director David Sahn and will be available as a CFNPP monograph shortly.

As part of the efforts to develop the analytical methodologies, a CFNPP workshop was held at Cornell University in 1987. The papers presented at the workshop and subsequently revised are included in this monograph.

Support for the workshop and the preparation of this monograph from the Pew Memorial Trust, the Africa Bureau and the Nutrition Office of the Agency for International Development, the United Nations ACC/Sub-Committee on Nutrition, and the Interamerican Institute of Cooperation in Agriculture (IICA) is gratefully acknowledged.

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Per Pinstrup-Andersen
Director, CFNPP

ABOUT THE AUTHORS

Chapter 1. Per Pinstrup-Andersen

Per Pinstrup-Andersen is Professor of Food Economics and Director of the Cornell Food and Nutrition Policy Program (CFNPP), Cornell University. Prior to joining Cornell, he was Program Director at International Food Policy Research Institute (IFPRI), Washington, D.C.

Chapter 2. Alain de Janvry, André Fargeix and Elisabeth Sadoulet

Alain de Janvry is Professor, André Fargeix is a Ph.D. candidate, and Elisabeth Sadoulet is Adjunct Assistant Professor, all in the Department of Agricultural and Resource Economics at the University of California, Berkeley. They are jointly involved in research on computable general equilibrium modeling of the impact of alternative approaches to stabilization and adjustment, with a focus on the trade-offs that exist between the economic efficiency of each alternative approach, the distribution of the welfare costs and benefits which they imply, and their relative political feasibilities and hence sustainability. This research is supported by the OECD Development Centre and by the *World Development Report 1990* project of the World Bank.

Chapter 3. Erik Thorbecke and David Berrian

Erik Thorbecke is the H.E. Babcock Professor of Economics at Cornell University. He holds joint appointments in the Department of Economics and the Division of Nutritional Sciences and is presently the Director of the Program on Comparative Economic Development. His research is concerned with i) the process of economic development and particularly the relationships among growth, employment, and poverty alleviation; ii) the social accounting matrix as a comprehensive data system and as a basis for planning models focused on growth and on poverty-alleviation issues; and, iii) structural adjustment in developing countries. He is the author of more than a dozen books and 80 journal articles.

David Berrian holds a B.S. degree in aeronautics and astronautics from Massachusetts Institute of Technology and is presently completing his Ph.D. degree in economics at Cornell. Before returning to graduate school, Berrian worked as a planner in Seattle, Washington. He is presently in charge of a project in Costa Rica to formulate a model to explore the impact of stabilization and structural adjustment policies on the socio-economic system.

Chapter 4. Alexander H. Sarris

Alexander Sarris has been a Professor of Economics, University of Athens, Greece since 1982. He received a Ph.D. from the Massachusetts Institute of Technology in 1976 in economics and electrical engineering. From 1977 until 1982 he was Assistant Professor at the Department of Agricultural and Resource Economics at the University of California at Berkeley. He has researched and published in the fields of economic development, international trade, agricultural economics, and macroeconomic adjustment and has been consultant and advisor for Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), IFPRI, the World Bank, the government of Greece, and other organizations.

Chapter 5. Peter B.R. Hazell

Peter Hazell is a Principal Economist in the Agriculture and Rural Development Department of the World Bank. He was previously Director of the Agricultural Growth Linkages Program at the International Food Policy Research Institute. Mr. Hazell trained as a general agriculturalist in the United Kingdom and subsequently obtained his Ph.D. in Agricultural Economics at Cornell in 1970. He is author/editor of seven books and more than 50 journal papers. Major areas of interest are risk management in agriculture, agricultural sector analysis, and farm/nonfarm growth linkages.

Chapter 6. Tony Addison and Lionel Demery

Tony Addison is Lecturer in Economics, School of Oriental and African Studies, University of London. Lionel Demery is Senior Economist, the Social Dimensions of Adjustment Unit, Africa Division, World Bank.

Chapter 7. Katherine Terrell

Katherine Terrell is currently an Assistant Professor of Economics at the University of Pittsburgh's Graduate School of Public and International Affairs. She received her Ph.D. from Cornell University in 1984. Prior to her current position she was associate director of the Program on Comparative Economic Development at Cornell University and prior to that on the staffs of the Organization of American States (O.A.S.) and the World Bank. Recently she has written and taught in the areas of third world labor markets, structural adjustment in Latin America, and macroeconomics and she has served as a consultant to the Agency for International Development (A.I.D.), the World Bank, and development agencies of various governments.

Chapter 8. Lea Achdut and David Bigman

Lea Achdut is the head of the Bureau of Research and Planning at the National Insurance Institute in Israel.

David Bigman is a Senior Lecturer at the Department of Agricultural Economics, the Hebrew University of Jerusalem. He is the author of *Coping with Hunger: Toward a System of Food Security and Price Stabilization, Food Policies and Food Security under Instability, and Norms of Economic Justice: The Measurement of Income Inequality, Poverty and Food Insecurity.*

Chapter 9. Thanos Catsambas

Thanos Catsambas is the Economic Counsellor with the Credit Bank, Athens Greece. He received his training at Yale University and has served in various capacities, including positions with the International Monetary Fund (IMF) and the World Bank. He has also provided technical assistance to many countries on various aspects of public finance. He specializes in macroeconomic planning and policy, public sector evaluation, and the impact of stabilization and adjustment programs on income distribution and poverty. His publications are in the areas of taxation, public goods, inflation, budget deficits, and external debt.

Chapter 10. Neville O. Beharie

Neville Beharie, a Jamaican citizen, is currently an Advisor to the Manager of the Economic and Social Development Department at the Inter-American Development Bank. Prior to his entry into the Bank in 1975, Mr. Beharie worked with the University of Alaska (1973-75), and the National Bureau of Economic Research, Inc. (NBER) (1969-72). Mr Beharie has a B.A. in Economics (summa cum laude) from the Inter-American University, Puerto Rico, and M.A. and Ph.D. in Economic Development from the University of Illinois.

Chapter 11. Jere R. Behrman

Jere Behrman is the William R. Kenen Professor of Economics, Co-Director of the Center for Analysis of Developing Economics and of the Center of Household and Family Economics, and Population Studies Center Associate at the University of Pennsylvania. His research interests primarily are on developing economies' issues, including health and nutrition. He has consulted for numerous international organizations and authored 16 books and over 150 professional articles.

Chapter 12. Philip Musgrove

Philip Musgrove is Advisor in Health Economics, Pan-American Health Organization, after working for the World Bank, the Brookings Institution, and Resources for the Future, and teaching at the University of Florida, George

Washington University, and American University. He has written, co-authored, or edited seven books, and published over forty articles and book chapters on health economics, consumer income and spending, natural resources, and nutrition, chiefly concerning Latin America.

Chapter 13. David E. Sahn

David Sahn is currently the Deputy Director of the Cornell University Food and Nutrition Policy Program. Previously, he was a research fellow at IFPRI. He has served as a consultant with numerous international organizations, inlcuding the World Bank, Food and Agricultural Organization, World Health Organization, World Food Council, and United Nations University. His research on the effects of agricultural and macroeconomic policies on incomes, consumption, and nutrition has focused on issues related to poverty alleviation and distributional concerns. He has worked in numerous African, Asian, and Latin American countries, and has written extensively on his research and experiences.

Chapter 14. Paul Glewwe and Dennis de Tray

Paul Glewwe is an economist in the Population and Human Resources Department of the World Bank. After receiving his Ph.D. in economics from Stanford University in 1985, he joined the faculty of the Agricultural Economics Department at the Pennsylvania State University. His research has focused on inequality, poverty, and education in developing countries and includes studies on African, Asian, and Latin American countries.

Dennis de Tray is Research Administrator for the World Bank. In that capacity he directs the Bank's centrally funded research program. Before coming to the Bank he worked at the Rand Corporation and the Pakistan Institute of Development Economics. His research interests have focused on the consequences of household and individual behavior for the design and analysis of public policy, especially human resource and welfare policy.

1. THE IMPACT OF MACROECONOMIC POLICY REFORMS ON POVERTY AND NUTRITION: AN OVERVIEW OF ANALYTICAL APPROACHES

Per Pinstrup-Andersen

1.1 Introduction

Many African and Latin American countries have experienced severe economic crises since the late 1970s. These crises were caused by adverse international developments such as rapid changes in oil prices, falling and unstable prices of many important export commodities, rapidly increasing rates of interest, and increasing dependence on foreign loans as well as inappropriate domestic policies resulting in increasing government deficits and reduced economic growth. In an attempt to deal with the crises, governments have implemented various types of macroeconomic policy reforms.

While many countries have experienced falling real average per capita incomes, the impact on the real incomes of a particular population group, such as the poor, depends on the nature, design, and implementation of the particular reform program. Macroeconomic reforms are not inherently good or bad for the poor. Some policy measures may affect the income of a certain group of low-income households positively while other low-income households may be affected negatively. Similarly, modifications of a policy reform program may change significantly the effects on a particular group of poor households. Therefore, information about the likely effects of particular policy measures on specific population groups may assist in assuring the desired effects of reform programs on growth as well as equity.

Unfortunately, such information is very scarce. One of the main reasons why the impact on low-income population groups is poorly documented is that it is difficult to estimate with a reasonable degree of accuracy. The relevant factors and relationships are many, and the separation of the impact of specific policies from the impact of other factors is very difficult.

It is important to predict short-term effects on the poor because policy reforms frequently include changes of particular concern to them, such as increasing food prices, lower real wages, and reduced government expenditures on social programs. This book is an attempt to contribute to the generation of the information needed to better understand how the poor can be protected from adverse effects of policy reforms and how positive effects may be enhanced. The focus of the book is on analytical methods needed to estimate the causal effects of policy reforms on the well-being of the poor, including their food security and nutritional status. The present chapter provides a conceptual framework for the rest of the book and briefly summarizes the highlights of each of the chapters.

1.2 A Conceptual Framework

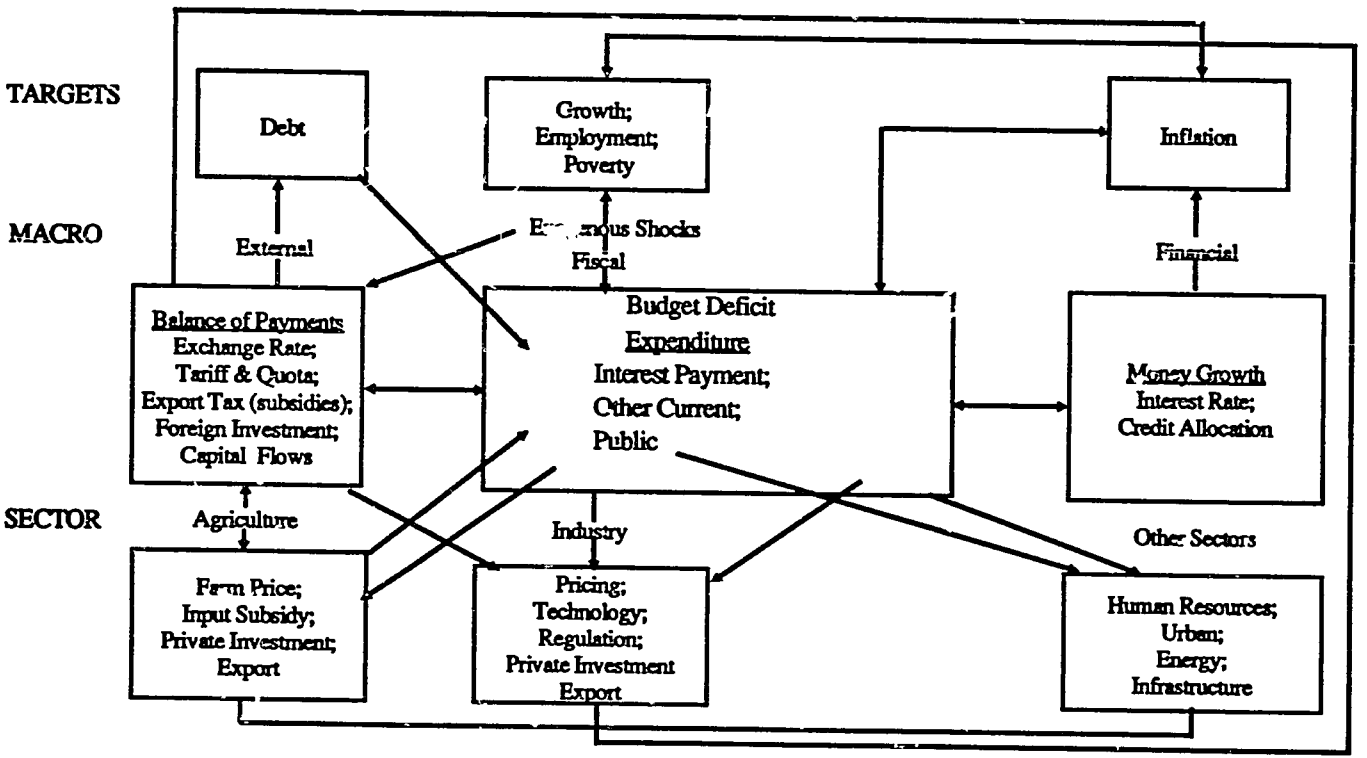
Macroeconomic policy reform programs usually include changes in both macroeconomic and sectorial policies. The interactions among the various policy changes are important for the final outcome. These interactions may be complex, as shown in figure 1.1, and contribute greatly to the difficulty of estimating the impact of any one policy change. As shown in figure 1.1, the main targets of macroeconomic policy reforms are foreign debt, economic growth, employment, poverty, and inflation. In an attempt to understand how poverty is affected, it is useful to consider separately the effects caused by changes in the public sector, e.g. changes in taxes, transfers, and public spending, and the incidence by sub-group, and the effects resulting from changes in output, employment, factor payments, and prices in the private sectors (figure 1.2). Obviously the links between the public and the private sectors are of paramount importance. A more detailed schematic outline of the pathways through which the effects of policy reforms on poverty may flow is shown in figure 1.3. If the interest goes beyond poverty to specific welfare measures such as household food security and nutrition, several additional links to policy reforms must be considered, including relative prices, government spending on primary health care and nutrition, gender-specific time allocation employment and income control, changes in sanitary conditions, and access to clean drinking water (figure 1.4).

1.3 An Analytical Framework

Ideally, the analytical model will incorporate all the critical links as outlined in figure 1.3 and include in the estimations the feedbacks occurring in the economy in a general equilibrium sense. The design of such models is discussed by de Janvry, Fargeix, Sadoulet, Thorbecke, and Berrian in chapters 2 and 3.

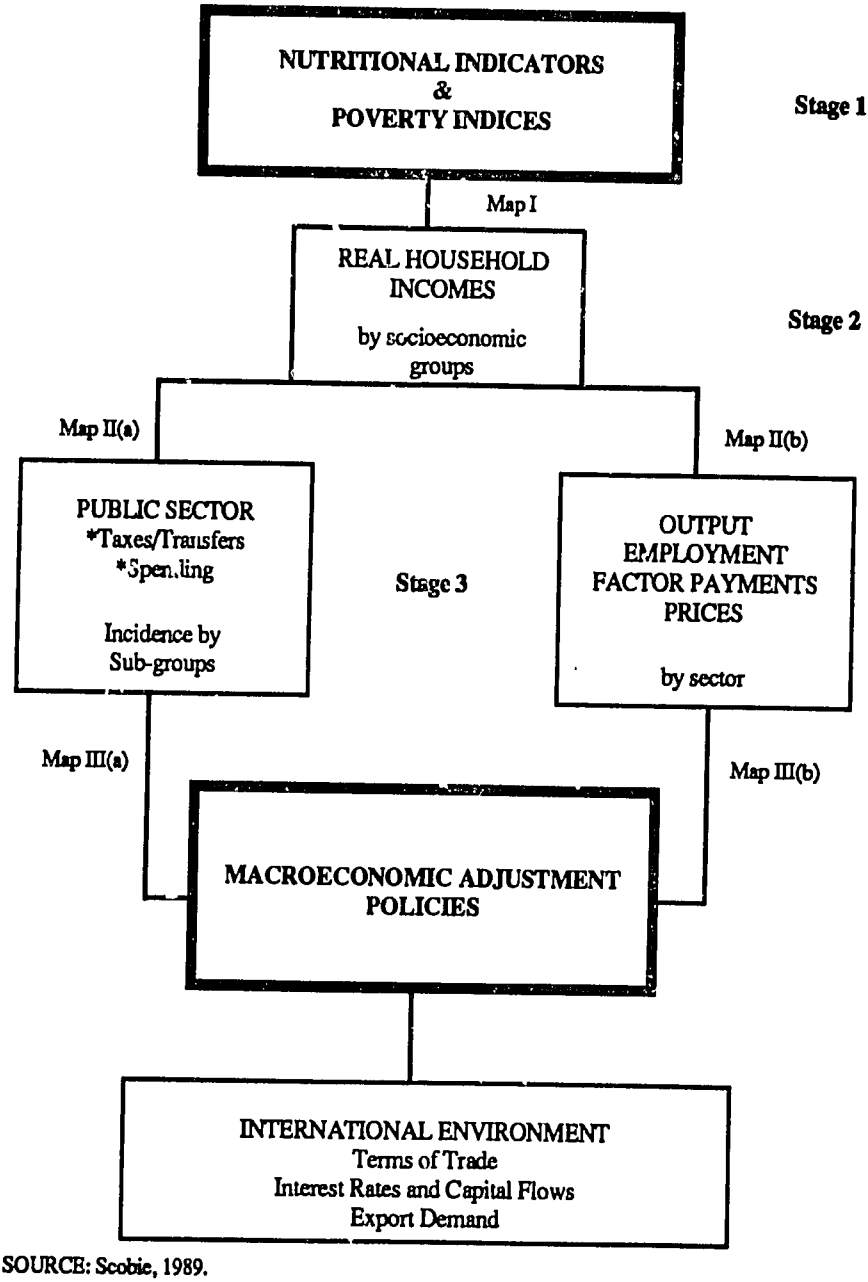
Using computable general equilibrium (CGE) models for Morocco, India, and Egypt, de Janvry, Fargeix, and Sadoulet illustrate the use of such models for the analysis of stabilization and structural adjustment policies and the types of results

Figure 1.1. Illustration of how adjustment policies interact.



SOURCE: World Bank (1988) *Adjustment Lending, An Evaluation of Ten Years of Experience*. Washington D.C.: Country Economics Dept.

Figure 1.2 - Schematic outline of the major elements of the research strategy for case studies.



SOURCE: Scobie, 1989.

Figure 1.3 - Schematic overview of the most important links between macroeconomic policy reforms and poverty.

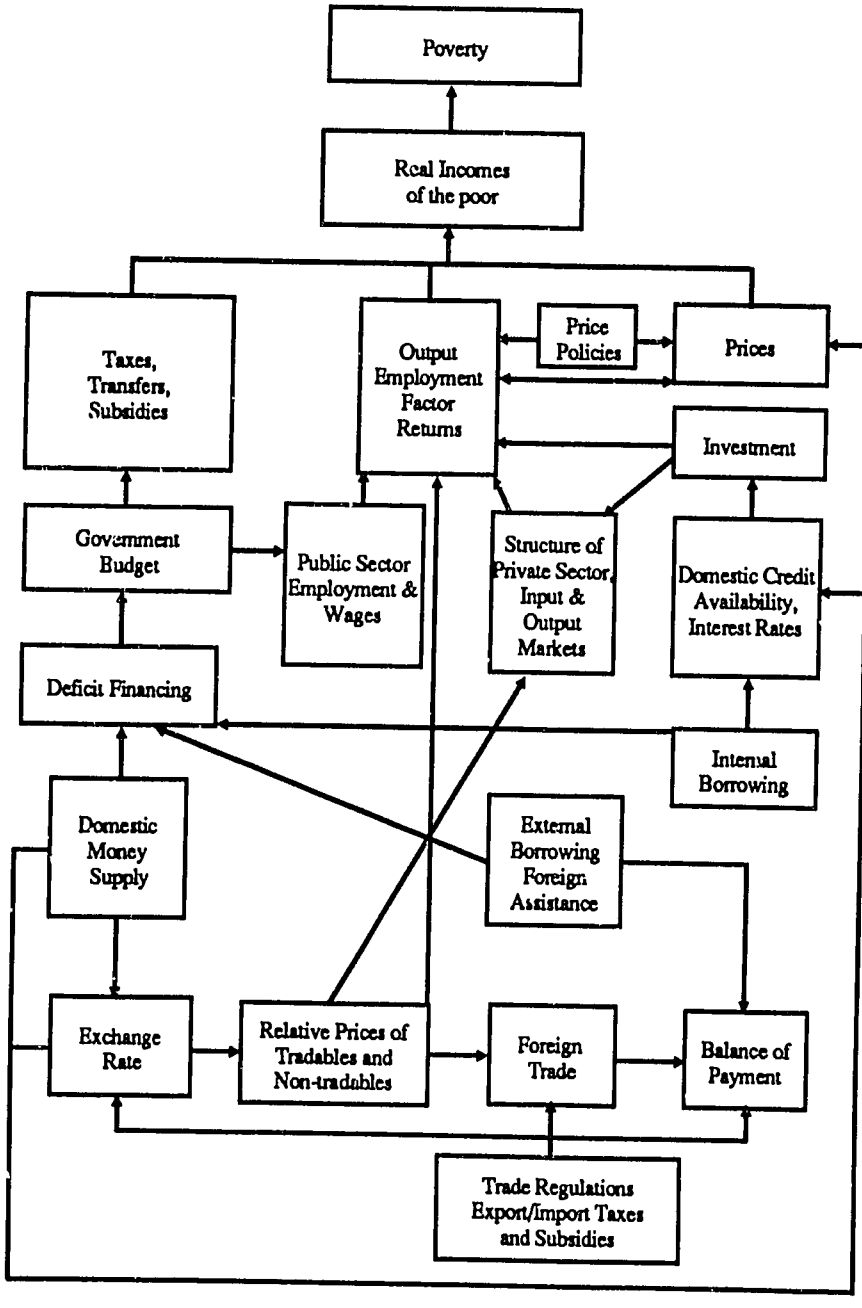
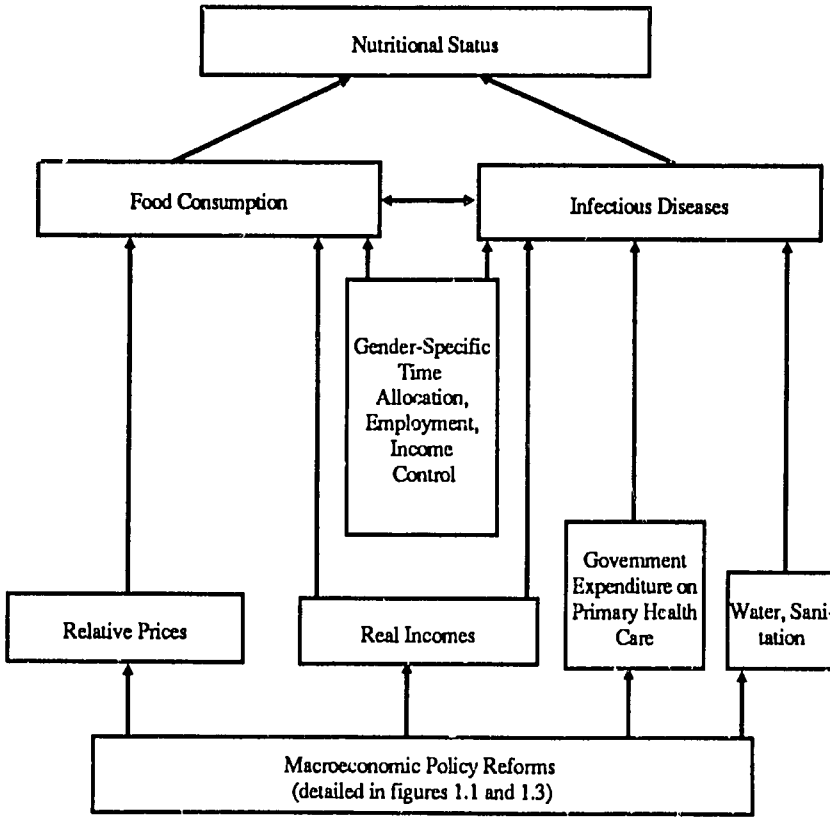


Figure 1.4 - Schematic illustration of the principal factors that may link macroeconomic policy reforms to nutrition.



that can be obtained. On the basis of policy experiments with these and other real-side CGEs, the authors conclude that many of the powerful growth and welfare effects of stabilization and structural adjustment policies occur through secondary consequences such as induces changes in relative prices and employment. These effects are large, difficult to identify, and likely to be missed in partial equilibrium approaches.

Many of the growth and welfare effects are due to monetary phenomena. Yet most CGEs, including those discussed above, are limited to the real side of the economy and exclude the financial sector. Therefore, the authors of chapter 2 conclude, it is essential to include a financial sector in real CGEs and to model the behavior related to financial assets and monetary phenomena. Attempts to do so in

past models are briefly reviewed, and the modifications needed to include the financial sector are discussed. Finally, an agenda for future modeling is presented.

A CGE-based analysis of the income distribution effects of policy reforms is usually based on a social accounting matrix (SAM). As further discussed in chapter 3, the SAM shows the major expenditure transactions among production activities, factors of production, owners of factors, and exogenous accounts. In chapter 3, Thorbecke and Berrian briefly describe the SAM and how it is used within a CGE. They then proceed to review results from several past CGE-based analyses of economic adjustment. The utility of a static modeling technique—Structural Path Analysis—for identifying the pathways and mechanisms by which exogenous income changes are transmitted through an economy is discussed, followed by an analysis of how best to measure the impact on poverty, i.e., how to translate income changes to changes in poverty. Several poverty measures are presented and their strengths and weaknesses are discussed. While these measures are based on the household as the socioeconomic unit, the authors recognize the need for more information about the intra-household income distribution, particularly in cases where food security and nutrition effects are of interest. The authors conclude that existing information is insufficient to incorporate intra-household distribution issues into CGEs. Chapter 3 concludes with a brief outline for an analysis of the poverty effects of policy reforms suggesting the following four major sets of activities: 1) definition of the structure of the economy in a base period, 2) identification and specification of the macroeconomic policy change, 3) specification of the CGE model, and 4) transformation of changes in income to changes in poverty.

The use of CGEs for the analysis of the effects of policy reforms on the poor is further elaborated in chapter 4, where Sarris specifies a model aimed at reforms in the agricultural sector. This sector is of particular importance because of its significance as a source of growth in general and as a source of income for a large share of the poor. The model, which is designed to incorporate a wide variety of policy instruments, assumes fixed nominal wage and foreign exchange rate in the short run and investments do not adjust to savings. The author argues that these assumptions are more appropriate than the neoclassical assumption that all markets clear for the analysis at hand. In addition to a detailed description of the static CGE model, the dynamic adjustment mechanisms are presented. The model was applied to analyses of four countries, and some of the results are reported in the chapter. Sarris concludes the chapter with a discussion of how to extend the model to stress the estimation of the impact on the poor and the additional data requirements associated with such an extension.

Income changes in the agricultural sector may have significant implications for incomes from non-agricultural rural sources through agricultural growth linkages. Since a large share of incomes earned by the rural poor in most developing countries originates from non-agricultural income sources, these linkages should be explicitly considered in analyses of how policy reforms affect the poor. Analytical approaches for doing so are discussed by Hazell in chapter 5. The determinants of the size of the multipliers are discussed, and a model for estimating regional agricultural multipliers is presented. The size of the value added multiplier is determined by three parameters: the marginal budget share for nontradeables in household expenditures, the ratio of nontradeable intermediates to gross output in total production, and the ratio of value added to gross output in total production. A sensitivity analysis is performed using various values of these three variables, and the author concludes that the multiplier is likely to be around 1.5 for rural Africa and about 1.8 for Asia. In view of the rather significant magnitude of the linkage effects, attempts should be made to incorporate them into CGEs. The author concludes the chapter with a set of suggestions as to how this might be done.

In chapter 6, Addison and Demery analyze the impact of policy reforms on income distribution on the basis of economic theory and derive a set of guiding principles for tracing the distributive effects. This is followed by the presentation of an analytical methodology for analyzing the effects of policy reforms on employment and wages (chapter 7). In this chapter, Terrell advances a two-pronged approach that reflects the nature of policy reforms. Reform policies are designed primarily to influence decisions about the pricing and allocation of inputs and outputs. This is the first prong. However, the response of the sectors to these policies affect wages and employment, this being the second prong of the approach. Thus, the second prong addresses such questions as whose wages increased or decreased, which groups are most likely to lose their jobs, and did they find alternative employment.

The effects on poverty and income distribution are further discussed by Achdut and Bigman in chapter 8. The emphasis of this chapter is on the effects operation through changes in price levels. The purpose of the chapter is to illustrate the use of household data collected over a sequence of years for an assessment of the effects of rapid inflation on poverty. The empirical analysis is applied to the Israeli economy for the period 1979-84, a period of extremely high rates of inflation. The model estimates trends in income inequality and poverty comparing a number of measures. The chapter concludes with preliminary results from ongoing research on the cost-effectiveness of various compensatory programs to protect the poor from adverse effects of inflation.

Analytical approaches to the estimation of the effects of policy reforms on the poor via changes in the public sector are analyzed in chapters 9 and 10. Tax and expenditure policies are discussed first (chapter 9), followed by a discussion of how to estimate the effects of changes in health and other social programs (chapter 10). After a brief discussion of a number of fundamental issues associated with the assessment of the effects of fiscal policies on income distribution, Catsambas (chapter 9) presents a consistent analytical framework for assessing the short-run distributional effects of changes in government revenues and expenditures. The author questions the usefulness of CGEs to estimate the effects on income distribution and poverty and proposes instead a partial equilibrium methodology of tax and expenditure incidence by income group.

With a focus on Latin America and the Caribbean, Beharie (chapter 10) argues that serious deteriorations have taken place in the physical infrastructure in education, health, and other social sectors and that malnutrition is on the increase. A major reason for these deteriorations is the inability of the public sector to provide the necessary support in periods of economic crisis. A conceptual model is presented to identify and illustrate the mechanisms through which reductions in government expenditures affect health and nutrition, and a methodology to assess these effects is proposed along with a listing of the data requirements. Finally, the author suggests ways to mitigate the negative effects of reductions in government spending on the poor.

Having addressed the various pathways through which macroeconomic policy reforms may influence low-income households, we now turn to the household response. In chapter 11, Behrman presents an analytical framework for analyzing the household behavior of particular relevance to food consumption, nutrition, and health. The author argues that the relationships of primary interest are reduced-form demand relations for food consumption, nutrient intakes, and health status. In addition to the presentation of the appropriate models, some of the most important data issues are discussed, and a brief synthesis of recent empirical evidence related to household food acquisition and consumption behavior is provided.

The last three chapters present results from empirical analyses of various aspects of economic policy reforms. In chapter 12, Musgrove reports the main findings from a study of several food related transfer programs in Brazil. He concludes that noneconomic determinants of nutritional status need to be taken into account in analytical models aimed at the estimation of the nutrition effects of reform programs. Without these determinants explicitly incorporated into the analyses, it is difficult to explain the links between changes in incomes and poverty on the one hand and changes in nutrition on the other. The nature and effectiveness of the

compensatory programs must also be built into the analysis in order to assist in making realistic choices among alternative programs.

In chapter 13, Sahn reviews the available evidence of the impact of policy reforms on food security in Africa and concludes that the assertion of strong negative effects cannot be supported by available information. Simultaneous occurrence of policy reform programs and food insecurity in many African countries has been misinterpreted to mean that the former has caused the latter. Thus, until solid causality analyses have been completed, it is difficult to say how food security and nutrition in Africa have been affected by policy reforms. Based on the information available, Sahn concludes that sustained improvements in food security can be made only if current economic stagnation is replaced by growth. Emphasis on raising output rather than contracting demand is likely to be beneficial to most groups, including most of the poor. The extent to which the poor will benefit will depend on how growth is promoted and the existing structure of production. Removal of the factors in the rural economy that have discriminated against small scale producers is likely to result in both economic growth and improved food security. In order to provide more policy-relevant information, the author suggests that policy performance and outcomes should be monitored in adjusting countries, and models should be developed that are capable of simulating the impact of various alternative adjustment paths.

Finally, in chapter 14, Glewwe and de Tray present some of the results from a study of Côte d'Ivoire and illustrate how household survey data can be used to assist in choosing policies to protect the poor during periods of economic crisis and economic policy reforms. Four general findings emerged from the study. First, the immediate effects of structural adjustment policies differ widely among groups of poor. The rural poor tend to be well insulated from negative effects occurring through the market because they produce much of the food they consume. Second, because most of the poor are in fact rural poor, the negative effects and the government cost of compensating them are less than often indicated. Third, the authors found that targeting on the poor is likely to be extremely difficult and expensive because the poor are more heterogeneous and widespread that often believed. Finally, it was concluded that household survey data can be extremely useful for assessing the direct, short-run effects of structural adjustment.

Taken together, the 13 chapters briefly discussed here provide a set of analytical approaches for consideration by analysts who wish to undertake empirical studies of how economic policy reforms affect low-income households. The need to estimate causal effects is emphasized throughout the book. We need to better understand how specific policies affect specific groups of low-income households and individuals within these households and how various modifications in the

reform programs and compensatory programs may avoid negative and enhance positive effects. Without solid quantitative estimates of causation, our knowledge of these issues will continue to be insufficient to provide guidelines for policy.

2. THE WELFARE EFFECTS OF STABILIZATION POLICIES AND STRUCTURAL ADJUSTMENT PROGRAMS ANALYZED IN COMPUTABLE GENERAL EQUILIBRIUM FRAMEWORKS

Alain de Janvry, André Fargeix, and Elisabeth Sadoulet

2.1 The Welfare Effects of Stabilization and Structural Adjustment

As a result of economic mismanagement or of unexpected internal or external shocks, most Third World countries have had to implement severe stabilization policies and structural adjustment programs, particularly during the last five years. Economic mismanagement resulted principally from severe distortions in international trade and overvalued exchange rates associated with ineffective import substitution industrialization policies, as well as from excessively expensive schemes of producer and consumer subsidies financed by money creation.

External shocks have also occurred with unexpected intensity during this period. Sluggish import demand by more developed countries (MDCs) due to slow economic growth and rising protectionism has led to falling international terms of trade for the less developed countries (LDCs). Implementation of monetary policies to control inflation in the MDCs has raised interest rates at the same time as new international loans were sharply reduced following the defaulting of Mexico in 1982, thus precipitating the debt crisis. Finally, availability of nonmilitary international aid has also been declining. These shocks came after a decade of rapid economic growth where primary commodity export booms and the extraordinary accumulation of foreign debt had created rapid appreciation of the real exchange rate.

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External shocks and economic mismanagement suddenly left the LDC economies with excessive domestic money creation and vastly overvalued exchange rates. The consequence was excess demand resulting in inflation and deficits in the balance of payments.

To adjust to these disequilibria, LDCs had to implement both short-run stabilization policies and medium-to-long-run structural adjustment programs. While the two cannot be fully distinguished, stabilization policies essentially attempt at managing aggregate demand to reduce both the balance-of-payments deficit and inflation, while structural adjustment programs aim at reallocating resources between sectors and at changing the structure of production and consumption.

Stabilization policies attack the balance-of-payments deficits through exchange rate devaluation. Inflation is confronted through a financial program that reduces the growth in the money supply and also the government spending deficit by lowering government expenditures and/or raising taxes (i.e., through contractionary fiscal and monetary policies). Reducing simultaneously the foreign sector deficit and inflation is, however, not free from difficulties. A devaluation of the nominal exchange rate that (as it should) depreciates the real exchange rate will not only raise the price of tradables relative to that of nontradables but will also raise the price of nontradables. This is due to the fact that real exchange rate depreciation induces a shift in resources away from the production of nontradables while it induces consumers to reallocate consumption for tradables toward nontradables. To prevent a devaluation from increasing inflation, it must, consequently, be accompanied by monetary restraint, particularly since the supply elasticity of nontradables tends to be low. Another potential contradiction between devaluation and inflation comes from speculation on the exchange rate, if its change is expected. In this case, speculation leads to capital outflight and hence to rising domestic interest rates and to cost-push inflation in the markup price sectors (industry). Finally, if the elasticity of substitution between domestic and imported goods is low in production as well as consumption, and if the imported components are high, exchange rate devaluation will fuel inflation and create the need for further devaluation, a classical inflationary spiral in many Latin American countries.

Structural adjustment refers to changes in production, factor use, technological options, and consumption patterns in response to depreciation of the real exchange rate that has cheapened the price of nontradables relative to that of tradables. Structural adjustment programs seek to assist the reallocation of resources from the production of nontradables (construction and services) to that of tradables. Since the objective is to increase efficiency, these programs are usually accompanied by liberalization policies, thus seeking to create net social gains by eliminating existing price and trade distortions. Tradables can be either exported, in which case structural

adjustment increases foreign exchange earnings, or imported, in which case it increases foreign exchange saving by import substitution. Since the price of tradable inputs rises relative to that of nontradables, factor use and technological options shift toward the latter, inducing use of more labor- and natural resource- intensive production patterns. This shift toward labor-intensive technologies is further reinforced if liberalization eliminates capital subsidies formerly received through negative real interest rates on institutional credit. Finally, consumers are induced by relative price changes to shift demand away from tradables toward nontradables, thus reducing import demand and freeing tradable supply for higher levels of exports. If, additionally, the effects of the foreign exchange shortage had been suppressed by import quotas and tariffs, depreciation of the real exchange rate and removal of protection lead to reallocation among tradables from import substitutes to exports.

As we will see, the specific combination of stabilization, liberalization, and adjustment policies and their speed of implementation create markedly different outcomes. While stabilization policies can be imposed as a shock treatment and create immediate gains on the balance of payment by contraction of the economy (but not necessarily on inflation and at the cost of a recession), structural adjustment requires a significant lapse of time, and this the more there exist rigidities in the substitution between nontradables and tradables among products, factors, and consumption goods. Key issues here are consequently, the extensiveness of the disequilibrium and the time path of adjustment and, hence, the political acceptability of the program which dictates its sustainability over time. This, in turn, is very much determined by the (real as well as perceived) growth, welfare, and income distribution effects of the stabilization and structural adjustment programs.

The growth and welfare effects of stabilization policies (SP) and structural adjustment policies (SAP) are both far-reaching and far from trivial, and it is the objective of this chapter to discuss how they can be analyzed in the context of (CGE) models. For one thing, the ways in which SPs and SAPs are implemented vary widely across countries according to the origins of disequilibria, the structure of the economy, and the forces of the political economy. Even whether a devaluation of the nominal exchange rate leads to depreciation of the real exchange rate depends on the price system, variations in the money supply, and the level of government spending. If, for example, wages are indexed on the price of tradable goods (principally food products), a nominal devaluation will eventually have no effect on the real exchange rate.

The growth effect of stabilization and adjustment depends on whether excess demand will be reduced principally by falling demand or by rising supply. Since resource reallocation toward tradables in production and toward nontradables in

factor use and consumption is rigid in the short run, demand adjustment will dominate at first and imply eventually severe growth losses. If resource reallocation does indeed follow, the long-run gains in going from disequilibrium to equilibrium should at least partially compensate short-run losses. The magnitude of reallocation and hence its difficulty depends upon whether disequilibrium was largely internal (excessive government expenditure relative to revenues, excessive wage demands relative to productivity growth, or willingly overvalued exchange rate) as in the 1960s and 1970s; or if it is mainly or additionally external (falling international terms of trade, falling international capital flows, and rising debt service costs) as in the 1980s. The key parameters for resource reallocation and hence for the success of a devaluation of the real exchange rate are, thus, (1) the elasticity of supply of exports (which depends not only on the elasticity of transformation between nontradables and tradables but also on the elasticity of substitution in consumption between tradables and nontradables and on the share of the output of tradables that is domestically consumed and hence can be freed for exports); (2) the elasticity of substitution in production between domestic and imported inputs, the share of imported inputs in factor use, and the possibility of technological innovations toward production functions with lower import content; (3) the elasticity of substitution in consumption between nontradable and tradable commodities; (4) the elasticity of export demand for the country on the world market; and (5) if devaluation is accompanied by elimination of credit subsidies, rising capital costs in the sectors that formerly benefited from credit subsidies will reduce employment and output while they will increase in the sectors (e.g., the peasantry and the urban informal economy) formerly excluded from credit subsidies. Impact of the devaluation on growth will consequently depend on the relative sizes of these sectors. How specific values of these elasticities and of structural shares combine in determining the ultimate growth effect of stabilization is highly complex and calls upon CGE analysis.

The welfare and income distribution effects of SPs and SAPs are equally difficult to predict. While the first impact will generally be negative on the welfare of the poor and regressive on the distribution of income, appropriate management of these policies and compensating programs may well allow for more progressive effects in the short run and welfare gains for the poor in the long run. As William Cline (1983, p. 192) wrote after reviewing a number of country experiences, "there appears to be considerable scope for taking distributional considerations into account in stabilization programs." For one thing, the ability of stabilization to control inflation and of adjustment to preserve growth have strong welfare effects. Inflation tends to be a highly regressive tax so that success in reducing it may benefit the poor most. If growth can be preserved, the social cost of unemployment will be reduced by that much.

Negative and regressive welfare effects tend to come from rising prices of tradables and inflationary effects of a devaluation that lower real wages (unless indexed) and the share of labor in GNP; rising real interest rates that increase the cost of capital in value added; exchange rate devaluation that favors the holders of foreign assets; and declining government spending leading to cuts in labor-intensive public works programs and in expenditures on food subsidies, health, education, housing, and social security.

Specific distributional effects are, however, complex and difficult to anticipate. On the production side, they depend on the ability of different social sectors to reallocate resources and on their relative presence in the production of tradable goods (are peasants, for instance, producing disproportionately nontradable goods, and are their resources cornered in these sectors?). Higher food prices will increase the incomes of family farm households, which are net sellers of food, while it will decrease that of net buyers. On the consumption side, the relative weight of tradables and nontradables in consumers' baskets is highly uneven across income levels (high-income services are nontradables while most staple foods are tradable). Finally, peasants who use a labor-intensive technology and labor-intensive farming systems may well benefit from exchange rate devaluation more than commercial farmers who use technologies and farming systems with high capital/labor ratios and a high import content. It is, again, for these reasons that the specific welfare and equity effects of stabilization and structural adjustment need to be looked at in the context of CGEs. We therefore turn toward the use of CGEs for that particular purpose in the rest of this chapter.

It is clear from the above that many growth and welfare effects of SPs and SAPs occur through monetary phenomena, particularly via the impact they have on the rate of inflation and the rate of interest. It is consequently essential that CGE models used for that purpose represent both the real and the financial sides of the economy. Most CGE models, however, only describe the real side and can consequently only determine relative prices with one price serving as numeraire. We explain in Appendix 2.1 how a core real-side CGE model is constructed and what alternative specifications can be introduced. As an illustration of the types of results that these models provide in studying SPs and SAPs, we present in section 2.2 the effects created by an exchange rate devaluation with and without compensatory welfare

programs and by reduction in food subsidies. We use for that purpose CGE models for Morocco, India, and Egypt.[1] Different economic structures help explain why the effect of a given policy instrument can differ sharply across countries.

In section 2.3, we discuss the types of modifications that need to be made to real-side CGEs in order to introduce the financial side of the economy. We do this by both reviewing past attempts and by suggesting needed additional extensions.

2.2 Experiments with Real-Side CGE Models

Real-side CGEs can be used to simulate the consequences of many aspects of SPs and SAPs. They include devaluation of the exchange rate (relative to a specific numeraire), trade liberalization, reduction in government expenditures and fiscal policies, exogenous adjustments in wages and interest rates, and income transfers. The models can trace out the reallocation of labor and capital in production and changes in consumption and trade patterns. This in turn affects sectoral output levels and the real incomes of specific social groups. In the following experiments, we analyze the effects of an exchange rate devaluation with and without compensatory programs and of reductions in food subsidies.

2.2.1 Exchange Rate Devaluation

A devaluation of the exchange rate will have very contrasted effects on Gross Domestic Product (GDP) growth and on the real income of specific socioeconomic groups depending on the resource constraints and on the economy's flexibility in production and consumption.

With productive capital fixed in all sectors in the short run, all changes in production will come from adjustments in sectoral employment. Some general macroeconomic results immediately follow: (1) if the economy is running with full employment of its labor force, no overall growth can be generated, and a devaluation of the exchange rate will induce reallocation of labor and production with no substantial effect on GDP; and (2) with the availability of labor resources previously in surplus, two cases can be considered depending on the model of price formation that applies.

First, if the commodity markets are in equilibrium, implying that there is no excess capacity in economic terms on the production side and that the marginal

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1 The model for Morocco is an updated version for the model constructed by A. Mateus, C. Bell, and E. Sadoulet at the World Bank. For a more complete analysis of SP and SAP with the original data and model, see A. Mateus (1986). The models for India and Egypt were developed by A. de Janvry and K. Subbarao (1986) and by J.J. Dethier (1985), respectively.

product of labor is equal to the fixed wage, changes in production are directly related to the change of the real cost of labor. Therefore, a devaluation that induces an increase of some or most of the commodity prices in a context of some fixed nominal wage will automatically induce growth.

Although a recession cannot happen in this case, the rate of growth depends on the parameters of production and consumption. This is illustrated in the first two experiments with the Morocco model in table 2.1. Both experiments assume marginal cost pricing, but they differ in the elasticities of demand for exports, of substitution between imports and domestic production, and of substitution between primary factors. While a 10 percent devaluation in a relatively flexible environment (experiment 1) induces a substantial reduction of both the balance of trade deficit and the government deficit and an overall growth of 1.2 percent, the same devaluation implemented in an extremely rigid economy has no impact on GDP (experiment 2).

The second case is that of an existing excess capacity in the productive sectors. Production directly responds to real demand, at given markup (or fixed) value added prices, independently of the change in wages. A devaluation raises the cost of imported inputs and creates a cost-push price increase that induces a decrease in consumption coming from all the incomes that are fixed in nominal terms, wage income and certain government expenditures in particular. On the other hand, total demand rises due to an increase in net external demand and in the value of transfers and remittances made in foreign currency. The overall impact of devaluation on growth then depends on the balance of these opposite elements. The base run for such a model of markup pricing in all nonagricultural sectors is given in experiment 3.

The importance of rigidities in the structure of the economy and in export demand is shown by experiments 3 to 5 where the impact of the same 10 percent devaluation is simulated. Assuming very rigid constraints in the two main export markets of Morocco (phosphates, and textiles and leather products) due to quota agreements with the European Economic Community, its main partner, and a low substitutability of the main imports (production goods and oil) by domestic production, the effect of a 10 percent nominal devaluation is a 1.5 percent increase in price (and therefore only a 8.5 percent real devaluation) and a decrease of .5 percent of real GNP (experiment 4). The urban and rural poor suffer from both the loss of employment and rising prices. Rich agricultural households are protected by the increase in value of their production, particularly import competitive cereals and export crops.

Releasing the constraints on industrial exports and combining it with an increase in import substitutability in the industrial sectors (experiment 5) generates growth

Table 2.1 - Exchange Rate Devaluation of 10%: Sensitivity Analysis with Morocco Model (Changes in %)

	MARGINAL COST PRICING		MARKUP PRICING				
	Base run	Low substitution	Base run	Export Quotas	High Import Sub-stitution	Unskilled wage increase	Food subsidies cut and income transfer
Experiment	1	2	3	4	5	6	7
Balance of trade deficit in dollars	-26.2	-12.5	-24.2	-15.8	-31.5	-22.1	-22.2
Government deficit	-22.2	-12.5	-21.1	-7.8	-26.8	8.6	-16.4
Gross domestic product	1.2	0.0	1.6	-.5	2.1	-.3	1.5
Price index	3.2	0.0	2.5	1.5	4.1	5.2	3.3
Real Incomes							
Rural poor	1.0	-2.1	1.5	-3.1	1.4	-1.3	-.3
Rural rich	2.6	-1.3	3.8	.2	2.8	.6	-1.1
Urban poor	-1.3	-1.4	-1.3	-2.8	-.2	-2.4	1.1

Experiment
2 - All elasticities of substitution and elasticities of export demand reduced to .35.
3 - Mark up pricing in industry and service; export quotas on phosphates.
4 - (3) + export quotas on industrial exports, and Armington elasticities equal to .4.
5 - (3) + Armington elasticities equal to 3 for oil and industry.
6 - (3) + 5% increase in unskilled nominal wage.
7 - Cut of food subsidies, transfer to urban poor of the base run value of food subsidies.

and employment without substantial price increase in these sectors. However, pressure on demand for agricultural products generates higher imports and higher prices. The resulting increase in the consumer price indexes (CPIs) partially offsets the benefits accruing to the urban poor from employment, while higher incomes are generated for all rural households.

2.2.2 Devaluation with Compensatory Programs

The above results suggest that some compensatory measure may be needed for specific urban groups in order to avoid the negative effects of devaluation. Keeping the same value for the elasticity parameters as in the base run (experiment 3), two compensatory programs are simulated: (1) an increase of 5 percent of the lower urban wages, and (2) a direct income transfer to the lower urban income group. The wage increase (experiment 6) induces cost-push price increases that more than offset the rise in nominal incomes for the poor. This decrease in domestic income, combined with a decrease in the competitiveness on the international market, produces a recession. A targeted income transfer will avoid the cost increase side of the previous redistribution scheme, but the financing of the transfer requires a cut in alternative government expenditures. In experiment 7 all food subsidies, implemented through a nontargeted price subsidy on flour and bread, are eliminated and replaced by an equivalent amount in income transfer to the urban poor. Food prices increase dramatically, inducing a general price increase of 3.3 percent and an even higher CPI increase of 6 percent to 7 percent for the different income groups. As the demand for cereal products decreases, producer prices and production do not increase as much as in the base run, leaving large farmers with a decrease in real income. Small farmers who are more specialized in cattle raising and are net buyers of food are hurt by the food price increase. This income redistribution measure has the advantage of imposing almost no cost on overall growth induced by devaluation as compared to the base run.

The main lesson to be learned from these experiments is that the impact of a devaluation (both on growth and poverty) is highly sensitive to the structural constraints facing the economy on the labor market, on capacity utilization, on import substitutability, and on the export markets. Because of their vulnerability to food prices, the urban poor always lose unless specific programs are targeted to them. Rural households, on the other hand, may benefit from growth in price and/or demand of their mostly tradable production. However, if the rural poor produce more nontradables, such as cattle, they will be hurt by inflation of consumer prices, too.

Table 2.2 - The Effect of a Food Subsidy Decrease of 1% of Gross Domestic Product (Changes in %)

	India[a]	Egypt[b]	
		Short run	Long run
Target group	Urban	All	
Consumer price index	- 6.9	+ .8	+ .8
Real income			
Landless	+6.0	—[c]	—
Small farmer	+1.0	+ .1	- 0.2
Large farmers	- 7.7	+ .2	- .3
Urban workers	+3.4	-1.6	- 1.8
Gross Domestic Product	- 0.5	-0.7	- 0.9

[a]Food subsidies are identical to an income transfer to the urban sector. The consumer price index is calculated on the basis of free market prices.

[b]Food subsidies are identical to a price wedge between subsidized and free market prices. The calculation of the consumer price index includes subsidized prices.

[c]Dashes indicate that category does not apply.

2.2.3 Reduction of Food Subsidies

Many Third World countries have systems of food subsidies that began as rationing schemes during World War II. These programs then acquired their own political momentum and absorbed as much as 21 percent of government expenditures in Egypt (1979) and 28 percent in Sri Lanka (1970). In recent years, under the pressure of balance of payments and inflationary difficulties, many countries have taken action to scale down food subsidies or have attempted to do so. We analyze in table 2.2 the growth and welfare effects of decreasing food subsidies to reduce government deficit using the CGE models for Egypt and India.

In Egypt, subsidies are based on imported goods that are financed by foreign aid and foreign borrowing. Decreasing food subsidies leads to falling food imports and rising domestic prices. In the short run this creates positive real income effects for farmers and negative effects for the urban poor. The reduction in foreign aid, which was both unlimited and at no significant cost, creates a negative impact on GDP growth in the short and long run. In the long term, the resulting depression generates loss of employment and decreases the real income of all rural and urban classes.

The case of India exhibits opposite results with positive impact on the welfare of the poor created by elimination of food subsidies. Indeed, food subsidies financed by increased public budget deficit created demand-pull price increases in the short run since aggregate consumption increased while food supply was inelastic. This price movement generated additional incomes for the net-selling farmers, hence

higher demand for industrial goods, higher profits for industry and, again, demand-pulled higher food prices. This created the perverse result that the real income of the target groups (urban workers) actually decreased when food subsidies were increased. The main losers were the net buying classes in agriculture (landless workers and small farmers) since they were hurt by high prices while not benefiting from access to subsidies. This result is consistent with the observation that food subsidies, under conditions of inelastic supply and of income elastic demand, are inflationary and can create backlash effects on the excluded net buying rural groups (Hayami, Subbarao, and Otsuka, 1977).

Quite different outcomes would be obtained, of course, if the elimination of subsidy expenditures were replaced by other expenditures in the current budget or in investment or if taxes were reduced by an equal amount.

The conclusion is that elimination of food subsidies may not always induce a decrease in the real income of the poor. Indeed, under certain conditions, the price deflation induced by the reduction in government deficit may over-compensate the direct loss of subsidy, inducing an increase in welfare of the poor, even among the previous beneficiaries.

These experiments with real-side CGEs show that SPs and SAPs have powerful growth and welfare effects and that many of these occur through secondary consequences (such as induced changes in relative prices and employment) that are both large and far from trivial to identify. Yet, real-side CGEs miss other important effects that occur through the financial side of the economy and the interactions between financial and real variables. The overall level of prices will, in particular, have very strong growth and welfare effects if there are many fixed nominal variables in the economy, such as wages, rate of interest, exchange rate, transfers, and particular assets. To analyze the impact of SPs and SAPs, it is thus essential to include a financial sector in real CGEs and to model the behavior of specific agents with regard to financial assets and monetary phenomena.

2.3 Introducing a Financial Sector in Real-Side CGEs

In the first section, we review briefly some attempts that have been made to introduce a financial sector into CGEs. We then discuss different modifications necessary to take into account most effects of SPs and SAPs in such a model.

2.3.1 Existing CGEs with Financial Sectors

The pioneering model of Adelman and Robinson (1978) examines the real income distribution effects of different policies. The financial sector includes only a market for loanable funds and a market for currency. The demand for and the supply of loanable funds are determined by investment demand and consumer savings, respectively, both of which depend on the interest rate. Although Adelman

and Robinson (1978) add some refinements (existence of an unofficial market for currency, rationing of borrowing by firms, and credit worthiness constraints on borrowing capacity), the market for loanable funds is basically clearing through the interest rate. As for the currency market, nominal supply is exogenous (fixed by the government), demand for real balances is determined by consumers' income, and the market is cleared by the price level. In the model formulation, however, the price level has very little effect on the rest of the economy. The only element of nonneutrality in the price level comes from the investment function: investments are set in nominal terms, and an increase in prices reduces real investment. There is no overall price effect on production and employment (there is always full employment; hence, wage always adjusts perfectly to price change), no real balance effect (since agents do not hold any nominal assets except a small quantity of money), and no intertemporal substitution effects (consumption does not depend on price level or expected inflation). Therefore, inflation is essentially a monetary phenomenon without any major real effect.

In Lewis (1985), integration of the real and financial sides is structurally very similar, but introduction of nominal values in household incomes, their financial wealth in particular, implies a stronger impact of inflation on the real side of the economy. Real and financial sides are related only by the interest rate. For a given level of investment, the CGE solves for relative prices and real wages and computes sectoral production and consumption as well as agents' real income, level of consumption, and savings. With investment and savings depending on the interest rate, r, equilibrium on the loanable funds market determines r and closes the model on the real side. Agents start the period with a financial wealth, FW_{t-1}, to which the current period savings are added to give the present financial wealth, FW_t. FW_t is then allocated between the two available financial assets, currency and time deposit. For the real income and r already computed, the demand for currency is proportional to the price level. The supply of currency is fixed by the government. Equilibrium on the currency market determines the price level, hence inflation.

As Lewis's experiments show, the impact of macroeconomic policy on the level of activity and the inflation level in these models critically depends on the functioning of the labor market.

Let us first define the instruments of macroeconomic policy available to the government in such a framework. Starting from the central budget constraint,[2] we

2 $G - T = D = \Delta H = \Delta CU + \Delta PR$, where G = government expenditure; T = tax revenues; D = government Deficit; H = monetary base; CU = currency; RR = level of commercial banks' reserves at central bank; Δ = change.

can decompose macroeconomic policy into its fiscal and monetary parts. Fiscal policy consists of setting the level and allocation of government expenditure and the level and sources of revenues. With the underdevelopment of financial market, which makes it impossible to issue bonds, the government must finance its deficit by creating money. The fiscal deficit, therefore, determines the level of the monetary base. Monetary policies only consist in choosing the composition of the monetary base between currency and required reserve. For instance, the central bank can require a given level of reserve from the commercial banks and finance the rest of its monetary base with currency. Or, like in Lewis (1985), the central bank can choose a reserve requirement (ratio of commercial bank reserves by deposits from individuals) and supply the amount of currency sufficient to cover the government deficit. The government macroeconomic policy can thus be summarized by the level of government deficit and currency supply.

The impact of such policies then strongly depends on the assumptions made about the labor market equilibrium. In a neoclassical model, real wages adjust to clear the labor market; and aggregate output is given by full employment production. As a consequence, government policy cannot influence real output. In that case, government expenditure expansion crowds out private investment and consumption through an increase in interest rates. Expansionary monetary policy, defined by an increase in currency supply for a given monetary base, only has an influence on the price level that serves both at equilibrating the currency market and the market for loanable funds. A rise in price reduces the real value of initial financial wealth (inflation tax) and hence decreases the real value of supply of loanable funds and equilibrates the loanable funds market (since expansionary monetary policy increases the supply of loanable funds by decreasing government borrowing). Here, inflation is essentially a monetary phenomenon.

On the other hand, if the nominal wage is fixed and if there is unemployment, the model has a Keynesian behavior. Aggregate supply is not fixed since an increase in price reduces real wage and favors employment and production. In that case, increased government expenditures increase aggregate demand, pushing up prices and stimulating production. A decrease in required reserve financing (expansionary monetary policy) makes more commercial bank funds available for loans. Therefore, it lowers interest rates, stimulates investment, and brings an increase in production by raising the price level. Contrary to the neoclassical case, inflation is both a monetary phenomenon and a consequence of increased demand.

Taylor and Rosensweig's (1984) CGE model has essentially the same structure as Lewis's (1985) except for a more developed financial sector: agents can hold different assets (currency, deposits, firm's equity, government security, capital, and foreign assets); the government and the central bank can use several monetary

instruments (forced borrowing from private banks, rediscount, and reserve requirement ratio); and banks can also borrow from abroad. Using a Keynesian closure, they simulate several policy experiments. Their findings are in agreement with our discussion above in that borrowing-financed fiscal expansion is strongly expansionary. The income effect on savings can be so large as to dominate the government's borrowing effect, inducing a net increase in savings supply, hence a fall in interest rates and an investment expansion (crowding in). Monetary contraction raises interest rates, reducing investment and national income.

2.3.2 Agenda for Future Modeling[3]

As further discussed in chapter 3, the analysis of the income distribution effects of stabilization policies starts from a social accounting matrix (SAM) with capital accounts, that is, identifying each agent's portfolio. Portfolios include both assets (such as real capital, housing, currency, demand deposits, interest-bearing deposits, government securities, firm's equity, and assets in foreign currency) and debts (including debt in foreign currency and the counterpart debts of the above financial assets). The immediate use of the data found in the capital account of the SAM would be to compute how the wealth of agents is influenced by exchange rate movements (capital gains/losses in claims or debts in foreign currency), inflation (part of the portfolio fixed in nominal terms), and interest rates (capital gains/losses on fixed interest rate debt/claims).

Combining this SAM with a simple macro model provides an interesting first step toward an income distribution analysis. The macro model would be used to find time paths of prices, interest rates, and exchange rates following a stabilization package; the data from the SAM capital account would generate the valuation effects on agents' wealth; and the SAM current account would be used for income multiplier analysis derived from the policy. A CGE-based study goes further in that financial variables as well as real variables are endogenized in a way that is consistent with behavioral assumptions about agents and the functioning of markets.

Starting from a real CGE, monetary phenomena can be brought into the model in different ways. The choice will depend greatly on the macro orientation given to the model, reflecting the functioning of markets in the country. The main macroeconomic choices concern the role of interest rates, the sources and effects of

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3 Since the writing of this chapter, an important part of the research agenda outlined in this section has been implimented by Bourguignon, Branson, and de Melo (1989) and by de Janvry, Fargeix and Sadoulet (1989).

inflation, capital mobility with foreign countries, and the role and determination of expectations about inflation and exchange rates.

In the following paragraphs, we examine how a real CGE can be simply extended to behave like different types of macroeconomic models. We then consider several issues that could be added to these models.

Appendix 2.2 gives a classification of the alternative macroeconomic structures that are discussed in the following sections. It is based on the specification of supply and demand on the goods and the currency markets (by Walras's Law, the market for loanable funds automatically equilibrates) and on the mechanism of wage determination.

2.3.2.1 Neoclassical Model with Full Employment. As already discussed, the full employment assumption creates a rigidity in supply that preconditions the impact of macroeconomic policy. Fiscal policy induces a change in the interest rate, that adjusts to raise or reduce consumption and investment demand when government demand changes. Monetary policy determines the price level.

With this model, the macroeconomic impact of stabilization policies is minimal. Since output supply is fixed, inflation and balance-of-payment problems can be solved by controlling the money supply, and devaluation will have an effect only on demand by reducing the real value of domestic income. Moreover, using this model does not seem justified in the short run: empirical evidence shows that there can be disequilibrium in the short run, especially on the labor market, and stabilization policies can have a strong effect on employment.

2.3.2.2 Monetarist and Keynesian Models. Consider now the case of a fixed nominal wage and a nonclearing labor market. The model can be described as a traditional IS-LM model determining aggregate demand for a given price, an aggregate supply that is a function of the price-wage ratio, and a flexible price bringing together supply and demand. (Since the nominal wage is fixed, an increase in price is equivalent to an increase in the price-wage ratio). In such a model, expansionary fiscal and monetary policies increase aggregate demand (directly for fiscal policy and through a decrease in interest rate and a rise in investment and consumption for monetary policy) and lead to higher prices and production.[4] The model's behavior, however, will greatly depend on key elasticity parameters. If the

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4 Both price and interest rate have an effect on all three markets (goods, currency, and loanable funds) and adjust simultaneously to clear them (Walras's law implies that two variables are enough to equilibrate three markets). We can not say that a particular market is cleared by a particular variable, contrary to the classical model, where for instance, output is fixed, and interest rates have to adjust to influence demand and clear the goods market.

elasticity of investment and consumption demand with respect to the interest rate is very low, monetary policy will be ineffective as in a traditional Keynesian model ($\partial X^d/\partial i = 0$) in Appendix table A2.2.1). On the other hand, if the elasticity of money demand with respect to the interest rate is low ($\partial M^d/\partial i = 0$), the model belongs to the monetarist tradition. Fiscal expansion will be ineffective, raising interest rates and crowding out investment and consumption; and monetary policy will be most effective since the entire decrease in interest rates will be absorbed by an increase in investment and consumption; and monetary policy will be most effective since the entire decrease in interest rates will be absorbed by an increase in investment and consumption. Within this last case, if we complete the model by adding an imperfect substitution on the goods market between domestic and foreign goods, the model's behavior will be similar to the International Monetary Fund (IMF) monetarist stabilization model as described in Khan and Knight (1981). That is, inflation and real production are positively influenced by an excess supply of money; fiscal expenditure has no direct effect on inflation and production (fiscal deficit, if financed by monetary expansion, does); and purchasing power parity does not necessarily hold, but domestic inflation is still positively correlated with foreign inflation.

Notice also that, in the general case where the two key elasticities are not zero, the model is close to the IMF model as discussed in Khan and Knight (1985). Here, fiscal expenditure will have a direct effect on production.

The model can also be made demand driven by taking a markup pricing behavior for firms. Output is thus assumed to adjust to demand without price signals. This hypothesis is more justified in an economy with large (eventually regulated) companies and excess capacity. In this case, the model will behave as a pure Keynesian, monetarist, or IS-LM model, depending on the values of the relevant elasticities of aggregate demand and demand for money. Expansionary policies (fiscal policy in the Keynesian case, monetary policy in the monetarist case, and both in the general case) generate growth but no inflation.

As can be expected from the previous discussion, the choice of a macroeconomic framework to represent the economy under study predetermines to a large extent the impact of the two instruments of stabilization policies considered here, the government budget deficit and the money supply. Under full employment, stabilization policies will reduce inflation without imposing any decline in the level of activity, as nominal wage adjusts fully to the price level and the real cost of labor does not increase. But, under labor surplus and rigid nominal wage, the reduction of money supply for the monetarists and the reduction of the government deficit for the Keynesians will allow the control of inflation at the cost of a recession, at least in the short-run. The underlying thrust, however, which is not represented in the

simple static model of a closed economy, is that the reduction of inflation will increase the competitiveness of the economy in the international market and growth may follow from increased exports.

2.3.2.3 Neostructuralist Model. Neostructuralists emphasize the presence of structural rigidities in the economy that prevent a rapid adaptation to external shocks. Some rigidities (e.g., immobile capital, imperfect substitution between domestic and foreign inputs and between primary inputs) are already embodied in a real CGE in the shape of the production functions. Elasticities of substitution can be set high or low depending on empirical estimations and the modeler's knowledge of existing rigidities.

The most important rigidity, however, comes from the functioning of the labor market. Structuralists state that the wage is set through a bargaining process between workers and industry owners in a fight over their relative share of the value added. Since the wage rate does not depend directly on supply and demand for labor, unemployment may appear. In that case, inflation includes a cost-pushed element: higher nominal wages bring higher prices (in cases of both markup pricing and marginal cost pricing).

If we keep the assumption of marginal cost pricing, the model can work as follows: In a first step, the nominal wage is determined by an equation such as $w_t = f(X_{t-1}, X_{t-2}, \ldots, X_{t-n})$, where X is a vector of variables that include generally only the wage rate and the price level (or inflation). The idea is that wages are set by contracts, which take into account past inflation and are predetermined for the current period. In a second step, w_t is introduced into a model that solves for the remaining variables, including the price level. In this case, inflation is a combination of an internal component and a demand pulled/monetary component.

It might be even more promising to combine the wage determination and the CGE in one step where wage depends on current inflation. Branson (1986) proposes the equation $\dot{w} = \gamma \dot{P}$ or

$$w_t = w_{t-1}[1 + \gamma\left(\frac{P_t - P_{t-1}}{P_{t-1}}\right)]$$

in discrete time where $\gamma\,(0 \leq \gamma \leq 1)$ is the degree of indexation depending on labor/capitalist relative power. In this case, the real wage is only partly flexible. The economic expansion, stimulated by fiscal and monetary policies, occurs at the cost of a rate of inflation greater than when nominal wages are fixed, because expansion requires a fall in the real wage while nominal wages will be (partly) resistant to any increase in price.[5]

Conversely, the recessionist impact of the stabilization policies will be lessened, as the reduction in nominal wage induces a lower increase in labor cost. This shows that, while modifying the intensity of the impact of stabilization policies, addition of a partial wage adjustment relation does not alter the direction of change in price and output.

An alternative model that produces strikingly different qualitative results is proposed by Taylor (1985).[6] The assumption is made of excess capacity in production and a markup pricing behavior that is more in line with the structuralist view. However, both the markup and the wage are endogenous, as they result from bargaining over the profit rate, itself a function of capacity utilization. The other difference is in the aggregate demand, which depends on the real interest rate $\dot{i}-\dot{p}$ and on the markup τ taken as a measure of inequality in the income distribution. Although differently modeled, the currency market is similar to the standard case.

There are two indeterminancies of sign in this model: an increase in demand induces an increase in capacity utilization and profitability, which may lead to an increase or decrease of the markup depending on the relative power of negotiating

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5 More precisely, a simple computation leads to

$$\frac{d(w_t P_t)}{w_t / P_t} = \sigma \frac{d\pi}{\pi}$$

with

$$\pi = \frac{P_{t+1} - p_t}{P_t} \; (rate\ of\ inflation)$$

and

$$\sigma = -(1-\gamma)\frac{\pi}{(1+\pi)(1+\pi\gamma)} \leq 0$$

for $\sigma<1$, a reduction of the real wage requires an increase in inflation. As the degree of indexation increases to 1, $|\sigma|$ decreases to 0, and the real wage becomes exogenous

6 Although the model is set up in a dynamic framework with growth rates as variables and a fairly rich structural system, it has been simplified and written in the standard framework proposed in Appendix 2.2 to facilitate comparisons with the other model.

parties. An increase in the markup has, in turn, two opposite effects: a reduction in a private demand, as profit earners are assumed to have a lower propensity to consume, and an increase in inflation, which reduces the real interest rate and induces higher investment demand (the Tobin effect). Two stable equilibria can emerge in the long run: In the orthodox case (profits increase more than wages in the bargaining process and the demand effect dominates), stabilization policies will shift the long-run equilibrium to a state of lower inflation rates, lower level of inequity (share of profits or markup rate), and higher level of capacity utilization. In the radical case (profit squeeze in the bargaining model and, therefore, relative loss to wage earners in recession, with the Tobin effect dominating the inequity effect in aggregate demand), all the results are reversed. Stabilization first reduces inflation, but the subsequent increase in profit share leads to a long-run equilibrium with higher inflation, higher inequity, and a lower level of activity. In the two other combinations of these effects, the model is not stable. An initial policy of stabilization will give rise to a spiral of recession and inflation (in the case of profit squeeze) or deflation (if bargaining is in favor of profit).

While one may cast some doubt on the empirical relevance of the radical case, with, in particular, a distribution bias in favor of workers in the bargaining process, the main lesson to draw from this model is that the macroeconomic impact of stabilization policies critically depends on structural features of the economy. Even the comparison of Taylor's orthodox case with the more standard macroeconomic model gives an indetermination result on overall growth. Taylor's model also shows the existence of many possible cases of instability, that is, of unsuccessful attempts at stabilization.

2.3.2.4 Other Issues. By going through different macro models, we have shown how several macro issues can be embodied in a CGE model, including (1) inflation (monetary phenomenon versus demand pull versus cost push); (2) supply situation and labor market (full employment versus unemployment and partly elastic supply versus unemployment and demand-driven model; and (3) wage versus markup rate dynamics (for cost-push inflation). We will now briefly review several other issues which have to be considered in modeling.

Functioning of Capital Markets. We have to consider the problem of both the availability of financial assets or borrowing possibilities and substitutability between them. The availability varies greatly across countries but is generally easy to observe empirically. It has profound implications for the macro behavior of the model. If, for instance, domestic residents cannot hold foreign assets, the domestic supply of savings is relatively less elastic to variations in domestic interest rates since residents cannot take advantage of higher interest rates abroad. The availability of foreign assets and firms' stocks also influences the way agents can

protect themselves against expected depreciation of the currency and inflation. Differential access to financial markets between household groups thus greatly influences income distribution.

Availability of financial assets/debts also poses the problem of rationing. If the exchange rate and the interest rate are controlled by government, the rationing scheme used to allocate foreign exchange and subsidize loans has income distribution effects.

The substitutability between assets, implicitly included in the asset demand function specification, also influences the macro behavior of the model. For instance, if foreign assets are perfect substitutes for domestic assets, the domestic interest rate is given by the foreign interest rate plus expected currency depreciation. As Dornbusch (1982) emphasizes in his criticism of neomonetarist stabilization policies, a crawling peg with a preset devaluation raises the domestic interest rate and brings a severe contraction. Imperfect substitutability of financial assets in the demand function can be viewed as a proxy for risk and transaction costs in shifting between assets and can be different for different household groups. It must be observed from institutional arrangements or estimated empirically on past data.

Intertemporal Consumption and Investment Functions. In most existing CGE models, savings and investment functions are very simple. Either the savings rate or aggregate investment (or both, foreign capital flows making up the difference between savings and investment) is exogenous or depends only on interest rate. Even without going into precise intertemporal utility or profit maximization, it is essential to have a simple formulation of how consumption and investment are influenced by current or expected future inflation. In a period of sustained inflation, households, especially if they are unable to protect their wealth perfectly through financial assets, should increase their current consumption and save less. This, in turn, may have important effects on employment and on the welfare of the poor. Such functions, however, should be estimated empirically.

Expectations. Since expected inflation and depreciation enter agents' behavioral equations, it is necessary to model how expectations are formed. The ideal would be to estimate jointly agents' behavioral equations and expectation formations. In most cases, this estimation is impossible to perform due to the paucity of data and the large number of coefficients to estimate.

One possibility is to assume rational expectations. In that case, the assumption of imperfect substitutability between assets in agents' demand takes implicitly into account exchange rates and inflation risks and transaction costs. The model would behave as if agents had a precise idea of what depreciation and inflation will be but do not shift all their resources into one asset because of uncertainty and costs.

It is, however, likely that agents do not behave in a perfectly rational manner because they do not have enough information to accurately forecast the future state of the economy. Other expectation mechanisms can be introduced in the model once the expectation equation is estimated.

Dynamics. Stabilization/adjustment models should be dynamic since adjustment requires that resources be shifted between sectors, which inevitably takes time. Generally, dynamics in CGE modeling has consisted of a succession of equilibria linked by the updating of some variables between periods. Such variables can be capital stock (linked by investment), labor allocation (it is possible to model a slow adjustment in the labor market), changes in the composition of socioeconomic groups (migration and population growth), or technological variables (productivity growth).

It would be better to specify a more general dynamic setting in which agents' behavior depends on the entire path of economic variables (for instance, savings and consumption behavior will depend on all expected future income, inflation, and interest rates). Empirical problems in estimating such behavior and in specifying the formation of expectations are, however, difficult to overcome. The model itself, in addition, becomes difficult to solve.

2.4 Conclusions on the Modeling of Stabilization Policies and Structural Adjustment Programs

A dynamic CGE model as outlined above would be used to run simulations of several policy packages. Several points need to be emphasized about such simulations. First, the simulation starts from an initial year equilibrium (this does not necessarily mean that this equilibrium is sustainable, and it may be a state of the economy artificially maintained by government intervention and incentive distortions) and studies the path of adjustment toward a long-run equilibrium.

The first point of focus is to compare the desirability of alternative long-run equilibria. There is, however, a large consensus about what optimal policies are in the long run. Once markets are made perfectly functioning, intervention in the economy should be eliminated or at least reduced to the minimum consistent with a few well-chosen goals (for instance, food subsidy to the urban poor). Therefore, comparing alternative equilibria will not yield very fruitful results.

The second point of focus, potentially much more interesting, is to analyze the adjustment path from the initial state to a given long-run equilibrium. Indeed, controversies about stabilization policies are essentially concerned with their short-run impact. Since there exist strong rigidities in the economy in the short term (sticky prices and wages and fixed capital allocation), some policies, which may be good

in the long term, may have large undesirable effects in the short term, especially on employment, national income, and income distribution. The dynamic model would allow us to analyze how alternative short-term policies will influence the path of key variables (such as the income of different socioeconomic groups, real wages, and output) toward their long-run values. We may well find, for instance, that some distortions have to be kept in the short run and removed only gradually.

Second, the implementation of policies will be different depending on the type of equilibrium the economy is in at the beginning of the simulation. For that reason it is important to distinguish between disequilibrium and artificially maintained equilibrium. Suppose that at $t = 0$ the economy is in equilibrium in state S_0 and an external shock occurs. S_0 is not sustainable anymore and becomes a state of disequilibrium. One possible study consists in analyzing the path of adjustment of the economy from S_0 to a long-term equilibrium, S_∞. On the other hand, the government can maintain certain features of this state (e.g., levels of expenditure) by imposing distortions in the markets. This action is likely to create an external disequilibrium that will result in a deficit in the balance of payments. This distorted state, S_1, is in fact an internal equilibrium because agents, behaving within the set of incentives imposed by government, willingly spend more than the country produces. If at $t = 1$ the government thinks that the balance-of-payment deficit is not sustainable and decides to adjust, the economy follows a path of adjustment from the artificially maintained equilibrium S_1 to S_∞.

Finally, there is the sequencing of policies and speed of adjustment.[7] The dynamic CGE model allows us to study the optimal sequence of policies moving the economy to the long-run equilibrium. Several related problems have to be analyzed. First is the optimal sequence of policies. For instance, should stabilization and liberalization policies be implemented at the same time? Corbo and de Melo (1987) note several reasons for a country (especially one with rapid inflation) to stabilize first: inflation makes relative prices very volatile, which makes liberalization (adjustment of relative prices) more difficult (this point is hard to model in a deterministic model such as the CGE); inflation makes agents engage less in transaction of long-term assets, which reduces the supply of finance for long-term investment; and if inflation is controlled by exchange rate pegging, it might create over-valuation, hence trade balance difficulties and capital outflows. For a country with moderate inflation, Corbo and de Melo argue that liberalization and stabilization can be undertaken simultaneously. A dynamic model can be used to explore

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7 This paragraph draws heavily on Corbo and de Melo (1987).

the trade-off between the gains from stabilizing before liberalizing and the losses from delaying liberalization (mainly inefficiencies involved in maintained regulations).

The second problem concerns the optimal speed of policy implementation. For instance, what are the advantages and disadvantages of a gradual reform versus shock treatment? For stabilization policies, shock treatment seems to be preferable because it quickly gives the right incentives for transferring resources toward the tradable goods sector and for reducing consumption. On the other hand, quick liberalization may have large unwanted effects. For instance, as in Chile (Corbo, 1985), rapid liberalization of capital flows can bring large capital inflows if domestic interest rates are higher than foreign interest rates and, therefore, increase the real exchange rate and create difficulties for the trade balance. Determining the optimal speed of policy reform is, therefore, a complex question, and the answer generally depends mainly on the speed of adjustment of the economy itself (i.e., the reallocation of capital and labor and productivity gains).

Appendix 2.1

Real-Side CGEs: Model Description

1.The Core CGE Model

The core of a Walrasian CGE model includes labor markets, product markets, and the external market for which agents' behavior defines supply and demand functions.[8] Equilibrium is ensured by corresponding flexible prices (wages, product prices, and exchange rate) on the three sets of markets. Table A2.1.1 gives the basic relations of the model, and Table A2.1.2 gives the list of symbols used.

The level of production, X_i, in any sector i is a function of the given installed capital, K_i, and labor use. Labor categories k, usually corresponding to different skills, are imperfectly substitutable among each other and with capital. Since capital does not adjust within any year, this factor is only relevant for the dynamic model. Labor demand, L_{ki}, is derived from profit maximization of the firms as a function of the domestic product price, pd_i, and the wage vector, w. Very low elasticities of substitution among factors will induce almost no price response of supply, reflecting the short-term rigidity of production. The extreme case of low substitutability among factors of production is implemented with a Leontief fixed-coefficient production function. Other inputs are intermediate goods used in fixed proportions to output. This asymmetry of treatment in intermediate goods and labor inputs differentiates the CGE models from the multimarket models in which all inputs are substitutable. In the labor markets, labor supply by skill, L_s, is a function of wage and market prices and equilibrium of all the labor and product markets determines the equilibrium wages.

Factor remunerations derive from levels of output, employment, and prices. More specifically, one distinguishes wage-labor remuneration, F_k, as the product of wage and employment net of relevant taxes, t_k, from nonwage income, V_i, as the residual in value added and also net of relevant taxes. Factor remunerations combine to determine the incomes of households and government. Households are usually disaggregated according to socioeconomic classes rather than income levels. This typically leads to a classification of rural households into landless, small, medium, and large farmers and of urban households into unskilled workers, skilled workers, and urban capitalists, sometimes with a characterization of urban marginals. These household categories derive their incomes from various sources in proportions that

8 Appendix 2.1 is taken largely from de Janvry and Sadoulet (1987).

Table A2.1.1- Equations of the Computable GeneralEquilibrium Model

Production

$$X_i^s = X_i^s(K_i, L_{ki})$$

(1)

Labor Markets

$$L_{ki} = L_{ki}(pd_i, w)$$

(2)

$$L_k^s = L_k^s(w_k, p)$$

(3)

$$\sum_i L_{ki} - L_k^s = 0$$

(4)

Factor Remuneration

Wage Income

$$F_k = F_k(w_k L_k^s, t_k)$$

(5)

Nonwage Income

$$V_i = V_i(p_i X_i - \sum_k w_k L_{ki}, t_i)$$

(6)

Institution Disposable Income

Households

$$Y_n = Y_n(\alpha_{nk} F_k, \alpha_{ni} V_i, t_n)$$

(7)

Table A2.1.1- (continued)

Institution Disposable Income (continued)

Government

$$Y_G = Y_G(X_i, F_k, V_i, Y_n, M, E, t)$$

(8)

Savings and Investment

Domestic savings

$$S = \sum_j s_j Y_j + ER\,\overline{F}\; j \in (\{n\}, G)$$

(9)

Investment by sector

$$I_i = k_i S / pk_i$$
$$pk_i = f(p)$$

(10)

Product Demand

Demand for investment goods

$$Z_i = \sum_j \Gamma_{ij} I_j$$

(11)

Table A2.1.1- (continued)

Household consumption

$$C_{ni} = C_{ni}[(1 - s_n)Y_n, p] \tag{12}$$

Govt. consumption

$$C_{Gi} = C_{Gi} = [(1 - s_G)Y_G, p] \tag{13}$$

Domestic demand and imports

$$d_i = f(pd_i, pm_i) \tag{14}$$

$$pm_i = pw_i ER(1 + tm_i) \tag{15}$$

$$p_i = p(pd_i, pm_i) \tag{16}$$

External Market

Imports

$$M_i = (1 - d_i)\left[\sum_n C_{ni} + C_{Gi} + Z_i + (AX)_i\right] \tag{17}$$

Exports

$$E_i = f(pe_i, pw_i) \tag{18}$$

$$pe_i = pd_i(1 + te_i)/ER \tag{19}$$

Table A2.1.1 - (continued)

Equilibrium

$$\sum_i pw_i M_i - \sum_i pe_i E_i - \overline{F} = 0$$

(20)

Equilibrium on the Product Markets

$$X_i^d = d_i \left[\sum_n C_{ni} + C_{Gi} + Z_i + (AX)_i \right] + E_i$$

(21)

$$X_i^d - X_i^s = 0$$

(22)

Numeraire

$$P = \sum_i \beta_i p_i = 1$$

(23)

Dynamic Relation

$$\Delta K_i = F\left(I_i\right)$$

(24)

Table A2.1.2 - List of Symbols

Endogenous Variables of the Static Model

X_i^s: Production by sector i.

M_i, E_i: Imports and exports of product i.

X_i^d: Domestic demand of product i.

L_{ki}: Labor demand of category k by sector i.

L_k^s: Labor supply of category k.

F_k: Remuneration of labor category k.

V_i: Nonwage remuneration by sector i.

Y_n: Income of household n.

Y_G: Government income.

S: Savings.

I_i: Investment by sector of destination.

Z_i: Investment by sector of origin.

C_{ni}, G_{Gi}: Consumption of good i by household n and by government.

d_i: Domestic share of supply of good i.

p_i, pd_i: Market price and domestic price of good i.

pm_i, pe_i: Import price and export price of good i.

pk_i: Price index of investment goods in sector i.

P: Aggregate price index.

w_k: Wage of labor category k.

ER: Exchange rate.

Table A2.1.2 - (continued)

Exogenous Variables of the Static Model

K_i: Capital in sector i.

pw_i: International price of good i in foreign currency.

F: Foreign capital inflow.

r_i: Exogenous markup rate.

Parameters

t_k, t_i, t_n: Tax rates on wages, nonwage income, and household incomes.

tm_i, te_i: Tax rates on imports and exports.

α_{nk}, α_{ni}: Shares of household n in wage income, F_k, and nonwage income Y_i

s_b, s_G: Saving rates of household n and government.

Γ: Matric of investment good composition.

A: Input-output matrix.

β: Weight of price i in price index.

depend on the particular economy and the choice of specific boundaries between the categories. Landless households receive wage income mostly from the agricultural sector; however, an important share of their income generally also comes from nonagricultural activities. both wage and nonwage. Farmers also receive income from a variety of sources, with the share of nonwage income from agriculture increasing as their holdings increase. When small farmers receive a substantial part of their income as wages, their economic status more closely resembles the landless than the large farmers. To study the vulnerability of the different groups to food price changes, each class can be characterized as a net seller or net buyer of any or all of the agricultural products. Government income derives principally from tax revenue.

By contrast to the neoclassical theory of the credit market—in which savings and investment functions depend on the interest rate which then serves as an equilibrating variable—the most neoclassical CGE models use a savings function, S, which is specified by constant savings ratios, s_j. Total investment is then determined by total savings. Nominal investment is allocated to each sector according to an exogenous rule, k_ii, which is a policy instrument or serves for counterfactual analysis. Real investment in each sector then depends on the average

price index of investment goods in sector i, pk_i, which itself is a function of market prices.

Demand for investment goods, Z_i, follows from the matrix that gives the composition of investment goods in each sector. Consumption functions by household class determine private demand by sector as a function of the market prices and class expenditures. Specification of the external sector determines the extent to which demand is satisfied by domestic production. In most models (and the Egypt and Morocco cases in particular), imports and domestic production are imperfect substitutes with low elasticities of substitution for production goods and high elasticities for most consumption goods, especially food. The domestic share (d_i) of supply is a function of the ratio of domestic product price (pd_i) to import price(pm_i), which itself is determined by international price (pw_i) , import taxes (tm_i), and the exchange rate (ER). The market price (p_i) of the aggregate of imports and domestic production, domestic demand (X_i^d), and imports(M_i) are then derived as functions of domestic and import prices. In other models (India model), imports are disaggregated into competitive and noncompetitive categories. Demand for noncompetitive imports originates either from the sectors of production as intermediate goods or from private consumption. Competitive imports are netted out of exports.

Exports are also determined in two alternative ways. In the first case, exports are sold at domestic prices converted in foreign currency, pe_i, and the volume is determined by the demand from the rest of the world, which is a function of pe_i relative to the world market price, pw_i. The second formulation reflects the small country case in which the demand from the rest of the world is infinitely elastic at the world price. The limiting factor to exports comes from the capacity of the country to switch its production from domestic market products to export products. The total production is a constant elasticity of transformation function of domestic products and exports, and the ratio of exports to total production is the corresponding function of the relative price $pd_i/(pw_iER)$. Equation (18) will then be replaced by

$$\frac{E_i}{X_i^d} = f(pd_i, pw_iER)$$

On the external market the condition of the balance-of-payments equilibrium, net of exogenous foreign capital inflow, $\overline{F}$, solves for the equilibrium exchange rate.

Finally, in the domestic market, the product markets equilibria solve for domestic prices. Because of the homogeneity of the model in prices, only relative prices are determined. Thus, a price normalization is necessary. Any nominal value of the model can be used for normalization. Since there is no money in this model, the

choice of a weighted average of domestic prices as a numeraire gives a no-inflation price system. This completes the static CGE model.

Dynamic scenarios consist of year-by-year sequences of static equilibria, based on the updating of the capital stock from the allocation of investment and of the exogenous variables and parameters. In particular, the level of productivity change due to technological progress has to be specified on the relevant parameters.

2. Alternative Closure Rules

Beyond the low or even zero substitutability between products or factors in the core model, more structuralist features are brought about in CGE models by alternative rules of functioning (often referred to as imperfections) of some of the markets. We will consider successively departures from the neoclassical framework on the labor and product markets and on the macroeconomic closures of the external market and the savings-investment equilibrium.

On certain labor markets, an infinitely elastic labor supply at a given wage is more appropriate than the neoclassical market-clearing mechanism. One alternative wage theory involves fixed nominal wages that reflect short-run institutional constraints on the adjustment of wages to the cost of living (all wages in the India and Morocco models and the unskilled wage in the Egypt model). Another wage theory specifies fixed real wages in accordance with an institutionalized minimum subsistence level or an efficiency theory of wage. Any other empirical model of wage formation and, in particular, a model of partial adjustment to inflation, $w = w_o P^{\varepsilon}$, can be implemented. If one of these formulations is adopted, equation (4) in table A2.1.1 is replaced by a wage equation. Since the market does not clear, a labor surplus can be computed as the difference between labor supply and demand. These alternative specifications of wage formation have important distributional implications.

On the product markets, price regulation, often implemented in the agricultural sectors, can substitute for the market-clearing mechanism. Excess demand or supply of goods is then absorbed either by variations of stocks added to government consumption or by exports or imports. In that case, a price equation, $p_i = \bar{p}_i$, is added, the corresponding equation (18) of table A2.1.1 is dropped, and exports in equations (21) and (22) are determined by the difference between supply and demand. In the industrial sectors, a downward stickiness of prices with a resulting cut in production and excess capacity in terms of installed capital is a common observation (India model and Morocco model for some experiments). This situation is modeled through a markup pricing rule and production levels that adapt exactly to demand. For this case, equation (1) is dropped, equation (22) reads as though production levels equals demand, and a markup price equation is added:

$$pd_i = f(w, P, r_i) \tag{25}$$

where r_i is an exogenous markup rate.

On the external market regulated exchange rates are also a common observation. Note that the exchange rate used in the model is a real exchange rate, since the normalization of prices imposed a constant price index. Specification of an exogenous exchange rate generates disequilibrium on the external market, which is eliminated by alternative rationing schemes or by a compensating foreign capital inflow. The latter case is the most common. Foreign capital inflow is then equilibrating variable of equation (20), and the exchange rate is exogenous throughout the model (Egypt model).

Finally, the savings-investment equilibrium can have alternative formulations. In some models, an investment-driven closure is justified by an active participation of the state in the investment program. This is a common feature in many developing countries. Since investment is then exogenous, savings must match this program. A straightforward closure is to assume that government savings complement private savings. In such a case, another component of the government budget must become residual. In the Egypt model, for example, government expenditures for wages and other administrative expenses is endogenous (the corresponding equation (13) is dropped). A more fundamental change of the macroeconomic closure rule occurs when the price index does not serve as a numeraire (equation (23) is dropped) and the adjustment of savings to fixed investment comes through a more general adjustment of the entire economy. Two clear cases are the classical Keynesian multiplier and the Keynes-Kalecki closure rule used in Taylor's Latin American structuralist models. In the first case, all prices are markup prices and relative wages are fixed, with one of them serving as a numeraire. The level and the structure of production are completely demand determined and, at equilibrium, savings are necessarily equal to the corresponding demand for investment goods. In the Latin American structuralist models, prices are flexible and nominal wages and the exchange rate are fixed. The price level adjusts to match demand to output and, since wages and the exchange rate are fixed, savings adjust to investment through inflation and changes in real wages and real exchange rate. In several models (India and Morocco) a mix of these two cases is implemented with flexible prices in the agricultural sectors and markup prices in some nonagricultural sectors.

Because the models do not deal with monetary phenomena, fixed nominal wages do not refer to fixed money wages in the usual sense but to wages fixed in terms of the numeraire. Their interpretation requires careful examination as the consequences of wage fixity depend both on the choice of numeraire as well as on the mechanism that determines the price index. In the India and Morocco models, wages

are fixed relative to each other and to the exchange rate, while the domestic price index varies. Real wages are thus strongly affected by price movements. In the Egypt model, by contrast, fixed nominal wages lead to real wages that are not responsive to price movements since the numeraire is the wholesale price index, which is highly correlated to the CPI used to deflate the income. On the other hand, fixed real wages are easy to interpret in the models as they refer to wages fixed relative to the consumer price index.

Adelman and Robinson (1985) have shown empirically that the macroeconomic results of a CGE and the distribution of income by social classes are strongly affected by the choice of closure rule when dealing with policy experiments that include an exogenous increase in total investment. This is principally due to the Keynesian component of the closure, which generates a change in the overall level of economic activity. This phenomenon and, hence, the choice of closure is, however, not important for experiments where the total level of investment is fixed.

Appendix 2.2

Classification of Macroeconomic Structure

1.Labor surplus and exogenous wage.

Short-run aggregate supply: $X^s = X^s\left(\frac{-w}{p}\right)$. (1)

Equilibrium on the goods market: $X^d(-i, \frac{W}{p}, +g) = X^s$. (2)

Equilibrium on the currency market: $M^d(-i, +p, +X^s) = M^s$. (3)

Exogenous variables, M^s, g, w, W; engogenous variables, i, p, X^s.

2.Markup pricing.

Equation (1) replaced by $p = w(1 + \tau)$, τ exogenous.

3.Full employment neoclassical.

Endogenous w determined by w/p = constant.

4.Neostructuralist.

With marginal cost pricing: $w = w(p)$.

With markup pricing and endogenous markup. Equation (2) replaced by:

$$X^d(i - \dot{p}, \tau, g) = c\overline{X}^s, \overline{X}^s \text{ exogenous}$$
$$w = w(c)$$
$$\tau = \tau(c)$$

Variables

X^s, X^d	=	aggregate supply and demand; also used as real income in (3)
M^s, M^d	=	currency supply and demand
i, w, p	=	nominal interest rate, nominal wage, and price
g	=	government deficit
W	=	nominal assets
c	=	capacity utilization
τ	=	markup rate

Table A2.2.1- Impact of Stabilization Policies

Macroeconomic Model	Decrease of g	Decrease of M^S
I.Exogenous Wage		
Keynesian $\partial X^d/\partial i = 0$ (Taylor and Rosensweig, 1984)	$\dot{p} < 0, \dot{X} < 0, \dot{i} < 0$	$\dot{p} = \dot{X} = 0, \quad \dot{i} > 0$
General IS-LM (Lewis, 1985; Khan and Knight, 1985)	$\dot{p} < 0, \dot{X} < 0, \dot{i} < 0$	$\dot{p} < 0, \dot{X} < 0, \dot{i} > 0$
Monetarist $\partial M^d/\partial i = 0$ (Khan and Knight, 1981)	$\dot{p} = \dot{X} = 0, \dot{i} < 0$	$\dot{p} < 0, \dot{X} < 0, \dot{i} > 0$
II.Full Employment		
(Adelman and neoclassical Robinson,1978)	Same results as I for $\dot{p}$ and $\dot{i}$; $\dot{X} = 0$	
III.Markup Pricing		
Pure Keynesian, IS-LM, monetarist	Same results as I for $\dot{X}$ and $\dot{i}$; $\dot{p} = 0$	
IV.Neostructuralist		
Partial adjustment of real wage (Branson ,1986)	$\dot{p} < 0, \dot{X} > 0, \dot{i} < 0$	$\dot{p} = \dot{X} = 0 \quad \dot{i} > 0$
Endogenous markup (Taylor, 1985)		
Orthodox case	$\dot{p}\downarrow, \dot{X}\uparrow$	$\dot{p}\downarrow, \dot{X}\uparrow, \dot{i} < 0$
Radical case	$p\uparrow, \dot{X}\downarrow$	$p\uparrow, \dot{X}\downarrow, \dot{i} > 0$

3. THE IMPACT OF STRUCTURAL ADJUSTMENT POLICIES ON POVERTY AND NUTRITION ANALYZED WITHIN A GENERAL EQUILIBRIUM FRAMEWORK

Erik Thorbecke and David Berrian

3.1 Introduction

Structural adjustment policies by their nature involve economy-wide impacts that change relative prices, real incomes of households, and sectoral resource allocation and output. Computable general equilibrium (CGE) models provide an economy-wide framework for analyzing how government policy works through market mechanisms to affect product prices, returns to factors, and the distribution of factor and other income to socioeconomic groups. Therefore, it seems appropriate that CGE models should be useful in showing how structural adjustment policies affect the level and distribution of poverty and nutrition in society.

The assigned topic for this chapter called for a review of past work using CGE models to estimate the short- and medium-term effects of macroeconomic policy on poverty. If interpreted literally this could be a very brief presentation indeed. So far, no CGE model has been developed for an actual economy that explicitly estimates policy induced changes in a well defined measure of poverty. This is not to deny, however, the value of the numerous CGE models that have been developed to explore the consequences of public policy on changes in the distribution of income among socioeconomic groups. Where the socioeconomic categories are defined so that some groups include a high proportion of society's poor (e.g., small farmers or rural, landless laborers), an analysis of the changes in incomes of the groups may give a qualitative indication of the effect on poverty. However, where there are considerable variations in access to the returns to productive factors within the groups, an analysis of income distribution among the groups is inadequate for judging the impact on poverty. Even the qualitative results from such an analysis can be misleading.

The purpose of this chapter is (1) to review some of the ways that CGE models have been used to explore the connection between macroeconomic policy and changes in incomes of those groups in society most likely to be poor, and (2) to identify the directions in which CGE analyses can be extended so that changes in well defined measures of poverty can be estimated. Section 3.2 presents the conceptual framework around which almost all CGE models are constructed. Section 3.3 briefly reviews three CGE models that have been used to explore the impact of alternative policies on the distribution of income to various socioeconomic groups. This section also introduces a technique for explicitly charting the pathways within an economy through which exogenous economic changes are conveyed. The first steps in extending the analyses of policy induced changes in intergroup income distribution to changes in societal poverty are developed in section 3.4. Section 3.5 argues that an analysis of poverty with reference to a single societal poverty line may not be appropriate where one is primarily concerned about the nutritional status of the population. A nutrition based poverty measure is presented and related to the analysis of poverty discussed in the previous section. Section 3.6 briefly addresses the issue that, in addition to intragroup variations in income, there are intrahousehold variations as well, and in some countries these variations, often based on age and gender distinctions, may have a significant effect on the incidence of nutritional risk and poverty. The concluding section outlines how a CGE model could be constructed to assess the short-term impact of government policy on the poverty and nutritional status of socioeconomic groups.

3.2 The Conceptual Framework of CGE Models

The conceptual basis of almost all CGE models is the Social Accounting Matrix (SAM). The SAM provides a framework that shows the major expenditure transactions among production activities, factors of production, owners of factors (households and companies), and exogenous accounts (typically government, capital account, and rest of the world). The categories (or accounts) into which production, factors, and households are disaggregated reflect the structure of production and socioeconomic groupings that are particularly relevant to the policies being analyzed (and the structure of data available).[1]

Table 3.1 presents a basic SAM. Each of the SAM accounts appears both as a column and a row. The cells in the resulting matrix show the amount that was

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1 The discussion of the usefulness of the SAM as an analytical and quantitative framework in simulating the impact of structural changes is based on Thorbecke (1987b).

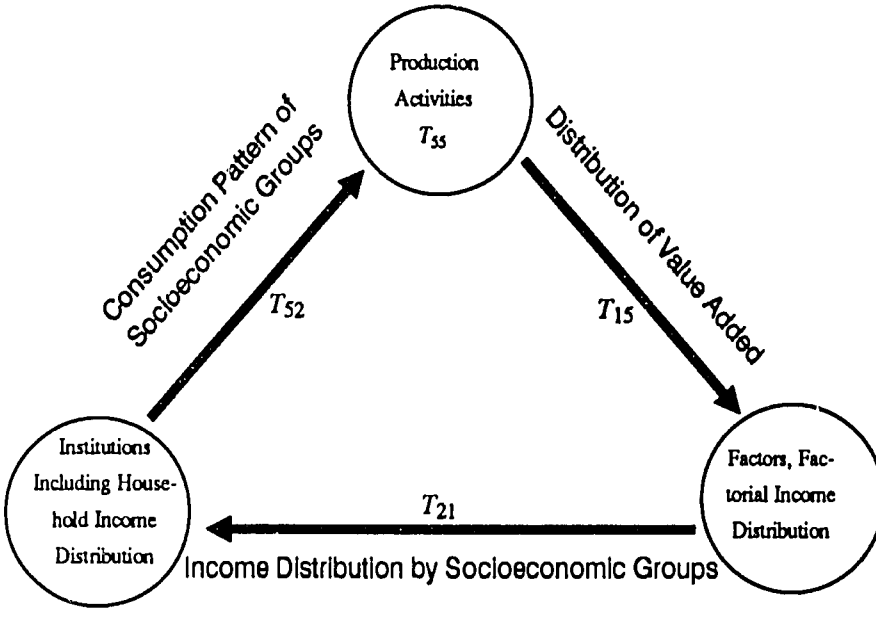
Table 3.1 - Basic Social Accounting Matrix (SAM)

			Expenditures							
			1	2a	2b	3	4	5	6	
			Factors of production	Institutions				Production activities	Rest of the world combined account	Totals
				Current Accounts			Combined capital account			
				Households	Companies	Government				
1	Factors of production							Value added payments to factors	Net factor income received from abroad	Income of the domestic factors of production
2a		Households	Allocation of labor income to households	Current transfers between households	Profits distributed to domestic households	Current transfers to domestic households			Net non-factor income received from abroad	Incomes of the domestic institutions after transfers
2b		Companies	Allocation of operating surplus to companies			Current transfers to domestic companies			Net non-factor income received plus indirect taxes	
3		Government		Direct taxes on income and indirect taxes on current expenditure	Direct taxes on companies plus operating surplus of state enterprise		Indirect taxes on capital goods	Indirect taxes on inputs	Net non-factor income received plus indirect taxes on exports	
4	Combined capital account			Household savings	Undistributed profits after tax	Government current account surplus			Net capital received from abroad	Aggregate savings
5	Production activities			Household consumption expenditure on domestic goods		Government current expenditure	Investment expenditures on domestic goods	Raw material purchases of domestic goods	Exports	Aggregate demand – gross outputs
6	Rest of the world combined account			Household consumption expenditure on imported goods		Debt servicing	Imports of capital goods	Imports of raw materials		Imports
Totals			Income of the domestic factors of production	Total outlay of households	Total outlay of companies	Total outlay of government	Aggregate investment	Total costs	Total foreign exchange receipts	

SOURCE: Thorbecke (1987b)

expended during a given period by the column category and received as income by the row category. Thus, the SAM is able to capture the economic interdependence of productive activities, returns to factors, and household income distribution. Figure 3.1 shows the principal components of the economy-wide, circular flow represented in the SAM. The submatrix formed by the intersection row 1 and column 5 in table 3.1 (denoted T_{15} in figure 3.1) shows the allocation of value added from production activities to various factors (e.g., various labor skills, land, and capital). This reveals the sectoral pattern of factor employment and the resulting factorial income distribution. In turn, given the household resource endowment and factor ownership (in particular, the amount of land owned and the amount of human and other capital possessed by households), T_{21} maps the factorial income distribution among the various socioeconomic groups. T_{52} completes the circular flow and reveals the consumption expenditures of socioeconomic groups on goods supplied

Figure 3.1 - Simplified interrelationship among principal SAM accounts (production activities, factors, and institutions).



SOURCE: Thorbecke (1987b).

NOTE: T stands for the corresponding matrix and flow in the SAM that appears in table 1. Thus, for example, T_{15} refers to the matrix that appears at the intersection of row 1 (account 1), i.e., "factors of production" and column 5 (account 5), i.e., "production activities."

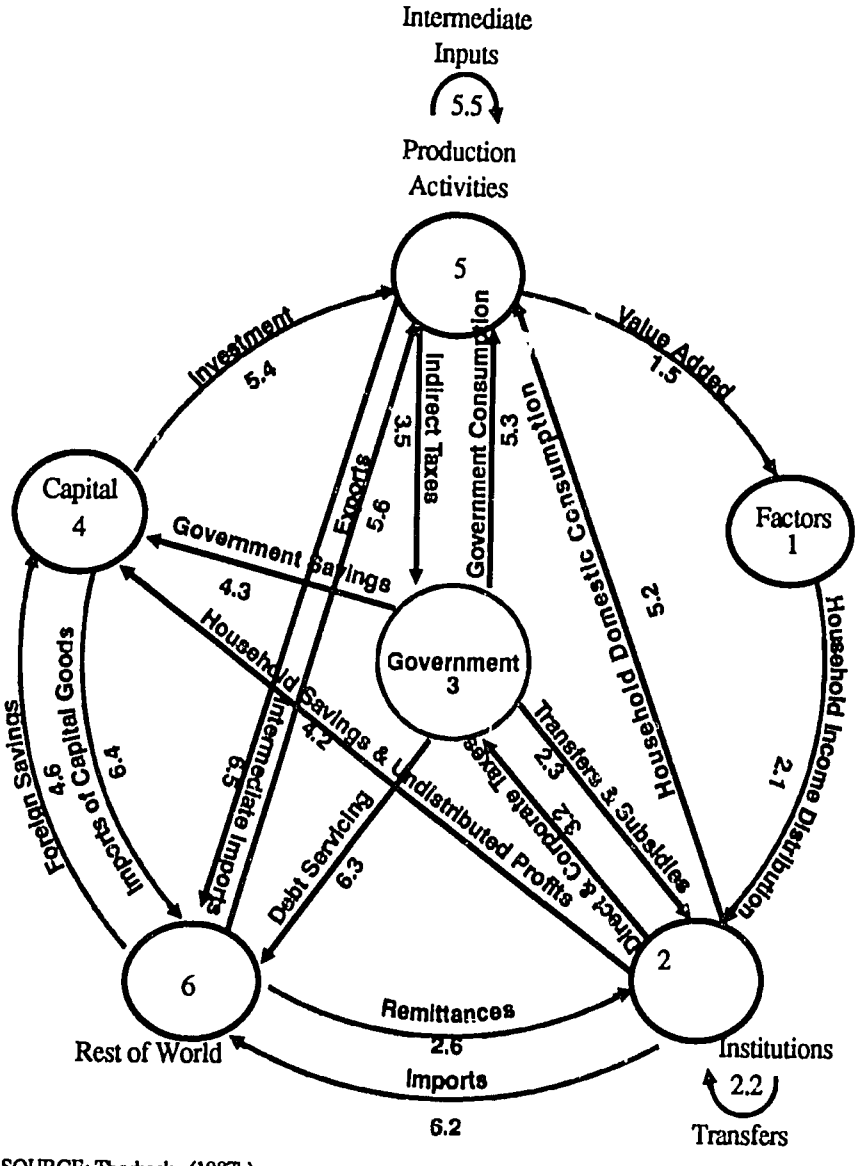
by the different production sectors. The pattern of interhousehold transfers is shown in T_{22}, while T_{55} is the well-known Leontief matrix showing the structure of demand for intermediate goods. Figure 3.2 is a more detailed flow diagram that shows all of the transactions represented by the SAM in table 3.1.

The structure of the SAM imposes a conceptual discipline on the organization of data and the specification of economic behavioral relationships that often proves to be quite useful. It forces investigators to think through and identify the relevant categories appropriate both to the research at hand and to the design and calibration of possible adjunct models. By identifying the economic flows among and within accounts, the SAM highlights the key behavioral relationships that must be incorporated into a general equilibrium model. Since the SAM embodies a representation of the circular, economic flows in a society, CGE models based on a SAM not only estimate the kind and magnitude of policy impacts but also clearly show the specific mechanisms through which the impacts are transmitted. Increased understanding of an economy's transmission mechanisms is an important research result in itself. Also, since the cells of a SAM show the expenditures of the column account that are income to the row account, it is necessary for row totals to be identical to corresponding column totals. This feature of the SAM forces investigators to reconcile data inconsistencies from the various data sources that go into constructing a SAM.

The SAM can be likened to a wide-angle snapshot of the economy during a given period and represents all of the economic flows that the investigator considers to be important for the research goals. Thus, the SAM establishes the initial conditions upon which the set of accounting and behavioral relations that constituted the CGE model can operate. The model's relationships are specified so as to transform the base period SAM into the SAM that presumably will be realized after the exogenous policy shock has worked its way through the economy. A comparison of the post-policy SAM with the initial SAM reveals the changes in the structure of production and distribution of income anticipated as a result of the policy.

In order to illustrate how the SAM approach lends itself to deriving the ultimate income distribution by socioeconomic groups following the implementation of structural adjustment policies, consider the following classification scheme for accounts. Starting with the module of production activities, three criteria suggest themselves in deriving an appropriate classification: (1) whether the commodities are tradable or nontradable, (2) the type of technology used (in terms of labor and capital intensity), and (3) the form of organization underlying the production process (i.e., a family farm or firm relying on family labor and self-employment or, alternatively, a corporation, partnership, or state enterprise). The first criterion is critical in distinguishing the consequences on output of a devaluation or any change

Figure 3.2 - Flow diagram of SAM transactions.



SOURCE: Thorbecke (1987b).

NOTE: The flow diagram reflects exactly the transactions and transformations appearing in the SAM in table 3.1. Note that transactions are numbered in a way consistent with the numbering of the acounts in that table. For example, the allocation of value added is a receipt for the Factor Account (1) and a payment by the Production Activities Account (5); hence the corresponding transformation (matrix) is denoted by 1.5.

in relative prices, whereas the last two criteria are important in mapping the impact of changes in the structure of production on the incomes accruing to different socioeconomic groups. On the basis of the above criteria, the following classification of agricultural and nonagricultural production activities might be suggested:

I. Agriculture and rural areas
  A. Tradable
    1. Export and cash crops (e.g., tree crops and plantation crops)
    2. Traded food crops (e.g., wheat or rice which is presently imported and could be import-substituted through domestic production or alternatively exported
    3. Food processing
  B. Nontradable
    1. Traditional domestic food crops (e.g., millet and sorghum in some African countries)
II. Nonagriculture
  A. Tradable
    1. Mining
    2. Consumer goods
    3. Intermediate goods
    4. Capital goods

  B. Nontradable
    1. Construction
      a. pure investment goods
    2. Social overhead (utilities, transportation, and housing)
    3. Services (retail, wholesale, government, and banking; could perhaps be further subdivided into urban formal services, urban informal services, and rural informal services)

The advantage of the above classification is that it is responsive to (1) the differential effects of adjustment on tradable versus nontradable sectors, (2) the differential supply elasticities of different commodities, particularly in agriculture, and (3) yields an income distribution, distinguishing between rural and urban areas. In the final analysis, the appropriate breakdown of production activities depends on the country being examined.

The classification of factors and households should be consistent with our interest in exploring the employment and equity issues as they relate more specifically to the rural areas. Again, with the qualification that any ultimate taxonomy

should be country-specific, the following classification of factors may be suggested: (1) family labor (unpaid and self-employed), (2) unskilled labor, (3) skilled labor (which could perhaps, at least in some countries, be further subdivided into organized and unorganized), and (4) capital, which could be further broken down between land and other forms of capital. This classification would correspond in broad lines with the likely segmentation that prevails among different labor markets and the sensitivity of these markets to adjustment measures. In particular, the distinction between family labor, which receives imputed labor income from production on its own farm, and paid unskilled labor, which receives wages, is crucial.

Finally, a possible classification of rural households by socioeconomic groups might look like this: (1) agricultural employees (landless workers and marginal farmers); (2) small farmers; (3) medium and large farmers; and (4) rural nonagricultural households, which could be further broken down into formal and informal. For the sake of completeness, the suggested classification of households in the urban areas might be (1) industrial and service workers, perhaps subdivided into organized and unorganized; (2) informal sector households deriving a large part of their income from self employment; (3) employers and capitalists; and (4) professionals. In general, the location of the households between rural and urban areas, the endowment of land and human capital, and the status or occupation of the household head would predetermine which socioeconomic group a household would be placed in. (Of course, members of a given household may receive income from sources other than that of the head of household.)

The above taxonomy captures the differential effects of adjustment measures on the primary household income distribution reasonably well. Two examples may suffice. First, assume that consequent to adjustment the output of paddy (rice) increases within a country setting where smallholders dominate (as in the majority of Asian countries). The impact of this development on the primary income distribution can be followed with the help of figure 3.1. Higher paddy output leads to a more intensive use of land and family labor and a correspondingly larger flow of value added accruing to family labor and land rent (note that with regard to smallholder agriculture, it is very difficult to distinguish that part of the smallholder's income that should be imputed to labor income and that part that can be attributed to the rent on land). This transformation is represented in figure 3.1 by T_{15}. In turn, the mapping from the factorial to the household income distribution occurs via arrow 2.1 in figure 3.2. Smallholders will receive income commensurate with the amount of land they possess and the amount of family labor used in the production process. Finally, the household domestic consumption pattern is given by 5.2, which provides the best reflection of the standard of living of the group of

smallholders. Among others, it would indicate the amount of food consumption enjoyed by this group.

The starting point of the second example might be a more intensive cultivation of tea or rubber on large-scale plantations, subsequent to adjustment. Plantations will have to hire additional workers, or additional person-days of unskilled labor. This would result in a larger flow of value added accruing to the factor "paid unskilled labor" and to returns to land and capital (again through flow 1.5). In turn, the socioeconomic group of landless workers would receive higher nominal incomes (through transformation 2.1) while the plantation enterprises would gain the increased profits and rent income. The ultimate impact on the standard of living of the landless would hinge largely on the trend in the prices of food, on which they spend the bulk of their income, compared to their new higher nominal incomes. Their real standard of living could be judged from 5.2.

3.3 Examples of the Use of CGE Models

Numerous CGE models have been constructed for developing countries. A number of these have explored the effects of policy change and have been concerned about resulting changes in income to socioeconomic groups.[2] Each model is different because it was designed for the circumstances of a specific country (or hypothetical economy) and the specific research aims of the investigator. Nevertheless, it is worthwhile to examine a number of these models to get a sense of the range of problems and behavioral relationships that can be incorporated into a CGE framework. In this section we will briefly review three CGE models, paying particular attention to the issues the models were used to explore, the underlying structure of the models, and the kind of conclusions the investigators were able to derive. Taylor's model of India (1983) demonstrates the use of a CGE model in exploring the effects of policy changes on income distribution; de Janvry and Subramanian (1986) use simple models of Egypt and India to simulate the effects of different food and nutrition policy packages and are able to apply the results to the political economy of food policy; Dervis, de Melo, and Robinson (1982) specify three hypothetical economies and analyze the distributional effects of alternative adjustment policies. In addition, this section will discuss a technique developed by Defourny and Thorbecke known as structural path analysis, which uses the SAM

2 See Devarajan, Lewis, and Robinson (1986) for an extensive bibliography of CGE models applied to developing countries.

to explicitly identify the major pathways along which economic influence is transmitted throughout the economy.

3.3.1 Short-Run Adjustment in India

Taylor (1983, chapter 4) develops a 47 variable, 48 equation[3] macromodel of the Indian economy to estimate the impacts of an exogenous increase in investment demand, a devaluation, and a change in food procurement policy. He constructs a SAM for 1980-81 and uses it to derive the parameters of the model and to serve as the base case to which changes in variables are referenced. Taylor's clear and careful explanation of how the SAM and the model were constructed is notable.

The model includes five production sectors: food agriculture, other agriculture, industry (manufacturing), infrastructure and energy, and services. The behavioral relationships specified combine a mixture of neoclassical and structuralist assumptions. The two agricultural sectors are assumed to have fixed output in the short term and to respond to changes in demand with price adjustments. The non-agricultural sectors are assumed to operate by markup pricing and to respond to changes in demand by variations in output. The socioeconomic categories in the SAM combine factor and household accounts: nonagricultural wage income, nonagricultural nonwage income (profit), and agricultural income. Thus the policy induced social effects estimated here are limited to changes in income shares between these categories.

In analyzing the effects of a four percent exogenous increase in investment demand in the manufacturing sector, Taylor sets up excess demand equations for all sectors, derives a Jacobian for the excess demand functions, and calculates both the elasticity of excess demand with respect to investment and the inverse of the Jacobian matrix. The elements of the Jacobian inverse are "multipliers" that capture the comparative static direct and indirect response of the endogenous variables to a one percent change in industrial investment demand. This analysis indicates that increased investment demand results in higher agricultural prices, higher non-agricultural output, and reduced real wages in the nonagricultural sectors. In relative terms there is an increase in agriculturalists' share of income and a fall in that of nonagricultural wage earners, while the share of profit stays about constant. Taylor also examines the impact of greater investment demand coupled with wage indexation, rising markup rates for manufactured goods, and changes in food stocks in response to price changes. Each of these modifications increases the inflationary

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3 The extra equation is a savings/investment balance that serves as a convenient numerical check on the computer solution of the model.

impact compared to the investment demand increase taken by itself, and if all are taken together the feedbacks among them cause extreme rises in agricultural prices. Taylor discounts the credibility of such large short-term price adjustments and goes on to show that if the model is modified to allow for increased competitive imports and an agricultural supply response, the price increases are greatly moderated. Import manipulation and farmers' supply responsiveness are thus shown to have significant macroeconomic effects in the model. This is consistent with the observed response of the Indian economy during that period.

3.3.2 The Political Economy of Food and Nutrition Policies in Egypt and India

De Janvry and Subramanian (1986) combine historical analysis and considerations of political economy with general equilibrium modeling to interpret the genesis and evolution of food and nutrition policies in Egypt and India. Three types of food policy are identified: (1) cheap food policy at no direct cost to government, such as through overvalued exchange rates, state monopoly procurement and sale, or export taxes; (2) food subsidy schemes without targeting, including both consumer and producer subsidies; and (3) targeted interventions in which subsidies or supplements are restricted geographically, by means tests, or to segments of the population that are nutritionally at risk. The authors review the historical experience of developing countries with respect to these policies to cheapen food and note a common pattern: (1) starting in response to crisis, benefits are initially directed toward the poor but increasingly redirected away from the most ill-fed; and (2) policies (and their costs) are rapidly expanded in response to demand by the nonpoor for associated subsidies and other institutional rents.

From this background de Janvry and Subramanian use CGE models to inquire into the growth and welfare effects of various food policy scenarios. The CGE model used for Egypt (developed by Dethier, 1985) contains eight production sectors: agriculture, food processing, textiles, other industries, construction, oil, transport, and services. Factors include capital and seven labor skill types. There are six household categories partitioned by urban/rural and by poor/middle income/rich. The labor markets are highly segmented with fixed wage differentials between sectors. Some labor types are sector specific, others are mobile. Family farm labor and construction labor is in full employment with wages adjusting to clear the market. Other labor categories are presumed to be in surplus with wages fixed in nominal terms. Savings is assumed equal to desired investment and each sector's share of investment is taken to be a policy instrument given exogenously for each year. Simulations with the Egypt model are for five years starting from a base year of 1979. Egypt is in the unusual position of having practically unlimited access to foreign exchange (from U.S. foreign aid) to maintain food subsidies. It is not clear,

however, how long such access will be continued. Therefore, of the six scenarios analyzed with the CGE model, three assume continued access to foreign exchange and three assume a foreign exchange shortage. Without a foreign exchange shortage the authors investigate the short- and middle-term impacts of continued subsidies at their current rates (the base case), of a decline in the world price of food, and of a shift in investment allocation toward sectors that produce largely for the domestic market. In the presence of a foreign exchange shortage, impacts are studied where subsidies and investment are unchanged but quantity rationing is imposed on foreign exchange, where foreign exchange is not rationed but subsidy rates are reduced while government investment increases, and where there is no foreign exchange rationing but where a sharp reduction in subsidies is accompanied by increased investment and direct transfer payments to the lower and middle income groups. Among the conclusions from these simulations are the following:

1. The real incomes of the rural poor, most of whom are unskilled agricultural workers, are stable in the short- to medium-term.
2. With no foreign exchange constraint, a policy of increased agricultural investment and increased productivity results in better income distribution and faster growth than simply continuing current subsidies.
3. When there is a shortage of foreign exchange, shifting food subsidies to agricultural investment results in faster growth, but there is a marked shift in income distribution toward rural incomes.

De Janvry and Subramanian use the results from their CGE model simulations and their previous historical analysis to conclude their article with a discussion of the gains and losses of socioeconomic groups from cheap food policies and how they interplay with the utility maximizing strategies of policy- makers and administrators. They explain why nutritional programs tend not only to redistribute benefits away from the poor and ill-fed but also to make these programs overexpand, creating increasing macroeconomic tradeoffs between short-run welfare gains and reduced growth in the long run.

3.3.3 Adjustment Policies in Three Archetype Economies

The most extensive quantitative work on the distributional effects of adjustment policies is that reported by Dervis, de Melo, and Robinson (1982, chapter 13). They construct three hypothetical archetype economies to investigate the extent to which differences in resource endowments and economic structures affect the impact of alternative adjustment policies. These economies are similar in many important respects: identical size of labor force and volume of total output, similar input-output coefficients, same use of technology, identical sectoral capital/output ratios, and

same trade elasticities and elasticities of production substitution. All of the economies are "semi-industrial" and generate over 20 percent of GDP in manufacturing. Consumption patterns and within-group income distributions vary between socioeconomic groups but are the same across economies. However, the economies are constructed to differ in the sectoral structures of production, volume of trade, employment, capital, compositions of labor force skill and exports/imports so that one economy is an archetypal primary good exporter (PE), another is a manufacturing exporter (ME), and the third is a relatively closed economy (CL).

The CGE model used to investigate policy response in the three economies contains eight production sectors: primary goods (agriculture and mining), food (including processing), consumer goods, intermediate goods, capital goods, construction, social overhead (including utilities, transportation, and housing), and services. Factors are labor and capital. The socioeconomic categorization reflects the necessary compromise between categories that are useful for both economic and political analyses. There are seven household groupings based on occupational/income source differences: farmers, marginal laborers, industrial laborers, service-sector laborers, agricultural capitalists, industrial capitalists, and service-sector capitalists.

The archetype economies are subjected to an external shock involving a 25 percent increase in the world price of imports while the volume of exports is lowered by 25 percent in all sectors (world prices of exports remaining fixed). The authors then compare the income distribution effects of three kinds of adjustment policy: devaluation, premium (import license) rationing, and premium rationing with fixed real wage for marginal labor.

A few of the more interesting results include,

1. The closed economy suffers a significantly higher GDP loss due to the shock than the other two economies. This is due to a higher import ratio for intermediate inputs and a low trade-substitution elasticity in the closed economy.
2. Devaluation leads to an improvement in the income shares of farmers in all three economies; however, the income shares and real incomes of marginal agricultural labor and unorganized urban labor deteriorate due to induced price increases.
3. The composition of imports determines to a large extent whether the burden of adjustment falls on consumption or investment; for example, in the manufacturing export economy, which is a food importer, the consumption loss tends to be high.
4. Premium rationing leads to significant income transfers to capitalists via the distribution of import licenses. The distributional shifts are highest for the manufactures export economy.

Dervis, de Melo, and Robinson extend their analysis by calculating changes in the poverty head count ratio of the different socioeconomic groups of the economies, assuming specific means and intragroup log variances as initial conditions. They note that societal poverty can significantly increase even when aggregate measures of relative income distribution show little variation.

Additionally, the authors develop a quantitative analytic method for judging the benefit (or loss) to each socioeconomic group from the alternative policy regimes. These gains/losses are then aggregated using different assumed distributions and mechanisms of political influence to arrive at a numerical index of policy feasibility for the alternative policies in the different economies. By this analysis devaluation in the closed and primary export economies is the least disruptive of the existing political order.

Overall the CGE modeling experiments by Dervis, de Melo, and Robinson make very clear the importance of a country's initial structure of trade, resource endowment, production, and employment for how policies will affect that country's economy. This emphasizes the significance in structural adjustment policy modeling of using multisector models capable of capturing structural differences and the mechanisms of economic interaction at work.

3.3.4 Structural Path Analysis

Structural Path Analysis is a static modeling technique that analyzes the various pathways of economic interaction emanating from an exogenous change in expenditure in any one of the SAM accounts. This technique, formally developed by Defourny and Thorbecke (1984), is based on information contained in the matrix of average (or marginal) expenditure propensities, A_n, which is easily calculated from the SAM (and additional information on income elasticities). The elements of this matrix (a_{ji}) show the direct increase in income received by SAM account category j due to an exogenous one-unit increase in income for SAM category i. The amount of direct influence of i on j through the path linking these two poles is thus a_{ji}. However, i may also influence j through a number of other paths. For example, i could directly affect category x, x could directly affect y, and finally category y could directly affect j. The total influence of i on j via this particular path is then the product $a_{xi}\, a_{yx}\, a_{jy}$ multiplied by the corresponding path multiplier. Paths of economic influence can be complex, containing various feedback loops. Defourny and Thorbecke show how to calculate the total influence of any path. While there is a vast number of possible pathways by which SAM category i can influence category j, inspection of the A_n matrix is usually sufficient to identify the most significant ones. By computing and comparing values of total influence for different

pathways, one can clearly see the actual mechanisms of economic interdependence that are important in transmitting exogenous changes among SAM categories.

Because this technique is based on a static analysis of the initial SAM, it is not appropriate for predicting the impact of policies that induce structural change. However, the technique can be very useful in suggesting the actual mechanisms by which exogenous income changes are transmitted through an economy, which should be incorporated into model specifications. A clear charting of pathways may also suggest certain bottlenecks in the process of adjustment that could prevent the economy from responding in ways that the model anticipates. This method makes explicit the fact that economic change rarely occurs through a single mechanism, but rather through a multitude of mechanisms, some of which are more important than others. Doing structural path analysis both on the initial SAM and the post-policy SAM and comparing the results would reveal changes in the total influence of certain pathways. These changes could be helpful in interpreting impacts of adjustment policy.

3.4 CGE Models and Measuring Impacts on Poverty

CGE models do not estimate changes in the level of poverty, they estimate changes in incomes of certain socioeconomic groups. Changes in income of household categories directly translate to changes in poverty only when the categories have been defined such that the variance in income between categories is much more than the variance in income within groups, and when aggregate income changes for a category are reflected in income changes to each of the households comprising the category. Unfortunately, many socioeconomic categories typically associated with poor households (e.g., small farmers and urban marginal workers) can have significant variance in the intragroup income distribution. This means, for example, that when a CGE model estimates that the real incomes of small farmers will go up it is not clear that any of the poor small farmers will receive the additional income. Poverty can vary in quite different ways from a group's aggregate income.

Undertaking an explicit intragroup analysis of poverty not only yields more accurate and reliable results but also provides the advantage of not having to select the model's socioeconomic categories, so that many of the poor fall within the same category. Instead, categorization can emphasize dimensions more directly related to economic processes (e.g., tradables/nontradables) or political constituencies.

A quantitative analysis of policy induced changes in poverty requires that an index of poverty be defined. The most commonly used poverty measures are the head count ratio (the fraction of total population with income below a poverty line) and the poverty income gap (the total income transfer required to bring the incomes

of all households in poverty up to the poverty line). These measures, however, fail to capture some of the welfare concerns many people have in alleviating poverty.[4] The head count ratio tells the extent of poverty but not its depth. If a very poor household receives additional income, but not enough to bring it above the poverty line, this welfare improvement will leave the head count unchanged. Using the head count ratio as the measure of poverty implies that efficient poverty alleviation should concentrate transfers to the least poor. This will reduce poverty with the least expenditure. The poverty income gap is responsive to any additional income to poor households, but it is insensitive as to which of the poor receive the income. The poverty gap is reduced by the same amount whether the additional income accrues to the poorest household or only to the slightly poor.

A class of poverty measures has been developed by Foster, Greer, and Thorbecke (1984) that includes both the head count and poverty gap as special cases, is capable of satisfying more stringent welfare criteria, and is additively decomposable for mutually exclusive subgroups. This poverty measure (FGT) is defined as

$$P\alpha = \frac{1}{n}\sum_{i=1}^{q}\left\{\frac{z-y_i}{z}\right\}^{\alpha}$$

where n = total population, q = number of households in poverty, y_i = income of the ith household, z = poverty line income, α = parameter chosen by policy-maker. This can be equivalently expressed in terms of the income frequency density ($f(y)$):

$$P\alpha = \int_{\underline{y}}^{z}\left\{\frac{z-y}{z}\right\}^{\alpha} f(y)dy$$

where $\underline{y}$ is the income of the poorest household. With $\alpha = 0$, P_o is just the head count ratio and with $\alpha = 1$, P_1 is the poverty gap. $P\alpha$ is strictly convex for $\alpha > 1$, which implies that greater emphasis is placed on the welfare of the poorest of the poor as α increases. The fact that the FGT poverty measure is additively decomposable means that the change in the societal FGT poverty measure is just the weighted sum of changes in FGT poverty measures for society's component subgroups, weighted by the subgroups' population shares:

4 See Sen (1976) and Kakwani (1980) for a discussion of the welfare criteria appropriate to poverty measures.

$$P\alpha = \frac{n_i}{n}P_{1,}\alpha + \frac{n_2}{n}P_{2,}\alpha + \cdots + \frac{n_k}{n}P_{k,}\alpha = \sum_{i=1}^{k}\frac{n_i}{n}P_{i,}\alpha$$

where n_i is the population of subgroup i and P_i, α is the FGT poverty measure for that subgroup.

Estimating the quantitative impact of policy on the FGT poverty measure can be done through a number of approaches. Common to all is the need for information (or presumption) about the initial distribution of income within socioeconomic categories and the specific mechanism by which changes in the aggregate incomes of the different socioeconomic groups are distributed within each group. For most socioeconomic groups (such as landless households, small farmers, and unskilled urban households) survey data are available to provide some information on intragroup income distribution. The mechanisms by which additional income is distributed within groups, however, is generally not known and could well vary between groups and with the specific nature of the policy being studied. Usually the mechanisms are presumed. The simplest assumed mechanisms are (1) additive distribution—all households receiving equal absolute amounts from an income increase to their group, and (2) multiplicative distribution—each household receiving the same percentage increase in their income. Simulation experiments conducted by Thorbecke and Berrian (1987) indicate that estimated changes in the FGT poverty measure are quite sensitive to the type of intragroup distributional mechanism presumed.

One approach to estimating changes in poverty is to presume a nicely behaved frequency density function, such as the lognormal, and fit that as closely as possible to the observed income mean and variance for each of the socioeconomic groupings. The fraction of the distribution that lies below a specified poverty line is then easily obtained from lognormal distribution tables. A CGE model will show how the mean income of each household category responds to policy and shocks. If the additional (or reduced) income is assumed to have an additive intragroup distribution, the post policy income distribution for each group is the initial distribution simply translated by the model's estimate of the change in mean income. This was the approach used by Dervis, de Melo, and Robinson (1982) in their simulations described in the previous section. Any nonadditive intragroup distribution of an aggregate income change must be captured in presumed changes in the intragroup income variances. This approach is appealing in that it is easy to calculate and makes minimum demands on the availability of empirical data. However, there are also many drawbacks: one is constrained to the functional form of the presumed distribution and the fit with actual intragroup distributions may not be good; there is very little flexibility in modeling nonadditive mechanisms for distribution of income changes;

and the only poverty measure this works for is the head count ratio, whose limitations have already been mentioned.

Another approach is to calculate FGT poverty measure values directly. Most census or survey data, when available, will show the number of households or persons in specific income categories for each socioeconomic group. The initial FGT poverty measure can then be estimated for each socioeconomic group by the formula

$$P_i,\alpha = \frac{1}{n_i}\sum_{k=1}^{m} n_k \left\{\frac{z - y_k}{2}\right\}^{\alpha}$$

where n_i = total population in socioeconomic group, n_k = population in income category k, y_k = midpoint of income category k, m = number of income categories such that $y_k < z$, and z = poverty line.

Intragroup income distribution changes resulting from the group's aggregate income change can be modeled either by keeping the same income categories and showing how the population in those categories (n_k) changes or by keeping the income category populations intact and varying the mean income and width of the category (y_k). In either case the transformation is constrained such that the mean income of the socioeconomic group matches the post-policy income of that group estimated through the CGE model. With the new n_k (or y_k) specified the post-policy poverty measure for each group can be calculated and compared with the initial value. A disadvantage of this approach is that it requires fairly detailed information on intragroup income distribution. However, the approach is quite flexible. It allows using as much empirical data as is available and makes one very aware of the assumptions required when information on income distribution and distributionary mechanisms must be presumed.

A third approach has been developed by Kanbur (1986a and 1987a,b), who starts from the definition of the FGT class of poverty measures and derives expressions for the marginal response of $P\alpha$ to exogenous income increases both for additive and for multiplicative intragroup distribution of the increase. He then uses these expressions as poverty response multipliers to estimate the magnitude of poverty change for incremental changes in the aggregate income of socioeconomic groups. Kanbur extends this approach to consider the effects of expenditure reduction and switching due to structural adjustment policy within a two sector (tradables/non-tradables), two factor (capital/labor) model. Assuming only laborers are in poverty, he derives expressions for poverty response due to percentage changes in prices of goods from the two sectors.

This approach has the drawback that it requires as much information and presumption as the previous two approaches; the expressions for poverty response beyond two sectors and for $\alpha > 1$ are very complicated; the analysis is strictly static and appropriate only for small changes; and it considers only the direct effects of policy. The last has been eased somewhat by Thorbecke (1986) and Thorbecke and Berrian (1988), who show how the approach can be modified to incorporate expenditure interactions among groups via the SAM-based, fixed-price multipliers. Kanbur does not regard his approach as an adjunct to CGE modeling but rather as an alternative to it. There is no reason, however, why his poverty response multipliers could not be adapted to the CGE context. As Kanbur notes (1987b), "only an application of the methodology to case studies can tell if this approach will be useful in practice or not." The comment applies equally well to the other approaches described.

3.5 Regional Variations in the Measurement of Poverty and Food Poverty

The poverty measurement discussed so far has been based on household income referenced to a single societal poverty line. A single poverty line is appropriate only when all households face the same prices and choose the same consumption bundle to maintain their standard of living. However, within most developing countries there are significant differences, both in price levels and in what is considered requisite for full, healthful participation in society, due to geographic, cultural, and other variations. In order to apply a consistent concept of poverty across society it may be necessary to establish different poverty lines for each socioeconomic group that reflect the income necessary within that group to maintain a basic standard of living. Use of "regional" poverty lines presents no methodological problem where poverty is measured with the FGT class of poverty indices since the indices are additively decomposable. If the regions to which the poverty lines apply are not coincident with the socioeconomic categories of the CGE, then of course one must be able to construct a mapping between the regions and the categories so that either composite poverty lines specific to the socioeconomic categories can be constructed or the socioeconomic categories can be disaggregated by region.

This type of analysis is developed by Greer and Thorbecke (1986a, b) for food poverty and applied to Kenya. Food poverty can be defined generally as a condition of lacking the resources necessary to acquire a nutritionally adequate diet. Since the typical diet of most people satisfies the major protein, vitamin, and mineral needs if enough calories are eaten, a household is defined as food poor if it is unable to provide its members with the recommended daily allowance (RDA) of calories. The food poverty line used by Greer and Thorbecke is the minimum food expenditure required to provide 2,250 calories per adult equivalent while eating the typical

diet for the region of the household and facing the prevailing regional prices. The regional food poverty line is established from household consumption and expenditure survey data in the following way. Regional data is used to estimate the parameters a and b of $lnX = a + bC$ where X is household food expenditure and C is caloric consumption per adult equivalent. Then setting C = 2,250 calories, the estimated equation yields Z_r the food expenditure poverty line for the region.

An index of food poverty is defined analogously to the FGT poverty measure:

$$P_{r,}\alpha = \frac{1}{n_r}\sum_{j=1}^{q_r}\left\{\varepsilon_j^r \frac{Z_r - X_j^r}{Z_r}\right\}^{\alpha}$$

where P_r, α = food poverty index for region r having poverty parameter, n_r = total population of the region, q_r = number of households in food poverty in the region, Z_r = region's monetary food poverty line, X_j^r = value of food consumption of the jth household expressed per adult equivalents, and ε_j^r = arc expenditure elasticity for calories faced by the jth household.

P_r, α approximates the normalized sum of calorie deficits (raised to the power α). It does not use the actual calorie deficits but rather the calorie shortfall implied by the household's level of expenditure on food (this includes the imputed value of food consumption out of own production in addition to purchased food). The link to the household's total income is through ε_j^r, which is estimated from the same data as was Z_r. As with the FGT poverty measure, the population share weighted sum of P_r, α's for all regions gives a food poverty index for society as a whole. CGE models can be used to estimate changes in food poverty in very much the same way as was described in the previous section for the FGT poverty index.

3.6 Intrahousehold Variations in Poverty

Throughout this presentation we have taken the socioeconomic unit of analysis to be the household. This is to make the implicit assumption that a household is a homogeneous collection of individuals. The assumption is usually justified on the basis that there is extensive income sharing in household units. However, there is now considerable evidence that individuals within households vary significantly not only in their production of household income but also in their share of household consumption. Characteristics of household members such as age, gender, employability, and occupation make a significant difference to the household's earnings and to the welfare of those individuals.

Gender-specific issues, in particular, are just now receiving attention. Gender differences have been shown to be significant determinants of access to education,

occupation, wage, amount of leisure, and nutritional status.[5] Women and girls in many developing countries apparently receive a smaller fraction of their RDA of calories and protein than do men and boys. Greer and Thorbecke (1986a) find that in Kenya female-headed households, ceteris paribus, allocate household income in such a way as to obtain more calories per adult equivalent than comparable male-headed households. As a United Nation's study (1984) points out: "Although a person earns or receives income, it does not follow that the same person also has control over how that income is used or that all household members benefit equally from its use. Cultural, traditional, and family circumstances determine who decides how household income is used and for what purposes. If these decisions are made inequitably, the level of living and nutritional standard may vary considerably among members of the same household. In such cases it is misleading to adopt household income per capita as a measure of the welfare of all household members. Rather it is preferable to study the intrahousehold flow of income. What is of crucial importance is to determine who benefits from the use of income."

To adequately model intrahousehold income distribution would require better knowledge of intrahousehold distribution mechanisms and better data about such variations than we have right now. Therefore, we cannot yet make suggestions about how an intrahousehold model can be incorporated into a CGE framework. We must content ourselves here with raising the issue and emphasizing its potential importance to an analysis of policy impacts on poverty and nutrition.

3.7 An Outline for the Analysis of Policy Impacts on Poverty

What do the discussions in the previous sections add up to in terms of designing an analytic approach for assessing the impacts of macroeconomic policy on poverty and nutrition? Although we are not aware of any empirical study that has traced the connection between policy incidence and poverty outcome, we believe it is possible to do so and offer the following brief outline of one way it could be accomplished.

Definition of the structure of the economy in a base period

To gauge how things have changed one has to know how they started out. It is very helpful to assemble existing data into a SAM for the base period. This involves defining an appropriate classification scheme for productive activities, factors, and socioeconomic groups. Data must be organized and made consistent so that the

5 See Folbre (1986) for a review of many of these issues.

amount of expenditures during the period within and between all categories can be shown in the SAM.

Identification and specification of the macroeconomic policy change

Whether the change being investigated is in a single policy or in a package of policies, it must be represented as a single, exogenous event that affects the pattern of expenditures shown in the SAM. Usually the event will be shown as a change in one of the exogenous SAM categories "Government" or "Rest of the World." How the policy event is represented will depend on the nature of the policy (or policy package), the strength of the policy's application, and on the specification of the CGE model.

Specification of the CGE model

The CGE model will consist of a system of equations that incorporate the sectoral accounting identities and any equilibrium and behavioral relationships considered appropriate in describing the dynamics of economic adjustment for the particular country. A full SAM-based CGE model will transform the base period SAM to a post-policy SAM when the exogenous changes due to the policy event are input into the model.

We must add a cautionary note. CGE models incorporate important assumptions and characteristics that limit their practicability. For example, in a CGE model one is forced to specify all basic economic interactions so that a complete picture of the circular flow within the economy can be obtained. Previous studies have shown that the results of CGE models tend to be very sensitive to how each of the model's relationships is specified. Therefore, if any part of the model is misspecified, results can be seriously in error even if the rest of the model is correct. For our purposes the only parts of the post-policy SAM that we require are the incomes to the socioeconomic categories and the prices of consumption goods. It is quite possible that a multisectoral, partial equilibrium model that provided the post-policy socioeconomic incomes and prices of consumption goods would be more reliable than a full-fledged CGE model.

Transformation of changes in income to changes in poverty

The general (or partial) equilibrium model will yield the change in aggregate income of the socioeconomic groups due to the policy event. To obtain the change in poverty of the groups one must:

1. Define an appropriate measure of poverty and a reference poverty line. The FGT poverty measure (with $\alpha > 1$) is suggested because it embodies appropriate welfare properties, is relatively easy to compute, and is additively decomposable. One has the option of using a single societal poverty line as a

reference or separate poverty lines for each socioeconomic group. Also, it is possible to define the poverty lines so that they explicitly reflect households' ability to purchase sufficient food for a nutritionally adequate diet.

2. Assemble data to give the income distribution of each socioeconomic category for the base period.
3. Specify the mechanism by which a change in each socioeconomic group's aggregate income transforms that income distribution. Then, since the change in each group's aggregate income due to the policy event is given by the model, the post-policy income distribution for each group can be obtained and the post-policy levels of poverty (with the poverty lines adjusted for changes in the price of consumption goods) can be calculated. Comparison of the post-policy levels of poverty with the levels of poverty from the base period give the changes in poverty due to the impact of macroeconomic policy.

This analytical process is easier to outline than it will be to accomplish. Large amounts of reliable data are needed for construction of the SAM, parameterization and testing of the model, and transformation of changes in income to changes in poverty. Inevitably, significant assumptions will need to be made in reconciling data, specifying behavioral relations, and bringing closure to the analytic process. These difficulties notwithstanding, we believe that this analytic process has the potential of providing valuable insight into how alternative adjustment policies affect the welfare of society's poor.

4. THE IMPACT OF MACRO-ECONOMIC ADJUSTMENT POLICIES ON REAL INCOMES OF THE POOR BROUGHT ABOUT BY CHANGES IN THE AGRICULTURAL SECTOR

Alexander H. Sarris

4.1 Introduction

Economic adjustment is the inevitable necessity arising out of unsustainable external and internal deficits, which in turn have their roots in adverse external or domestic economic developments. Stabilization programs have been adopted by a large number of developing countries in recent years, usually at the suggestion of the International Monetary Fund (IMF) and as a condition for the continued availability of external financing, with the aim to reduce the external and internal deficits in a short period of time. These macroeconomic programs, which usually consist of public expenditure reduction, wage restraint, and devaluation, generally achieve their short-run aims as well as reduce investment and growth in the short- and medium-run. To restore growth, multilateral lending institutions (primarily the World Bank) have been promoting and financing the adoption of Structural Adjustment Programs (SAPs). These programs aim largely at reducing domestic distortions, improving economic efficiency, and creating incentives compatible with comparative advantage, as a precondition for resuming high growth rates. The means by which these aims are pursued include the following:

1. restructuring of trade policies by general liberalization;
2. restructuring and improving the effectiveness of public revenues and expenditures;
3. public investment program reforms;

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4. reforms of public enterprises and institutions with a general push for more privatization;
5. liberalization of the financial sector;
6. reforms of sectoral price policies.

Programs of such a wide scope affect the incomes of the countries' inhabitants in many ways. However, a given measure need not have the same impact on different groups within the population in direction or in magnitude. Furthermore, combinations of measures might not interact additively, in the sense that ceteris paribus, the total effect is the sum of the separate effects. This is the consequence of the complicated nonlinear structure of production and institutional relations in all countries, that make the predictions of consequences from nonmarginal changes quite difficult. Nevertheless, given the prominence of the SAPs in recent years, the need arises for research aimed at analyzing the consequences of individual as well as combinations of policy reforms.

The aim of this chapter is to present an empirical methodology that has been utilized for comparing the short- and medium-term outcomes of stabilization and structural adjustment policies across a range of countries. Subsequently, it is shown how this framework can be extended to incorporate in more detail the impact of theses policies on the poor. Albeit the methodology developed is quite general, the discussion in this paper is restricted to reforms in the agricultural sector. A detailed analytical review of the debate and the impact on the agricultural sector can be found in Sarris (1987a). Here the concern will be mostly with methodological questions.

The emphasis on the poor comes from the growing recognition among the international institutions, analysts, and affected countries that there might be some serious negative side effects of SAPs inflicted on the weakest segments of the population. The restriction to the agricultural component of SAPs can be justified on the grounds that agriculture not only is the largest producing sector in most developing countries, but also because it is always heavily interfered with and hence invariably features prominently in almost all SAPs.

References to the poor in this chapter will mean the small farmers, the small nonfarm rural and urban businessman, the landless agricultural laborers, and the low-skill, low-wage urban laborers. These are the classes in which poverty and malnutrition is most concentrated. These groups do not comprise all the poor in a given economy, nor do all members of these groups suffer equally. However, they can be clearly identified, which is important for tracing the impact of policy changes.

Adjustments in the agricultural sector come about in many forms, but one can distinguish the following major types: first, changes in agricultural output prices arising from abolition of various forms of indirect product specific taxes or

subsidies; secondly, changes arising from abolition or reduction of subsidies or taxes to agricultural inputs; third, changes arising from modification in agricultural trade taxes or subsidies; fourth, changes arising from shifting the public investment programs more or less in favor of agriculture; fifth, reforms of the rules of agricultural institutions such as marketing boards; and, finally, changes in agricultural product prices to consumers via reforms in consumer subsidies. This chapter will be concerned with the impact of these changes on the poor.

SAPs have come into operation in several countries only during the last seven years. These programs cover a wide range of reforms and have a mixed record of implementation success. Accounts of the results are still missing or are hidden in confidential documents of multilateral agencies. Even if the records become public, however, evaluation is hampered by some serious conceptual difficulties. If counterfactual analysis based on an analytical model is not used, then the actual outcomes of the economic variables of interest or their deviations from expected values cannot be attributed only to the SAP. In most cases the values of exogenous variables on which projections and program design are based cannot be accurately assumed. Furthermore, the SAP might not have been implemented as planned. Finally, the outcomes might be primarily due to other concurrent policy changes or government actions. Analytical modeling, while an evolving and imperfect science, still remains the only way to trace the impact of policy changes that have macro effects. This paper is a contribution towards a more complete methodology for studying the impact of the SAPs on the poor.

While there have been several attempts to analyze the general impact of stabilization and structural adjustment programs, there have been few attempts to date to empirically investigate the impact of recession and adjustment on the poor. The recent survey of Cornia (1987b) of existing related empirical work, such as that of Zulu and Nsouli (1985) or Khan and Knight (1985), points out that very little is known about the impact of adjustment programs on overall poverty rates.

The plan of this chapter is as follows. In the next section the model used for the comparative analysis in Sarris (1987b) is outlined. Then some of the results that have been obtained are exhibited. In the fourth section the extensions necessary for studying the impacts on the poor are discussed both conceptually and analytically. In the final section data requirements and other practical problems are discussed.

4.2 The Model

The model design can incorporate a wide variety of policy instruments, some of which may be in place at the time of SAP implementation and some of which may not. In this section the main features of the Computable General Equilibrium (CGE) model are presented.

4.2.1 Production

Consider an economy composed of n sectors, m of which produce agricultural goods and r = n – m which produce nonagricultural goods. Production in sector i, denoted by x_i, is given by a CES function of an index of intermediate inputs N_i and a quantity measure of value added V_i

$$x_i = A_i\left\{\alpha_{1i}N_i^{\frac{\sigma_{1i}-1}{\sigma_{1i}}} + \alpha_{2i}V_i^{\frac{\sigma_{1i}-1}{\sigma_{1i}}}\right\}^{\frac{\sigma_{1i}}{\sigma_{1i}-1}} \qquad i=1....,n \tag{1}$$

where σ_{1i} is the elasticity of substitution, A_i is a technological constant, and α_{1i}, α_{2i} are parameters.

Let the producer price in sector i be $p_i' = p_i\,(1-t_i)$ where t_i denotes the indirect tax rate and p_i is the equilibrium market price in sector i. Then, if p_{Ni} denotes an index of intermediate input price, value added in sector i is equal to

$$VAD_i = p_i'x_i - p_{Ni}N_i \tag{2}$$

Suppose that p_i' and p_{Ni} are given. What is the quantity produced and the value added? The model uses two different mechanisms to determine this, one for agricultural sectors and one for nonagricultural ones.

In agriculture the factors of production are to a large extent common to all sectors. Hence, to assume sector specific factors, while a more appropriate assumption in the context of a highly developed country, is not warranted for developing countries. How, then, is production determined in the agricultural sectors? The procedure used follows.

First, assume that for the whole agricultural sector the quantity of value added is fixed in the short run (one year) and determined by the availability of factors of production in a CES fashion

$$V_a = \left\{\gamma_{1a}L_a^{\frac{\sigma_{3a}-1}{\sigma_{3a}}} + \gamma_{2a}K_a^{\frac{\sigma_{3a}-1}{\sigma_{3a}}} + \gamma_{3a}T_a^{\frac{\sigma_{3a}-1}{\sigma_{3a}}}\right\}^{\frac{\sigma_{3a}}{\sigma_{3a}-1}} \tag{3}$$

where V_a is the quantity of agricultural value added; L_a, K_a, T_a are the currently available amounts of agricultural labor, capital, and land, respectively; σ_{3a} is an elasticity of substitution; and γ_{1a}, γ_{2a}, γ_{3a} are parameters.

How is V_a allocated to the m agricultural sectors? It is assumed that V_a is a CET (constant elasticity of transformation) index of the quantities of value added in the individual agricultural sectors

$$V_a = \left\{ \sum_{i=1}^{m} a_i V_i^{\frac{\tau+1}{\tau}} \right\}^{\frac{\tau}{1+\tau}} \tag{4}$$

where τ is the elasticity of transformation (for a detailed analysis of the CET transformation frontier see Powell and Gruen, 1968), and a_i are parameters. If it is assumed that the price of value added in sector i is denoted by π_i (see the following equations), then allocation of V_a to the r sectors is done by maximizing the total value of agricultural value added

$$\sum_{i=1}^{m} \pi_i V_i \tag{5}$$

subject to (4).

The maximization yields the following allocation functions

$$V_i = a_i^{-\tau} V_a \left\{ \frac{\pi_i}{\pi_a} \right\}^{\tau} \qquad i=1...,m \tag{6}$$

where π_a is a CET index of the prices π_i and has the meaning of the "price of agricultural value added"

$$\pi_a = \left\{ \sum_{i=1}^{m} a_i^{-\tau} \pi_i^{1+\tau} \right\}^{\frac{1}{1+\tau}} \tag{7}$$

It also holds that

$$\pi_a V_a = \sum_{i=1}^{m} \pi_i V_i \tag{8}$$

The above procedure yields naturally the imputed returns or prices of labor, capital, and land in the agricultural sector. By Euler's theorem and the linear homogeneity of the CET index (4) one can write

$$V_a = \frac{\partial V_a}{\partial L_a} L_a + \frac{\partial V_a}{\partial K_a} K_a + \frac{\partial V_a}{\partial T_a} T_a \tag{9}$$

Multiplying (9) by π_a one obtains

$$\pi_a V_a = \left\{ \pi_a \frac{\partial V_a}{\partial K_a} \right\} L_a + \left\{ \pi_a \frac{\partial V_a}{\partial K_a} \right\} K_a + \left\{ \pi_a \frac{\partial V_a}{\partial T_a} \right\} T_a \tag{10}$$

Equation (10) is a natural allocation of the agricultural value added to its factors. The shadow prices of labor capital and land respectively are equal to

$$\pi_{La} = \pi_a \frac{\partial V_a}{\partial L_a} = \pi_a \gamma_{1a} \left\{ \frac{V_a}{L_a} \right\}^{\frac{1}{\sigma_{3a}}} \tag{11}$$

$$\pi_{Ka} = \pi_a \frac{\partial V_a}{\partial K_a} = \pi_a \gamma_{2a} \left\{ \frac{V_a}{K_a} \right\}^{\frac{1}{\sigma_{3a}}} \tag{12}$$

$$\pi_{Ta} = \pi_a \frac{\partial V_a}{\partial T_a} = \pi_a \gamma_{3a} \left\{ \frac{V_a}{T_a} \right\}^{\frac{1}{\sigma_{3a}}} \tag{13}$$

The endogenously determined implicit returns to the various agricultural factors are influenced by product prices (which will affect the value of π_i and hence π_a), and are quite important in the dynamic part of the model because they influence the rates of rural to urban migration and capital accumulation.

Several observations are in order in this specification. First, the model implies that the marginal product of labor in agriculture is positive, albeit small. In other words, there is no "surplus labor" in agriculture. It then implies that the returns to the factors of production are the same in all agricultural sectors. The same type of assumption is used for allocating labor and land in the partial equilibrium models of Braverman, Hammer, and Jorgenson (1985), and Braverman and Hammer (1985), albeit under a different structure. It is also used in the model of Quizon and Binswanger (1985).

Assuming that V_i is fixed for agricultural producers in sector i, production is found by maximizing value added (or profit) in equation (2) subject to the produc-

tion function (1). The demand for the intermediate product N_i is given by the following equation

$$N_i = B_{1i} V_i \left\{ \frac{p_i'}{p_{Ni}} \right\}^{\sigma_{1i}} \{\Delta_{1i}\}^{\frac{\sigma_{1i}}{1-\sigma_{1i}}} \qquad i=1,\ldots,m \tag{14}$$

where

$$B_{1i} = A_i^{\sigma_{1i}} \alpha_{1i}^{\sigma_{1i}} \{\alpha_{2i}\}^{\frac{\sigma_{1i}}{\sigma_{1i}-1}} \qquad i=1,\ldots,m \tag{15}$$

$$\Delta_{1i} = 1 - A_i^{\sigma_{1i-1}} \alpha_{1i}^{\sigma_{1i}} \left\{ \frac{p_i'}{p_{Ni}} \right\}^{\sigma_{1i}-1} \qquad i=1,\ldots,m \tag{16}$$

substituting expression (14) in the production function the supply of the i'th agricultural product is found.

$$x_i = A_i \{\alpha_{2i}\}^{\frac{\sigma_{1i}}{\sigma_{1i}-1}} V_i \{\Delta_{1i}\}^{\frac{\sigma_{1i}}{1-\sigma_{1i}}} \qquad i=1,\ldots,m \tag{17}$$

Finally, by substituting (14) and (17) in (2) one finds the profit function for agricultural sector i, which expresses the value added in a convenient way.

$$VAD_i = \pi_i V_i \qquad i=1,\ldots,m \tag{18}$$

where

$$\pi_i = A_i \{\alpha_{2i}\}^{\frac{\sigma_{1i}}{\sigma_{1i}-1}} p_i' \{\Delta_{1i}\}^{\frac{1}{1-\sigma_{1i}}} \qquad i=1,\ldots,m \tag{19}$$

By Hotelling's lemma it should hold that

$$x_i = \frac{\partial VAD_i}{\partial p_i'} \tag{20}$$

$$N_i = -\frac{\partial VAD_i}{\partial p_{Ni}}$$

(21)

These relations indeed hold as can be verified by substitution in equations (20) and (21).

The price of value added π_i is basically a unit profit function and is what enters the allocation of agricultural value added exhibited above.

The advantage of an agricultural production mechanism of the type analyzed is that it can be readily extended to any number of agricultural sectors, and it can be readily linked with a macro-model. If many agricultural sectors are assumed, the micro detail can be enhanced with more complicated allocation functions than the one exhibited in (4) (for instance, a nested CET). One could also consider complications such as different land types, different labor types, etc. For the purpose of this analysis, however, this is deemed unnecessary.

In nonagricultural sectors the production specification is the following. Supply is determined by profit maximization, where profit is understood as the return to capital and hence excludes the wage bill.

$$\Pi_i = p_i' x_i - p_{Ni} N_i - w L_i \qquad i=m+1,\ldots,n$$

(22)

where w is the nonagricultural wage rate (for convenience assumed the same in all sectors) and L_i is employment in sector i.

Maximization of (22) subject to (1) and the CES specification for V_i

$$V_i = \left\{ \gamma_{1i} L_i^{\frac{\sigma_{3i}-1}{\sigma_{3i}}} + \gamma_{2i} K_i^{\frac{\sigma_{3i}-1}{\sigma_{3i}}} \right\}^{\frac{\sigma_{3i}}{\sigma_{3i}-1}} \qquad i=m+1,\ldots,n$$

(23)

yields the following factor demand and product supply relations for sectors i=1,..., n

$$N_i = B_{1i} V_i \left\{ \frac{p_i'}{p_{Ni}} \right\}^{\sigma_{1i}} \{\Delta_{1i}\}^{\frac{\sigma_{1i}}{1-\sigma_{1i}}}$$

(24)

$$x_i = A_i \{\alpha_{2i}\}^{\frac{\sigma_{1i}}{\sigma_{1i}-1}} V_i \{\Delta_{1i}\}^{\frac{\sigma_{1i}}{1-\sigma_{1i}}}$$

$$V_i = \{\gamma_{2i}\}^{\frac{\sigma_{3i}}{\sigma_{3i}-1}} K_i \{\Delta_{2i}\}^{\frac{\sigma_{3i}}{1-\sigma_{3i}}}$$

(26)

$$L_i = B_{2i} K_i \{\Delta_{1i}\}^{\frac{\sigma_{3i}}{1-\sigma_{1i}}} \{\Delta_{2i}\}^{\frac{\sigma_{3i}}{1-\sigma_{3i}}} \left\{\frac{p_i'}{w}\right\}^{\sigma_{3i}}$$

(27)

where B_{1i} and Δ_{1i} have exactly the same form as in equations (15) and (16), while B_{2i} and Δ_{2i} are defined as follows

$$B_{2i} = A_i^{\sigma_{3i}} \{\alpha_{2i}\}^{\frac{\sigma_{1i}\sigma_{3i}}{\sigma_{1i}-1}} \gamma_{1i}^{\sigma_{3i}} \{\gamma_{2i}\}^{\frac{\sigma_{3i}}{\sigma_{3i}-1}}$$

(28)

$$\Delta_{2i} = 1 - A_i^{\sigma_{3i}-1} \{\alpha_{2i}\}^{\frac{\sigma_{1i}(\sigma_{3i}-1)}{\sigma_{1i}-1}} \gamma_{1i}^{\sigma_{3i}} \{\Delta_{1i}\}^{\frac{1-\sigma_{3i}}{\sigma_{1i}-1}} \left\{\frac{p_i'}{w}\right\}^{\sigma_{3i}-1}$$

(29)

The profit function in (22) can be found by substituting the expressions (24)-(27) in (22). The result is

$$\Pi_i = \pi_{Ki} K_i \qquad i=m+1,\ldots,n$$

(30)

where π_{Ki} is the return to a unit of capital and is equal to

$$\pi_{Ki} = p_i' A_i \{\gamma_{2i}\}^{\frac{\sigma_{3i}}{\sigma_{3i}-1}} \{\alpha_{2i}\}^{\frac{\sigma_{1i}-1}{\sigma_{1i}-1}} \{\Delta_{1i}\}^{\frac{1}{1-\sigma_{1i}}} \{\Delta_{2i}\}^{\frac{1}{1-\sigma_{3i}}} \qquad i=m+1,\ldots,n$$

(31)

Capital is fixed within each year in this putty-clay model and the return to the unit of capital is endogenous.

The specification of production implies that there is substitution within each period among primary factors of production, the magnitude of which is governed by the elasticities of substitution. Also note that the model implies that there is always unemployment in the nonagricultural sectors, since the wage rate is assumed fixed. Wage, however, as will be seen in the sequel, adjusts from period to period on the basis of employment rate.

4.2.2 Intermediate Product Demand

In most CGE models, the demand for intermediates is given by fixed input-output coefficients. Here this notion is generalized by assuming that there is a limited degree of substitution among intermediate inputs.

The quantity of intermediate input N_i is assumed to be given by a CES function of intermediate product inputs.

$$N_i = \left\{ \sum_{j=1}^{n+1} \beta_{ji} \{x_{ji}\}^{\frac{\sigma_{2i}-1}{\sigma_{2i}}} \right\}^{\frac{\sigma_{2i}}{\sigma_{2i}-1}} \tag{32}$$

where x_{ji} is the quantity of the j'th intermediate input used in the production of the i'th good. The good indexed by j=n+1 denotes the input of the noncompetitive import.

Once N_i is found as exhibited earlier, its allocation is done by using the Armington (1969) procedure, namely, minimizing for each sector i the total cost of intermediate inputs subject to (32)

$$\min \sum_{j=1}^{n+1} p_{ji} x_{ji} \tag{33}$$

where p_{ji} is the price of product j used as input to production in sector i. If there are input subsidies or taxes these influence the price of p_{ji} which does not have to be equal to p_j.

The demand for x_{ji} is then found as follows

$$x_{ji} = N_i \{\beta_{ji}\}^{\sigma_{2i}} \left\{ \frac{p_{ji}}{p_{Ni}} \right\}^{-\sigma_{2i}}$$

where p_{Ni} is a CES index of intermediate input price

$$p_{Ni} = \left\{ \sum_{j=1}^{n+1} \beta_{ji}^{\sigma_{2i}} p_{ji}^{1-\sigma_{2i}} \right\}^{\frac{1}{1-\sigma_{2i}}}$$

4.2.3 Competitive Import Demand

In many countries there is a substantial amount of competitive imports, namely, those for which there is a high degree of substitutability with domestic production. In recent years it has become established that the best way to treat these imports in a CGE is as if they are differentiated from the domestic product but with a reasonably high degree of substitutability (see Dervis, deMelo, and Robinson, 1982). This practice is followed here by assuming that the good actually consumed internally is a mixture of the domestically produced and the imported products.

$$y_i = \left\{\delta_{1i}\{y_{id}\}^{\frac{\sigma_{4i}-1}{\sigma_{4i}}} + \delta_{2i}\{y_{im}\}^{\frac{\sigma_{4i}-1}{\sigma_{4i}}}\right\}^{\frac{\sigma_{4i}}{\sigma_{4i}-1}} \tag{36}$$

where y_i is the quantity index of the good available domestically for consumption (intermediate, private, or investment), while y_{id} is the quantity of domestically produced good i, and y_{im} is the quantity of the competitively imported good i. Allocation of a given amount of y_i to its two components is done a la Armington by minimizing the total cost of the two goods

$$\min\{p_i y_{id} + p_{mi} y_{im}\} \tag{37}$$

subject to (36). In (37) p_{mi} is the internal price of the imported good and includes whatever tariffs or border taxes are applied.

The allocation is done via the following formulas

$$y_{id} = y_i \delta_{1i}^{\sigma_{4i}} \left\{\frac{p_i}{p_{ni}}\right\}^{-\sigma_{4i}} \tag{38}$$

$$y_{im} = y_i \delta_{2i}^{\sigma_{4i}} \left\{\frac{p_{mi}}{p_{ni}}\right\}^{-\sigma_{4i}} \tag{39}$$

where p_{ni} is an index of the domestic price of product i.

$$p_{ni} = \left\{\delta_{1i}^{\sigma_{4i}} p_i^{1-\sigma_{4i}} + \delta_{2i}^{\sigma_{4i}} p_{mi}^{1-\sigma_{4i}}\right\}^{\frac{1}{1-\sigma_{4i}}} \tag{40}$$

The prices p_{ni} are used to compute all internal prices. For instance, the intermediate input prices p_{ji} exhibited earlier are specified as follows

$$p_{ji} = p_{nj}(1 - s_{ji}) \tag{41}$$

where s_{ji} is the input subsidy rate for product j used in the production of product i.

4.2.4 Incomes and Consumption

There are two income groups distinguished in the model, rural and urban. More detailed income breakdown is possible if the consumption data is available and if assignment of the ownership of the various factors of production is possible. This is usually a fairly tedious task (see, for instance, the model in Adelman and Robinson, 1978), albeit several attempts have been made in recent years (see, e.g., Taylor et al., 1980). For the purposes at hand, however, the above breakdown is appropriate.

The rural income group receives as income mainly the value added of the agricultural sectors, while the urban income group receives the value added from the nonagricultural sectors and the bulk of the government wage bill. Depending on the Social Accounting Matrix (SAM), each income group can receive a fraction of the income of the other. Government and foreign transfers are also added to disposable income. Per capita income is estimated by dividing gross income by the population in the two groups.

Per capita consumption is computed using the permanent income hypothesis. If y_{kPC} is per capita disposable income for the k'th income group, then per capita consumption Y_k^C is estimated as follows

$$Y_k^C = YP_k^C + (1 - s_k)(y_{kPC} - YP_k^C) \tag{42}$$

where YP_k^C is per capita permanent consumption and s_k is the marginal savings rate for income group k. By specifying marginal savings rates, the permanent consumption parameters can be derived from the basic year SAM data. The adopted specification implies greater stability of consumption than that of income, a well-known feature of all economies.

Given the per capita consumption expenditures for each income group, demand for individual commodities is given by a linear expenditure system (LES), which is used quite commonly in such types of models.

4.2.5 Exports, Investment Demand and Private Stock Changes

Since in any CGE the products of each sector are necessarily aggregates of individual homogeneous products, the exported product should be considered as a

differentiated one in the world market with a less than infinite export demand price elasticity. This is implemented in the model by using constant but non-infinite price elasticity of export demand functions.

$$E_i = \overline{E}_i \left\{ \frac{p_i(1-s_{ei})}{ep^*_{ei}} \right\}^{-\eta_i} \tag{43}$$

In (43) E_i is the quantity exported, p^*_{ei} is the world price of the competing good in the world market, e is the foreign exchange rate, and s_{ei} is the export subsidy rate (negative if an export tax). The export function has a constant elasticity with respect to the ratio of the price offered by domestic producers in the international market (equal to $p_i\,(1-s_{ei})/e$) and the competing price.

Demand for investment in this model is determined endogenously but not as a function of available savings. Denote the price of good i if purchased for investment as p_{vi}. This is equal to the internal price p_{ni} exhibited in (40) except where adjusted by special investment tariffs or subsidies. Let θ_{ij} denote the amount of sector i input required for making a unit of capital of sector j, namely, the traditional capital coefficient. Then the current cost of a unit of new capital in sector j can be expressed as follows

$$p_{Kj} = \sum_{i=1}^{n+1} \theta_{ij} p_{vi} \tag{44}$$

From the production model it was seen that, for the agricultural as well as the nonagricultural sectors, the current profitability of a unit of installed capital in sector j is equal to π_{Kj} (cf. equations (12) and (31)).

The current real return on a unit of capital in sector j is defined as follows

$$R_j = \frac{\pi_{Kj}}{p_{Kj}} \tag{45}$$

Then the gross demand for new capacity in sector j is given by the following function

$$\frac{\Delta K_j}{K_j} = \zeta_{0j} + \zeta_{1j} R_j + EXINV_j \tag{46}$$

In (46) $EXINV_j$ is an exogenous variable used to simulate autonomous increases in capital formation beyond what is expressed by the first two terms. The parameter ζ_{1j} is specified independently and denotes the elasticity of capital formation with respect to the real rate of return on capital, while the parameter ζ_{0j} is estimated from the base year data.

Given gross capital formation, the demand of sector i product for investment is given as follows

$$I_i = \sum_j \theta_{ij} \Delta K_j \tag{47}$$

Notice that the specification of investment is not of the neoclassical type where it adjusts only as function of available savings. Here, the mechanism is largely Keynesian (or "forced savings" type). Total savings adjust to the aggregate investment expenditure, which is, however, determined endogenously.

In a similar context Cavallo and Mundlak (1982) use an investment function for the specification of total real investment, and an allocation mechanism based on relative profits for investment in each sector. There has been a large debate on the choice of closure rules in CGEs, namely the way in which aggregate savings and investments are brought to balance (see, e.g., Taylor and Lysy, 1979; Rattso, 1982; Ahluwalia and Lysy, 1979). The choice is not clear but for a developing country context the present specification seems quite reasonable (see also the discussion in Taylor, 1981), and has been adopted in several recent CGE models.

Total stock changes in this model are assumed endogenous and are given by the following expression

$$\Delta S_{it} = G_i \left(\frac{p_t}{p_{t0}}\right)^{b_i} \left(\frac{x_{it}}{x_{it-1}}\right)^{c_i} \tag{48}$$

where $b_i < 0$ and $c_i > 0$. This specification implies that an increase in price of period t leads to a smaller stock change than normal, while a production increase implies a larger stock change. There is no distinction made in the model between private and public stocks.

4.2.6 Consistency of the Static Model and Solution Procedure

Equilibrium in the static model is brought about by bringing to zero the excess demands for the domestically produced good defined as follows

$$ED_i = \sum_{j=1}^{n} x_{ijd} + Q_{id} + I_{id} + G_i + E_i + \Delta S_i - x_i \tag{49}$$

where the subscript d denotes the demand for the differentiated domestic product, illustrated in section 4.2.3, is a fraction of total demand. In (49) Q_{id} is total consumer demand for domestically produced good i (namely, the sum of quantities demanded by all income groups), and G_i denotes exogenously specified government expenditures on the domestic product. The equilibrating variables are the gross producer prices p_i.

Once the excess demands are brought to zero, a consistency check is the so-called "savings-investment identity." This relation is not a new one but follows from the equilibrium conditions

$$ED_i = 0 \qquad i=1,\ldots, n \tag{50}$$

It states that the value of aggregate investment equals the value of aggregate savings. The value of investment includes expenditures on domestic and imported investment goods as well as expenditures on stock changes. Aggregate savings, on the other hand. includes private savings, namely, the difference between total private income and consumption expenditures; government savings, namely, the difference between total government receipts and expenditures (the negative of the government deficit); and foreign savings, which is the difference between the value of total foreign receipts and the value of total foreign expenditures (the negative of the balance of payments deficit).

The solution procedure used is to minimize the following function of the excess demands with respect to the prices

$$W = \sum_{i=1}^{n} ED_i^2 \tag{51}$$

A nonlinear optimization routine is used to solve (51). The routine stops when the conditions for the minimum are satisfied, and these in turn imply that each of the excess demands is equal to zero.

4.2.7 Special Features of the Static Model

The model as outlined has several features that must be highlighted. First, note that the wage rate and the foreign exchange rate are held nominally constant in the

short-run, namely, in the equilibrium system for one period. This implies that, while the model is homogenous of degree zero in all prices p_i, w, and e, it is not homogenous with respect to p_i once w and e are fixed. This assumption of fixed nominal wage, combined with our investment functions that do not adjust to savings, classify this model in the category of those favored by structuralists and the closure rule to the ones termed "Kaldorian" (see Taylor and Lysy, 1979; Dervis, deMelo, and Robinson, 1982; and Rattso, 1982 for a discussion of these important issues).

It is the author's belief that this type of mechanism fits the structure of developing economies better than the more neoclassical assumptions of all markets clearing, and investment adjusting to savings. This is all the more so since the medium run is viewed as a sequence of short runs, and it is in the short run that structuralist features are of more importance.

Also note that some variables will be fixed (or grow constantly) in nominal terms. Notable among these is government transfers to households. This feature also adds to the nonhomogeneity of the model.

4.2.8 Dynamic Adjustment Mechanisms

Besides several exogenously specified variables that are assumed to grow at fixed rates, there are a few variables, which, while assumed fixed for any given period, are assumed to adjust endogenously from period to period.

The first one among these is the capital stock available for production in the agricultural and the nonagricultural sectors. If we denote by K_{jt} the capital stock in place in the beginning and during period t, in sector j, then next period's capital stock is equal to

$$K_{j,t+1} = K_{jt}(1 - \delta_j) + \Delta K_{jt} \tag{52}$$

where δ_j is an assumed physical depreciation rate.

Labor availability in the agricultural sector is assumed to adjust as follows

$$L_{a,t+1} = L_{at}(1 + g_{La}) - MIG_t \tag{53}$$

where g_{La} is a constant growth rate, and MIG_t is the rural-urban migration. This variable in turn is specified endogenously in a fashion inspired by Harris and Todaro (1970) and Mundlak (1979), but adjusted to fit the model

$$\frac{MIG_t}{L_{at}} = M\left\{\frac{w_t}{\pi_{L_{at}}}\right\}^{\mu_1} EM_t^{\mu_2}\left\{\frac{MIG_{t-1}}{L_{a,t-1}}\right\}^{\mu_3} \tag{54}$$

where EM_t is the employment rate in the nonagricultural sector,

$$EM_t = \frac{\sum_{i=m+1}^{n} L_{it} + L_{Gt}}{L_{Tt} - L_{at}} \tag{55}$$

L_{Gt} is government employment and L_T is total labor force. As specified in (55) the rate of rural-urban migration is a function of relative returns to labor in the nonagricultural and agricultural sectors, and the probability of finding employment in the urban sector, proxied by the nonagricultural employment rate.

The nonagricultural wage rate is assumed to adjust as a function of the consumer price index (CPI) and the employment rate

$$\frac{w_{t+1}}{w_t} = W\left\{\frac{CPI_t}{CPI_{t-1}}\right\}^{\nu_1} EM_t^{\nu_2} \tag{56}$$

where CPI is the consumer price index specified as follows

$$CPI = \sum_{i=1}^{n+1} \psi_i p_{ci} \tag{57}$$

ψ_i is the base year consumer expenditure share on good i, and is held fixed throughout the simulation.

Note that if one sets $\nu_1 = 0$, $\nu_2 = 0$, and $W = 1$, then in essence one assumes a fixed nominal wage throughout the period. If $\nu_1 = 1$, $\nu_2 = 0$, and $w = 1$, then the "lagged real wage," namely, the nominal wage discounted by last period's CPI, is fixed.

Government employment is also assumed to adjust as a function of the employment rate

$$\frac{L_{G,t+1}}{L_{Gt}} = F(1 + g_{LG})EM_t^{\theta} \tag{58}$$

where g_{LG} is a fixed growth rate and $\theta < 0$. The story behind (58) is that the government tries to counteract urban unemployment by hiring more civil servants in periods of low employment and vice versa in periods of high employment.

The government wage is also specified to adjust endogenously as a function of the nonagricultural wage.

$$\frac{w_{Gt}}{w_{G,t-1}} = D\left\{\frac{w_t}{w_{t-1}}\right\}^{\varepsilon} \tag{59}$$

The dynamic adjustments specified illustrate the reasons for treating agriculture as has been done. The basic dynamic processes that lead to structural adjustment in the model are the capital accumulation functions, the labor migration functions, and the wage adjustment mechanism. Given the limited knowledge about dynamic adjustment processes in economics, the model is confined to a two sector dynamic adjustment model, namely, agriculture/nonagriculture. For this type of model one can borrow from the theories of rural-urban migration and the macro theories of investment and wage adjustment to specify reasonable dynamic equations. If one had specified, for instance, more labor categories with a different wage for each, one would have to also define a model of mobility between the various labor classes, let alone the adjustment mechanisms for the different wage rates. Furthermore many labor categories, especially in agriculture, would require a model of land and capital transfer among income classes. Even for economies with large and efficient data these are extremely tedious tasks that might be necessary if income distribution is the objective but not required if the purpose is to sketch the broad consequences of structural adjustment and especially if the model is to be made applicable to many countries (for a specification of such a large model see Adelman and Robinson, 1978).

The remaining variables of the model that are fixed and predetermined in a given period are assumed either to grow at fixed rates (such as transfers, government noncompetitive imports, government expenditures, technological constants such as A_i, etc.), or are specified exogenously for each period (such as foreign prices and the random production and export demand shocks).

The complete model as specified has a number of features that make it amenable to a wide range of analyses. The number of sectors can be expanded at will without changing the basic structure. A wide variety of policy instruments is inherent in the

structure. The specification of production via functions that permit substitution among inputs makes the model appropriate for the study of the effects of flexibility in an ec+ Finally, the endogenous dynamic adjustments help the study of medium-run effects of policy shifts as well as exogenous variable changes.

4.3 Some Empirical Results

The model of the previous section was applied to four countries: India, Sri Lanka, Peru, and Ivory Coast. The details of the assumptions, reference runs, etc., can be found in Sarris (1987b). Here we illustrate results of a few of the many experiments reported in that document. Table 4.1 summarizes the impacts (namely the deviations from the reference run values) on rural and urban real incomes, real per capita GDP, and the balance of payments deficit of some policy changes associated with stabilization and especially structural adjustment programs. The table compares the short-run impacts (Year 1) with the medium-runs impacts (Year 10). The results indicate that in general the medium-run impacts of policy changes are similar across different country structures. However, the short-run outcomes differ not only in magnitude but also in direction, and not only across countries but also between the short- and medium-run.

Abolition of agricultural input subsidies and consumer food subsidies seems to improve the external deficit at the expense of real incomes and GDP in both the short- and the medium-run.

However, abolishing the indirect taxes on agriculture seems to give a strong boost to production and incomes in the medium run, albeit there might be some short-run real income declines in the urban sector. The problem seems to be that the external deficit has worsened. The same general conclusion seems to hold as far as trade liberalization is concerned.

A devaluation has mixed results. While the external deficit unambiguously declines in all cases, both in the short- and medium-run, the outcomes on rural incomes and real per capita GDP are seen to differ across countries and also between the short and medium run. Clearly this is a case where no generalization can be made.

The above results highlight the potential of the model for counterfactual analysis as well as the surprises that can be uncovered (and potentially prevented) in implementing SAPs.

4.4. Extending the Model to Stress the Impact on the Poor

Since the major determinant of aggregate consumption is income and real income is the main variable affected by macro or micro policy changes, it is most

Table 4.1 - Outcome of Policy Changes on Key Economic Variables (Percent Deviation from Reference Run Values)

Experiment	Variable	India		Sri Lanka		Peru		Ivory Coast	
		Year 1	Year 10	Year 1	Year 10	Year 1	Year 10	Year 1	Year 10
Abolish agricultural input subsidies	RINC RUR[a]	-1.27	-.71						
	RINC URB[b]	-1.35	-.61						
	RPCAP GDP[c]	-1.02	-.72						
	BOPD[d]	–	–						
Abolish consumer food subsidies	RINC RUR	-.82	-.66	-.94	-.84	-1.81	-1.61		
	RINC URB	-.02	-.13	-.44	-.50	-.22	-.12		
	RPCAP GDP	-.10	-.02	-.37	-.33	-.13	-.02		
	BOPD	–	–	–	–	–	–		
Abolish agricultural indirect taxes	RINC RUR	5.07	4.41	6.60	6.37	.51	.44	3.22	3.98
	RINC URB	-.70	.44	.35	1.78	.09	.07	1.61	1.45
	RPCAP GDP	3.35	2.63	5.59	5.55	.15	.14	2.35	2.49
	BOPD	+	+	+	+	+	+	+	+
Trade liberalization	RINC RUR	4.64	3.08	20.61	19.53			21.02	33.52
	RINC URB	1.26	3.00	-4.22	.73			20.00	14.89
	RPCAP GDP	3.44	2.60	12.87	12.96			15.13	15.20
	BOPD	+	+	+	+			+	+
Devaluation	RINC RUR	.06	-.71	-.72	-1.14	-1.19	-2.66	-.09	-2.14
	RINC URB	-.92	-.12	-3.83	-2.89	.09	-.75	-4.42	-2.87
	RPCAP GDP	.55	-.32	-1.47	-1.48	.28	-.81	-2.99	-2.44
	BOPD	–	–	–	–	–	–	–	–

NOTE: A plus sign indicates a worsening (increase) in the balance-of-payments deficit, a minus sign indicates an improvement (decline).
[a]RINC RUR = Real Income of Rural Population; [b]RINC URB = Real Income of Urban Population;
[c]RPCAP GDP = Real Per Capita GDP; [d]BOPD = Balance-of-Payment deficit.

important to describe the sources of income of the various poor groups in an economy. Earlier four groups of analytical interest were identified, namely, small farmers, small nonfarm businessmen, landless agricultural laborers, and low-skill, low-wage urban workers. The way to specify their income within the framework outlined in the second section will now be indicated.

Income is the return to primary productive factors of production and hence it is the ownership of those factors by the various groups that is of crucial importance.

In addition to the four income classes mentioned earlier, a minimal classification of the remaining functional income groups would include medium and large farmers, urban organized labor, urban capitalists, and public employees. One must also allow for the possibility of government as an income recipient through its ownership of public corporations involved in productive activities. This type of classification, with small variations, seems to have been accepted in several studies on income distribution (for a recent survey see Addison and Demery, 1985). Table 4.2 indicates the likely sources of income by ownership of production factors of the various functional groups identified above. Several features are quite evident in most countries. For instance, small farmers might also have incomes as laborers in nonagricultural activities. Medium and large farmers might own some nonagricultural businesses. Small nonfarm businessmen and other urban laborers might own some land whose returns they receive. The picture, while not complete, nevertheless exhibits the substantial empirical difficulties that might arise in describing the income sources of various groups. Since adjustment policies influence the returns to the various factors quite differently, the ownership pattern becomes quite important in determining the consequences upon incomes. This is all the more important in economies where household incomes are diversified by source.

The functional characterization of income sources as exhibited in table 4.2 might be impossible to implement accurately and empirically for lack of complete data (see, for instance, the amount of data required for implementing the Adelman and Robinson, 1978 model). However, it is possible to make some approximations based on survey data that are sufficient for the purpose of tracing effects of SAPs.

While all economy-wide models have used one production function to describe production in each sector, it could be argued that this is inappropriate for many developing countries because of production dualism. In the agricultural sector this dualism might involve the coexistence of semi-subsistence and fully market-oriented farm households, while in the nonagricultural sectors dualism means the coexistence of formal and informal activities. Cornia (1987a) surveys the literature on the role of the informal sector and points out that there are significant links between the informal and the formal sectors. He also cites evidence that in

Table 4.2 - Possible Factor Ownership of the Main Household Groups

		Agricultural Sectors (1, 2,..., m)	Nonagricultural Sectors (m+1,..., n)	Government
Small farmers	L	X	X	
	K	X		
	T	X		
Landless agricultural labor	L	X		
	K			
	T			
Medium and large farmers	L	X		
	K	X	X	
	T	X	X	
Small nonfarm businessmen	L		X	
	K	X		
	T	X		
Low skill urban labor	L		X	
	K			
	T			
Organized labor	L		X	
	K			
	T	X		
Urban capitalists	L			
	K		X	
	T			
Public employees	L		X	X
	K			
	T	X		
Government	L			
	K		X	
	T			

NOTE: X denotes that the functional group on the left is likely to own some productive factor employed in the activity indicated in the columns. L, K, T denote labor, capital, and land, respectively. The numerical column headings 1, 2,..., m refer to the various sectors of which some are agricultural and some non-agricultural.

developing countries the informal sector occupies about 50-70 percent of the urban population, a certainly non-negligible proportion.

The difficulty from the perspective described here lies in being able to describe analytically the nonmarket oriented sectors and specify empirically the relevant numbers. There have been recent analytical advances in modeling agricultural households of different types (Braverman, Hammer, and Ahn, 1985), but those are partial models that remain to be integrated with economy-wide ones. The integration with larger models is important because it is only with their help that the return to the various factors can be ascertained. In the remaining discussion this complicating aspect of many economies will be ignored and the discussion will concern the returns to the various factors of production.

Note that despite the complexity of income generation evident in table 4.2, income determination for all classes depends on returns to a relatively small set of production factors. Some of these production factors could be split further. For instance, in many recent CGEs the labor input to L_i to the production sector i is given by an aggregation function of different labor types (see Dervis, deMelo, and Robinson, 1982).

$$L_i = L_i(L_{i1}, \ldots, L_{is}) \tag{60}$$

where L_{ij} is the input of labor type j (such as, for instance, skilled or unskilled) in the production sector i. The land factor could also be split by the same type of aggregation function. The level of disaggregation would depend on data availability. The key thing to observe is that within a model of the type outlined earlier, with free mobility of each specific factor of production across the sectors where it is used, the return to each factor of production can be obtained endogenously.

The disaggregation of aggregate production factors in more distinct subclasses will be easier to implement in a short-run rather than in a medium-run model. The difficulty in the latter case would lie with the necessity to describe a mechanism of dynamic transformation of production factors of one type into another type (e.g., unskilled into skilled labor, unirrigated into irrigated land, etc.)

Given the ownership pattern of factors of production by the various classes, incomes can be easily derived by the model. The consumption behavior of the various classes is the second crucial determinant of impact. This is probably an easier exercise. Using household survey data it is possible to derive complete demand systems by various functional groups that can be incorporated in a straightforward manner in an economy-wide model.

With the disaggregation of the factors of production and consumption behavior, a model of the type outlined earlier can be solved endogenously for all macro and sectoral effects of changes in policies associated with SAPs. The impact on micro variables, such as health and nutritional status, family, and gender specific allocation of employment and food consumption, could be derived in a separate model which uses as exogenous variables the endogenous variables of the economy-wide model. The only potentially serious feedback from this micro module to the macro model as outlined in the schematic diagram of Pinstrup-Andersen and Scobie (1987) is the impact on human capital and subsequent effects on production. While this consideration will be quite crucial in the medium- and long-run, the feedbacks are not likely to be very important in the short-run. As Cornia (1987a) has shown, households have a variety of coping mechanisms to mitigate the adverse effects of short-run income losses.

In closing, one must emphasize the difference between the approach presented above and that of others, e.g., de Janvry and Subbarao, 1984, who also attempted to model the distributional impact of changes in agricultural price policies. While their income group breakdown was not very different from the one outlined here, their specification of incomes formation was. In their model the income accrued to groups is assumed to come from fixed shares of the various sectors' value added. This would be appropriate if the distribution (not the magnitude) of ownership of primary factors was the same across income groups. However, if this is not the case (a most likely possibility) one must resort to specifying the ownership pattern of individual factors.

4.5 Data Requirements and Concluding Remarks

In order to implement the extended model outlined above both macro and micro data are required. At the macro level one must start with a detailed social accounting matrix (SAM). For the purposes of the type of exercise envisioned it is not important to have a SAM with a large number of sectors due to empirical difficulties and the need to keep the macro part of the model simple. More emphasis should be placed on incorporating as much policy detail (in terms of flows) as possible in the SAM. In the models estimated in Sarris (1987b), for instance, the SAMs were reduced to five sectors (basic food crops, main cash crops, rest of agriculture, manufacturing, services), a breakdown that preserved comparability across countries and facilitated the choice of some parameters that had to be specified as best guesses.

Given the macro benchmark data set, the micro data are needed to assess the factor ownership matrix outlined in table 4.2 and the consumption patterns of the various groups. This type of data must be obtained through farm management surveys, small business and other nonagricultural surveys, and household budget surveys. Furthermore, there will be a task of extrapolating the sample data to make

them compatible with the macro aggregates. Data necessary to construct the nutrition and family submodels will also come from micro surveys but they need not be compatible with the macro data, as they will feed into a submodel that does not feed back into the macro model (see chapter 11).

Assuming that all data has been adequately collected and that the model is specified, a major empirical problem remains the validation of the model. Obviously no counterfactual experiments are credible unless the model itself is a good representation of reality. This, however, presents a difficult empirical problem that can be tackled only by simulating the model in periods for which there exist observations and tuning it so as to reproduce the actual outcomes as closely as possible (for a discussion of the problems and issues involved see Mansur and Whalley, 1984).

Given the complexity of empirically tracing the impacts of SAPs on the poor one might question whether simpler techniques exist. Unfortunately, all partial models will have to assume as exogenous some key variables such as prices, or quantities demanded by other sectors, or unemployment opportunities and wages, etc. However, it is such variables that largely determine incomes and consumption of the poor and hence assuming them exogenous amounts to assuming away a large part of the problem. Clearly, there are no easy ways to the answers, which are crucial for shaping future macro policy recommendations.

5. AGRICULTURAL GROWTH LINKAGES AND THE ALLEVIATION OF RURAL POVERTY: IMPORTANCE AND IMPLICATIONS FOR AGRICULTURAL AND MACRO MODELS

Peter B. R. Hazell

The indirect benefits of agricultural growth for the nonfarm economy can be substantial. In a study of agricultural and industrial performance in India, Rangarajan (1982) found that a 1 percent addition to the agricultural growth rate stimulated a 0.5 percent addition to the growth rate of industrial output and a 0.7 percent addition to the growth rate of national income. At a regional level, Gibb (1974) found that each 1 percent increase in agricultural income in the Nueva Ecija Province of Central Luzon in the Philippines generated a 1-2 percent increase in employment in most sectors of the local nonfarm economy. Similarly, studies of technological change in rice production in the Muda region of Malaysia (Bell, Hazell, and Slade, 1982) and North Arcot in South India (Hazell, Ramasamy, and Rajagopalan, 1988) found that for each dollar of income created directly in agriculture, an additional eighty cents of value added was created indirectly in the local nonfarm economy.

Increases in household consumption expenditure play a key role in growth linkages to the nonfarm economy. Bell, Hazell, and Slade (1982) report that about two-thirds of the eighty cent income multiplier in Muda was due to increased rural household demands for consumer goods and services; only one-third was due to agriculture's increased demands for inputs and processing, transport, and marketing services. In North Arcot, Hazell, Ramasamy, and Rajagopalan (1988) found that about half the multiplier was due to increased consumption expenditures. Gibb (1974) also found strong employment links to the nonfood consumer oriented sectors in his study of Nueva Ecija. These findings strongly support Mellor's (1976) contention that, because much of the accepted wisdom on development strategy

ignores these consumption linkages, it has tended to seriously underestimate the potential importance of agriculture. Hirschman (1959), for example, in his influential study of the importance of linkages in promoting development, focused only on production linkages and found them to be weak for agriculture as compared to most other sectors of the economy. On this basis, he recommended that the greatest priority be given to public investment in nonagriculture.

In addition to enhancing agriculture's contribution to national economic growth, the existence of strong consumer expenditure linkages between agricultural households and the nonfarm economy is important for two other reasons.

First, the income and employment generated by these linkages is concentrated predominantly in rural areas and especially in rural towns. In many Asian countries, some one-half to two-thirds of the reported nonagricultural and urban work force is actually located in rural towns and is engaged in activities that depend directly or indirectly on local agriculture. The linkages, therefore, have the potential to reach a significant share of the urban work force, to encourage the growth of rural towns, and to slow excessive rates of migration to large cities.

Second, the kinds of goods and services demanded are typically produced by small, labor-intensive enterprises. They are focused on such sectors as transportation, hotels and restaurants, entertainment, personal services, health, distributive trades, and housing and residential construction. Increased household demands for specialty agricultural products, particularly fresh fruits and vegetables and fish and livestock, can also provide important increases in rural employment.

Strong household links to the rural nonfarm economy not only help alleviate problems of rural underemployment, but, because the major beneficiaries of the increased employment earnings are often the poor, they also help reduce rural poverty and malnutrition. Survey evidence from many countries confirms that small farmers and landless workers obtain substantial shares of their total income from nonagricultural sources. Consequently, the beneficiaries of the indirect employment gains generated by agricultural growth need not be limited to poor, nonagricultural households residing in towns. Rather, they have the potential to touch a wide range of occupation groups within the poorer segments of society.

The indirect benefits of agricultural growth are not restricted to the poor. The earnings of skilled workers increase, and lucrative returns to capital and managerial skills are provided. In the Muda study, Bell, Hazell, and Slade found that the indirect project benefits were skewed in favor of the nonfarm households in the region, many of whom were relatively well-off. They also found that, even among agricultural households, the landed households fared better than the landless. Although the indirect effects of agricultural growth are unlikely to improve the relative distribu-

tion of income within rural areas, they can still have a widespread impact on alleviating absolute poverty.

5.1 Determinants of the Size of the Indirect Benefits in Rural Regions

Given the importance of household consumption expenditures in generating income and employment multipliers, three considerations stand out as determinants of the size of the indirect benefits induced by agricultural growth within rural areas.

First is the amount of extra income generated by farmers as a result of increased agricultural output. Obviously, the greater the increase in farm incomes, the greater the incremental expenditure by farm households on consumer goods and services. Agricultural growth is not always accompanied by increased farm incomes, particularly when growth is rapid and the national demand for the output is price inelastic. Some governments also hold farm prices artificially low in an attempt to reduce the price of food for urban consumers.

Technological change usually reduces the cost of producing a unit of agricultural output. Consequently, some reduction in prices can still be consistent with increases in farm incomes. Often, though, price reductions act to transfer income from rural to urban areas, reducing the amount of indirect growth generated within rural regions.

A second consideration is the structure of rural household expenditure patterns. To a regional economy, local household expenditures on imported goods (from outside the region) represent a direct leakage that reduces the size of the local income and employment multipliers. But, as Siamwalla (1982) has argued, if incremental income is spent on locally produced goods that could be exported from the region at a constant price, that expenditure represents a loss in export proceeds and is as much a leakage as if the money were expended upon imported goods. Thus, the stimulative effect of increased household expenditure on the local economy depends on the expenditure share allocated to locally produced goods and services that are also nontradables.

While household expenditures on local nontradables are an important determinant of the size of the regional income and employment multipliers, it is also crucial that the supplies of these goods be elastic. This leads to the third key consideration for growth linkages—the supply structure of the nonfarm economy in rural regions.

If the supply of nontradables is inelastic, then increased household demands for these goods and services will simply increase prices rather than employment and real incomes of labor. As it happens, most nontradables are services (transportation, hotels and restaurants, entertainment, personal services, health, education, housing

and distributive trades, etc.). These activities tend to be labor intensive, so we should expect their supply to be more responsive to demand in labor surplus regions and/or where demand is seasonal and coincides with slack periods in the agricultural calendar. Other important factors are the status of the local infrastructure (roads, electricity, market centers, banking, etc.) and government policy towards small businesses.

5.2 Modeling Regional Agricultural Multipliers

For most rural regions in developing countries, the major output is food or cash crops, the greater part of which is exported out of the region at given prices. In return, these regions import from outside the region manufactured goods for investment, production, and household consumption. Locally produced nonfood goods and services are also produced in the towns and villages and cater almost exclusively to local demand. These local nontradable goods often include some specialty agricultural commodities, such as fresh fruits, vegetables, and livestock products.

A reasonable characterization of the supply structure of many rural regions follows. The major output supply—food grains or export crops—is typically fixed by the available land and technology. On the other hand, the output of nontradables is elastic. In Asia, this is because the supply of labor, which is the major input for nontradables, is also elastic. In sub-Saharan Africa the nontradables are mostly income elastic agricultural products that can be produced at the expense of less profitable food grain or export crops. Other nontradables, particularly services, are often provided in the dry season, when labor is relatively abundant.

If initially there is surplus capacity in the nontradables sector, supply will be highly elastic. This surplus capacity may exist in many small family businesses and where hired labor is used to provide services or to manufacture goods during slack periods in the agricultural calendar. Once such excess capacity has been used up, the supply of nontradables will become less elastic. But there are good reasons to believe it will remain quite elastic. First, the incremental capital-output ratio for the production of most nontradables is small. Bell, Hazell, and Slade (1982, p. 282) estimate that for the Muda region, each dollar of indirect value added associated with agricultural growth required between $0.75 and $1.50 of complementary investment by the private sector. In a situation of rapid regional growth, such capital requirements might easily be generated from within the nontradables sector itself.

Second, even when a region's economy approaches full employment, labor may still be available to the nontradables sector at relatively low wages. This will happen, for example, if the changes in aggregate household demand accompanying growth enable workers to transfer from low productivity activities to more productive ones. It can also happen where cheap migrant labor is attracted from outside the region.

If we further assume that the prices of all tradables (exports and imports) are given to the region, then we can construct a simple regional model to measure the multiplier effects.

Let X denote regional total gross output, which is comprised of tradable output T and nontradable output N. Then

$$X = T + N, \tag{1}$$

We assume that the output of tradables is fixed

$$T = \bar{T}, \tag{2}$$

However, the output of nontradables is elastic, and therefore output is determined by the regional demand for nontradables. This is comprised of household expenditure (C_H) on nontradables for consumption purposes and intermediate demands for nontradables (C_p) in regional production. We shall assume household expenditure can be approximated by a linear function of income

$$C_H = C_o + \beta Y, \tag{3}$$

where C_o is a constant and β is the marginal budget share for nontradables out of income (value added) Y. We also assume that intermediate demands for nontradables are proportional to regional gross output X, so that

$$C_p = \alpha X, \tag{4}$$

Here α is the ratio of nontradable intermediates to gross output. Regional demand for nontradables, which is equal to nontradable output, is then

$$N = C_H + C_p. \tag{5}$$

Finally, total household income in the region or regional value added is

$$Y = vX, \tag{6}$$

where v is the ratio of value added to gross output. Substituting equations (2) through (5) into (1) yields

$$X = \bar{T} + C_o + (\alpha + \beta v)X, \text{ or}$$
$$X = (C_o + \bar{T}) / (1 - \alpha - \beta v), \tag{7}$$

Equation (7) determines the region's gross output given the output of tradables and key behavioral parameters of the regional economy.

Suppose now that the output of tradables is increased through technological change in agriculture. What will be the multiplier impact on the region's income or value added?

Using (6) and (7), the derivative

$$\frac{dY}{d\bar{T}} = v/(1 - \alpha - \beta v) \tag{8}$$

measures the change in regional value added for a unit change in agricultural gross output. The value-added multiplier is defined as the change in regional value added given a one-unit increase in agricultural value added. To obtain this multiplier we divide (8) by the ratio of value added to gross output for agricultural tradables. Since by assumption this ratio is also v, the value added multiplier is

$$\left(\frac{1}{v}\right)\left(\frac{dY}{d\bar{T}}\right) = 1/(1 - \alpha - \beta v) \tag{9}$$

In this model the value-added multiplier happens to equal the gross output multiplier $dX/d\bar{T}$.

5.3 The Size of the Multiplier

The size of the value added multiplier is determined by three key parameters: the marginal budget share for nontradables in household expenditures (β), the ratio of nontradable intermediates to gross output in total production (α), and the ratio of value added to gross output in total production (v). If these three parameters are known, we can calculate the size of the multiplier benefits deriving from agricultural growth in a rural region.

Since α, β and v are all ratios, they must take on values between 0 and 1. Furthermore, since $1 - v$ is the ratio of total intermediates to gross output, then α cannot exceed $1 - v$. In table 5.1 we show the values of the regional value added multiplier for some selected values of α, β and v.

Other things being equal, the regional value added multiplier increases with the ratio of value added to gross output (v). Poorer regions tend to have higher values of v because they use less intermediates in production. However, this favorable

Table 5.1 - Value of the Regional Value Added Multiplier Under Different Assumptions about Key Parameters for a Regional Economy

			Value Added Multiplier		% Multiplier due to
ν	β	α	Consumption Endogenous	Consumption Exogenous	Consumption Linkages
0.3	0.3	0.35	1.786	1.538	31.5
0.3	0.3	0.525	2.597	2.105	30.8
0.3	0.5	0.35	2.0	1.538	46.2
0.3	0.5	0.525	3.077	2.105	46.8
0.4	0.3	0.3	1.724	1.429	40.7
0.4	0.3	0.45	2.326	1.818	38.3
0.4	0.4	0.3	1.852	1.429	49.6
0.4	0.4	0.45	2.564	1.818	47.7
0.4	0.5	0.3	2.0	1.429	57.1
0.4	0.5	0.45	2.857	1.818	56.0
0.5	0.3	0.25	1.667	1.333	50.2
0.5	0.3	0.375	2.105	1.6	45.7
0.5	0.4	0.25	1.818	1.333	59.3
0.5	0.4	0.375	2.352	1.6	55.6
0.5	0.5	0.25	2.0	1.333	66.7
0.5	0.5	0.375	2.667	1.6	64.0
0.6	0.3	0.2	1.613	1.25	59.2
0.6	0.3	0.3	1.923	1.429	53.5
0.6	0.5	0.2	2.0	1.25	75.0
0.6	0.5	0.3	2.5	1.425	71.4
0.85	0.3	0.05	1.439	1.052	89.0
0.85	0.3	0.10	1.550	1.111	81.1

component to the multiplier is likely to be offset in poor regions by a lower marginal budget share for nontradables (β); table 5.1 shows that the multiplier declines with β. How the value of α might differ between regions is less clear. On the one hand, a higher ratio of value added to gross output should lead to a lower value of α. On the other hand, this may be offset by a greater reliance on nontradables as intermediates in poorer regions. By itself, larger values of α act to increase the value added multiplier.

The Muda region studied by Bell, Hazell, and Slade (1982) is a moderately prosperous rice growing region in Malaysia. In 1973 the per capita income was U.S. $227. Using their data, we estimate the relevant parameters for Muda to be $\nu = 0.5$, $\beta = 0.4$, and $\alpha = 0.25$. Table 5.1 gives a multiplier of 1.818 for this combination of

parameters, which is very close to the value added multiplier of 1.83 reported by Bell, Hazell, and Slade after a more careful analysis. Hazell, Ramasamy, and Rajagopalan (1988) have derived a similar multiplier for their North Arcot study region in South India using a similar modeling approach.

While similar studies have yet to be undertaken in sub-Saharan Africa, it is possible to provide rough orders of magnitude for the parameter values. The Gusau region of northern Nigeria studied by Hazell and Röell (1983) is much poorer than Muda. In 1976 the region's per capita income was about half that of Muda in 1973. Hazell and Röell give an estimated value for β of about 0.3. A similar value for β can be obtained for rural Sierra Leone using data provided by King and Byerlee (1977).

The value added to gross output ratio (ν) tends to be high in African agriculture—about 0.9 to 0.95—because few modern inputs are used. Careful studies of a range of rural nonagricultural activities in Botswana (Haggblade, 1982, Section B; Haggblade, 1984, p. 315) and Sierra Leone (Liedholm and Chuta, 1985) suggest an average ν value of about 0.6. Assuming that about 70 percent of rural value added derives from agriculture, the average value of ν is in the range 0.81 to 0.86. Since α must be less than or equal to $1 - \nu = 0.14$ to 0.19, we shall assume α values in the range 0.05 to 0.1.

Given these parameter values for rural regions in sub-Saharan Africa, the multiplier would be about 1.5 (table 5.1). When compared to the multiplier of 1.83 reported for the two Asian case studies, the indirect gains in nontradable value added are only 60 percent as large in sub-Saharan Africa.

These indicative multipliers assume a highly elastic supply of nontradables. If this supply is less elastic, perhaps because of labor shortages in sub-Saharan Africa, then the multiplier will necessarily be smaller.

5.4 The Relative Importance of Consumption and Inter-Industry Linkages in the Multiplier

We can also use our model to isolate the importance of the household consumption linkages relative to the inter-industry linkages in the multiplier. To do this we need a variant of the model in which household consumption is held constant. The derived multiplier arising from agricultural growth will then be due entirely to inter-industry linkages.

Replace equation (3) with

$$C_H = C_o \tag{10}$$

where C_o is a constant. Regional gross output X becomes

$$X = (C_o + \bar{T})/(1 - \alpha). \tag{11}$$

Calculating the value added multiplier as before, this is now

$$\left(\frac{1}{v}\right)\left(\frac{dY}{dT}\right) = 1/(1 - \alpha). \tag{12}$$

Thus, when household consumption expenditure is held constant, the value of the regional multiplier is determined solely by α—the ratio of nontradable intermediates to gross output in total production.

The values of the multiplier obtained from (12) for selected values of α are also reported in table 5.1, where they can be compared with the full multipliers corresponding to endogenous consumption behavior. The difference between each matching pair of multipliers is the component of the full multiplier attributable to the consumption linkages. For example, in the first row of table 5.1 the full multiplier leads to an indirect gain in regional income of U.S. $0.786 for each U.S. $1.0 increase in value added in agriculture. But when household consumption is held constant the indirect gain is only U.S. $0.538. The difference, U.S. $0.786 - U.S. $0.538 = U.S. $0.248, is therefore the indirect gain attributable to the household consumption linkages. This is equal to 31.5 percent of the total indirect gain.

The share of the multiplier attributable to the consumption linkages increases with β and v but declines as α increases. For the Muda region with parameter values $v = 0.5$, $\beta = 0.4$ and $\alpha = 0.25$, 59.3 percent of the multiplier is attributable to the consumption linkages. This is almost identical to Bell, Hazell and Slade's estimate (1982, p. 179).

In contrast, the consumption linkages become relatively more important in regions having the kinds of parameter values we previously associated with sub-Saharan Africa. For example, if $v = 0.85$, $\beta = 0.3$ and $\alpha = 0.1$, the consumption linkages account for 81 percent of the multiplier. This is not because the consumption linkages are more powerful in Africa than Asia (we have assumed a smaller value of β for Africa). Rather, it reflects the weaker interindustry linkages associated with high values of v and low values of α.

5.5 Macroeconomic Consequences and Simulations

The multipliers arising from agricultural growth are important for the development of rural areas, but are they important for national economic growth? To answer this question, two key issues must be addressed.

First, our regional analysis presumes that regional growth is an end in itself, and gives no regard to spillover effects that might be induced elsewhere in the national

economy. For example, imports into a rural region are leakages as far as regional growth is concerned. But if these goods are produced in other rural areas or if they create jobs for the urban poor, they will still be desirable from the national viewpoint. Similarly, savings invested outside the region represent a loss to regional growth, but they are nevertheless valuable in furthering national economic growth. Conversely, regional growth may incur costs elsewhere in the economy. For example, labor and capital will be less likely to move from rural to urban areas if rural regions are growing successfully, which will dampen the growth of the urban economy.

To measure the full indirect impact of agricultural growth on the national economy, a more general equilibrium modeling approach is required. Byerlee has done this for Nigeria (Byerlee, 1973) and Sierra Leone (Byerlee et al., 1977). Using a macroeconomic simulation model, he analyzes the impact of government policies on expanding the production of export and food crops. For Nigeria, his results show that policies that expand food crop production increase value added in nonagriculture by Naira 0.23 for each Naira 1.00 increase in value added in agriculture. In contrast, policies to increase export crop production lead to between Naira 0.73 and Naira 0.96 of additional value added in nonagriculture for each Naira 1.00 increase in agricultural value added.

The results for Sierra Leone are more modest, probably reflecting its weaker industrial base. Increases in food crop production have a similar impact on the national economy as in Nigeria: Leone 0.29 of nonagricultural value added for each Leone 1.00 of additional value added in agriculture. But the linkages emanating from increased export crop production are weaker than in Nigeria—Leone 0.42 of value added in nonagriculture for each Leone 1.00 of additional value added in agriculture.

These results are generally consistent with the size of our regional multipliers, which suggests that any positive spillover effects arising beyond a region's boundaries are largely offset by negative spillover effects.

There are no comparable studies for Asia, but modeling studies of India (Rangarajan, 1982) and South Korea (Adelman, 1984) suggest stronger linkage effects from agricultural growth on the national economy in Asian countries.

The second key issue is whether the size of the indirect benefits from agricultural growth differ from those generated by growth elsewhere in the national economy, especially in the industrial sector.

Hirschman (1959) argues that the indirect benefits from industrial growth are larger, but his analysis was based only on interindustry linkages. Mellor (1976) argues that, once the household consumption linkages are allowed for, agriculture has the potential to generate larger and more employment intensive rounds of growth in the national economy. Singer (1979) considers the production and

consumption linkages together sufficient to provide the basis for a balanced growth development strategy.

Consider the comparison of two projects that generate identical amounts of household income; one an agricultural investment project in a rural region and the other an industrial project in an urban region. Under what conditions will the indirect benefits generated by incremental household expenditure in the rural region exceed those in the urban region?

In a purely neoclassical world with perfect markets for all products and factors and with free international trade, the indirect benefits from the two projects should be the same (at least in an equilibrium analysis). This will be true even if rural and urban households have very different expenditure patterns when characterized by their labor and capital content and by the location of their production. But factor markets are not perfect in developing countries. Labor tends to be more abundantly available in rural areas at lower wages, and capital often gets locked up in rural areas because of inadequately developed financial institutions. At the same time, rural households have larger propensities to consume labor-intensive goods and services out of incremental income than do urban households, and a higher proportion of these goods and services are produced in rural areas (King and Byerlee, 1977). Within this context it would not be surprising to find that the indirect benefits of the rural project are substantially larger, particularly when export restrictions on labor-intensive manufactured goods prevent the economy from adjusting its factor use ratios.

This conclusion is supported by model simulations of alternative growth strategies for Korea (Adelman, 1984). Adelman found that an agriculturally based growth strategy (achieved through enhanced productivity) outperformed an industrially-based export strategy in growth in income and employment and in a more equitable distribution of income. Two features of the model that may account for these results are a) the assumption of a fixed wage for unskilled labor and hence the existence of unemployment, and b) a more inelastic demand structure for manufactured exports than for agricultural exports. The assumption of a reasonably elastic demand for agricultural exports is crucial in maintaining the agricultural terms of trade in the model. Without this the surpluses generated by an agriculturally based growth strategy could lead to a reduction in farmers' prices sufficient to cause agricultural income to decline (see, for example, Quizon and Binswanger's model of India (1985), and Bautista's model of the Philippines (1986).

5.6 Implications for Macroeconomic Modeling

Proper specification of agricultural growth linkages is necessary for an accurate prediction of the absolute income levels of the poor and of the distribution of income

between and amongst urban and rural households and regions. Both considerations are important for assessing the poverty implications of alternative agricultural and macroeconomic policies.

Incorporating the linkages into a model will also affect its predictions of national income, employment and aggregate factor use ratios whenever factor and product market distortions are also included. For example, if rural or unskilled labor markets are specified in the model so that unemployment is possible, this should act to increase the supply elasticity of nontradables and, hence, highlight the importance of rural-urban differences in intersectoral production linkages and household expenditure patterns in determining the level and employment intensity of national income. The effect will be accentuated if restrictions on the export of manufactured goods are also incorporated. Of course, if the demand for agricultural exports is thought to be less elastic than the export demand for manufactured goods, this may well work against an agriculturally based development strategy.

Since insufficient attention has been previously given to agricultural growth linkages in the specification of macroeconomic models, it is difficult to assess which linkage features need to be incorporated. Some features will be necessary, others only desirable, but this will depend on the nature of the model and, in particular, on the assumptions about the workings of factor and products markets. Until more precise knowledge is available, one can only suggest a list of linkage features for inclusion in any model. These are as follows:

1. Differentiation between different types of urban and rural households to capture differences in their sources and levels of income, employment, and expenditure, savings, and investment behavior.
2. Disaggregation of manufacturing to include a specific agro-processing sector. This sector is much more disbursed amongst rural towns than most other manufacturing sectors and has a different rural-urban income distribution as well as stronger interindustry links to agriculture.
3. Specification of a nontradables sector, preferably differentiating between rural- and urban-based activities. Rural based nontradables (and I include rural market towns) tend to be labor intensive and have low incremental capital/output ratios. Their supply elasticities are also likely to be different from the supply elasticities of other nonagricultural activities, especially manufacturing.
4. Disaggregation of agricultural commodities to at least the level of food grains, livestock products, and industrial crops. This is essential for realistic modeling of the domestic and export demand for these products, which has a crucial bearing on agriculture's terms of trade.
5. Differentiate between urban and rural labor markets, recognizing the greater seasonality of the latter and the likelihood of a more elastic supply.

6. ADJUSTMENT AND INCOME DISTRIBUTION: SOME METHODOLOGICAL ISSUES

Tony Addison and Lionel Demery

6.1. Introduction

For the past 14 years developing countries have been increasingly obliged to adjust their economies to an adverse international economic environment, including the oil shocks of 1973 and 1979, world recession, and deteriorating terms of trade. Yet concern over the effects of these adjustment policies on the welfare of poor or vulnerable groups has only recently become evident, and policy-makers have not been particularly well served by either theoretical or applied analyses. This is partly due to the general neglect in economic theory of the trade-offs between macroeconomic policy on the one hand and distribution on the other, but it is also a reflection of the methodological difficulties in undertaking empirical work. We therefore review a selection of the more important of these problems, arising from work undertaken at the Overseas Development Institute (ODI).[1]

An important criticism of the present literature on balance of payments policy in developing countries is the imprecise and, in some cases, misleading use of terms. "Balance-of-payments adjustment," "stabilization," and "structural adjustment" are now well worn and commonplace expressions. Yet their exact meaning is not always clear. For example, the term "adjustment" has been interpreted as both a means of correcting external disequilibria and as the objective itself—the adjustment of the balance of payments deficit. Killick (1986) reviews the few attempts that have been made at defining these terms and isolates their many ambiguities. He takes "adjustment" to refer to the accommodating changes required in the domestic economy in order to correct for balance of payments disequilibria that cannot be addressed through financing.

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1 This chapter is a revision of an earlier paper presented at a conference on "Adjustment and Equitable Growth," held at the OECD Development Centre, Paris, 21-25 April 1987.

Under the general aegis of adjustment there is some merit in the distinction between stabilization and structural adjustment. Buiter (1986, p. 1-5), while admitting that the distinction is not always clear in practice, takes it as his starting point. According to his usage, "Stabilization policy aims to influence (and, one hopes, to minimize) deviations from full employment equilibrium or full capacity equilibrium. Structural adjustment policy or allocative policy aims to influence the full employment equilibrium configuration itself." Under this definition stabilization takes as given the institutional framework and the "rules" of domestic and international markets, whereas structural adjustments involve changing the institutions and the regulations that govern exchange. Although there are exceptions stabilization is generally effected over shorter periods than structural adjustment and involves greater use of macroeconomic variables. Structural adjustment programs, while seeking to alter prices with economy-wide effects (such as exchange rates and interest rates), are generally more disaggregated and microeconomic in orientation than stabilization policies.

In reviewing the distributive effects of stabilization policy, this chapter will confine its attention to those instruments that are primarily adopted for their stabilizing consequences—devaluation, monetary control, and fiscal restraint. However, this is not to imply that these have no structural effects. Devaluation in particular figures prominently in many structural adjustment programs. However, by directing our attention to stabilization, we exclude policies whose fundamental objective is to change institutions and markets and that consequently have complex distributional effects. Some of these have been discussed in Addison and Demery (1986a).

Before proceeding there is some advantage in considering a number of important issues that confront researchers into this subject. The first concerns the nature of the income distribution objective. In an earlier publication we reviewed alternative measures of poverty and inequality and drew attention to the limitations of both the size and functional distributions in Less Developed Countries (LDCs) (Addison and Demery, 1985). Most importantly, changes within a particular category (be it decile or factor group) can reflect offsetting movements in the fate of heterogeneous groups who happen to be represented within the category (Chenery et al., 1974, p. 43; Griffin and Khan, 1978, p. 302). There would appear to be significant advantages to using policy relevant socioeconomic groups as an organizing framework, with an emphasis on those that constitute the poor. The identification of those groups that are most vulnerable to recession and corrective macroeconomic policies can then be the basis of designing appropriate poverty alleviation programs.

Moreover, Stewart's (1983, p. 4-5) distinction between the primary and the secondary distributions of income is helpful to our task. She distinguishes between

"primary claims on resources which arise directly out of the productive process of work and accumulation, and secondary claims which result from the transfer of primary claims." The latter may work through the family, community, or, most importantly for our purposes, through the state in the form of taxes and transfer payments. This is a helpful but not a watertight distinction, since obviously secondary transfers will affect the structure of production, but it does provide a useful starting point.

The rationale of many stabilization programs is that short-term losses have to be incurred and belts have to be tightened in order to secure improved output and consumption levels in the future. The implementation of such programs therefore often amounts to an intertemporal reallocation of consumption. If this is the case the choice of time horizon becomes critical in making judgments about the distributive effects of stabilization. There may be a tendency for absolute poverty to increase in the short run as a consequence of reduced consumption and employment, but this may be outweighed in the longer term if stabilization creates the conditions necessary for sustained economic growth. It does not always follow, however, that those who bear the short-run costs of adjustment will also benefit from the advantages of improved growth performance should it occur. There are two distinct though obviously related distributional issues involved here: first, who bears the immediate burden of adjustment? and second, who is likely to benefit over the longer term (Foxley, 1981, p. 191)?

This leads to a related research issue, that of identifying a benchmark for evaluating the income distribution effects of stabilization. Two separate questions must be resolved in this connection. First is the problem of the counterfactual. It should be kept in mind that income distributions are likely to change with or without the stabilization program. Indeed the unsustainability of the original disequilibrium suggests that some adjustments (whether deliberate or not) are inevitable, so that the distribution of income is certain to change Before and after comparisons of income distribution may therefore be misleading, and some attempt has to be made to compare the outcomes under a particular stabilization package with the outcomes under alternative policies (Johnson and Salop, 1980, p. 10).

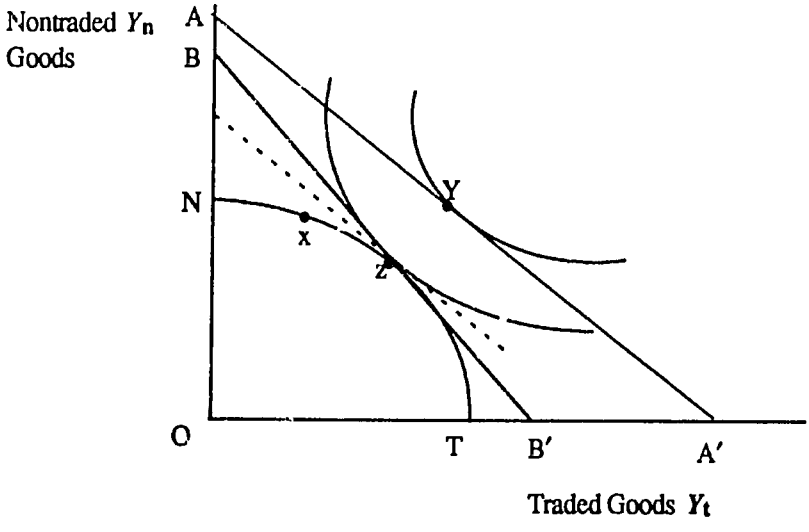
A second issue surrounding the benchmarks of such research concerns the choice of points for comparison. Stabilization policies are typically applied following a financial and payments crisis, with balance of payments deficits rising over a period prior to the imposition of policy changes. It is important to bear in mind at the outset the potential relationship between income distribution and the generation of payments deficits (during what we may term the "destabilizing phase"), as well as the subsequent effects that stabilization policies have during the "stabilizing phase." A number of authors have dealt with the distributional effects of stabilization (Knight,

1976; Johnson and Salop, 1980; and Khan and Knight, 1982), but few have taken into explicit account the distributional implications of the events leading to disequilibrium (a notable exception being Lal, 1984). If the external disequilibrium has been caused by fiscal expansion, it may be associated with significant distributional changes. These may or may not be reversed during the stabilizing phase, since those who benefitted from the fiscal expansion may not be harmed by the contraction. Therefore, as much account ought to be taken of the distributional implications of the factors leading to the payments crisis as of the effects of the corrective policies. Many recent studies dealing with the latter have tended to neglect this simple point. The ODI country case studies for Jamaica and Zimbabwe identified important distributional changes during both the destabilizing and stabilizing periods.

6.2 How Far Does the Theory Take Us?

The choice of methodology for empirical work on this subject depends critically on the underlying theoretical framework. Consequently we begin by examining the economic theory of adjustment and distribution. Most theoretical accounts take as their starting point the so-called Dependent Economy model, which assumes full employment and treats the cause of the payments deficit as arising from an overexpansion in domestic absorption (Lal, 1984). Figure 6.1 shows the familiar small country case, with the production of tradables (Y_t) and nontradables (Y_n) bounded by the frontier NT. We depict an initial disequilibrium caused by previous

Figure 6.1 - The dependent economy model.



monetary and fiscal expansion. The resulting excess demand for goods leads to an appreciation of the real exchange rate (i.e., a decrease in P_t/P_n) and a trade deficit of xy.

If P_n were fully flexible, the trade deficit could be eliminated simply by reducing the level of absorption. This would lead to a fall in P_n, a depreciation of the real exchange rate, and expenditure and production switching that would restore internal and external balance. But if P_n were inflexible downwards, or if it were slow to respond to excess supplies, disabsorption has to be combined with a nominal devaluation in order to induce the switching required to restore full equilibrium (at z).

The distributional changes associated with the adjustment of the economy from x to z can be divided into three categories. The impact effect of a devaluation is simply to raise incomes in the tradables sector and to lower them in nontradables. Wages and profits will be higher in tradable activities, and this will remain so long as no factor mobility is permitted between sectors. How this affects equity depends on the degree of income inequality within sectors and the relative weight of each sector. This is given by

$$s^2 = \sum x_i s_i^2 + \sum x_i (Y_i - Y)^2 \tag{1}$$

where s^2 is the variance in the overall income, s_i^2 is the income variance within the sector i (i = N, T), Y_i is the mean income of i, Y is the overall mean income, and x_i the population weight applied to each sector. Production switching would raise mean incomes in the tradables sector and lower them in nontradables. If switching does not affect the within-sector variance (s_i^2), overall income inequality would only improve if $Y_t < Y_n$, so that the second term on the right-hand side of (1) falls (so long as mean incomes in T continue to remain below N after the devaluation). In other words if the distribution of income within sectors remains unchanged following a devaluation, overall income distribution will improve only if incomes in the traded sector are on average lower than those in nontradables.

Similarly, Kanbur (1986b) takes a class of decomposable poverty measures (derived by Foster, Greer, and Thorbecke, 1984) to derive the impact effects on poverty. To do so, he makes two assumptions: only wage earners are poor (thus excluding profit income from the analysis) and within-sector income distributions are unchanged by switching policy. Taking the poverty index when $\alpha = 1$, the impact effect of a switching policy Π on poverty is given by

$$dPVa_{\alpha}/d\Pi = -(d\theta_n/d\Pi)\{x_nH_n(1-I_n)\} - (d\theta_t/d\Pi)\{x_tH_t(1-I_t)\}$$

(2)

where PVα is the index of poverty (α = 1), H and I refer to the head count and income gap ratios, respectively, and θ_i is the proportionate change in factor incomes in sector i (i = N, T) following the relative price change induced by the switching policy. The net effect on poverty will obviously depend on whether the increase in poverty in nontradables is compensated by the fall in poverty in tradables.

In the long run, where full factor mobility between sectors exists, it is clear that production switching from x to z under devaluation will redistribute incomes towards those factors used relatively intensively in the T sector. Thus, if capital were used more intensively in tradables, production switching, at existing factor prices, would lead to excess demand for capital—the increased demand for capital in the expanding T sector exceeding the supply of capital yielded by the contracting N sector—and the rate of profit will rise. By contrast, the excess supply of labor created by these sectoral shifts will induce a fall in the real wage. This model is the basis of much recent work on stabilization and income distribution (Knight, 1976; Johnson and Salop, 1980; Lal, 1984). The factor intensity of the respective sectors is an empirical matter. Corden (1985) assumes that labor intensity is greater in non-tradables, while Lal (1984) takes tradables as more labor intensive.

Again, Kanbur (1986b) has derived the long-run effects on poverty of a switching policy. With α = 1, this is given by

$$dPV_{\alpha}/d\Pi = -(d\theta_w/d\Pi)\{x_tH_t(1-I_t) + x_nH_n(1-I_n)\} + (dx_t/d\Pi)\{H_tI_t - H_nI_n\}$$

(3)

where θ_w is the induced proportional change in the real wage. If the real wage increases ($d\theta_w/d\Pi > 0$), the first term on the right-hand side of (3) is negative. This simply states that increases in the real wage will reduce poverty if only wage earners are poor, and if the distribution of income within the wage earning group remains unchanged. In addition to this "real wage effect" on poverty, however, there is "labor transfer effect," given by the second term on the right-hand side of (3). The sign of this term depends on whether poverty is greater in the tradables sector (i.e., on whether $H_tI_t > H_nI_n$). If poverty is greater in tradables, this term is positive, and resource transfers into tradables will increase poverty. On the other hand, when the real wage is expected to fall in the long run (because nontradables are labor intensive), the effect on poverty may not be adverse. If poverty is significantly

greater in nontradables (i.e., $H_t I_t > H_n I_n$) and if there is a sufficiently large labor transfer across sectors, it may be that overall poverty will decline.

Finally, in the short run with the capital fixed and only labor mobile, the increase in incomes in tradables only induces labor to be reallocated from nontradables. Following Dornbusch (1980, p. 98), we note that the equilibrium wage under such assumptions is given by

$$\dot{W} = a\dot{P}n + (1-a)\dot{P}t \qquad 0 < a\ 1 \tag{4}$$

where the dot refers to a percentage change. Rearrangement gives

$$\dot{W} - \dot{P}t = -a(\dot{P}t - \dot{P}n) \qquad \dot{W} - \dot{P}n = (1-a)(\dot{P}t - \dot{P}n) \tag{5}$$

In this short-run case, production switching is derived from the reallocation of labor. To encourage increased employment in the traded sector, the real product wage in that sector must fall. By the same token, to discourage employment in sector N, the real product wage must rise. Thus the effect on the real consumption wage of a devaluation is ambiguous and depends on the relative weights in workers' consumption baskets. If workers spend a sufficiently high proportion of their income on nontradables, it may be possible to achieve the objectives of stabilization in the short run without reducing the real wage. However, if their propensity to consume tradables is high, stabilization will lead to a fall in workers' living standards. This is independent of the assumed relative factor intensities. Corden (1985) has shown that these results of the basic model apply under the assumption of fixed money wages rather than fixed Pn.

6.2.1 The Effects of Expenditure Reduction

To complete our analysis of stabilization under full employment, we now consider the effects on primary incomes of fiscal and monetary contraction. Recall from figure 6.1 that restoring internal and external balance (at z) requires both a depreciation in the real exchange rate and a reduction in absorption. The reduction in absorption, however, will influence the real economy changes that occur in two ways. First, the nature of the fiscal contraction will influence the amount of the devaluation necessary to restore equilibrium and thus the amount of production switching that will occur. Second, monetary contraction may have effects on the structure of output that are independent of those associated with the real exchange rate depreciation.

The extent to which Pt/Pn must increase to restore equilibrium depends on the manner in which the government reduces its level of expenditure (see Khan and

Lizondo, 1987). It can do so in three ways: first, by increasing the level of taxation; second, through reducing its expenditure of tradables; and, finally, by reducing expenditure on nontradables. Each of these needs to be combined with different combinations of exchange rate adjustments. In the first place, if the government were able to make the necessary cuts in aggregate absorption entirely through reducing its expenditure on tradables, it is clear that no devaluation would be necessary. A reduction of government expenditure on tradables of xy (in figure 6.1) would remove the trade deficit without any discretionary change in the exchange rate.

On the other hand, reducing the fiscal deficit by increasing taxes or cutting expenditure on nontradables has to be combined with devaluation to restore equilibrium. Moreover, a smaller devaluation is required under a policy of increased taxes than in combination with reduced expenditure on nontradables, because under the latter the reduction in expenditure falls entirely on nontradables and requires a larger decline in its relative price to restore equilibrium. Increasing taxes leads to private sector expenditure cuts on both tradables and nontradables. So the method of reducing the fiscal deficit can have an effect on the amount of production switching that takes place under stabilization. The more the decrease in absorption is achieved by cuts in tradables expenditure by the government, and the less it is achieved by cuts in nontradables spending or tax increases, the nearer will the equilibrium point on the production frontier (point z) be to the initial production point (x), and the less switching will be necessary.

In most developing countries, fiscal cuts are closely associated with monetary restraint. Again, the method through which monetary restraint is achieved can influence the structure of output and the income distribution effects of stabilization. This is because monetary restraint will have a direct effect on production, which is independent of the switching mechanisms we have described. Unless monetary restraint concentrates entirely on controlling credit expansion to the public sector, it will entail some reduction in the supply of credit to private productive enterprises. Since different sectors have varying needs for credit in financing their activities, changes in credit availability (and cost, if interest rates are raised) will affect firms differently. This will depend on the firm's credit dependency, or "gearing." If nontraded sectors have less dependency on institutional credit than their traded counterparts, monetary restraint may have a greater output-reducing impact on tradables and thus run counter to the switching effects of the devaluation. The relative dependency on credit of tradables and nontradables is an empirical matter and needs further research.

6.2.2 Summary: So What Happens to the Real Wage?

Although many observers presume that the real wage will fall as a result of devaluation (and even further when the effects on the "social wage" of disabsorption are taken into account), this theory is strictly agnostic. Under neoclassical factor mobility assumptions, the change in the real wage (whether or not money wages are assumed rigid) will depend on relative factor intensities in the traded and nontraded sectors. The direction of change therefore is independent of consumption propensities, although the extent of a real wage fall (assuming that the N sector is labor intensive) will be less the more nontradables feature in workers' consumption baskets. Making the model more realistic by assuming sector specific capital creates complications for the theoretician. Now, whatever the factor intensity assumption, the effect on the real wage is uncertain, and will depend on workers' consumption patterns.

6.2.3 Adjustment and Unemployment

The Dependent Economy model depicts adjustment as a costless movement along the production frontier in response to relative price changes. Increases in the output of tradables can only be achieved by reductions in nontradable output. These changes in output had predictable effects on the distribution of primary incomes under various assumptions of factor intensity and mobility and consumption patterns. The main problem with this account is that it is ill-suited to real world situations in which unemployment exists alongside external disequilibria. Using the neoclassical equilibrium theoretical framework to analyze disequilibrium situations can lead to serious policy misspecifications. The recent work by Dixit (1978), Neary (1980) and Cuddington, Johansson, and Lofgren (1984) has shown that the disequilibrium framework of Barro and Grossman (1971) can be applied to open economies and provide insights into the distributional effects of macroeconomic policy.

In these models the assumption of fixed prices leads to nonprice rationing in the various markets. Because of the small country assumption, no quantity rationing can exist in the tradables market. With unemployment in the labor market it is assumed that wages are set too high to clear the market, there being a persistent excess supply of labor. If there is an excess supply of nontradables, this unemployment is characterized as "Keynesian," while "Classical" unemployment applies when excess demand exists in the sector.

With unemployment in the economy, adjustment need not require a reduction in aggregate absorption to reduce the trade deficit. How are the switching effects identified in the full-employment model now modified, and what in theory are the implications for income distribution? Two important differences occur in the case of Keynesian unemployment. First, a devaluation will not necessarily reduce the trade deficit, which depends on the relative magnitude of price and income effects.

Secondly, the increase in tradable output required to reduce the trade deficit is not at the expense of nontradables as in the full-employment model. Under Keynesian unemployment the output of both sectors increases as a result of a devaluation, thereby reducing unemployment.

The neat theoretical reasoning in the full-employment model to trace the primary distributive effects of devaluation no longer applies. Since both W and Pn are fixed (by assumption) and Pt is raised by the devaluation, the real wage certainly declines. This induces an increase in employment in both sectors. So in contrast to the neoclassical equilibrium model outlined above, the real wage effect is unambiguously adverse in the presence of unemployment. This is because there is now no necessity for the real product wage to decline in nontradables. The net affect on labor's real income share, therefore, depends on the relation between the cut in the real consumption wage and the increase in employment. This in turn depends on the real wage elasticities of demand for labor. But even if it were shown that labor's share falls as a result of devaluation (with the increase in employment being insufficient to counteract the effect of the real wage decline), there can be no presumption that income distribution has worsened. In granting employment to the most vulnerable groups (those who are unemployed or underemployed in the initial situation) a devaluation may conceivably reduce poverty. Similar conclusions hold for the case of Classical unemployment, except that the increase in employment only occurs in the tradables sector, so that the condition governing labor's share relates to the elasticity of demand for labor in the tradables sector only.

6.2.4 The Deflationary Effects of Devaluation

To round off this review of the theory, mention must be made of the possible deflationary effects of devaluation. The expansionary effects observed under Classical and Keynesian unemployment are the principal benefit to the working population. These, however, have been questioned by a number of analysts. In some cases, poor supply responses in developing countries are said to limit the applicability of the disequilibrium models described above. This may arise either from a dependence on imported intermediate goods (the prices of which increase under a devaluation) or because the production of exportables is often in the hands of small peasant farmers, who may not be in a position to respond to the price incentives offered by devaluation. In other cases, adverse aggregate demand effects are thought to be important. These arise from a number of mechanisms, including the effects of

the general reduction in real income, the redistribution of income away from groups with high marginal propensities to consume, and the decrease in real money balances (Cooper, 1971; Krugman and Taylor, 1978).[2] Alternatively, a high import dependency may interact with segmented capital markets to produce a contractionary outcome (Bruno, 1979).

6.2.5 Gathering the Threads

Having reviewed the various elements of neoclassical and Keynesian theory on the distributive effects of devaluation, let us now draw the threads of the arguments together by way of conclusion. In the full-employment model, an external disequilibrium is restored principally through switching policies. The poverty effects of switching will depend not only on the real wage effects (as determined by relative factor intensities) but also on the resource switching effects, since a transfer of wage labor between sectors will have direct effects on poverty if its incidence and intensity differ between sectors. But the theory based on factor intensities only applies when capital and labor are perfectly mobile. This model (which is the basis of Johnson and Salop, 1980) is therefore of dubious value for the short-run perspective of stabilization analysis. In cases where only labor is mobile, the effect on the real wage depends on the relative weights of traded and nontraded goods in workers' consumption baskets.

If unemployment characterizes the original situation prior to the stabilization programs, the effects on income distribution are quite different. The share of labor increases if the elasticity of labor demand is sufficiently high to encourage a proportionately greater increase in employment than the (inevitable) decline in the real wage. Moreover, labor reallocation is not strictly intersectoral as in the full-employment model, but transfers take place out of the unemployment pool. This has significantly different implications for income distribution and poverty, with the poor generally belonging to the unemployed and underemployed.

Finally, there are many who question the employment expansionary effects of devaluation, arguing that deflationary forces will dominate any tendency for output to expand. In this scenario of stagflation, both real wages and employment decline, and the prospects of the poor during stabilization are grim indeed.

The theory therefore suggests the following guiding principles in tracing the distributive effects of stabilization policy:

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2 For a recent application of the Krugman-Taylor model see Barbone and Rivera-Batiz (1987) on Jamaica.

1. Is stabilization best represented as involving a process of switching under general conditions of full employment, or is it mainly achieved through reductions in the general level of activity? The effects of each broad category of processes are likely to be quite different. In the former case, it is possible that the incomes of some poor groups will be raised through stabilization. In the latter, this is out of the question.
2. If the process involves switching, much depends on whether this occurs at full employment or not. In the full employment case, labor moves out of nontradables into tradables. Here the poverty effects will depend on three main factors: the prevalence of poverty in tradable and nontradable sectors; the direction of change in the real wage; and the extent to which labor moves into tradables.
3. Switching with unemployment involves the movement of labor out of employment (assuming that devaluation is expansionary) into tradables. In this case, beneficial effects on poverty are likely.
4. Under expenditure reduction, the degree to which poverty reduction increases will depend on the size of the multiplier process leading to declining employment in nontradables (assuming Keynesian unemployment). Fixed price models also suggest that the poor engaged in nontradables are likely to be more vulnerable to fiscal contraction than those in the tradables sector.

6.3. The Need for Case Studies

While theory provides an essential framework for tracking the distributional effects of adjustment, it does not yield unambiguous predictions. Even under the limiting assumption of full employment, the impact of the principal macroeconomic instruments on the primary distribution of income will vary between countries depending on differences in factor intensities, factor mobility, and consumption baskets. Moreover, these processes may be enhanced or offset by the impact of policy changes on the secondary distribution of income. Researchers must therefore go beyond pure theory to empirical analysis.

There are two broad routes open to such empirical analysis, the first being modeling/simulation exercises and the second being in-depth case studies. A strong case exists for conducting simulation exercises that allow for counterfactual experiments and the employment of different assumptions to close the model. Nevertheless, there are difficulties in choosing the most effective model. The main problem arises out of the fact that our subject straddles two distinct branches of economics. Adjustment policies are the concern of macroeconomics, with its emphasis on the interaction between important macro aggregates. In contrast, income distribution demands a more disaggregative treatment, distinguishing not only between different socioeconomic groups, but also between the sector specific mechanisms that determine output and its distribution.

Simulation experiments on the effects of adjustment policies on income distribution can be helpful, but their results often reflect the a priori thinking of the model builders. For example, the distributive effects of adjustment are more significant in simulations of Keynesian models (Taylor, 1979) than in neoclassical models (Dervis, de Melo, and Robinson, 1982). This can also be seen in the recent work on Social Accounting Matrices (SAMs). The SAM does not imply any one closure rule since it is typically underdetermined. Recent work on the "Transactions Values" approach to SAMs, in which the closure rules are explicitly determined, has shown the more important distributive effects under Keynesian closures (Drud, Grais, and Pyatt, 1983). The other limitation of simulation experiments is that they usually fail to do sufficient justice to the complex political economy that lies behind both the emergence of the trade deficit and the choice of corrective measures. Therefore, simulation experiments need to be coordinated with in-depth case studies. These can provide a richer source of information and are essential for certain levels of disaggregation, such as the intrafamily distribution of consumption (UNICEF, 1985).

The development of a methodology for case study work is no easy task. The case study approach inevitably involves a compromise between the application of a uniform theoretical framework and the specific characteristics of individual countries. Moreover, the case history approach is open to the criticism that it fails to deal with the problems of causality and the counterfactual. Too often such studies become mere descriptions of the before and after situations. Therefore, in designing the case studies several steps are essential.

First, an identification of the causes of the trade imbalance must be made, as well as an analysis of the role of distributional factors in generating macroeconomic disequilibrium. Case studies carried out under the ODI research project demonstrated that distributional factors were important in explaining the emergence of internal and external imbalance, especially in Jamaica and Zimbabwe.

Second, the macroeconomic policies that were implemented to correct internal and external imbalance must be clarified. It is important to distinguish between the intended policy outcome and its realization. Expenditure switching through exchange rate adjustment, for example, can be offset if not properly coordinated with monetary and fiscal policy. ODI's case study of Sri Lanka showed that large changes in the nominal values of policy instruments do not necessarily translate into real changes. Moreover, other responses to policy interventions, such as wage indexation, can offset policy intentions.

Third, an analysis of the real economy adjustments caused by macropolicy instruments is an essential ingredient of a case study since it is needed to establish changes in the primary distribution of income. Resource transfers between sectors

are likely to play an important equilibrating role. These can be between nontradables and tradables or between formal and informal sectors. ODI case studies highlighted the increased role of the informal sector during adjustment, which is due either to its absorptive function in the labor market or to production switching. The rapid growth of the informal sector in both Jamaica and Kenya was emphasized in ODI case studies as being at least partly due to adjustment policies. A point worth emphasizing is that these real economy outcomes must be analytically related to the macropolicies adopted. To repeat, simple before and after comparisons are woefully inadequate.

With these considerations in mind case studies can then proceed to the examination of how these real economy changes affect income distribution and poverty. It is useful to begin with the impact effect, that is, the distributional impact of adjustment before factors become mobile. This first approximation would identify those sectors in which incomes rise through adjustment and whether the relative or absolute poor benefit as a result. In the next stage labor mobility can be introduced while retaining the assumption of capital immobility. As a third stage the analysis should examine the long-term effect when all factors are mobile, new investments can be made, and the adjustment policies are feeding into the process of capital accumulation and growth. Each of these stages will generate information on the pattern of nominal income changes. It is then necessary to determine the associated real income changes at each stage by devising appropriate price indices for each socioeconomic group, depending on the composition of their consumption baskets. ODI case studies for Jamaica and Sri Lanka showed the importance of different consumption baskets in determining the real income effects of adjustment.

Finally, changes in the primary distribution must be combined with movements in the secondary distribution in order to determine the overall welfare outcome. Again, the ODI studies of Jamaica, Sri Lanka, and Zimbabwe showed the importance of social expenditures, food subsidies, and tax incidence in generating the final distributional outcome. Secondary income transfers, however, can also occur directly between households. For example, urban to rural remittances can change significantly as a result of adjustment.

6.3.1 The Choice of Case Studies

Perhaps the most important decision affecting a comparative study is the initial choice of countries. Several criteria for country selection are discussed below.

The cause of the disequilibria, whether emanating from external shocks (terms of trade decline, world recession) or internal shocks (drought, destabilizing macro or micropolicies) must be determined. In recent times, many countries have experienced all of these influences, and consequently country selection should be based on the relative importance of each factor.

Another consideration is the nature of the policy response, particularly the emphasis given to short-run macrostabilization as against medium- to long-term structural adjustment. This encompasses the application of supporting sectoral or micropolicies, particularly any market liberalization that is undertaken. The balance between stabilization and structural adjustment will depend on the availability of external financing.

The structure of the economy and the characteristics of its institutions is significant. The extent to which sectors are articulated with each other, or whether there is dualism, is an important initial consideration. Secondly, the relative importance of the informal sector and its composition can be critical in determining distributional responses. Thirdly, the composition of the tradables sector varies significantly across countries and exhibits much larger differences than the variation between nontradable sectors. Ideally, country case studies should be selected to include the following categories: countries whose exports are dominated by labor-intensive manufactures; countries in which the export sector is mainly comprised of plantation agriculture and mineral extraction, that is, relatively intensive in the use of capital and natural resources; and finally, countries in which export production is centered in the hands of small holder-producers.

The incidence of poverty, both in terms of the numbers involved and their location, should be considered. Specifically, countries should be selected to ensure that both urban and rural poverty groups are covered, since the transmission mechanisms are certain to be different in each case.

6.4. Policy Intervention

To end this review we turn to issues of policy and to the specific question: How can we help the poor during adjustment? While there is now a large body of analysis and practice concerned with issues of poverty alleviation in developing countries, this work reaches ambiguous conclusions. Moreover, implementing poverty alleviation under adjustment raises special problems of its own since tight finances typically constrain the room for policy maneuver.

A central issue is whether poverty alleviation under adjustment is best conducted through enhancing the primary income claims of the poor or through acting on secondary income transfers to them. One cautious position is to take adjustment policies as given and assist those vulnerable groups that are adversely affected through compensatory programs. Adjustment policies will then have direct and substantial benefits for the primary incomes of poorer groups. Consequently, policy interventions should focus most of their attention on secondary income transfers to compensate for any adverse short-term poverty fallout that may occur before the benefits to primary incomes of policy reform and growth are realized. This position

has been taken within the World Bank in a recent study presented to the Development Committee.[3]

But a more ambitious approach is to redesign adjustment programs to yield more benefits to the poor from the reallocation of resources promoted by policy change. That is, measures should be taken to implement transfers and protect and raise social expenditures going to the poor, but policy must go beyond this to raise the capability of the poor to generate primary incomes. Thus, for example, while UNICEF has recommended measures with regard to secondary transfers and social expenditures, it has also urged direct policy interventions in primary income generation (UNICEF, 1985, p. 68).

The present authors have examined some actual examples of policy where poverty alleviation under adjustment has been achieved through measures to enhance the participation and the productivity of the poor in tradable activities (Addison and Demery, 1986b). We have argued that raising the primary incomes of the poor through this means has the potential to minimize any adverse distributional effects of adjustment programs without undermining their principal macroeconomic objectives.

Four broad approaches to raising the primary incomes of the poor can be identified.[4] First, their access to productive assets can be improved under an adjustment program, in the spirit of redistribution with growth. Land reform is an obvious candidate, and has been included in World Bank SALs for Thailand (Beckmann, 1986). Alternatively, incomes can be raised by enhancing the returns on the assets they hold through increasing output prices and productivity and reducing input prices. This might occur in the process of dismantling market distortions under structural adjustment or through targeted policy interventions to help poorer farmers increase the share of their gains form export crop expansions.

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3 "The report to the Development Committee argues that by compensating the poor directly through carefully targeted transfers in cash or kind, governments can protect the poor during the transition from a distorted economy to a balanced one" (World Bank News 6, no. 15 (April 16, 1987); 9). The report also recommends carefully designed emergency employment programs, but the focus remains on secondary income transfers.

4 The categories feature the main mechanisms through which the primary incomes of the poor may be raised. By the same token, they also represent the processes through which incomes of the poor may be reduced during adjustment.

If the poor possess few productive assets other than their labor, increasing their access to productive employment may be the only means of raising primary claims. Structural measures to improve the operation of the labor market my be preferred to short-run emergency employment schemes. The ILO is currently supporting a number of projects in West Africa to help the urban unemployed take up farming.[5] The human capital of the poor can be protected through guaranteeing their access to health and education services. Indonesia has attempted to protect and expand primary health care expenditures despite fiscal restraint. Finally, for those poverty groups that cannot be drawn into the restructuring of production, income or consumption transfers may be the only effective means of assistance. Jamaica has implemented a program to provide food assistance to those most vulnerable to the price increases implemented under adjustment. Argentina and Chile have also undertaken the distribution of food to poorer groups in response to the effects of recession (World Bank, 1986b). The discipline of adjustment can provide an opportunity for reviewing state expenditures and better targeting poverty alleviation.

It remains to be seen whether structural adjustment policy design can be sufficiently flexible to attempt to raise the incomes of the poor, especially those hurt by the main effects of the program. The alternative is simply to arrange supplementary income transfers, at least over the short term. Whichever methods are chosen there is an undoubted need for the policy debate on adjustment with equity to be better served by empirical analysis.

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5 See Richards (1986) and van der Hoeven (1987) for recent analysis of employment policies under adjustment.

7. A METHODOLOGY FOR ANALYZING THE EFFECTS OF STABILIZATION AND STRUCTURAL ADJUSTMENT POLICIES ON LABOR MARKETS OF DEVELOPING COUNTRIES

Katherine Terrell

7.1 Introduction

There is considerable evidence (e.g., Cortazar, 1986; Foxley, 1981; PREALC, 1987) that adjustment policies applied in Latin America and elsewhere during the 1975-84 period have been accompanied by a decline in real wages, as well as a sharp increase in the number of unemployed and poor. This chapter is written in response to recent concern, expressed by the World Bank (1987b) among others, about the social costs of the macroeconomic adjustment policies. Its purpose is to outline a methodology for evaluating the effects of these policies (disentangled from other effects) on wages and employment. Whereas the concern is with the relative positions of everyone in the labor market, emphasis will be placed on the change in earnings and employment of the poor.

At the outset it is worthwhile to define terms and indicate some relevant caveats. To begin with, what I will attempt to measure as the effects of the policies are the differences between the levels of wages and employment observed under the policies and the levels that would have existed in the absence of such policies. As Goldstein and Montiel (1986) note, this is but one of at least three possible measuring rods. Another technique is to measure the effects by comparing the observed outcome under the policies with the observed outcome before the policies went into effect. Yet another method is to compare the outcomes of the treatment and control group. My preference for the first measure is that only it can provide an estimate of the policies' independent effect in the real world, where nonpolicy factors (for example, oil price shocks, varying rates of economic activity in industrial

countries, etc.) are operating on the observed outcomes. I will be concentrating on short-run effects, defined as those appearing in the first three years of the policies.

My approach is based on the assumption that it is important to study the policy effects on the entire labor force and not just on those who were poor when these policies were introduced. What is of issue here are the relative effects of these programs on different groups. If, for example, wages of the poor declined by 20 percent and wages of the nonpoor declined by 50 percent, then it cannot be said that the poor shouldered the burden of the costs. Moreover, it is possible that many in the ranks of the nonpoor joined the ranks of the poor—that is, were "impoverished"—as a result of these policies.

Finally, the results of the proposed analysis will vary considerably depending on the methodology and policy instruments that are included in the policy package. Before developing the theoretical and empirical methodology in the second and third sections, I first present an overview of the larger conceptual framework that illustrates the channels through which the policies are expected to affect the labor market.

7.1.1 Schematic Model

Given the nature of the adjustment policies and the structure of Third World labor markets, a two-pronged analysis of the effects of the adjustment policies on individual welfare seems desirable. The two-pronged approach is motivated by the fact that adjustment policies are designed primarily to influence decisions about the pricing and allocation of inputs and outputs of economic sectors. The sectors' responses to these policies in turn affect workers' wages and employment.[1]

Hence, the first prong of the analysis will examine the effects of the policies on the levels and changes in employment and wages at the firm and sectoral levels. The second prong will look more closely at the effects of these decisions on individuals, to answer such questions as: (1) Whose wages rose (fell) due to the policies? (2) Which groups were most likely to have lost their jobs? (3) What were the responses of different groups to these new circumstances? Specifically, who found employment and where? Who remained unemployed and for how long?

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1 Of course, other (exogenous) factors affect both the economic sectors' behavior and the design of the macroeconomic policies. The goal of the methodological framework is to control for the independent effect of these exogenous factors.

7.1.2 Description of Adjustment Policies

One of the principal thrusts of the structural adjustment programs is to improve the efficiency of resource allocation and use by bringing prices closer to world prices (by reducing distortions) and by restructuring government expenditures and revenues. Moreover, since the countries typically have large imbalances in their external accounts, adjustment (stabilization) programs also try to restore balance. The programs are typically characterized by trade liberalization, tightened monetary and fiscal policy, changes in the exchange rate, and restructuring of public investment and public enterprises.[2]

These policy instruments can affect labor markets in various ways: (1) directly, by reducing the number of employed (as has been mandated in several civil services) or the wage level (for example, through policies of wage restraints in a sector, labor market, or the minimum wage); and (2) indirectly, through their effect on relative factor prices and on the quantities and prices of the output (of goods and services). For example, in the area of trade liberalization, the reduction of tariffs is a principal recommendation. Reducing tariffs on intermediate inputs should alter the relative prices of inputs and hence factor use. The reduction of tariffs on imported final goods that are also produced domestically can have a negative effect on the price or output of the domestic product and will hence reduce or alter the use of inputs. Tight monetary policies will raise the interest rate (price of capital) and alter the use of inputs. Devaluation can increase production (and employment) in the export oriented sectors and possibly negatively affect output of firms producing for the domestic sector.

In short, the first prong looks at the effects of these policies on prices and the responses of producers to these prices/policies in terms of input (labor) use and output supply. In separating the price effects of policy changes from those of exogenous forces, the models presented in this chapter will draw on results of other chapters of this monograph, dealing with the relative effects of macroeconomic policies versus exogenous shocks on prices. The second prong will focus on who

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2 The extent to which any or all of these policies are carried out varies considerably from country to country. If care is taken in selecting a fairly comprehensive list of policies and testing their effects on several labor markets, this should assist in the identification of their effects. It should be noted, however, that in undertaking a cross-country comparison of the effects of the macroeconomic adjustment policies, one might want to distinguish between countries where the International Monetary Fund (IMF) and World Bank have been directly involved and countries that have imposed their own IMF/World Bank type program. As Goldstein and Montiel (1986) have demonstrated, there is a "selectivity bias" that arises primarily from the fact that countries with IMF programs tend to be in a worse economic situation to begin with.

lost or gained employment in the main sectors and the wage effects on different groups.

7.1.3 Definition of Economic Sectors

In examining the effects of adjustment policies on wages and employment at the sectoral level across countries, some agreement must be reached on which sectors will be the focus of attention.

The economic sectors could be grouped into private formal, public enterprise, civil service, urban informal, rural farm, or nonfarm, based on the view that the units in these sectors pursue different goals or face different constraints. Within each of these sectors, one could separate the effects on workers with different skills (possibly defined by years of education)—an approach which would assist one in locating the lower income workers.

The plan of this chapter is as follows: section 2 develops the firm and sectoral models, while section 3 focuses on models of individual behavior and outcomes. Within each of these sections there will be some discussion as to data requirements for each level of analysis. Section 4 summarizes and concludes with the advantages and limitations of this type of a study.

7.2 Employment and Wages at the Firm and Sectoral Levels

This section establishes the link between adjustment policies and the employment and wage-setting behavior of the main economic agents in a typical less developed country (LDC).[3] In particular, using plausible behavioral models, I derive calculable employment and wage equations for (1) private profit maximizing firms, (2) public enterprises, and (3) civil service. The approach recognizes the fact that different productive and administrative units pursue different goals and face different constraints. Hence, the response to adjustment policies of a small (profit maximizing) firm in the informal sector may be quite different from that of a large public enterprise.

The strategy is to start at the level of a firm but proceed to an industry (sector) level analysis because most adjustment policies affect a given industry (sector) rather than individual firms alone. Moreover, sectoral analysis carries the investigation one step closer to a general equilibrium framework, without making the problem empirically unmanageable. In view of these factors, the approach will (1)

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3 This section draws on joint work with Jan Svejnar and is part of a larger research project.

analyze the main types of firms, (2) embed these firms in an industry (sector) where labor supply is perfectly elastic, and (3) examine the case where the labor supply schedule is upward sloping.

7.2.1 Profit Maximizing Firm

In this subsection we examine the behavior of formal and informal sector firms that are price takers and select the quantities of inputs and output so as to maximize profit. In particular, consider a firm that produces output Q according to a well behaved (strictly quasiconcave) production function Q = Q(L,K), with labor L and capital K being the only inputs. (As shown below, extension to the case of three or more factors of production is straightforward.) The firm faces the wage rate W and the rental on capital r. It strives to maximize profit Π where

$$\Pi = PQ - WL - rK, \tag{1}$$

and P is the output price.

To analyze the impact of adjustment policies in this context, it is useful to define the relevant world prices P*, W*, and r*, and to recognize that the prices faced by a typical firm in an LDC may deviate from these world prices by markups/markdowns γ_1, γ_2, and γ_3, respectively:

$$P = (1 + \tau_i)P^* \tag{2}$$

$$W = (1 + \tau_2)W^* \tag{3}$$

$$r = (1 + \tau_3)r^* \tag{4}$$

The principal short-term goal of an adjustment exercise is to bring the γs as close to zero as possible. The various structural adjustment instruments identified in the first section (reduction in tariffs, devaluation, etc.) may be thought of as operating through one or several of the γ parameters. In terms of equation (1), the structural adjustment policies may be seen as affecting P, W, and/or r. Hence, in order to assess the effect of adjustment policies on employment and earnings, one needs an estimating equation relating L to P, W, and r. The important point to note is that, in order to assess the impact of adjustment policies in the present framework, one must be able to quantify these policies in terms of their impact on the exogenous variables (i.e., P, W, and r in the present context). For example, if P declines by 15 percent

in a given year, with 10 percent of the decline due to a tariff reduction and 5 percent to a general world price decrease, the impact of the adjustment policy is only that attributable to the 10 percent decrease. The outcome brought about by the other 5 percent decreases in P is attributable to other exogenous factors and reflects the situation that would exist in the absence of the particular adjustment policy.[4]

Proceeding from equation (1) and letting Q_i be the marginal product of input i, one can characterize the firm's profit-maximizing behavior by two first-order conditions

$$PQ_L(L, K) = W \tag{5}$$

$$PQ_K(L, K) = r \tag{6}$$

which may in principle be solved for the two endogenous variables L and K in terms of the three exogenous variables P, W, and r:

$$L = L(P, W, r) \tag{7}$$

$$K = K(P, W, r). \tag{8}$$

The input demand equations (7) and (8) constitute the key to assessing the firm-level impact of adjustment policies within the present analytical framework. For example, when the production function is of the Cobb-Douglas form, the estimating labor demand equation of the typical firm is loglinear

$$lnL = \alpha_0 + \alpha_1 lnP + \alpha_2 lnW + \alpha_3 lnr, \tag{9}$$

and the percentage effect on employment of a 1 percent decrease in the output price (e.g., by lowering tariffs) is given by α_1. Alternatively, one may prefer not to impose a specific functional form on the production process and rather differentiate equation (7) totally to obtain

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4 Of course, if the 5 percent decline in P^* happened to be the result of adjustment policies undertaken in other countries, then one could claim that, in a broader sense, the entire 15 percent effect is caused by adjustment policies.

$$dL = (\partial L/\partial P)dP + (\partial L/\partial W)dW + (\partial L/\partial r)dr. \tag{10}$$

Since for any variable X, dX = XdlnX, equation (10) can be expressed in a logarithmic form as

$$dlnL = \eta_{LP}dlnP + \eta_{LW}dlnW + \eta_{Lr}dlnr, \tag{11}$$

where η_{LP} is the price elasticity of the demand for labor, η_{LW} is the elasticity of the demand curve for labor, and η_{Lr} is the rental rate elasticity of the demand for labor.

The advantage of equation (11) is that it does not rely on a particular production function and that it permits direct estimation of the various elasticities. From the econometric standpoint, it is useful to note that within a time series (panel data) framework, equation (11) may be approximated by

$$\begin{aligned} lnL_t - lnL_{t-1} &= \eta_{LP}(lnP_t - lnP_{t-1}) \\ &+ \eta_{LW}(lnW_t - lnW_{t-1}) + \eta_{Lr}(lnr_t - lnr_{t-1}). \end{aligned} \tag{12}$$

Equation (12) is of course the first difference form of equation (9), and the relative merit of the two specifications may be examined through an analysis of the residuals.

More generally, one would like to capture the dynamics (i.e., the short-term versus long-term nature) of employment adjustment in response to changes in policy instruments and exogenous factors over time. Depending on the availability of data, this can be accomplished by including lagged values of the relevant variables in the estimating equation. Since the distinction between short- and long-term effects is desirable for the purposes of this study, the data to be collected should preferably be of a time series (panel) nature.

Finally, an important point to note is that the estimating equations (9)-(12) implicitly contain technological, organizational, and cost factors that may vary across firms and sectors. In practical implementations of these and other models, it is often useful to express these factors explicitly in the form of proxy variables.

7.2.2 Industry (Sector) Level

To proceed from the input demand functions (7) and (8) of a typical firm to the level of an industry or a sector, one has to sum up the individual demand curves for all the relevant producers. Hence, if there are m firms demanding the labor input, the aggregate labor demand function can be expressed as

$$L = \sum_{i=1}^{m} L_i(P, W, r) = L(P, W, r), \tag{13}$$

where L_i is the labor demand function of an individual firm. Analogously to equations (9), (10), and (11), one can then derive the estimating equations at the industry (sector) level.

A frequently invoked assumption in both the development and labor economics literature is that the supply of labor to a given industry (sector) is infinitely elastic. This notion has certain empirical validity, especially in the long-term, as resources can move from one use to another. In this case the height of the (horizontal) supply curve of labor determines the wage W, and the demand function (13) determines the level of employment conditional to this W as well as P and r. To the extent that adjustment policies do not affect the supply side of the labor market, their effect is limited to employment rather than both employment and wages. However, if the height of the (horizontal) supply curve depends on factors that are influenced by the adjustment policies (e.g., wage freeze, wage indexing, or the general price level), then the impact will be noticeable in terms of both employment and wages.

More generally suppose that labor is supplied with elasticity δ. The preceding scenario ($\delta \rightarrow \infty$) is a special case but in the short-run it is likely that $\delta < \infty$. The short-run situation at the industry (sector) level may be characterized by a labor demand function

$$dlnL = \eta_{LP} dlnP + \eta_{LW} dlnW + \eta_{Lr} dlnr \tag{14}$$

as well as a labor supply equation

$$dlnL = \delta dlnW. \tag{15}$$

Equations (14) and (15) ensure that, as P or r change, W will adjust so as to keep the changes in labor demand and supply in equilibrium. Equating (14) and (15) and solving for dlnW, one obtains the wage equation

$$dlnW = [\eta_{LP}/(\delta - \eta_{LW})] dlnP + [\eta_{Lr}/(\delta - \eta_{LW})] dlnr, \tag{16}$$

which permits one to assess the impact of adjustment policies (affecting P and r) on the wage W.

Similarly, equating (14) and (15) and solving for dlnL yields an industry (sector)-level employment equation

$$dlnL = [\eta_{LP}/(1 - \eta_{LW}/\delta)]dlnP + [\eta_{Lr}/(1 - \eta_{LW}/\delta)]dlnr. \tag{17}$$

Analogously to equation (16), equation (17) allows one to estimate the impact of adjustment policies (through their effect on P and r) on employment L.[5]

7.2.3 Public Enterprises and Other than Profit-Maximizing Firms

The model of the preceding section implies that firms set employment so that marginal product of labor equals the wage (equation (5)). The validity of this profit-maximizing (cost-minimizing) condition has been challenged in the context of public enterprise and, where labor regulations or trade unions are significant, for private firms (see, e.g., Svejnar, 1986a and 1986b). In particular, labor unions and governments have been under social pressure in many LDCs to increase employment in the presence of open and disguised unemployment. This pressure has been reflected most in the behavior of (para-) public enterprises, and the issue of wage leadership and/or featherbedding in this sector has been a focal point of virtually all adjustment policies. Moreover, an examination of government regulations in the modern private sector of countries as diverse as Panama, Argentina, Senegal, Kenya, Yugoslavia, and India reveals that employment often exceeds the point of equality between the marginal product of labor and wage (labor cost).

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5 In analyzing the impact of adjustment policies it may be desirable to examine the impact on different types of workers (men versus women, skilled versus unskilled, etc.) and take into account the fact that firms may use more than one nonlabor input. It is useful to sketch out the extension of the preceding framework to this context. Treating each type of labor as a seperate input, the production function becomes

$$Q = Q(X_1,...,X_n),$$

where xi is input i. Letting W = (W1,...,Wn) be the vector of input prices corresponding to X = (X1,...,Xn), the factor demand equations may be expressed as

Aggregating to the industry level and accounting for supply side can be done analogously to equations (13) - (17).

An ad hoc approximation for capturing this phenomenon is to estimate equations (9)-(12) separately for private and public firms and see if the relevant elasticities vary between the two sectors. This would be a simple method to gauge the different responses of the two types of firms to changes in exogenous factors and policies.

Alternatively, one can employ one of the models that have been recently developed to deal specifically with this topic.[6] A fruitful approach from the empirical standpoint is to assume that the firm acts as if maximizing a combination of profit, employment, and wages, with each one of these goals being given certain weight in the overall objective function U. The functional form that can be used in this context is the weighted geometric average of the three goals:[7]

$$U = \Pi^{\gamma_\pi}(W - \overline{W})^{\gamma_W}(L - \overline{L})^{\gamma_L}, \tag{18}$$

where $\overline{W}$ and $\overline{L}$ are the reservation wage and employment levels, respectively, and γ_π, γ_W, and γ_L are the weights of each of the three goals that underlie the economic behavior of the firm ($\gamma_\pi + \gamma_W + \gamma_L = 1$). The reservation wage $\overline{W}$ and employment $\overline{L}$ can be thought of as either the threat points of labor unions or the minimum politically (socially) acceptable levels of wages and employment. Profits would be $\Pi = PQ - WL - rK$ as before.

Apart from capturing various realistic aspects of enterprise behavior, the model in equation (18) has the analytical advantage of capturing the behavior of a strictly profit-maximizing firm as a special (nested) case when the extra sociopolitical weights on employment and wages are zero—that is, $U = \Pi$ as $\gamma_W = \gamma_L = 0$ and hence $\gamma_\pi = 1$. Since the public enterprise aspect of adjustment policies usually entails an attempt to reduce excess employment (i.e., reduce γ_L) and sometimes also wages (γ_W) in these enterprises, the model of equation (18) permits one to test whether γ_L and γ_W indeed diminish as a result of public enterprise reform.

In sum, on the basis of the objective function in equation (18), one can assess the employment and wage impact of adjustment policies through their effect on prices (P and r), the weights on wages and employment (γ_W and L)[8] and, in principle,

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6 See e.g., Svejnar and Smith (1984), Svejnar (1986a,b), MaCurdy and Pencavel (1986), and Brown and Ashenfelter (1986).

7 See e.g., Svejnar (1986a).

8 In a bargaining framework one can think of γ_π, γ_W, and γ_L as the bargaining powers of the groups whose goals are π, W and L, respectively.

also on the reservation (minimum acceptable) levels of wages $\overline{W}$ and employment $\overline{L}$.

Since W, L, and K are the endogenous variables at the firm level in equation (18), the usual maximization exercise yields three first-order conditions:

$$W = \overline{W} + \left(\frac{\gamma_W}{\gamma_\pi}\right)\left(\frac{\Pi}{L}\right) \tag{19}$$

$$PQ_L = W - \frac{\gamma_L}{\gamma_\pi}\left(\frac{\Pi}{L - \overline{L}}\right) \tag{20}$$

$$PQ_K = r. \tag{21}$$

Equation (19) indicates that the actual wage $\overline{W}$ is equal to the reservation wage W plus a share of profit per worker, where the share is the relative weight of wages and profitability in the objective function of the firm. Condition (20) confirms that the firm hires labor beyond the point of equality between the marginal product of labor and wage ($PQ_L < W$) so long as the weight of employment is positive ($\gamma_L > 0$). Finally, condition (21) indicates that the rule for utilization of capital is identical to that of a profit-maximizing firm.

With three endogenous variables (W, L, and K) and six exogenous variables (p, r, $\overline{W}$, $\overline{L}$, γ_L, and γ_W), one can in principle derive three reduced-form equations

$$W = W(P, r, \overline{W}, \overline{L}, \gamma_L, \gamma_W)$$

$$L = L(P, r, \overline{W}, \overline{L}, \gamma_L, \gamma_W)$$

$$K = K(P, r, \overline{W}, \overline{L}, \gamma_L, \gamma_W).$$

However, in the present model it is impossible to obtain a closed-form solution, and one is forced to estimate some variants of the first-order conditions (19)-(21). For instance, with a Cobb-Douglas production function ($PQ_L = \alpha PQ/L$), one can rearrange equations (19) and (20) to obtain equations

$$L = \beta_1 \frac{\Pi}{W - \overline{W}} \tag{22}$$

$$W = \alpha\frac{PQ}{L} + \beta_2\frac{\Pi}{L-\bar{L}}, \tag{23}$$

where $\beta_1 = \gamma_W/\gamma_\pi$ and $\beta_2 = \gamma_L/\gamma_\pi$. Equations (22) and (23) can be estimated jointly by instrumental variables to assess the effects of adjustment policies on γ_L and γ_W.

7.2.4 Civil Service

A reduction in the number of civil servants is frequently a major goal of structural adjustment policies. The civil services reorganization sometimes also entails a restructuring of pay scales so as to bring earnings of government employees more in line with their private sector counterparts.

Permanent layoffs of a large number of civil servants may naturally have significant welfare (poverty) implications and hence deserve careful analysis. There are usually two employment effects in a civil service reform. One is a visible quantitative adjustment that is directly attributed to the structural adjustment exercise. For instance, if adjustment policies envision a reduction in the number of civil servants by 5,000 over a three-year period and the total number of civil servants is indeed reduced by this amount, the usual conclusion is that the short-term (three-year) effect of adjustment policies on the size of civil service is -5,000. This conclusion may of course be misleading if there are certain other determinants of the size of the government sector that might have caused the number of civil servants to grow or decrease in the absence of adjustment policies. The total short-term effect of adjustment is the sum of these two effects (i.e., the decrease in civil service employment from what it would have been in the absence of the adjustment policies).

If the effect of stopping the natural evolution of the size of civil service is important, the analysis of the employment impact of adjustment policies becomes difficult. The reason is that there are no simple and widely accepted models of government behavior that would permit one to derive the employment (labor demand) equation for civil service.

There is considerable literature on the public sector labor markets in more developed countries (see, e.g., Hamermesh, 1975; Ashenfelter and Oates, 1979; and Courant, Gramlich, and Rubinfeld, 1979). However, many of the models are based on the utility-maximizing model of a median voter or other models of the government's response to voters' preferences, which may not be very realistic in the setting of many Third World countries. Nevertheless it is possible that Ashenfelter and Ehrenberg's (1975) model, which links public sector employment to civil servants' wages and the real employment budget of the government, might be a plausible starting point for analysis:

$$L = L(W, B), \tag{24}$$

where B is the appropriate measure of budgetary resources that are available for the civil service wage bill. In particular, it can then be expected that the income-compensated (fixed budget) demand curve for public servants is downward sloping ($\partial L/\partial W < 0$). This framework can be extended in many ways: e.g. by including a dummy variable D coded 1 during the adjustment period and 0 otherwise. In a loglinear setting one can then envision models of the type

$$lnL = \alpha_0 + \alpha_1 lnW + \alpha_2 lnB + \alpha_3 D \tag{25}$$

$$lnL = \beta_0 + \beta_1 lnW + \beta_2 lnB + \beta_3 D + \beta_4 D lnB. \tag{26}$$

Model (25) assumes that the adjustment policy has a quantitative impact without affecting the underlying behavioral pattern that determines civil service employment. In contrast model (26) allows the test of a hypothesis that adjustment policies affect the usual link between the (employment) budget and civil service employment. Since (25) is linearly nested in (26), the two competing hypotheses can be tested directly.

Naturally other approaches to analyzing the civil service labor market are possible, and the appropriate framework may vary from one country to another.

7.3 Employment (Unemployment) and Wages of Individuals

The analysis of the earnings and employment of individuals will complement the findings from the enterprise- and sectoral-level analyses in several ways. First, it will identify the groups in the labor market that are most affected by the policies

in terms of changes in wages and employment status. Moreover, it will identify the sensitivity of these changes to individual, firm, and sectoral characteristics. Second, the individual-level analysis will provide information on the response of different (target) groups in the labor market to the policies, in terms of finding a new job or remaining unemployed.

In order to carry out this stage of the analysis it will be necessary to create a new data base that merges a time series of selected macroeconomic and sectoral variables with retrospective data from a nationwide random sample of households.[9] The retrospective data should cover the period beginning two or three years prior to the implementation of the policies up to the time of the survey, in order to help separate out the policy effects. Data need to be collected on both personal characteristics (human capital) as well as on firm/enterprise and sector/industry characteristics. Moreover separations from the job should be identified as voluntary (quits) versus involuntary (layoffs).

Examples of the individual-specific variables (I) which should be made available by the survey are

1. age;
2. sex;
3. ethnic status or nationality (where relevant);
4. education (years of schooling, at each point in time);[10]
5. tenure or duration on the job (job-specific experience);
6. years in the labor force (general experience);
7. skill level (captured by occupation);
8. wage, including fringe benefits.

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9 Two points of qualification should be made. Whereas the quality of panel data is indisputably better than retrospective data in terms or reliability, I am not aware of the availability of such data for the period under analysis. Moreover, if such data sets exist, it is unlikely that they will contain the necessary variables.

Second, whereas much of the analysis would be carried out at the individual level, household data are paramount for the analysis of earnings and poverty. For example, Lachaud (1987) has shown that the policy of reducing employment in the Senegalese public sector is likely to have serious implications for household welfare since the probability that the spouse of a public sector employee also works in the government is very high.

10 Should one want to measure the effects of training programs (and changes in government policies on these programs) on employment and/or wages, one might want to include this dimension of education as well.

The firm-specific variables (F) that should be included as a minimum are

1. Ownership (public, private, foreign versus domestic)
2. size;
3. proportion of total industrial output;
4. capital-labor ratio (to capture technology);
5. degree of export orientation.

To isolate the effects of adjustment policies from exogenous shocks, one would want to add from other sources a series of policy (P) variables. This could be done at three levels of complexity/precision. First, dummy variables equal to one for the period of the policy and zero otherwise would assist in capturing these overall affects (analysis of covariance). Second, one could construct variables that quantify the policies, e.g., the percent change in the tariff, and assemble a time series of these variables so as to be better able to identify the effects.

Third, since one of the questions this section strives to answer is who were those most affected by the policies, it would be of interest to separate the sector-specific effect from the individual-specific effect by including variables that quantify the percentage change in wage or employment in a sector at each time period. The inclusion of such variables in individual wage employment equations would allow us to assess how different types of individuals are affected by sectoral shocks. For example, do hours worked change significantly for people who (at the beginning of the observation) happen to be in a sector that expanded versus contracted? Do people with different individual characteristics (age, sex, etc.) respond differently to different sectoral shocks? If one knows what fraction of the shock (e.g., output or employment contraction) in a sector is due to policies versus exogenous factors, it is then possible to identify the impact of the policy on the welfare of specific target groups.

With such data base, it would be possible to estimate models of the following general form:

$$E_i = E_i(I, F, P) \tag{27}$$

$$W_i = W_i(I, F, P) \tag{28}$$

where E_i will, for the moment, be referred to as employment for individual i; W_i is the individual's wage; I is a vector of individual-specific characteristics; F is a vector of firm-specific characteristics; and P is vector of policy instruments.

The following two subsections develop these general employment and wage models that could be estimated with a data base of the type described above.

7.3.1 The Determinants of Employment and Hours Worked

Several approaches can be used to understand the dynamics of Third World labor markets and the effects of adjustment policies. Much can be learned from simple descriptive statistics about which groups have experienced a higher incidence of unemployment, who are the new hires in which sector, etc. Whereas this type of analysis would provide useful information about the reaction of different groups in the labor market to the total shocks to the economy (domestic and external), it is not helpful in identifying the various components of the shocks.

7.3.1.1 Linear Regression on Hours Worked. A simple and approximative method for estimating the effect of the policies on employment is to fit a linear regression of I, F, and S vectors of variables on individuals' annual (monthly) hours of work. The policy variables (P) could be interacted with individual (I) and sector-specific (S) variables in order to identify which groups' hours of work were most affected (positively and negatively) by the policies.

In general the function that would be estimated would then be

$$lnH_i = H_i(\mathrm{I}, \mathrm{F}, \mathrm{S}, \mathrm{IP}, \mathrm{SP}) \tag{29}$$

where lnH_i is the log of the number of (annual, monthly) hours worked by individual i, and I, F, and S are the vectors of variables described above.

Equations of this kind would enable us to answer questions about whether women's work hours were affected more than men's in a specific sector or whether the educated or uneducated experienced greater changes in hours of employment due to a policy instrument.

The principal attraction of this approach is its ability to capture a number of effects on the target groups within a simple linear framework. The drawbacks are that the data on hours worked would probably not be very reliable and that one would not know to what extent the variation in hours worked was due to a change in wages. Of course the individual-specific variables include human capital variables that in part proxy for wages. However, adjustment policies may affect the relationship between individual (human capital) variables and wages, hence, as I show later in the section titled "Changes in Wages," it is also useful to estimate a general wage equation.

The approach of equation (29) is able to identify which groups' hours of work and wages increased and decreased due to the policy variables. However it does not illuminate which groups were more (less) likely to lose (gain) employment as a

result of structural adjustment, a question of interest to policy-makers and the World Bank.

7.3.1.2 Estimation of Transition Probabilities. The estimation of transitions from one labor market state to another (e.g., employment to unemployment) is at the forefront of much of the current labor economics literature. The estimation techniques are fairly complex and it is still not clear how sensitive the results are to various functional forms. With these caveats in mind, I next outline a framework which modifies the Burdett, Kiefer, Mortensen, and Neumann (1984) model to better fit labor markets in less developed countries (LDCs) and capture the effects of adjustment policies.

The model I propose would estimate the probabilities that individuals will move among the following three labor market states: employment in the modern sector, employment in the informal sector, and unemployment.[11] These transition probabilities are represented by a Markov chain in that they are independent of which state the individual is in and the duration in that state. What influences the transition probabilities are events that lead to changes in the utility associated with being in a given state. These events may be labor market phenomena (e.g., a better job offer) or anything that occurs in the economy, person's life, etc. that changes his/her utility from that state. The model therefore allows for the inclusion of adjustment policies as utility changing events. The important assumptions of the model are that these events arrive at a rate described by a Poisson process and are independent random draws from the distribution F.

The distribution function associated with the duration of any spell in state i can be written as[12]

$$F_i(t|I) = 1 - exp(-t\lambda_i(z)), \qquad i=1, 2, 3, \tag{30}$$

where $\lambda_i(I)$ is the hazard function associated with state i and I is a vector of individual-specific characteristics and the human capital wage.

The conditional probability, that state j will be the new state after a completed spell in state i, $i \neq j$, is $\lambda_{ij}(I)/\lambda_i(I)$. Hence the probability density function associated with a completed spell in any state when the origin state is i and j is the destination state can be written as

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11 This is the first modification of the Burdett et al. (1984) model that has employment, unemployment, and nonparticipation as the three states.

12 See Burdett et al. (1984, p. 566).

$$f_{ij}(t|I) = \lambda_{ij}(I)(1 - F_i(t|I)), \qquad i, j, = 1, 2, 3, i \neq j. \tag{31}$$

The log likelihood function for a sample of k=1, 2, 3,...K spells can be expressed as

$$lnL = \sum_{k=1}^{K} \{d_k \ln \lambda_{i_k j_k}(I_k) - T_k \lambda_{i_k}(I_k)\} \tag{32}$$

where $d_k = 1$ if the spell is complete and 0 otherwise; i_k and j_k denote the origin and destination states respectively; I_k indicates the human capital wage and characteristics of the individual involved in the spell; and T_k indicates the length of the spell.[13]

In order to implement the model, a functional form for $\lambda_{ij}(I)$ must be chosen. The exponential function is a convenient and widely used form. With this specification the log likelihood function becomes

$$lnL = \sum_{k=1}^{K} \{d_k I_k \beta_{i_k j_k} - T_k \sum_{n=1}^{3}, n \neq j_k exp(I_k \beta_{i_k n})\}. \tag{33}$$

This function can be maximized using Newton's method within SAS's MATRIX procedure to obtain transition probabilities from unemployment to employment in the modern sector or from employment in the modern sector to employment in the informal sector, etc. for stratified subsamples (e.g., young men versus young women, etc.). Moreover, the effect of the characteristics found in the I vector (education, age, etc.) can also be estimated.

Analysis of the duration of unemployment due to policy effects may be an additional useful research topic. Very little information exists for developing countries, and studies might take the methodology presented by Flinn and Heckman (1982) and Topel (1986) as points of departure.

7.3.2 Changes in Wages

The principal focus of this section is to disentangle the policy effects from other effects on the wage changes of individuals one to three years after the implemen-

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13 Left- and right censored spells are treated symmetrically. This is appropriate only because the specification implies an exponential distribution of durations.

tation of the adjustment policies. The main instruments that directly affect the levels of wage are wage freezes, indexing or nonindexing of wages, setting of minimum wages, and changing structure of wages in the public sector. Real wages would be indirectly influenced by policies to change prices and the exchange rate through inflation. Great care would need to be taken to adjust all wages with good consumer price indices.

We would learn from section 7.2 above how aggregate wages changed in different sectors/enterprises in the economy. The goal here would be to identify

1. the wage changes of the groups who remained in those sectors which were most affected (positively and negatively) by the policies;
2. the wage change of those who left their jobs voluntarily from that of those who left involuntarily;
3. the changes in the level of poverty associated with the policies.

In order to capture these effects one could augment the basic Human Capital earnings function[14]

$$lnw_{it} = \alpha_o + \alpha_1 Schooling + \alpha_2 Exper + \alpha_3 (Exper)^2 + v_{it}$$

where lnw_{it} is the natural logarithm of wages in the current period for each individual, Schooling is the number of years of education, and Exper is the number of years in the labor force up to the current period.[15]

One could begin by adding two sets of dummy variables. One set of dummies would be used to categorize people's employment along two dimensions: (1) the sector in which the individual is currently employed at the time t (e.g., Formal (FO), Urban Informal (UF), Rural Informal (RI), Government (G)), and (2) a rubric

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14 For the derivation of this estimatable equation see Mincer (1974).

15 Whereas several studies (e.g., Bartel, 1980; Terrell, 1987) have recently decomposed this component of human capital into job-specific experience (tenure) and general labor force experience in order to capture their separate effects on the earnings profile (especially when job mobility is concerned), this is not done here as it brings into focus the effects of tenure, which is a more detailed analysis.

indicating whether the individual is in the same sector (or firm) in the current period as in the previous period[16] (NM) or had left another sector voluntarily (VM) or involuntarily (IM) to be in the current sector.[17] The base category could be those in the rural informal sector in the current period. In other words there would be nine dummies, each equal to 1 if the individual fell into one of the nine cells in the diagram below and 0 otherwise:

	G	FO	UR	RI
NM	X	X	X	O
IM	X	X	X	O
VM	X	X	X	O

An earnings equation of this kind would therefore let us know what the wage changes were for these nine categories relative to that of those in the rural informal sector over the entire period, holding human capital (schooling and experience) constant.

In order to capture the general effect on the wage level of the policies, one could then include a dummy (P) equal to 1 for the year(s) when the policies were in effect and 0 otherwise. This would provide an estimate of the general change in the wage level being accounted for by the policies, holding constant the wage changes brought about by the categories above.

However, as mentioned at the beginning of this chapter, the true effect of these policies should be measured as the difference between the level of wages observed under the policies and the level that would have been observed in the absence of these policies. To arrive at such a measure, one would interact the dummy P with the nine dummies in the two-dimensional diagram on the previous page. The coefficients on these interacted variables would measure the wage change brought about by these policies whereas the wage change that would have occurred in their absence is measured by the coefficients on the nine dummies without the interaction terms.

In order to learn about the changes in the levels of poverty associated with these policies (question 3 above), it is necessary to use the "headcount" measure (i.e.,

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16 The period can be defined as a month or year depending on the data and or interest of the study.

17 The categories are designed to learn about wage changes for the groups we are concerned with, and could obviously be modified to fit the labor market characteristics of a particular country. For example, I have not included the rural farm sector because a large portion are farmers who do not earn wages.

workers earning less than the poverty line as set in the country). This measure is selected over the measure commonly used by the World Bank (the bottom 30 to 40 percent of the population in per capita income) in order to capture changes in the total number of poor due to these policies. Briefly, a probit analysis of the probability of being in poverty, given the individual's characteristics and sector, is suggested.

7.4 Summary and Conclusions

The chapter presents a methodology for evaluating the impact of adjustment policies on employment and wages in LDCs. Since the focus is on the welfare of the individuals but the effects of policies are usually manifested through the behavior of firms and administrative units, I have adopted a two-pronged approach to analyzing the issue. The first analyzes the effect of adjustment policies on firms and sectors as well as their response to these policies in terms of labor demand and wages. The second is complementary and focuses on how these policies affect the wages and employment status (hours worked) of individuals with different demographic characteristics and sectoral affiliation. My strategy combines two levels of analytical aggregation and entails the use of individual, firm-level, and sectoral data. The proposed analysis is of a partial equilibrium nature but its sectoral component goes a long way toward general equilibrium without becoming empirically unmanageable.

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8. THE USE OF HOUSEHOLD DATA IN MACROECONOMIC ANALYSIS OF ALTERNATIVE WELFARE PROGRAMS

Lea Achdut and David Bigman

Over the last two decades an increasing number of developing countries have collected extensive household data in the framework of income, expenditure, and employment surveys. Many of these countries conduct annual income and employment surveys on a routine basis. In recent years the World Bank has also conducted detailed expenditure surveys in a number of developing countries—especially in Africa—where household data were most difficult to obtain. Nevertheless very little effort has been made to incorporate these data in an analysis of the economic trends and an evaluation of macroeconomic policies. Although the effects of these policies on poverty and income inequality are extremely important, the conventional macroeconomic analysis continues to focus on the general trends of the average values of the main economic variables such as incomes and wages, while paying little or no attention to developments among specific subgroups of the population. Questions such as whether the rise—or fall—in the average wage rate that the economy under consideration has experienced was equally shared by all segments of the population; whether inflation—or stabilization—hurt both the very poor and the very rich in equal proportions, etc. remained unanswered although, from the social and political point of view, these are often crucial. Furthermore all too often the main goal of the policies was to affect only certain groups rather than the general population. By focusing on the averages the conventional macroeconomic analysis may lack the proper basis for an evaluation of these policies.

At the same time studies on poverty and income inequality in specific countries were conducted as one-time projects, thereby reflecting a particular state of affairs, and thus could not be instrumental for an evaluation of changes over time in the economic environment.

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The purpose of this chapter is to illustrate the use of household data collected over a sequence of years for an evaluation of macroeconomic policies and trends. The chapter analyzes the changes over time in poverty and income inequality in Israel during the six-year period from 1979 through 1984. During this period Israel experienced one of the highest rates of inflation in the world, which peaked to more than 450 percent annually in 1984.

The inflationary waves progressed in three phases: in the five-year period from 1974 until mid-1979 inflation was relatively low and rather steady, at an annual rate of 35 percent to 45 percent. In mid-1979 inflation rose rather sharply to an annual rate of 130 percent and remained at that average level until the end of 1983. In 1984 and until June 1985 inflation jumped to a level of 400 percent to 500 percent annually. In July 1985 the government of Israel introduced a sweeping package of policies that rolled the inflationary tide back to a level of less than 30 percent annually. All these changes were induced by government policies and thus were largely unanticipated by the public. Wages and most financial assets were, however, protected from the bites of inflation by an elaborate and widespread system of indexation. The more vulnerable sections of the populations were cared for by an indexation of all the social security benefits.

Our results indicate that over the period 1979 through 1984 there have been surprisingly small changes in the levels of income inequality and poverty. The Gini coefficient of income inequality during this 5-year period rose by a mere 3.3 percent and the poverty gap rose by 13.8 percent. A careful analysis of the year to year changes shows, however, very large differences between the developments in the years 1980 and 1984—in which the rate of inflation jumped to higher levels—and the developments in the years 1981 through 1983—in which inflation was high but relatively steady. Thus, for example, in the three-year period from 1981 to 1983, income inequality (measured by the Gini coefficient) declined by 4.8 percent, and the poverty gap decreased by 9.6 percent. In 1984, however, as the inflation rate doubled income inequality rose by 8.8 percent and the poverty gap rose by 19.4 percent.

The primary reasons for these striking differences are the effects of government welfare programs on the one hand and extensive wage indexation on the other hand. With the rise in inflation the social security benefits were almost automatically increased, the income tax structure was adjusted, and other direct assistance programs were shielded from erosion or even stepped up in real terms. At the same time the degree of wage indexation was raised and the time intervals between consecutive wage adjustments was shortened from one year in the mid-1970s to six, three, and finally only one month in 1984. All these adjustments were introduced, however, only after some lag, since it took time for the policy-makers and

the labor unions to fully grasp the changes and complete all the necessary administrative and legal arrangements that made these adjustments possible. These lags were the reason for the sharp rise in poverty and inequality in years of unanticipated jumps in the rate of inflation. When the welfare programs and the indexation agreements were adjusted, however, these trends were reversed. Paradoxically, these adjustments worked to undo any gains that the inflationary policies were hoped to achieve by buffering the decline in private consumption and thus planted the seeds of the next inflationary wave.

8.1 Aggregate Inequality and Poverty Measures

In analyzing the basic trends and year-to-year changes in poverty, we examined the three factors that determine the level of overall poverty and its year to year changes: (1) the percentage of the poor in the total population, that is, the width of poverty; (2) the size of the income gap of the poor, that is, the depth of poverty; and (3) the degree of inequality in the distribution of the poverty gaps among the poor, which represents the concern over relative deprivation within the poor population. However, different poverty measures represent different sensitivities to each of these factors and thus may register different degrees of intensity of the poverty problem and perhaps even different trends in the development of poverty over time.

Similarly, different income inequality measures, such as the Gini coefficient, the coefficient of variation, and Atkinson's measure (1971), also reflect different sensitivities to income changes at different ranges of the income distribution. The Gini coefficient, for instance, is relatively insensitive to income changes at the middle range. The coefficient of variation (CV) does not distinguish between income changes at the upper or lower tails and thus does not satisfy the Principle of Transfers of Dalton (which requires that a finite sequence of transformations transferring income from the rich to the poor has to decrease the value of the inequality index).

The differences between the various poverty and inequality measures are basically a reflection of the different sensitivities of the social welfare functions that are implicit in each measure (see Bigman, 1987). In our analysis we have therefore considered the trends in poverty and inequality as indicated by a number of indices. This allowed us also to examine the changes at the various ranges of the income distribution, as we shall see later on.

Four poverty indices will be examined in this chapter: the Head Count ratio (denoted by H), which registers the percentage of the poor in the total population, the Poverty Gap ratio (G), which registers the percentage shortfall of the average income of the poor from the poverty line, and the two poverty measures proposed by Sen (1976) (PS) and Foster, Greer, and Thorbecke (1984) (PF). The two indices

H and G are the common measures of poverty in empirical studies although their weaknesses have been widely discussed in the literature (see, e.g., Sen, 1979; 1981; Kakwani, 1980; Foster, 1984; Bigman, 1986). The Head Count measure does not reflect the "depth" of poverty, that is, the size of the poverty gap. The Poverty Gap measure does not reflect the "width" of poverty, i.e., the size of the poor population and its share in the total population, nor is it sensitive to the inequality in the distribution of the poverty gaps among the poor. The other two indices, PS and PF, reflect the three components of overall poverty, namely the width, the depth, and the degree of inequality among the poor, or "relative deprivation," but each index attaches different weights to each of these components.

We will also examine three indices of income inequality: the Gini coefficient, the coefficient of variation, and the extended, rank weighted coefficient of variation. By giving higher weights to deviations from the mean at the lower tail of the income distribution, the latter index ensures that the Dalton Principle of Transfers is satisfied. At the same time it is more sensitive than the Gini coefficient to the size of the deviations from the mean and thus reflects a higher sensitivity to the absolute deprivation (see Bigman, 1986).[1]

Data sources are the annual income surveys, which the Central Bureau of Statistics has conducted since 1965. The investigation unit in these surveys is the individual household, and the population includes all households in urban localities. The income surveys distinguish between three definitions of income: (1) "economic (or market) income" is all current income prior to any deduction and transfer payments, (2) "gross income" is economic income plus all cash transfer payments, and (3) "net income" is gross income minus the deduction of obligatory payments (mainly income tax and national insurance contributions paid by the employees).

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1 The extended rank-weight coefficient of variation is given by

$$E.V. = \Sigma R_i \left[\frac{(y_i - \mu)}{\mu} \right]^2$$

where $R_i = [(n + 1 - i)2]/[n(n + 1)]$, is the rank order of the corresponding individual.

Our definition of the poverty line is the same as that of the National Insurance Institute. It determines the line at that income per "standard adult," which is equal to 40 percent of the median ("equivalent") gross income in the population.[2] Total income in each household is divided by the number of "standard adults" in that household so that the average income is factorized by an equivalence scale so as to take into account economies of scale in consumption.[3]

8.2 Trends of Income Inequality

Despite the high and rising rates of inflation there have been remarkably small changes in the overall income inequality during the five-year period 1979-83. The inequality in the distribution of economic incomes has risen slightly by 1.1 percent to 3.4 percent—depending on the index of inequality. The inequality of net incomes has declined by 5 percent according to the Gini coefficient and by even more according to the CV measure. In 1984, however, the inflationary shock caused a steep rise in the inequality of net incomes by 9 percent to up to 19 percent—depending on the index. The rise in the inequality in the distribution of gross income was even larger, mostly as a result of the lagged adjustment of the social security benefits, as we shall see below. Lags in the adjustment of the income taxes have increased the average tax rate, especially at the middle- and lower-income ranges, thereby increasing the progressivity of the tax system. Consequently, the rise in inequality as an effect of the inflationary shock was somewhat smaller for net incomes. These trends are summarized in tables 8.1 and 8.2.

To further emphasize the different trends registered by the different indices, we have normalized their values in the various years by their value in 1979. The normalized indices for net income that manifest the percentage changes from that base year are presented in figure 8.1. The results show that the three indices differ quite markedly in the magnitude of the changes that they register. In the three-year period from 1980 to 1983 the Gini coefficient shows a decrease of 6.8 percent whereas the CV measure shows a decrease of 13.3 percent. In 1984 income

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2 This definition of the poverty line determines its level relative to the incomes of the general population rather than as an absolute level which is determined by specific needs. The relative approach is common in many European countries whereas the absolute, i.e. "minimum needs" approach is the one used in the U.S.

3 Thus, for instance, if a family of two adults is considered as consisting of "two standard adults," a family of one adult is considered as consisting of "1.3 standard adults," a family of three adults is considered as consisting of "2.75 standard adults," etc.

Table 8.1 - Inequality Measures of Total Population: Economic Income

		1979	1980	1981	1982	1983	1984
GINI	INDEX	0.4308	0.4327	0.4368	0.4433	0.4357	0.4706
	DLT %	n.a.	0.45	0.93	1.50	-1.72	8.01
C.V.	INDEX	0.8425	0.8297	0.8653	0.8510	0.8328	0.9438
	DLT %	n.a.	-1.51	4.28	-1.65	-2.13	13.32
EXTEND-	INDEX	0.8315	0.8399	0.8491	0.8697	0.8565	0.9390
ED C.V.	DLT %	n.a.	1.02	1.09	2.42	-1.51	9.63

DLT % represents the percent change.
n.a. = not available.

Table 8.2 - Inequality Measures of Total Population: Net Income

		1979	1980	1981	1982	1983	1984
GINI	INDEX	0.3176	0.3236	0.3183	0.3132	0.3016	0.3280
	DLT %	n.a.	1.86	-1.64	-1.59	-3.69	8.75
C.V.	INDEX	0.6387	0.6525	0.6211	0.5904	0.5660	0.6376
	DLT %	n.a.	2.15	-4.82	-4.93	-4.12	12.63
EXTEND-	INDEX	0.5098	0.5213	0.5215	0.5098	0.4891	0.5373
ED C.V.	DLT %	n.a.	2.25	0.0	-2.25	-4.05	9.86

DLT % represents the percent change.
n.a. = not available.

inequality rose by 8.8 percent according to the Gini coefficient and by 12.6 percent according to the CV.

One result of the inflationary tides is the rise in the progressivity of the income tax at higher rates of inflation. This effect can be quantified by comparing the income inequality indices for gross and net incomes. On average the income taxes have brought the Gini index based on net income to a level lower by 13 percent to 15 percent than the index based on gross income. In 1980, however, the reduction in the inequality index was by 13.3 percent, it rose to 15 percent in 1981 and 1982, and further rose to 17 percent in 1983 and 18 percent in 1984 despite frequent adjustments in the tax structure to take account of inflation. The reduction in inequality was even larger when measured by the C.V., since this measure is more sensitive than the Gini to changes in income at the higher tail.

Another indicator of the rise in the progressivity of the income tax system is the continuous decline of the tax threshold as a percentage of the average wage. In 1977 and 1978 incomes lower than 45 percent of the average wage were exempt from

Table 8.3 - Indicators of Progressivity of the Income Tax System

Indicator	1978	1979	1980	1981	1982	1983	1984
Gini coefficient of net income as percent of Gini coefficient of gross income	n.a.	86.8	87.7	85.8	84.9	83.3	82.0
CV coefficient of net income as percent of CV coefficient of gross income	n.a.	87.4	90.6	82.6	81.6	80.8	77.6
Real change in tax threshold (%)	–1.9	+0.2	–12.2	+7.7	+3.5	3.3	–8.0
Tax threshold as percent of average wage	44.1	40.7	36.0	36.6	36.5	33.6	31.2

n.a. = not available

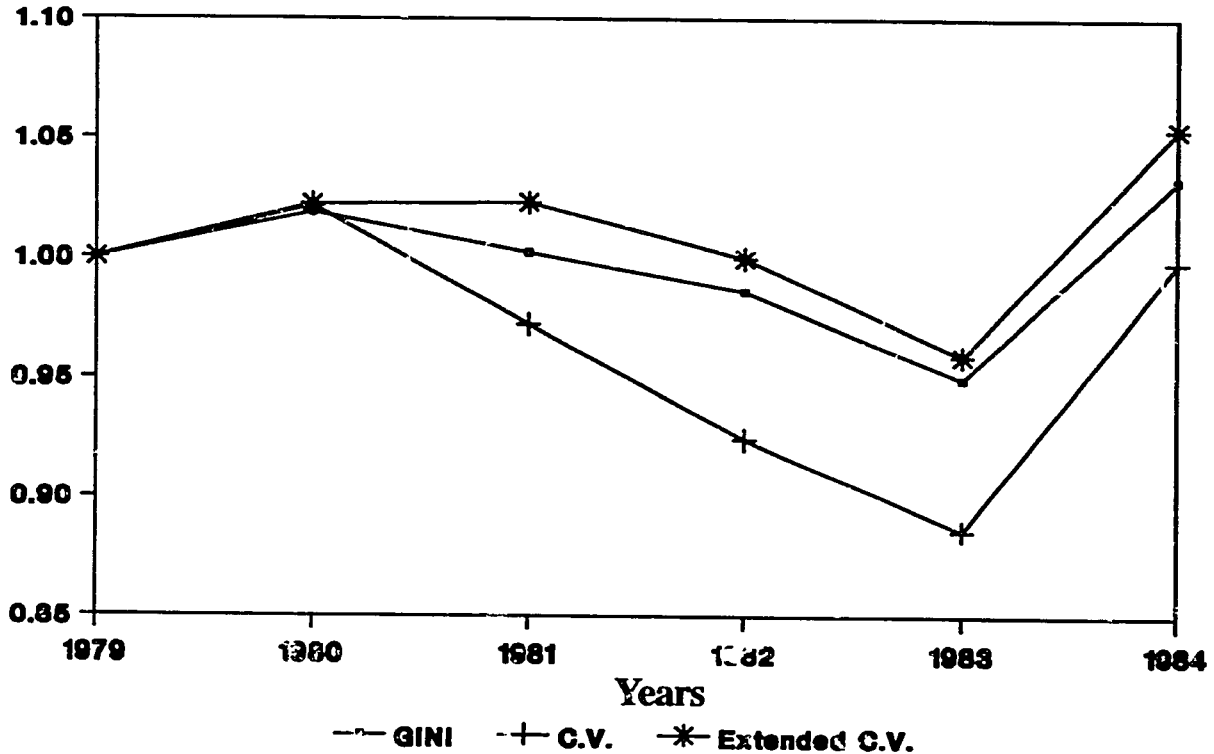
income taxes. In 1980 this percentage declined to 36 percent and in 1984 it further declined to 31 percent. These trends are summarized in table 8.3.

8.3 Trends in Poverty

The most noteworthy observation of our analysis of the trends in poverty is the sharp distinction between the trends in the three-year period 1981-83, in which inflation was high but rather steady, and developments in the two years 1980 and 1984, in which inflation surged to higher levels. In the 1981-83 period the percentage of the population with net income below the poverty line declined by 4.8 percent and the poverty gap of net income narrowed by 10.6 percent. As a result the two poverty indices PS and PF registered a decrease in poverty by 14.1 percent and 22.5 percent respectively. In 1980, in contrast, with the rise of inflation from a monthly level of 3 percent to a level of 7 percent, the Head Count ratio rose by 7.3 percent and the Poverty Gap rose by 5.3 percent. In 1984, as inflation rose further to a monthly level of 15 percent and higher, the Head Count ratio rose by 26.4 percent and the poverty gap rose by 19.4 percent. As a result Sen's poverty index PS rose in that year alone by 45.3 percent, and the index of Foster, Greer, and Thorbecke, PF, rose by more than 60 percent. These results are summarized in tables 8.4 and 8.5 with respect to economic and net incomes, respectively.

Whereas the changes in poverty were dominated by the inflationary shocks, changes in the rates of unemployment during these years appear to have had a

Figure 8.1 - Measures of inequality of total population (net income).



SOURCE: Achdut and Bigman, 1987.

Table 8.4 - Poverty Measures: Economic Income

		1979	1980	1981	1982	1983	1984
Poverty	Index	0.558	0.5659	0.5907	0.5846	0.5897	0.5976
Gap	DLT %	n.a.	1.26	4.38	-1.02	0.86	1.33
Head	Index	0.2358	0.2379	0.2331	0.2513	0.2438	0.2780
Count	DLT %	n.a.	.90	-2.03	-7.83	-2.98	14.00
PS	Index	0.1799	0.1834	0.1852	0.1983	0.1924	0.2203
	DLT %	n.a.	1.95	0.95	7.11	-2.98	14.46
PF	Index	0.1044	0.1075	0.1119	0.1190	0.1152	0.1319
	DLT %	n.a.	2.97	4.09	6.36	-3.25	14.57

DLT % represents the percent change.
n.a. = not available

Table 8.5 - Poverty Measures: Net Income

		1979	1980	1981	1982	1983	1984
Poverty	INDEX	0.2516	0.2649	0.2710	0.2573	0.2396	0.2862
Gap	DLT %	n.a.	5.29	2.39	-5.05	-6.87	19.42
Head	INDEX	0.1622	0.1741	0.1665	0.1606	0.1658	0.2096
Count	DLT %	n.a.	7.30	-4.32	-3.56	3.25	26.38
PS	INDEX	0.0586	0.0674	0.0650	0.0601	0.0579	0.0841
	DLT %	n.a.	14.91	-3.46	-7.59	-3.73	45.25
PF	INDEX	0.0169	0.0209	0.02	0.0178	0.162	0.0260
	DLT %	n.a.	23.85	-4.21	-11.28	-8.78	60.26

DLT % represents the percent change.
n.a. = not available

relatively small effect. In 1981, for instance, the percentage of the population with economic income below the poverty line declined by 2 percent despite the rise in the unemployment rate from 3.8 percent to 4.9 percent. These changes are summarized in table 8.6. It seems that the rise in unemployment in 1981—which may have been caused in part by the rise in the minimum wage rate—worked to offset the effect of that rise in the minimum wage on the poverty gap. It should also be noted that the definition of the poverty line in relative terms as percentage of the median income may work to increase the poverty gap in years when incomes are rising. This may have also reduced the effect of the 1981 rise in the average wage rate by 6.1 percent on the poverty gap.

Figure 8.2 illustrates the trends in poverty by showing the values of the normalized poverty indices. It emphasizes that until 1983 the two poverty measures

Table 8.6 - Selected Macroeconomic and Poverty Indicators

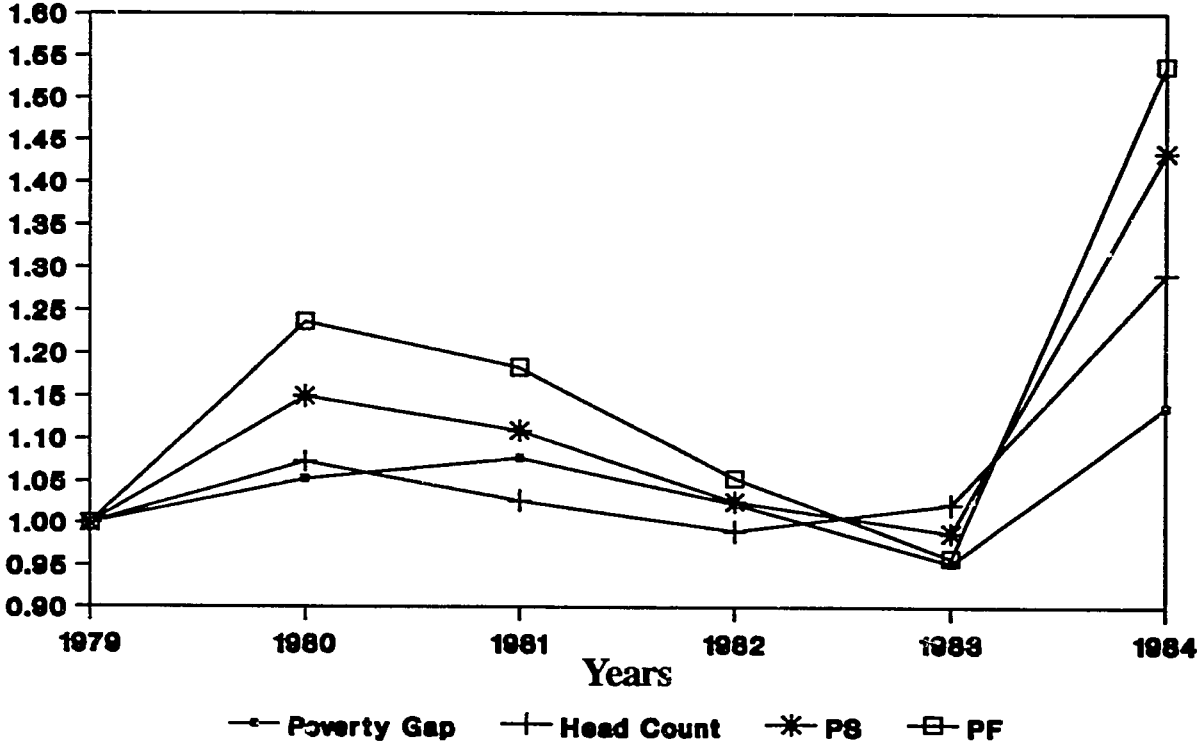
Indicator	1979	1980	1981	1982	1983	1984
Rate of unemployment	3.2	3.0	4.9	4.9	4.6	5.0
Rate of inflation[a]	58.2	109.6	128.4	112.2	138.8	242.8
Real change in the average wage %[a]	+8.4	–1.0	+6.1	+4.0	+4.8	–0.8
Real change in the minimum wage %[a]	–0.7	–15.8	+44.9	+6.4	+7.1	–3.7
Minimum wage as percent of average wage	31.0	26.3	36.0	36.8	37.6	36.5
Poverty line income in 1984 prices (in old Israeli Shekels)	15,351	14,648	15,563	16,330	17,935	17,939
Real change in poverty line income (%)	n.a.	–4.6	+6.2	+4.9	+9.8	0.0
Poverty line as percent of average gross income	39.8	39.6	39.1	40.7	40.4	39.9
Poverty line as percent of average net income	46.6	47.1	46.6	47.6	48.9	50.5

[a]Calculated to fit approximately the fiscal year of the survey, which differs from the calandar year.
n.a. = not available

most commonly used—the Head Count and the Poverty Gap ratios—did not exhibit any clear trend whereas the two indices proposed by Sen and by Foster, Greer, and Thorbecke clearly exhibited the rise in poverty in 1980 and the monotonic decline in 1981-83. The decline in poverty until 1983 took place despite the erosion of economic incomes. From 1979 to 1983 the percentage of the population with economic incomes lower than the poverty line rose by 3.4 percent and their poverty gap rose by 5.5 percent. The large increase in the various social security benefits, however, reversed these trends and brought down the measures of poverty from 1981-83.

In 1979-83 these benefits, the most important of which are the children's allowance, the income support benefits, and the old-age statutory benefits, brought more than 30 percent of the families whose economic income was less than the poverty line to levels of net income above that line and cut in half the poverty gap of those that remained poor. In 1984, however, these benefits were considerably eroded in real terms, and that was the main reason for the rise in the percentage of

Figure 8.2 - Trends in poverty as indicated by the different poverty measures (net income).



SOURCE: Achdut and Bigman, 1987.

Normalization Index

Table 8.7 - Selected Indicators for the Effects of Social Security Benefits

Indicator	1979	1980	1981	1982	1983	1984
(1) Poverty gap-economic income	0.56	0.57	0.59	0.58	0.59	0.60
(2) Poverty gap-net income	0.25	0.26	0.27	0.26	0.24	0.29
(3) Ratio of (2) to (1)	45.0	46.8	45.9	44.0	40.6	48.0
(4) Head count-economic income	0.24	0.24	0.23	0.25	0.24	0.28
(5) Head count-net income	0.16	0.17	0.17	0.16	0.17	0.21
(6) Ratio of (5) to (6)	68.8	73.2	71.4	63.9	68.0	75.0
(7) PS-economic income	0.180	0.183	0.185	0.198	0.192	0.220
(8) PS-net income	0.059	0.067	0.065	0.060	0.058	0.084
(9) Ratio of (7) to (8)	32.6	36.8	35.1	30.3	30.1	38.2
(10) Ratio between average gross income of the poor to average gross income in the population	26.1	25.6	25.5	26.0	27.1	25.3
(11) Ratio between average gross income of the poor to their average economic income	1.64	1.65	1.76	1.71	1.82	1.74

the population below the poverty line from 16 percent to 21 percent and in their poverty gap from 25 percent to 29 percent despite the small increase of less than 1 percent in the poverty gap of their economic incomes.

Table 8.7 summarizes a number of indicators that allow an assessment of the overall affects of the social security benefits. On average these benefits have contributed to the gross income of the poor by as much as 75 percent of its total value, thereby cutting the poverty gap to less than half its size when measured on the basis of the economic income alone. This is indicated by the ratio between the poverty gap with net income to that with economic income. This ratio declined, however, from an average of 46 percent in 1979-81 to 40 percent in 1983 but rose sharply to 48 percent in 1984. These benefits also provided some 30 percent of the poor population with enough additional income to cross the poverty line. This is indicated in table 8.9 by the ratio between the Head Count ratio with net income to that with economic income. These trends are further accentuated by the ratio between Sen's poverty index with net incomes to that with economic incomes, since

this measure summarizes the combined effect of the benefits on the percentage of the poor population and on their poverty gap. The ratio shows that on average poverty was reduced to only one third of its value as an effect of these benefits. These and other indicators suggest that the large increases in benefits that began in 1981 more than offset the negative effects of the inflationary tide in 1980. However, the second inflationary shock in 1984 completely erased these effects of the social security policy. It was this erosion in the social security benefits much more than the erosion in real wages that was responsible for the sharp rise in poverty in that year.

8.4 Cost-Effectiveness of Alternative Welfare Programs

The main effort of the research has been devoted to the analysis of the different poverty-alleviating policies and programs carried out by the government, their direct effects on the poor, and their cost-effectiveness relative to their fiscal cost. Based on this analysis we would be able to propose guidelines for restructuring the government spending on the social welfare programs, so as to maximize their effects on the poor, and eliminating programs that are found to be relatively less effective.

Although this work is still in progress and thus we cannot report on our findings here, we would like to describe in the remaining of the chapter the methodology to be followed in this analysis.

The steps to be followed in the analysis for each individual household are

i. identify the size and composition of each household (number of persons in each household, their age, sex, and employment status);

ii. transform each member of the household into a "standard adult." This transformation should take into account the number of individuals in the household—in order to account for economies of scale in consumption—and their age and sex composition, in order to account for the different nutrition requirements.

iii. using the data on the total income for the household, and its composition in terms of "standard adults," estimate the level of income per "standard adults" in that household;

iv. determine whether the household under consideration is "poor" by comparing the household's average income per standard adult to the "poverty line"—which itself is also defined in terms of income per "standard adult";

v. measure the level of poverty on the basis of one (or more) of the common poverty measures—as a function of the income (per standard adult) of the poor households and the poverty line.

Symbolically, these steps can be summarized as follows: Let

$$Y = (Y_1, \ldots, Y_n)$$

be the vector of incomes per household of the n households in the population and let

$$C_i = (C_i^1, \ldots, C_i^m) \qquad i=1,\ldots,n$$

be the vector describing the number of individuals in each household of each of the m age and sex categories. The number of "standard adults" in the ith household is given by

$$A_i = \sum_{k=1}^{m} a_k C_i^k$$

where a_k is the standardization coefficient. The income "per standard adult" in that household is thus calculated as the ratio $X_i = Y_i/A_i$. By repeating this calculation for all households we obtain the vector X of incomes per standard adult.

$$X = (X_1, \ldots, X_n)$$

The poverty index is calculated as a function of the vector X of incomes per standard adults, and the poverty line z is defined as that income per standard adult below which a person is considered poor. The poverty measure can thus be written in a general functional form as:

$$P(z, X)$$

In addition to z and X the poverty measure is also a function of the weights given to the different individuals and the elasticity of "inequality aversion" which reflects the sensitivity of the corresponding social evaluation function to income inequalities.

The household's income itself has several components such as wages of the working adults, rent, interest, social welfare receipts and payments, etc. Hence Y_i can be written as

$$Y_i = \sum_{j=1}^{J} W_j^i \qquad i=1,\ldots,n$$

where W_j^i is the jth component of the ith household's income. By changing any one of these components we obtain a different vector of the household's incomes. Let X^1 denote the new vector of incomes per standard adults, and let the new poverty measure be $P(z, X^1)$.

Note that in order for P(z, X) to measure the poverty index in the population, the original vector of incomes in the sample must be expanded by the corresponding expansion factors. In the above formulation we assume that this expansion has already been made so that Y is indeed the vector of incomes in the population, and p(z, X) is the poverty measure in the population.

Alternative policies can be simulated and the effects of each policy on overall poverty can be estimated by repeating this analysis, changing at each stage the relevant component of the family's income.

For each alternative we can estimate also the fiscal costs of the program by adding up the costs per family over all the family in the sample and expanding them for the entire population.

Consider, for example, the social welfare payments given to the members of the household who belong to a certain age category (e.g., child allowance). The total fiscal costs are given by

$$F(d_k) = \sum_{i=1}^{n} C_i^k d_k,$$

where d_k is the social welfare payments given to household members of the k category. Given these payments we can calculate the corresponding poverty measure $P[z, X(d_k)]$, where $X(d_k)$ represents the vector of incomes per standard adults that result from these payments.

Consider now another program and assume that it consists of welfare payments to a different category, say p. The first step is to calculate the size of welfare payments to members of the p category that equate the total fiscal costs on the second program to those of the first program. These would be given by dp, where

$$F(d_k) = \sum_{i=1}^{n} C_i^k d_k$$

$$= \sum_{i=1}^{n} C_i^p d_p = F(d_p)$$

Given these welfare payments and the predetermined poverty line, the second program will be (strictly) more cost effective than the first in alleviating poverty if and only if

$$P[z, X(d_p)] < P[z, X(d_k)].$$

A number of comments should be made with respect to this criterion

1) In addition to the direct welfare payments one should take into account the program's administrative costs. This can be done without difficulty by changing appropriately the calculation of the fiscal costs $F(d_k)$, adding to the direct payments the indirect administrative costs.
2) If data are available on the degrees of coverage of the different welfare program, this factor must also be taken into account by extending properly the poverty index.
3) Although the poverty measure is a cardinal measure its numerical value depends on the predetermined value of the corresponding (subjective) weights and of the inequality aversion elasticity. Hence, although this criterion can be used for ordering different program, it cannot be used for answering questions such as "by how much is one program more cost effective than the other" without at least making explicit the underlying assumptions.
4) The main difficulty in using the above criterion for comparing alternative welfare program is that although poverty is an important characteristic of the income profile in the economy, it is only one of several (at least two) parameters that characterize the welfare of society at large. It is, therefore, possible that even though the criterion based on the poverty measure may indicate that the second program is more cost effective than the first, society will still be better off with the first program. Two possible effects of the programs may lead to this apparent contradiction. One is that the first program may be more effective with respect to the "poorest of the poor" but less effective with respect to less poor families. If society is highly sensitive to the depth of poverty it may still prefer the first program. Another possibility is that while the second program is much more effective with respect to the non-poor it is not as effective with respect to the poor themselves. If society is sensitive to poverty, it may still prefer the first program.

In order to establish that one program is unequivocally better than the other, one has to show that one welfare program dominates the other, i.e., is preferred for all possible levels of the 'poverty aversion' elasticity (which reflect, in turn, all possible sensitivities to poverty).

While there are several ways to examine the welfare (or "stochastic") dominance relationship, the one most suitable for our analysis is the one which is built upon the poverty measure itself. According to this criterion, one program welfare dominates the other if and only if

$$P[z, X(d_p)] < P[z, X(d_k)]$$

for all possible levels of the poverty line z. In practice the way to extend the latter criterion of cost-effectiveness is to compare the corresponding poverty measures for several plausible poverty lines (rather than all possible levels).

By means of this sensitivity analysis we should be able to determine how effective government spending on the existing social welfare programs is and what policy changes should be made in order to effectively diminish the width and depth of poverty.

9. DISTRIBUTIONAL IMPLICATIONS OF GOVERNMENT TAX AND EXPENDITURE POLICIES: ISSUES, PROBLEMS, AND METHODOLOGY

Thanos Catsambas*

Our knowledge about distributional consequences of stabilization policies in developing countries is still very limited. Jean-Jacques Dethier (1986) has called this "a scandalous omission," but, realistically speaking, an endeavor to obtain such knowledge would confront methodological and empirical difficulties of major proportions. It is not surprising, therefore, that research on these issues has so far been limited in scope and methodological breadth. General methodologies that appear suitable for this kind of investigation are Computable General Equilibrium (CGE) models, Social Accounting Matrices (SAM) methodologies, and ad hoc partial equilibrium studies. In a sense, different techniques bring about a refreshing variety of insightful approaches. After a period of experimentation, however, it became apparent that, to a certain extent, the different methodologies also defined (explicitly or implicitly) the problem itself instead of the other way around. Therefore, the identification of a consistent methodology for the evaluation of the short-run effects of adjustment programs could be a great step towards long overdue research coordination in an important area of public policy.

This chapter addresses the methodological issues arising from the measurement of the distributional impact of tax and expenditure policies, especially their impact

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on the poor.[1] It is a companion paper to an earlier International Monetary Fund (IMF) Occasional Paper (1986) that provided a general introduction to the conceptual and empirical problems associated with the measurement of the distributional implications of Fund supported adjustment programs. That paper stated that although "the official Fund position on distributional issues remains that distributional policies are entirely a sovereign issue ... if the authorities ask the Fund to evaluate alternative approaches to meeting their distributional concerns the Fund is (and has been) prepared to do so" (IMF, 1986, p. 4).

This chapter is part of the Fund's continuing interest in addressing distributional concerns of member countries and in attempting to quantify the impact of adjustment programs. However, the views expressed herein are personal and do not reflect the Fund's final methodological position, as active research is still going on in this area. The emphasis will be on the exposition of an analytical framework for a conceptually consistent treatment of tax and expenditure policies, following an evaluation of the existing trade-offs between theoretically desirable but empirically infeasible approaches to the measurement of the distributional impact of fiscal policy.

The chapter consists of two parts. The first discusses the fundamental issues involved in the assessment of the impact of fiscal policies on income distribution. Major topics include the time frame, the distinction between primary and secondary income distribution, the measurement of nominal versus real incomes, the choice of the unit of observation, and the measurement of the informal sector. It also discusses the usefulness and relevance of general equilibrium methodologies for the evaluation of distributional effects in the short-run. The second part develops a consistent analytical framework for assessing the short-run distributional impact of budgetary revenues and expenditures. At the end suggestions for future research and the expected data requirements are pointed out. The suggested analytical framework should be viewed as the best compromise between conceptual optimality and practicality, especially in the face of severe data constraints within countries undertaking adjustment programs.

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1 Following Addison and Demery (1985), the term "income distribution" in this paper should be understood to cover both the issue of inequality and the incidence of poverty.

9.1 The Fundamental Issues

9.1.1 The Time Frame

An important conceptual consideration is the choice of the time frame for the analysis. The time frame (short-run versus medium- and long-run) is intimately related to the distinction between "stabilization" and "structural adjustment" programs. Typically a stabilization program places emphasis on demand management and attempts to move the economy towards full capacity for a given macroeconomic equilibrium. On the other hand a structural adjustment program focuses primarily on supply-side effects and attempts to increase the productive capacity of the economy, that is, to change the point of macroeconomic equilibrium.

But such a distinction is loose and not always valid. To identify, for example, changes in relative prices exclusively with structural programs, as some researchers have suggested, would conspicuously ignore the presence of exchange rate policies in the majority of IMF-supported stabilization programs.

Heuristically speaking, therefore, the most constructive approach to the question of the relevant time frame is to accept axiomatically the existence of a "J" curve in the economy's trajectory and measure the short-term costs of the adjustment before considering the existence of (potential) longer-term benefits.

If instead of dealing with income distribution as a whole the focus is primarily on the poor, the argument in favor of a short-run approach becomes even more compelling. Pinstrup-Andersen (1987) convincingly states that "even if the ultimate benefits to the poor of adjustment programs could more than offset their short-run losses, the absolute poor may be unable to deal with the short-term losses, even with the expectations of large longer-run gains, because they are already operating at the minimum subsistence level with few or no opportunities for borrowing to carry them over until the long-term benefits materialize. This is why the short-term effects on the poor are so important."

9.1.2 Primary versus Secondary Income Distribution

Stewart's (1983) distinction between primary and secondary income distribution highlights the importance of using the appropriate methodology for analyzing the distributional impact of fiscal actions and, additionally, of differentiating between the short- and the longer-term. Other studies have recognized the importance of making such a distinction (e.g., Thorbecke, 1987a; OECD, 1986).

Paraphrasing (and generalizing) Stewart's definition, the primary income distribution is determined by the institutional setting of the economy, whereas the secondary income distribution is derived from (and is directly linked with) the distributional implications of fiscal actions. Admittedly there is a conceptual problem with this reasoning insofar as government is part of the institutional setting

of the economy and, therefore, major fiscal actions would necessarily involve changes in that setting. However, the nature of adjustment programs usually supports the presumption that, because fiscal policy actions are typically limited and budgetary measures are marginal, the fiscal outcome does not per se affect the institutional setting of the economy (de Wulf, 1980). This presumption is reinforced by the short-term horizon of this analysis.

9.1.3 Nominal versus Real Incomes

Another important consideration relates to the interface between the impact of the fiscal instruments on nominal incomes and the impact of the total adjustment package on inflation, which will determine the real incomes of the income groups.[2] Even if an adjustment program comprised only fiscal measures, it would still be difficult to isolate a priori the inflationary implications of each individual instrument. But given that all adjustment programs involve a host of other policy instruments (credit policy, exchange rate policy, wage and price policies), it would be entirely futile to try to identify a priori the impact of fiscal actions on the real incomes of individuals. Instead, the assessment should be done in two separate steps: first, the calculation of the impact on nominal incomes; second, the calculation of real incomes based on the observed movements of the price level. In that respect, a conceptual inconsistency appears unavoidable in the area of the public sector insofar as price changes will reflect the whole adjustment package and not just the impact of the fiscal measures.

9.1.4 The Unit of Observation

Different methodologies of income distribution use different units of observation for their measurement. More frequently than not, the choice is dictated by the underlying structure of the methodology. General equilibrium methodologies, for example, typically use the functional criterion, that is, the split between labor and capital income, because of the use of such aggregates in the production function analyses on which those models are based. SAMs (and, more generally, input-out-

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2 Addison and Demery (1985) correctly point out the significance of deflating each socioeconomic group's income by the relevant cost of living index. They cite a study on Sri Lanka (Lee, 1977) in which the real income of the bottom 60 percent of the distribution was found to have fallen between 1963-73, although the money income share of that group rose over the same period. The discrepancy was due to the increasing relative price of food grains, which constitute a large portion of the budget for the lower deciles. To what extent such a calculation is generally feasible in developing countries is an open question.

put methodologies) focus on an institutional split among households, enterprises, and government.

Incidence analysis—which is at the heart of the microeconomic approach to income distribution studies—is fundamentally invariant to the unit of observation chosen for the empirical implementation of the project. At the conceptual level, the issues of incidence analysis are the same, whether one attempts to assess the distributional impact by income group, by region (e.g., urban versus rural), by profession, or by any other criterion. The basic unit of observation is the individual (or the household), because public finance theory and welfare analysis recognize that only people bear the burden of taxation or enjoy the benefit of budgetary expenditures. This reasoning suggests that the choice of the unit of observation should be based on criteria other than the convenience of the methodological approach, and there is little doubt that the individual is the unit of observation that best captures the essence of distributional considerations.

9.1.5 The Measurement of the Informal Sector

There is one significant aspect of measurement at the most general level, namely, the treatment of the informal sector. The informal sector is known to play a major role in the type of economies under consideration and to reflect a high degree of the incidence of poverty in the economy. There are different characterizations of the informal sector (see, e.g., Addison and Demery, 1985, and Dethier, 1986), but its importance for the purposes of budgetary incidence usually lies with lost revenue due to tax evasion. Fundamentally, the principal question is whether inferences based on official statistics alone adequately and accurately reflect all the economic channels of adjustment policies. If data on household income, consumption patterns, and direct taxes were reliable and gathered independently, one could in principle observe an asymmetric, yet conceptually valid, treatment of the informal sector, in the sense that it would escape the taxation but at the same time take advantage of government expenditure policies. It is very unlikely, however, that incomes are estimated independently of tax payments or that household income and expenditure surveys will be compatible with National Income Accounts data. In such circumstances the feasibility of a proper measurement of the informal sector is seriously compromised, and the appropriate evaluation of the impact of an adjustment program remains an open question.

A corollary of the measurement question related to the informal sector is whether inequality in general and poverty in particular can be adequately measured by income statistics alone or whether more specific criteria should be utilized. For the general question of inequality both theoretical and empirical arguments suggest that expenditure statistics may be more reliable than income statistics as an index of welfare. For poverty in particular specialized indicators for health and nutrition may

be necessary, which obviously go beyond the routinely collected economic statistics.[3] At the present state of knowledge the utilization of criteria other than a measure of real incomes for the purposes of this study appears infeasible.

9.1.6 General versus Partial Equilibrium Analysis

As alluded to earlier the most important corollary stemming from the fundamental issues discussed above concerns the choice of the analytical methodology for assessing the distributional implications of an adjustment program, particularly its fiscal components. It is obvious that given the broad scope of the issue and the anticipated data limitations, the choice of the appropriate approach will necessarily involve some trade-off between theoretical superiority and operational practicality. Nonetheless, certain conceptual issues can be decided a priori.

The macroeconomic approach to income distribution, exemplified by CGE and SAM models, is based on the structure of production, employment, and demand. Proponents of this approach (e.g., Thorbecke, 1987a; Pyatt, 1987) typically argue that such models are best suited for calculating the changes in relative income shares of functional groups, in particular capital and labor, because general equilibrium methodologies ensure that the transmission of macroeconomic impulses throughout the economy is properly accounted for. The analysis of a CGE, for example, is typically confined to the functional (or extended functional) breakdown of income shares, reflecting the affinity of those models with the neoclassical theory of distribution through the use of a stylized split between capital and labor income.[4] Such an approach, unless complemented by a separate methodology, may seriously limit the usefulness of CGE and SAM models for assessing the impact of fiscal measures on poverty, since a comprehensive definition of the poor clearly transcends the functional distribution of income. Huang (1987) summarizes this concern as follows:

> The fundamental relationships employed by these models link output and labor demand to the price and cost factors influencing sectoral profitability. The impact of macro-policies on income distribution is generally analyzed within this framework by considering the short- and medium-term effects of price changes and the medium- to long-term income and employment effects of factor move-

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3 However, even a direct, simplistic link between nutrient intake and health status has been challenged (chapter 11).

4 For a clear understanding of the controversy on the role of a CGE macro specification, especially of the closure rules, on the distributional results, see Adelman and Robinson (1988).

ments. While such analysis may reveal changes in the aggregate distribution of income, it is more difficult to trace what happens to the income levels of specific socioeconomic groups defined by their pre-adjustment source of livelihood.

The time frame of general equilibrium methodologies is an important factor in determining their relevance for distributional considerations. CGE and SAM models examine steady-state conditions at two points in time but generally remain silent about the real time path implicit in their calculations. Since a general equilibrium approach necessarily allows for behavioral changes, it may prove an unrealistic choice for the short-term horizon required by the focus of this investigation. In the words of Bourguignon (1987), "a macroeconomic approach to income distribution phenomena must ideally be complemented by a direct analysis of distributional changes during the adjustment period, as well as outside that period in order to have a basis for comparison" (original emphasis).

Finally the data requirements for general equilibrium models are usually enormous and would far surpass the capabilities of a typical country that initiates an adjustment program. Moreover, the application of a CGE critically depends on certain parameter values, which, unless assumed a priori, would be very difficult to estimate econometrically from the data base normally available in those countries. One could argue that partial equilibrium methodologies have similar informational requirements, except that they choose to ignore them by implicitly assuming several zero elasticities. This is a valid argument, but in principle the question still remains whether the potential margin of error is greater with zero values and a short-term outlook or assumed nonzero values and a longer-term horizon.

In any event the weakest aspect of CGE and SAM models for distributional purposes remains their link with the primary income distribution and the factorial allocation of income. The heterogeneity in the occupations of households within the lowest income groups (e.g., landless farmers, small agricultural holders, urban skilled workers) makes the factorial distribution less appropriate to represent the reality of developing economies. This limitation is clearly recognized by Thorbecke (1987a), one of the leading proponents of CGEs, who clearly states that "whereas a SAM type model might explain the determination of total incomes accruing to different socioeconomic groups, such a model, by itself, does not generate the intra-group income distributions. Additional information has to be grafted upon the SAM to capture the initial within-group distributions and some mechanisms added to the model yielding the new post-adjustment SAM values which would provide the corresponding new distributions."

The methodology for such an endeavor in the case of taxes and expenditures is the theme of the remainder of the chapter.

9.2 Towards an Analytical Framework of Fiscal Incidence

9.2.1 Effective and Net Fiscal Incidence

In the area of income distribution the concept of incidence is an indispensable prerequisite for any kind of distributional investigation. Their linkage is intimate because incidence is the direct result of a fiscal action even in the absence of conscious redistributional policies. Whether the budget is used for any of the three Musgravian classifications (stabilization, distribution, resource allocation), taxation reduces real resources available to individuals and expenditure increases real income. The net effect of the budget could thus be analyzed to show what groups of the population receive a net benefit from the budget, what groups are net contributors to the budget, and how the end result affects the original income distribution of the population.

Figure 9.1 - Stages of impact of government budget: their conceptual equivalence

Taxes		Expenditures
1.Statutory incidence: tax collections	⟷	Impact incidence expenditure disbursements
2.Operational effective incidence tax burdens	⟷	Operational effective incidence expenditure benefits
3."General equilibrium" incidence: behavioral changes, direct and indirect effects	⟷	"General equilibrium" incidence behavioral changes, direct and indirect effects

Two concepts are of critical importance in this area: First, the concept of "effective incidence," and second, the concept of "net fiscal incidence."

By effective incidence we mean the ultimate resting place of a tax burden or an expenditure benefit. Effective incidence is thus to be distinguished from statutory incidence, which is based on the letter of the law, and from intended or expected incidence, which is based on the spirit of the law. Statutory incidence will at best provide us with the dollar flows of, say, a tax instrument, such as the corporate profits tax. However, corporations, even though they may pay taxes, do not bear the burden of taxation; only people do. It is therefore important to estimate the effective incidence of a tax instrument, that is, to calculate the tax burden on people in their capacity as consumers, as workers, or as capitalists. In the case of the corporate profits tax, for instance, it would be safe to assume that the statutory and

the intended incidence coincide but that the effective incidence is sharply different. However, it is not always the case that the statutory and the intended incidence coincide. For many excise taxes the statutory incidence is on the wholesaler or manufacturer (for reasons of administrative simplicity), but the intended incidence is clearly on the final consumer. In this case, therefore, the intended and effective incidence coincide, but the statutory incidence is different.

By net fiscal incidence we refer to the estimation of both tax burdens and expenditure benefits and the derivation of the overall impact from the activities of government. For many decades the expenditure side of the budget was ignored and the concept of incidence was identified exclusively with the allocation of the tax burden. Today all researchers recognize the need to account for expenditure incidence as well, but progress in this area lags well behind that on the tax side because expenditures are more varied than taxes and are conceptually more difficult to classify. The most intriguing aspect is usually the lack of conceptual consistency with the tax side in the sense that expenditure benefits are conceptually treated differently from tax burdens. The clarification of this issue and its methodological implications for research are one of the main topics of this chapter.

9.2.2 Tax Burdens and Expenditure Benefits: Their Conceptual Equivalence

Figure 9.1 depicts diagrammatically the levels of impact of the government budget in terms of various concepts of incidence, from the less to the more sophisticated, but at the same time from the easier to the more difficult to estimate. A movement from (1) to (3) entails an improvement in the underlying theoretical considerations and, in principle, the last group of this taxonomy would be the most appropriate concept to employ, since it would involve both direct and indirect effects. As explained earlier, however, computable general equilibrium methodologies are inadequate for dealing with personal income distributions, and the resulting empirical complications render this stage impractical.

At the other extreme tax collections and expenditure disbursements simply correspond to the concept of statutory incidence, which is analytically meaningless. We thus conclude that the stage termed "operational effective incidence" is the best compromise for a conceptually sound and empirically feasible concept for the estimation of the fiscal impact of adjustment programs on income distribution.

Figure 9.1 clearly delineates the limits for a congruent treatment of the tax and expenditure side and suggests the degree to which any deviation (intentional or not) from a symmetrical procedure may have a bearing on the desirable notion of "net fiscal incidence."

The most striking discrepancy can potentially occur in the treatment of the expenditure side, especially as regards the difference between the economic and the

functional classification of expenditures. CGE and SAM models, for example, clearly look at the economic classification of expenditures, since it is only through it that one can trace the dollar flows to sector and industries of the economy. Yet it is apparent (or, at least, should become apparent on simple reflection) that if a conscious decision has been made to estimate the operational effective incidence, only the functional distribution of expenditures is relevant. There are serious conceptual issues in splitting expenditure categories according to meaningful functional groups, and those will be discussed below; but in principle, only a functional classification of expenditures could reflect effective incidence, that is, the impact of the spending programs according to the services they provide to households.

9.2.3 Incidence Issues on the Tax Side

The principal issue on the tax side is the estimation of effective incidence for those taxes that are believed to be shifted from their statutory liability. For the purposes of this project five broad categories would sufficiently capture the necessary degree of detail: (1) personal income, (2) corporate profits, (3) social security, (4) sales and excise (including customs duties), and (5) property taxes. Typical adjustment programs may streamline the personal and the corporate profits tax, but the bulk of the necessary revenues usually comes from excises, notably on tobacco, beer, and petroleum products, as well as import and export duties. Changes in property taxes or social security contributions are not prominent in adjustment programs (IMF, 1986).

Conceptually, the most controversial incidence issue relates to the corporate profits tax, but its quantitative significance in adjustment programs is rather limited. Personal income taxes are usually assumed to remain unshifted, an assumption generally valid for wage earners and salaried personnel but not necessarily true for professionals. Social security contributions can be in principle shifted either backward or forward, but in light of some early research the empirical significance of such a distinction is limited (Brittain, 1972).

Methodologically, an interesting case is presented by the excises, especially those levied on intermediate goods such as petroleum products. Although there is usually little doubt that the intended and effective incidence coincide (i.e., the burden of the tax falls on final consumers), there is reason to believe that the regressivity of consumption taxes may have been overestimated. For, even with the assumption of full forward shifting, the burden of taxes imposed on intermediate goods will necessarily fall on wider groups of consumers than those in direct final consumption of the excisable product. Accounting for the differential impact of taxes levied on intermediate commodities can be achieved by using interindustry information on the economy through an input-output analysis. Earlier results of such

an investigation for the American economy have indicated that, although the incidence of excise taxes is on the whole regressive, their distributional impact may not be as inequitable as the traditional methodology implies (Catsambas, 1982a).

In summary, the tax side does not present insurmountable conceptual or methodological difficulties, although the empirical implementation might be seriously hampered by a possible unavailability of the necessary statistical information.

9.2.4 Incidence Issues on the Expenditure Side

Unlike the estimation of tax burdens, which is derived from an extensive body of economic theory, albeit with uncertain results due to some controversial issues, no comparable theoretical framework supports the analysis of expenditure incidence. Many studies raise important questions on the expenditure side and even attempt to provide some answers, but only a few have consciously utilized a consistent analytical framework. The notable examples are Meerman (1979) on Malaysia and Selowsky (1979) on Colombia. The complications arising on the expenditure side of the government budget are partly due to the extensive number of programs and the objectives for which those programs are designed. Conceptual problems are also generated by the fact that most expenditure items fall somewhere between the "pure private good" and the "pure public good" of economic theory.

However, by far the most important limitation in the benefit allocation of government expenditures is the lack of an economic theory of benefit incidence that parallels the theory of tax incidence. The problem is summarized below.

The various influences that are generated by budget expenditures can be divided into three successive stages of impact. First, the outlays generate incomes to the recipients of the payments. Second, spending programs provide services to beneficiary groups that might otherwise have been out of reach for them. Third, the expenditure activity of the government sets in motion economic forces which, over a longer period, may influence the behavior of rational economic actors, thus altering the economic environment of decision-making units.

These three stages correspond to the delineation of figure 9.1, moving from impact to general equilibrium analysis. Having ruled out a general equilibrium approach for the reasons explained earlier, an analysis of expenditures symmetrical with that of taxes would require us to use the concept of operational expenditure incidence (stage 2), under which the true beneficiaries of the government programs would be identified.

Unfortunately, in some important cases (notably pure public goods but also some merit goods as well) it is nearly impossible to identify even the initial beneficiary. In the case of private goods provided through the budget this may reflect our limited knowledge about the technical characteristics of the goods and services and of

people's preferences. In the case of public goods this additionally reflects the complete absence of the market mechanism, which in turn is the raison d'etre for the public sector itself. In any case, unlike the tax side where the statutory payer of the tax is always known, on the expenditure side even the first-order beneficiary of a program may not be promptly identifiable.

This has led many researchers to limit themselves to the tracing of the expenditure disbursements as income flows to the various economic sectors where payments are made (stage 1 of figure 9.1). This approach would not only be inconsistent with the treatment of the tax side, as explained earlier, it would additionally make little sense for evaluating the impact of an adjustment program on the poor.

There are two fundamental reasons behind this assertion. First, changes in public spending by economic classification, such as public sector employment and wage freezes or reductions, basically affect middle-income groups, that is, civil servants, and not the poor. Second, the poor are the consumers of the services of government programs, and the curtailment of such services under an adjustment effort would affect their real incomes. Classical examples are health and education expenses: if we were to allocate the benefits from these programs to, say, doctors or teachers, our reasoning would be equivalent to ascertaining that the beneficiaries from national defense expenditures are only the soldiers and the officers of the armed forces! Yet all the models that use the economic classification of expenditures implicitly make this odd assumption. If we wish to concentrate on poverty the irrationality of this approach becomes even more obvious: changes in current or capital expenditures for health and education programs do not affect the poor in terms of money flows, because it is obviously the middle class that receives the government paychecks. The poor, however, are severely affected by the curtailment of services that the retrenchment of those programs implies. It is therefore the measurement of those services that would reflect the true beneficiaries of a government program and would indicate how they are affected by an adjustment effort.

9.2.5 Measurement of Net Fiscal Incidence

This reasoning suggests the following four-stage measurement process: first, the grouping of the tax and expenditure items by sets that can be treated homogeneously in terms of conceptual incidence; second, the identification of effective incidence either by estimation or by hypothesis; third, the use of an appropriate statistical series for the allocation of the tax burden or the expenditure benefit according to income class; fourth, a comparison of the postadjustment distribution with the preadjustment one and the drawing of conclusions about the changes in relative income positions.

The choice of income concept in incidence calculations is an important consideration, because it affects the inferences about the redistributive impact of fiscal policy. The basic issue is what taxes and transfer payments, if any, should be included in the income concept. A measure of income that includes taxes and transfers implies a definition that changes as shifting assumptions change. Therefore, in comparing a post-adjustment distribution with the preadjustment one, it may be difficult to separate the effects of actual fiscal measures (tax and expenditure changes) from the differential definition of the income base. For that reason many authors prefer to use an income measure, which, depending on their particular framework, stays invariant to changes in the incidence assumptions.[5]

A second important consideration is the use of the "counterfactual," that is, the hypothetical situation with which the postadjustment situation should be compared. Huang (1987) aptly distinguishes three cases: first, the "before and after" method, which involves a simple comparison of income distribution before and after an adjustment program; second, the "actual-versus-no-action" approach, which would compare what actually happened with what would have happened without adjustment; and third, the "actual-versus-optimal" approach, which would compare the actual postadjustment situation with a hypothetical result under an "optimal" set of policies.

In my opinion the concern about the counterfactual has been exaggerated. Not only does the name itself imply a futile endeavor, but any attempt to introduce simulations of some hypothetical developments would introduce a margin of error of unknown magnitude in relation to the simple comparison of the first method. It is, of course, true that under an extended time perspective the counterfactual argument becomes more relevant for two reasons: first, the recognition that an adjustment effort is itself the consequence of an unsustainable disequilibrium over the medium-term; second, the expectation that adjustment measures will also have allocative effects and that, consequently, supply considerations and the sources side of income will need to be taken into account. In these circumstances the global effects of an adjustment effort must be compared with the hypothetical situation that would have prevailed in the absence of such an effort. However, within the short-term framework of this analysis and the emphasis on the uses side of income, the before-and-after method seems perfectly acceptable.

9.2.5.1 The Tax Side. On the tax side the grouping of taxes by the five major categories mentioned earlier should be sufficient for all practical purposes. An

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5 For a thorough exposition of these and related issues, see Whalley (1984).

estimate of the burden of direct taxes is usually available through the calculation of disposable income in the National Income Accounts but could also be estimated in a rather straightforward manner. The burden of all indirect taxes can be allocated either directly by final expenditure or through the use of an input-output table. The burden of the corporate profits tax will have to be allocated according to an estimated or assumed incidence assumption on final consumers, wage earners, or shareholders. In the absence of econometric evidence alternative allocations may be unavoidable for sensitivity analysis.

The empirical estimation requires direct data on the burden of direct taxes and detailed consumption data for all the indirect taxes and the alternative shifting hypotheses of the corporate profits tax and the social security tax. The use of proxies, such as employment data instead of consumption data, may turn out to be necessary in certain cases. It is also possible, indeed likely, that the use of a general consumption series, such as sales data, may be the fallback position for many indirect taxes for which detailed expenditure data by income class may be unavailable.

9.2.5.2 The Expenditure Side. The conceptual difficulties with the incidence of expenditures discussed earlier suggest that the distributional impact of an adjustment program be evaluated for two broad categories: first, expenditures that directly reduce the real incomes of individuals both from the sources side and from the uses side; second, expenditures that affect the welfare of individuals through the reduction of goods and services available to them.

The first category would include transfer payments, interest payments, and subsidies, and the second category would include all private and public goods. By private goods provided through the budget we mean goods and services for which beneficiary groups can in principle be identified, as for instance would be the case of programs for the satisfaction of merit wants. By public goods we mean programs aimed at satisfying social wants for which no specific beneficiary can be identified. The market cannot satisfy such wants, because people cannot be excluded from the benefits and are consequently unwilling to engage in voluntary payments.

Transfer payments are conceptually equivalent to direct taxes, and subsidies are conceptually equivalent to indirect taxes. Therefore the benefit allocation should in principle be no more complicated than the burden allocation of the corresponding taxes. In this case transfers and subsidies will have to be derived from the economic classification of government expenditures for all programs affected by the cutbacks.

Subsidies, particularly food subsidies, deserve special attention because of their predominant position in most adjustment programs (see IMF, 1986). The subject has been extensively researched. Yet a few methodological remarks are in order. First, it is important to define a correspondence between the socioeconomic groups identified in food subsidy research and the general classification of income classes

to be used in other parts of the project. Food subsidy studies tend to use highly sophisticated techniques, but the disaggregation of income groups is not always compatible with the traditional income classification (see, e.g., Yitzhaki, 1987). Second, it is also important to recognize that while food subsidies may have a positive effect on the uses sides for consumers, they could also have a negative effect on the sources side for small agricultural producers (Schneider, 1985). The net impact of those two effects would have to be appropriately measured for an overall assessment of the distributional implications of food subsidy programs. Namor (1987) provides a thorough review of the various facets of the food subsidy question.

The second broad category would include all "private" and "public" goods. The classification of spending programs between private and public goods is not always easy. This is most likely to be true for a number of capital expenditures, although operational experience teaches that one should be very cautious in making a distinction between current and capital expenditures, not only for conceptual but also for practical reasons. Highways are a good example of the dilemma: services from this program accrue to identifiable (at least in principle) individuals. However, with reasonable accuracy, it is also arguable that these outlays should be considered as "social overhead expenditures" and that they should therefore be classified as "public" goods.

To retain internal consistency in the methodology of this project the only operationally feasible criterion is to base the split between private and public goods on the notion of "allocable public expenditures" (Musgrave, Case, and Leonard, 1974). According to this yardstick, which admittedly contains a degree of circular reasoning but hopefully ensures a consistent framework, private goods are those expenditures for which a subset of society can be identified as a direct beneficiary and for which a direct imputation is possible. By elimination all other expenditures are public goods. According to this classification private goods would comprise only wages and salaries, other purchases of goods and services, and, where relevant, net lending. On the other hand public goods would be a distinct category in that it would include total amounts of all expenditures for the programs involved.

Figure 9.2 presents a schematic outline of the expenditure methodology suggested in this chapter. Expenditures for a typical country with an adjustment program are presented in a matrix form where rows depict the functional classification and columns the economic classification. According to the suggested methodology, the grouping of expenditures would take the following form: subsidies, transfer payments, and interest payments would be directly attributed to individuals in their capacity as consumers of the private goods affected by the expenditure cutbacks, as producers of the subsidized commodities, or as direct recipients of money incomes. Wages and salaries, other purchases of goods and

Figure 9.2 - Conceptual classification of government expenditures for incidence purposes.

Economic Classification / Functional Classification	Capital Expenditure		Net Lending	Current Expenditures				
	Fixed Capital Formation	Capital Transfers		Wages and Salaries	Other Purchases of Goods and Services	Subsidy Payments	Transfer Payments	Interest Payments
Public Goods								
General Public Services								
Defense								
Public Order and Safety								
Natural Resources								
Private Goods								
Education								
Agriculture								
Health								
Housing and Community Service								
Economic Services								
Social Security								
Interest Payments								

services, capital expenditure, and net lending would be identified with the appropriate functional programs, and the allocation of benefits would follow the identification of the relevant beneficiary group. If in a particular category, for example, social security, the predominant type of expenditure is a transfer payment, then other types of expenditures would be prorated to the direct beneficiaries of the transfer programs. Analogous reasoning would suggest that wages, salaries, and other purchases in, say, agriculture would follow the distribution of subsidy payments to the individual beneficiaries. Needless to point out, there may be several zero entries in the matrix of figure 9.2. Finally, public goods would be treated as a separate category comprising all types of government spending.

For private goods the degree of sophistication in the techniques to be utilized for identifying the beneficiaries of individual expenditure programs will largely depend on the resources available for the completion of the project and the quality of the underlying statistical information. For example, in a methodologically exemplary study on the distribution of expenditure benefits of Malaysia, Meerman (1979) used a very detailed sample survey for exploring household use of public outputs. Moreover, he used econometric techniques to analyze household consumption of utilities, that is, to test the presumption that access to a service (electricity, water, and sewage disposal) and effective demand are identical. In most developing countries such methodologies would be impractical. At a minimum, however, the allocation of program benefits would require statistical series reflecting the consumption of services offered by those programs by income groups, such as enrollment in different levels of education, health expenditures, and hospitalization.

The importance of an accurate evaluation of the benefit incidence of social programs cannot be overestimated. Behrman (1988a) cites Jimenez (1984) as concluding (for a number of developing countries) that "the present distribution of subsidies [in-hospital care and university education] tends to be highly skewed towards higher income groups, who obtain greater access to more costly social services ... even if they are uniformily free for all." The surprising corollary of such a conclusion would be that a cutback in health and education expenditures would have desirable distributional consequences![6]

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6 Once again, one must be careful to distinguish between income distribution and poverty. The "desirable" distributional consequences refer only to the *relative* positions of individuals. However, in an absolute sense a cutback in social expenditures may have serious consequences for the poor, who may be unable to cope with the reduction in the provision of social services, especially in the area of health.

It is worthwhile pointing out at this juncture that the lack of unifying theoretical propositions on expenditure incidence makes it impossible to allow for benefit "snatching" or "relinquishing" by the original beneficiary, and implies only a direct attribution to households of the quantity of services provided by the budget. Thus, although conceptually we are still operating at stage 2 of figure 9.1, the effective incidence of expenditures coincides with the nominal incidence. Although this approach may overlook some cases of snatching or relinquishing (the counterparts to shifting hypotheses on the tax side), it is nevertheless an improvement over the methodology (identified by stage 1) that attempts to determine the direct dollar flows either by type of economic expenditure or by program.

There remains the problem of public goods. There is a vast literature on the theory of public goods, which goes much beyond the scope of this chapter. The distributional implications of public goods have been dealt with in a seminal paper by Aaron and McGuire (1970), and the theory has been extended and modified by Maital (1973), Brennan (1976), and Catsambas (1982b). Basically, we remain agnostic about the true preferences of individuals and any attempt at allocating public goods benefits is bound to depend on arbitrary assumptions about the structure of preferences and the value of some critical parameters. One pragmatic solution would be to assume that the benefits are proportional to the post-fisc income distribution (excepting public goods) and, therefore, to ignore their redistributional impact. Otherwise, the use of alternative assumptions—per capita allocation, a function of income, a function of wealth—appears inevitable.

Regardless of how public goods benefits are allocated to households, the focus should remain on the assessment of the benefits from the programs, not on the dollar flows of the programs. Nonetheless, the distributional implications of public goods within the context of an adjustment program will probably remain the weakest aspect of the exercise.

9.2.6 Directions for Future Research and Data Requirements

Both conceptual and empirical considerations point to the fact that research efforts in the future should be concentrated on the expenditure side of the budget. The tax side, apart from the existence of a strong theoretical background for incidence analysis, is less important for two reasons. First, empirical evidence suggests that the distributional impact of taxes is basically neutral. This has been shown to be true for countries ranging from the United States (Pechman and Okner, 1974), to Taiwan, Malaysia, and Nigeria (Stewart, 1983). For developed countries the basic explanation is that the nominal progressivity of the individual income tax (the principal distributional instrument in the fiscal area) has been eroded by a complex administrative structure based on several exemptions and deductions. For developing countries, the major reason is that direct taxes, including the income tax,

usually represents only a small share of tax revenues. Second, it would stand to reason that the poor, whether in the formal or the informal sector, are not affected by tax increases, except in extreme cases. It is unlikely that they would be affected by direct taxes, and indirect taxes would have some effect only to the extent that the poor's consumption basket includes an important portion of marketed goods that are specifically exempt from taxation - an unlikely eventuality. In any event, difficulties on the tax side are usually empirical, seldom methodological.

Not so with the expenditure side. Here the major stumbling block is the existence and operational usefulness of preference indicators by consumers for public programs, and the intricacy of expressing benefits in income-equivalent terms. Several attempts have been made over the years to measure the benefit valuation of expenditure programs by individuals and to assess distributional changes. The areas of research have ranged from in-kind income (Peskin, 1976) to public goods (Aaron and McGuire, 1970; Maital, 1973) to food subsidies (Yitzhaki, 1987). The basic weakness of all these studies is the use of a critical parameter (typically an income elasticity), which has been either assumed or estimated on an unrealistic specification of a utility function. Additionally, according to the Yitzhaki paper, each extended Gini coefficient offers a different weighting scheme for constructing the income elasticities (Yitzhaki, 1987). Yet, in the case of food subsidies, the sensitivity of the income elasticity of demand of the subsidized goods by income classes cannot be overemphasized (Namor, 1987). Likewise the marginal utility of income among different income classes is a prerequisite for the valuation of public goods, but this parameter is virtually inestimable unless a very restrictive form of the utility function is assumed (Catsambas, 1982b). The results are therefore very sensitive to unobservable and probably unmeasurable parameters.

Nonetheless it seems that this is the only avenue for further research. Given that distributional objectives are fundamentally influenced by only the expenditure side of the budget, it is important to direct our efforts towards a better measurement and evaluation of those programs. The emphasis should be on the measurement of expenditure incidence as opposed to the use of untestable hypotheses.

In terms of data requirements, detailed and reliable household income and expenditure surveys are the most important informational prerequisite for any progress along the lines of this endeavor. Such surveys are usually reported in terms of income groups, but obviously any information on other possible criteria (e.g., urban-rural), would be useful and welcome. The problem is that household surveys typically available in developing countries are woefully inadequate for the requirements of such a project. It appears inevitable that, as in the case of the Meerman and Selowsky studies, only well-designed, ad hoc surveys could provide a reliable

data base. Finally, any effort towards the estimation of expenditure functions could complement, or substitute for, gaps in the household income surveys.

9.3 Conclusion

This chapter has discussed methodological issues in the estimation of the impact of government tax and expenditure policies within the framework of adjustment programs on income distribution, especially on the incomes of the poor. It has raised skepticism about the operational usefulness of macroeconomic methodologies not only because of their strong assumptions but, more importantly, because their focus is on the factorial or institutional distribution of income, which does not serve well the requirements of a distributional investigation.

Instead this study has proposed the use of the traditional, partial equilibrium methodology of tax and expenditure incidence by income group as the best compromise between conceptually desirable and empirically feasible approaches. It has also pointed out that more emphasis should be placed on the expenditure than on the tax side and that, consequently, research efforts should be directed towards a better measurement of expenditure incidence. In suggesting this methodology the author has questioned the measurement of expenditure programs in terms of their dollar flows and has argued that only benefits from the services of such programs are relevant for assessing the impact of adjustment efforts on the incomes of the poor.

10. MACROECONOMIC ADJUSTMENT, GOVERNMENT EXPENDITURE ON HEALTH AND RELATED SOCIAL PROGRAMS, AND THE POOR IN LATIN AMERICA AND THE CARIBBEAN

Neville O. Beharie

10.1 Introduction

The basic objectives of this chapter are to present a general overview of trends in social conditions in the Latin American and Caribbean region during the 1980s, to provide some reflections on how links between government expenditure and health and nutrition status might be assessed, and to review possible mechanisms that can mitigate the adverse effects of reductions in government expenditures on low income-groups. The chapter is divided into the following sections:

- an overview of health and nutrition conditions in the region;
- identification of the major mechanisms and processes through which changes in government expenditures for health, nutrition, and related programs affect low income and other vulnerable groups;
- identification of the principal elements required to formulate a research methodology designed to assess the impact of changes in policy on social conditions; and
- review of available policy options that can minimize the adverse effects of reduced government expenditure on target groups.

10.2 Changes In Health and Nutritional Status In the Region

Rising unemployment and underemployment, declining real incomes, deterioration in income distribution, and reductions in the level and quality of public services have had an important effect on general social conditions in the region during the first half of the 1980s. While the social effects of this crisis, in contrast with the financial and economic ones, are only now emerging, the damages are more difficult

to reverse, and the consequences are likely to be felt far into the future. The evidence, although sketchy, is compelling: serious deterioration of physical infrastructure in the education, health/sanitation, and housing sectors; erosion of teacher salaries, increased student/teacher ratios, overcrowding of facilities, and shortages of books and materials; a rising incidence of nutrition-related ailments; fewer facilities that provide health/nutrition services to pregnant women and nursing mothers; and scattered evidence of lower birth weights, increased child abandonment, and juvenile delinquency. The continuation of these trends would have serious implications not only from the point of view of equity but also with respect to the region's medium and long-term productivity, and its ability and resilience to respond to stiff technological and competitive challenges that lie ahead (Beharie, 1986).

A major effect of the crisis is the inability of the public sector to function as a counterforce, mainly because of the dramatic declines in revenues and the consequent need to implement measures of fiscal austerity. Recent studies made of five countries in the region, focusing mainly on urban areas, suggest that declines in public social outlays imply a substantial worsening in the distribution of income and a significant rise in the percent of the population living below the poverty line (IDB/ECIEL, 1986).

Available data for Latin America and the Caribbean, although incomplete, show a considerable deterioration in the level of social services provided in the first half of the 1980s. Annual average health expenditures by central governments as a percentage of total expenditures were lower in 1981-85 than in 1976-80 for three-fourths of the IDB's borrowing member countries. Moreover, this occurred during a time when government expenditures were themselves declining significantly in real terms (table 10.1).

These trends are corroborated by UNICEF research in several countries, showing that government expenditures for health and education fell at a faster rate than those in other sectors (Cornia et al., 1987). Though the strength of the link between government expenditures and nutritional status in the population needs further research, it is worth noting that in many—if not most—countries in the region certain social indices, such as infant mortality rates, which have steadily improved in recent decades, are now stagnant (World Bank, 1986b).

While the relative importance of government policies as compared to other factors cannot be easily determined, it is clear that the combination of reduced household income and shrinking government food subsidies:

> . . . made it even more difficult to satisfy food requirements, with the exception of the highest income sectors. In Mexico, available evidence indicates that the middle class altered its diet so as to include a greater proportion of cheap food, while the urban poor had to actually reduce their consumption of nutrients. In

Table 10.1 - Government Expenditure on Education and Health
(Percent of Total Expenditures; Period Averages for 1976-80 and 1981-85)

Country	Education		Health		Health and Education	
	1976-80	1981-85	1976-80	1981-85	1976-80	1981-85
Argentina	10.08	10.65	3.91	2.61	13.99	13.26
Bahamas	21.79	20.63	14.25	13.71	36.04	34.34
Barbados	21.16	20.57	14.93	13.99	36.09	34.56
Bolivia	27.90	20.80	9.20	3.65	37.10	24.45
Brazil	4.00	2.79	5.78	4.37	9.78	7.16
Chile	12.51	9.97	6.05	5.76	18.56	15.73
Colombia	22.62	24.33	8.13	6.71	30.75	31.04
Costa Rica	32.65	23.65	6.40	5.22	39.05	28.87
Equador	36.75	31.29	13.37	12.85	50.12	44.14
El Salvador	20.31	16.46	8.77	7.17	29.08	23.63
Guatemala	12.33	12.39	8.36	7.73	20.69	20.12
Guyana	12.46	8.14	5.97	4.68	18.43	12.82
Haiti	4.37	4.78	5.44	4.46	9.81	9.24
Honduras	14.93	16.54	7.40	6.90	22.33	23.44
Jamaica	15.71	16.38	7.48	8.42	23.19	24.80
Mexico	19.60	12.11	2.98	1.21	22.58	13.32
Nicaragua	13.43	10.70	8.11	9.49	21.54	20.19
Panama	17.16	18.71	6.57	6.76	23.73	25.47
Paraguay	12.59	8.70	3.47	7.11	16.06	15.81
Peru	15.89	16.21	5.51	5.68	21.40	21.89
Dominican Republic	11.93	13.80	11.27	9.94	23.20	23.74
Suriname	5.91	0.96	3.59	0.77	9.50	1.73
Trinidad & Tobago	8.97	10.24	5.09	5.87	14.06	16.11
Uruguay	13.98	8.98	6.29	4.91	20.27	13.89
Venezuela	16.44	17.66	5.10	4.96	21.54	22.62

SOURCE: IDB 1986 - data based on national statistics.

Brazil, the frequency of anemia among children of poor families seems to have increased in 1985 in comparison with 1973-1974. In Chile, the amount of milk distributed in school programs fell, and in 1983 represented 74 percent of the amount distributed in 1981, while the country's budget for school needs in general remained low between 1982 and 1985 in comparison with the peaks attained in previous years. In Guatemala, the per capita supply of nutrients progressively declined and in 1985 fell to 92.7 percent in the case of proteins and 87.9 percent in the case of fats (ECLAC, 1987a).

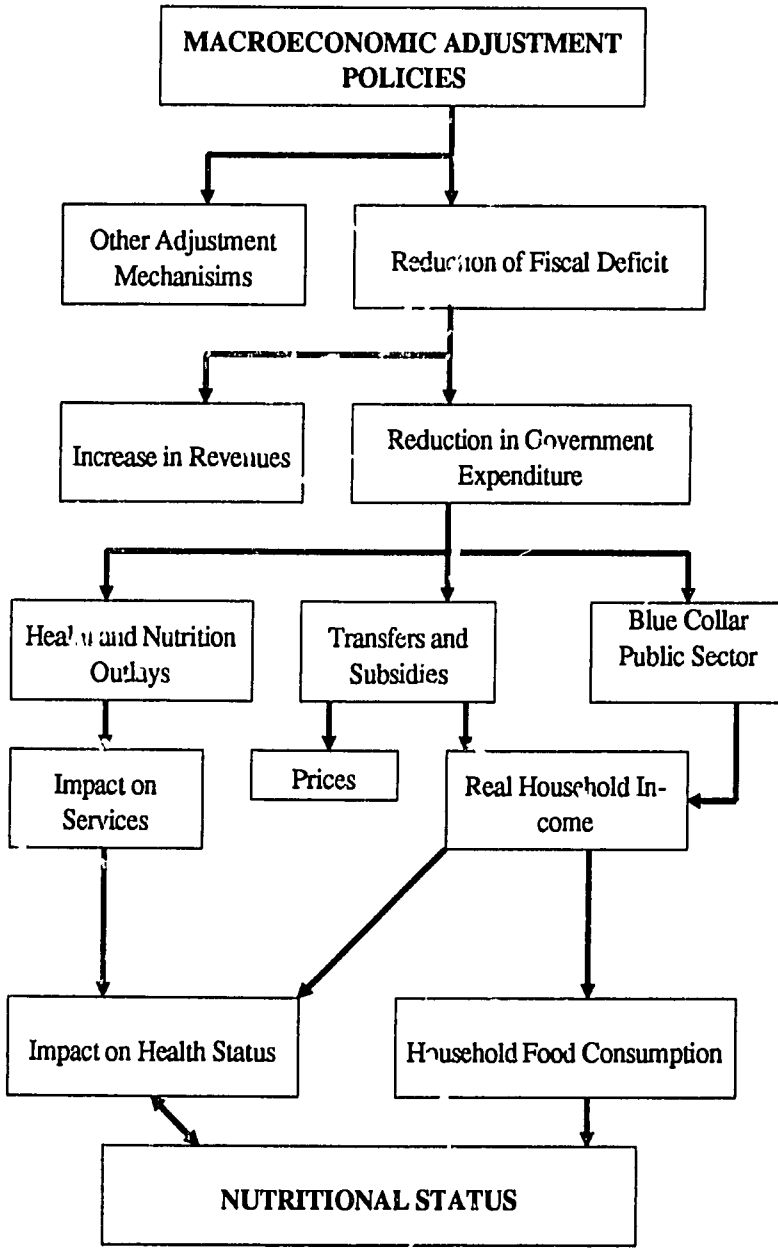
10.3 Mechanisms through which Reductions in Government Expenditure Affect Health and Nutrition Conditions

An almost universal feature of macroeconomic adjustment programs is fiscal austerity, typically aimed at lowering public sector deficits. Such deficit-reducing programs tend to adversely and disproportionately affect low-income groups whether the adjustments are made via reductions in expenditure or by revenue expansion. Apart from the general real income-reducing effects of most adjustment policies through other channels, contraction of government expenditures tends to negatively affect low-income groups by reducing their household purchasing power and/or by lessening access to basic health, sanitation, and nutrition services. This occurs in at least three ways:

1. elimination of or reductions in subsidies and transfers;
2. reduction in blue collar public sector employment opportunities and/or real wage rates; or
3. cuts in government expenditures for health, sanitation, and nutrition programs.

Although in principle the "shock" of reduced government expenditure can have some positive effects by improving waste management or by increasing institutional efficiency, it is difficult to measure this. While it is typical for the overall level of real expenditure to be reduced, the composition tends to vary from country-to-country and period-to-period. Moreover, the incidence of reduced expenditure is likely to occur in a non-uniform fashion, given the differential lags with which expenditure changes are transmitted through the system. The principal ways in which the effects of government expenditure reductions are reflected in health and nutrition conditions are graphically depicted in figure 10.1. When government expenditures are lowered, real incomes of poor households decline because subsidies are reduced (and hence prices for basic necessities increase), income transfers

Figure 10.1 - Interactions Between Adjustment Policies and Health and Nutrition Status.



are diminished, or lower wages may be paid to low-income public sector employees because of outright loss of jobs and/or wage-rate restraint. Because food purchases comprise some 60-80 percent of the household budgets of low-income families who, in addition, exhibit a high price elasticity in their demand for food, higher food prices have serious nutritional and health implications. The already inadequate diets of low-income families are likely to worsen in terms of quantity, quality, and composition.

Reduced expenditure by the government for health and nutrition (infrastructure, materials, services) will surely adversely affect the quantity and quality of services for low-income consumers, although the precise outcome will vary according to what is cut (capital versus current, preventive versus curative). Even within these categories reduced access to various types of services will result in diverse impacts on health and nutrition conditions, given differences in sensitivity and response time between "process" and "status" indicators. Moreover, since the price elasticity of demand for health care appears to be low, policy changes that result in increased costs indirectly reduce resources available for basic needs, especially for food.

10.4 Towards a Methodology to Assess the Effects of Reductions in Government Expenditure on Health and Nutrition

The methodological difficulties involved in tracing the direction, relative magnitude, and lag structure of the effects of changes in macroeconomic policies on government expenditures, their repercussions on food consumption and access to health services by low-income persons, and their ultimate impact on health and nutritional status are formidable. The difficulties include at least the following:

- the large number of factors involved at each stage and the consequent difficulty in separating the effect of one variable from that of another;
- the non-uniformity of lag structures both across variables and over time for a given variable;
- effects caused by societal adjustments resulting from reductions in expenditures tend to be intermixed with those brought about by the crisis itself that elicited curbs in government spending;
- formulation of a definition for "vulnerable" or "target" groups, which is likely to vary across countries because of differences in demographic/economic structures and the form in which data are available; and
- difficulties in estimating "leakage" of program benefits to non-target socioeconomic groups.

As a background to the formulation of an impact assessment methodology further research is needed on a number of empirical questions:

- What is the response time between a crisis and subsequent government expenditure reductions?
- What is typically the nature of expenditure reductions?
- To what degree are expenditure reductions combined with finer targeting of programs and services, and what is the efficacy of that approach?
- Which socioeconomic groups tend to be most affected by different expenditure reduction modalities and in what particular ways?
- What are the principal variables through which effects are manifested?

While such information would provide a basis for a general assessment of the possible distributive impacts of government expenditure changes, still more detailed work would be needed to provide specific recommendations on policy design. In this connection, although government expenditure "incidence" studies take into account only direct effects of government outlays—ignoring their possible repercussions on levels of economic activity, employment, or factor prices, and typically assuming no change in other variables such as tax rates—they provide a reasonable point of departure for the purpose of making a first approximation of impact (Foxley et al., 1979).

Two major difficulties that arise, even ignoring the matter of indirect effects that would involve more general equilibrium analyses, are the identification of beneficiaries and the measurement of benefits or losses.

Theoretically beneficiaries could be identified on the basis of eligibility criteria; actual beneficiaries, however, can probably be determined only by sample surveys made within the target population.

Methods of measurement might in principle differ according to whether the programs involved are "asset-creating" or "consumption-oriented" and whether they distribute benefits in cash or in kind. In almost every case, however, the actual method of measurement used will fall short of the theoretical ideal because of the difficulties in making necessary adjustments. Cash transfers or subsidies, for instance, affect income levels directly, so their monetary value is easily used to measure the benefit. In the case of a transfer in kind, such as access to a health or nutrition service, the benefit measure is usually the cost of providing the service rather than a "willingness to pay" criterion, notwithstanding the fact that, in this case, the true value of the transfer is more linked to its longer term impact on human capital formation and altered future benefit streams. The problems inherent in this approach are discussed at length by Meldau (1980).

10.5 Data Requirements

Considerable data, not all of which are systematically gathered, are needed to monitor the effects of adjustment policies on social conditions "to improve our knowledge of the complex causal mechanisms at work in this area" and "to permit compensating action before irreversible damage has been done" (Stewart, 1986). In addition we need to determine what data are needed to develop early warning systems for impending health and nutrition emergencies.

The list of data series presented in table 10.2 is neither exhaustive nor definitive; nor will all the desired data be available in any given case. A data-gathering strategy that generates information from different angles would enrich the content of the data base and facilitate estimation where gaps occur.

10.6 Approaches to Mitigating the Negative Effects of Government Expenditure Reduction on Low-Income Groups

An essential element in any attempt to mitigate the negative effects of lower government expenditure for health and nutrition is the re-routing of public expenditure towards activities that absorb a relatively large amount of labor. Indeed:

> . . . it is possible to design project packages that will help not only to revive the economy, which is the immediate objective, but also to solve the structural employment problem. Such projects are concerned basically with irrigation, drinking water supply, sewerage, and construction of housing and schools. They also have the merit of benefiting first and foremost people living in the suburbs and in the countryside—the two areas in which the poorest sections of the population are concentrated (Tokman, 1984).

The effects of such policies could be reinforced by selective emergency employment programs such as those tried in Chile, Panama, and Jamaica. These programs can be targeted to a specific group and implemented fairly rapidly. Even such efforts, however, would have only a modest effect on persons with very low incomes because approximately three-quarters of the poor work in the informal sector (Tokman, 1984).

- Some preliminary notions on specific elements that might help diminish the negative effects of reduced government expenditure on low-income groups include the following:
- switch public expenditures to employment-intensive activities where feasible;
- make the delivery of health and nutrition services more efficient while targeting beneficiaries more accurately;

Table 10.2 - List of Selected Data Series Necessary to Assess the Impact of Government Expenditures on Health and Nutrition Status.

Economic/Demographic
- Real gross domestic product
- Population: total age-sex distrubution
- Employment and wage structure: age, sex, occupation, region
- Unemployment structure: age sex, occupation, region, duration
- Capital stock in the health sector
- Opportunity cost of capital in the health sector
- Informal sector data

Government
- Total government expenditure
  - Current
  - Capital
- Government expenditure for health, sanitation, nutrition, and related categories
  - Current
  - Capital
- Government transfers, by program
- Government subsidies, by program
- Government employment and wage rate by category, especially blue collar

Income/Expenditure
- Distribution of income by income groups, region, age, sex
- Household budget data for low income groups, especially percent allocation for food and medical services

Prices
- Consumer price indicies
  - Total
  - Food
  - Other
- Prices for basic foods (low income basket)
- Utility (user) charges for low income households

Health Indicators
- Infant mortality rate
- Child mortality rate
- Crude death rate
- Deaths by principal cause
- Degrees of malnutrition
- Birth weights
- Out-patient visits
- Hospital attendce
- Immunizations
- Maternal literacy
- Access to potable water
- Access to sewerage disposal systems
- Supply/imports of medicines, medial supplies

Nutrition indicators
- Nutrient intake (calories, proteins) by income level, age
- School lunch programs
- Milk distribution programs for vulverable groups
- Per capita production of basic foods
- Own production of basic foods
- Average monthly rainfall by region

- make the delivery of health and nutrition services more efficient while targeting beneficiaries more accurately;
- institute procedures that minimize leakage of benefits to non-target groups. This might be facilitated by concentrating subsidies on the demand side (i.e., directly to the beneficiaries) rather than on the supply side (producers, intermediaries, etc.);
- include a progressive element in benefit programs; and
- concentrate on preventive medicine and out-patient services in health programs.

10.7 Conclusion

This chapter offers a general sketch of some of the important issues that are related to the impact of reductions in government expenditure on health and nutrition. Much more work remains to be done with regard to data development, conceptualization of linkages, and empirical tests and modelling. Given that adjustment problems and fiscal austerity will continue to characterize the economies of the region, it is essential that this work be intensified to allow policy designs that are sensitive to distributive considerations.

11. MACROECONOMIC ADJUSTMENT, HOUSEHOLD FOOD CONSUMPTION, NUTRIENT INTAKES, AND HEALTH STATUS

Jere R. Behrman*

In the 1980s macroeconomic fluctuations and macroeconomic adjustment programs in developing countries have been pervasive. Cornia (1986, 19) reports, for example, that the average growth rate in per capita GDP for 1981-85 for all developing countries was -1.1 percent, as compared with 2.7 percent for the 1976-80 quinquennium. A record number of developing countries currently are engaged in formal International Monetary Fund (IMF) stabilization programs, and a number of others have undertaken stabilization efforts on their own. Given the large outstanding foreign debts in many developing countries and the lukewarm prospects at best for short and medium-term growth in their exports to industrial countries, short-run macroeconomic adjustment programs will remain pervasive for many developing countries into the 1990s.

A number of observers have claimed that these short-run macroeconomic adjustment programs have deleterious effects on nutrition and other human resources (e.g., Jolly, 1985; Jolly and Cornia, 1984; UNICEF, 1984; World Food Council, 1985; Cornia, Jolly, and Stewart, 1987). These claims are based on a number of case studies, mostly conducted under the sponsorship of UNICEF. However, these studies, while suggestive, are not fully persuasive. The editors of some of the studies seem to be searching hard for evidence of such effects rather than conducting a

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* William R. Kenan, Jr. Professor of Economics, Co-Director of Center for Analysis of Developing Economies and Center for Household and Family Analysis, and member of the Population Studies Center at the University of Pennsylvania. I thank other conference participants for helpful comments on the draft presented at the conference.

balanced appraisal.[1] They also do not base their analysis on a systematic framework to incorporate the complicated links between (1) macroeconomic adjustment policies; (2) macroeconomic outcomes such as inflation, overall unemployment, economic growth, and real exchange rates; (3) income distribution, the composition of governmental expenditures, and critical relative prices such as for basic staples; and (4) the behavior of households, which directly determines most of the nutrients consumed by most individuals, given the assets that the household controls and the market conditions, policy regimes, and informal interhousehold transfer processes that prevail.[2] Therefore a number of interested parties—including Pinstrup-Andersen (1986), Behrman (1988a; 1989a), and the World Bank/IMF Development Committee in its meeting of October 1986 (according to Pinstrup-Andersen)—have called for more systematic analyses of the short-run food and nutritional impact of macroeconomic adjustment policies in developing countries.

This chapter focuses on the last link in the complicated process that is summarized in the previous paragraph: how are the determinants of food, nutrient intakes, and health status by households affected by changes in the market conditions and policy regimes in which households operate due to macroeconomic adjustment policies?

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1 In Preston's (1986, p. 375) words in his review of Jolly and Cornia (1984): "What is remarkable is that the best data on children's status in most of the countries reviewed—that on infant and child mortality—shows continued declines nearly everywhere. Nutritional status indicators also typically show improvement as do school enrollment figures, despite downturns in governmental expenditure on health and education in some countries."

2 After reviewing the literature Behrman (1988a) concludes: "Health and nutrition in developing countries may be adversely affected by economic adjustment policies, either concurrently or with substantial lags. Macro and micro economic theories indicate possible channels for such effects, primarily through altering income and prices broadly-defined for the poorest and the most vulnerable. Such theories also point to the complexity of such channels and that the effects may be small because of the limited effectiveness of macroeconomic policies, the lack of impact of policies on some of the poorest, and the adjustment and substitution capabilities of those of the poor whose real income and prices broadly-defined are altered negatively. ...Certainly any conclusion about the impact of economic adjustment in developing countries on health and nutrition must be tentative at this time because of the conceptual and empirical problems in assessing such effects. Theoretical and empirical studies raise many questions that would have to be answered before...a conclusion [about the impact on human capital of economic adjustment policies] legitimately could be reached. For example, in a particular economy exactly what are the effects of economic adjustment policies on aggregate economic indicators, how do these translate through product and input markets into changes in the real income and prices broadly-defined faced by poor individuals and households, to what extent do such individuals and households change their behavior in response to the real income and relative price changes in ways that affect their health and nutrition, and what are the time lags and adjustment periods throughout this complicated system? There is much that is not known about such complex events. Better data and more systematic analysis are desirable, may prove enlightening, and may support the multiplied impact assertion of Jolly and Cornia, et al. or may support my tentative more ameliorative conclusion.

To explore this question satisfactorily, a conceptual framework concerning household behavior is useful. Some major components of that framework are presented in the first section. Then in the second section some major data problems that are relevant for exploring the critical dimensions of household behavior are discussed. In section 11.3 some recent studies that provide insights into critical behavioral parameters are surveyed. In the last section concluding remarks are presented.

11.1 Overall Analytical Framework

The links between macroeconomic adjustment policies and the market and policy environment in which households operate are discussed extensively in the other chapters (see also Addison and Demery, 1985; Kanbur, 1985). Presumably, from the point of view of nutritionally vulnerable households, among the major proximate changes may be changed (probably reduced) employment options; changed market prices, probably including increased prices for many foods because of reductions in governmental food subsidies and currency devaluation; changed (probably reduced) provision of governmental health services; and changed (probably reduced) income.

Some qualifications about these effects need to be made. Not all of these changes occur in a manner that is detrimental to the nutritionally vulnerable households. Moreover, these households are heterogeneous, so changes that worsen some may improve the lot of others. For example, increases in basic staple prices may worsen the situation of poor consumers but improve that of poor producers. Finally, there is the question of what is the relevant point of reference. That is, how are food and nutrient consumption and the health status of the nutritionally vulnerable affected by a particular macroeconomic adjustment program as compared to other realistic alternatives, not as compared to some ideal situation. Nevertheless the chapter will proceed as if the above changes are probable, though it will try to distinguish among different types of vulnerable households.

The author will begin with a standard household model of individual food and nutrient consumption and health status determination on the consumption side and discuss in particular possible price and income effects. Then he will discuss the implications of some particular changes on the income side, including the possible endogeneity of labor productivity and of interhousehold transfers.

11.1.1 Household Model of Food and Nutrient Consumption

The implications of the one-period household production model are outlined in the spirit of Becker (1981 and many references therein) and many related studies for the food and nutrient consumption and health status relations of primary interest

for this chapter. This discussion provides a framework for many of the micro relations that could illuminate our knowledge about the issues of concern.

It is posited that the household has a preference function that depends, inter alia, on the food consumption (C_i^f), nonfood consumption (C_i^n), health (H_i), and time use (T_i) of each of the I household members, as well the number of household members (Ic children plus Ia adults = I):[3]

$$U = U(C_i^f, C_i^n, T_i, \text{I},...); \qquad i=1,..., I \tag{1}$$

Each of the variables is presented as a vector since there may be different elements in each. For example, the composition of food consumption may be important in determining satisfaction as well as in the provision of nutrients. Note that nutrients per se are not included in the preference function, though nutrient intakes are associated with food consumption and presumably have an impact on health status. That is, it is posited that calorie or vitamin A consumption per se does not affect welfare, though the form of the consumption (i.e., whether dal or chappatis or tortillas) and its impact on health may. If nutrient consumption is changed due to macroeconomic adjustment policies, it may alter satisfaction through such channels.

The preference function is maximized subject to two sets of constraints. The first includes broadly defined "production functions." Among the most important of these for this chapter are those for health (H^i) and nutrition (N_i), and of secondary

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3 Some critics of the household approach question whether it is sensible to begin with an unified household preference function, instead of bargaining among individuals each with their own preferences (for theoretical models of such processes see Manser and Brown, 1980 and McElory and Horny, 1981). While, a priori, the bargaining approach may seem preferable and more general for the empirical relations of concern here (and almost all, if not all existing estimates), the two approaches cannot be identified from each other (given the nature of the data). They both depend on the same structural production functions and lead to the same reduced-form relations in terms of observed variables. To be able to identify the bargaining model from the unified preference model, observed variables are required that reflect the bargaining power of various household members but not the value of their time (so schooling or wages cannot fulfill this role though sometimes they are interpreted as doing so). For further discussion of this issue see Behrman and Deolalikar (1988c) or the interchange between Folbre (1983b) and Rosenzweig and Schultz (1984).

importance are those for births (B) and mortality (M_i). (Also of relevance may be production functions for wages and farm/firm output, which the author assumes are determined separably from consumption here, but the implications of possible simultaneity are discussed below in section 11.1.2.)

Health of the ith household member (H_i) is posited to be produced by nutrients consumed by that individual (N_i), other health-related inputs (C_i^h),[4] the general environment (R), endowments related to the inherent robustness and capabilities of the individual (E_i) and of the mother/wife/primary health care provider (hereafter mother, E_m), the time use of the individual (T_i) and of the mother (T_m), and the schooling of the individual (S_i) and of the mother (S_m).[5]

$$H^i = H(N_i, C_i^h, R, E_i, E_m, T_i, T_m, S_i, S_m); \quad i=1,\ldots, I \tag{2}$$

Nutrients play a prominent role in this health production function. However, five observations about this role are useful.

First, nutrients are not equivalent to health status. Moreover, they may not be good indicators of health status unless one of two conditions is satisfied: (a) the health production function in (2) has fixed coefficients between nutrients and the other inputs so that there is no substitution between nutrients and the other inputs:[6]

$$H_i = min(H^*(N_i), H^{**}(C_i^h, R,\ldots)). \tag{2a}$$

Such a condition seems very strong—suggesting, for example, that nutrition inputs result in the same level of health for individuals who have different inherent robustness (related to E_i) or different time use patterns (T_i), and (b) all individuals in society (or at least in the sample) face the same relative prices for all of the inputs in the health production function (2) and, therefore, in their maximizing behavior

4 C^h_i is a subset of C^n_i.

5 The possibility of contagion within the household for simplicity is ignored. To include it would not change the reduced-form relations of interest below since in such relations the health of each household member already depends on all of the variables that are exogenous or predetermined for the household.

6 This includes the extreme case in which only nutrients count in producing health status.

select the same nonnutrient and nutrient input combinations, thus resulting in nutrients (or any other single input) being a perfect proxy for the composite input.[7] This also seems to be a very strong condition that is unlikely to be satisfied. Relative market prices are likely to differ for individuals across space because of transportation costs and even in one location if prices of some items are subsidized for some members of society (e.g., subsidized food or medical services for the poor). Effective prices for endowments, moreover, are likely to vary since no market exists, for example, for genetic endowments, with the result that effective prices differ even for members of the same household (with the possible exception of identical twins). Therefore, nutrients are not necessarily a very good indicator of health status, or vice versa. In fact nutrients may not even be associated positively with health status. If endowments are very important in the production of health and nutrients are allocated so as to compensate for endowment inadequacies, nutrients may be inversely associated with health status.[8] The lack of a necessarily strong correlation between nutrient intakes and health status is useful to emphasize because at times in the nutritional and economic literature what logically seem to be indicators of health status—for example, various anthropometric measures—are referred to as indicators of nutritional status.

Second, basal metabolism, which also plays a role in the absorption of nutrients, apparently varies considerably across individuals and possibly adjusts to nutrient intakes (e.g., see Sukhatme, 1982 and the references therein). In the health production function metabolism is reflected partially in the individual's endowments but also, if it is affected by nutrient intakes, in those intakes. The variance and possible endogeneity of basal metabolism may weaken further the association between nutrient intake and health status (also see section 11.2 below).

Third, time use and associated energy expenditure also alter how a given level of nutrient intake affects health status, at least as measured by the usual health indicators. Two persons with identical basal metabolisms may absorb vastly differing amounts of current nutrient intakes through different physical activities and thus have different quantities of nutrients remaining to affect longer-run health status. While the importance of time use patterns is widely recognized, empirical estimates often do not control for differences.

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7 This statement is a little strong in that it would suffice for prices to be such that the composite nonnutritive input be the same for everyone and that the trade-off between nutrients and nonnutrients be the same for everyone.

8 Analytically this situation is exactly parallel to the possible lack of association or inverse association between child quality and schooling discussed in Behrman (1987).

Fourth, besides nutrients there are a number of other inputs in this health production function. Human resources as represented by mother's schooling, for example, may affect substantially the knowledge and efficiency of the use of nutrients and other health related inputs (though such effects may be captured in the nutrient production relation in equation 4 below).

Fifth, there is a lot that is not known about the biological technology in the health production function. The marginal product in terms of health status of increasing nutrients is likely to be positive for poorly nourished individuals. But at higher levels of nutritional intake the marginal products may become negative, leading to obesity, arteriosclerosis, etc. Even at moderate intake levels whether the marginal product is positive or negative may depend upon exactly what dimension of health is of interest. For example, increased calorie consumption may increase current energy levels while it contributes to longer-run obesity problems. Moreover, many nutrients may interact, and all may interact with other inputs, such as the environment, endowments, and nonnutrient health-related inputs. Furthermore, some effects have considerable lags that may make them hard to detect. A casual perusal of the nutrition literature over the past several decades reinforces the observation that many details of these biological processes are not known, as indicated by changing fads about the importance of proteins versus calories, etc.

Though the health status production function is critical in understanding the roles of changing nutrient intakes in response to macroeconomic adjustment program, other production functions are also important. These are discussed briefly below.

Mortality (M_i) can be considered to result when an individual's health status falls below a critical level ($\overline{H}_i$):

$$M_i = M(H_i - \overline{H}_i); \qquad \text{for each } i=1,\ldots, I. \tag{3}$$

The critical level, of course, may vary across individuals. In a sense mortality is just another (albeit extreme and irreversible) health status indicator, so the above comments about associations between health status and nutrients carry over except that the irreversibility of mortality sharply limits some substitutions over time.

Nutrient intakes of the i'th individual in the household (N_i) depend on food intakes of that individual (C_i^f) and time use and capacities of the mother (T_m, S_m, E_m):

$$N_i = N(C_i^f, S_m, E_m, T_m, \ldots); \qquad \text{for each } i=1,\ldots, I. \tag{4}$$

For given expenditures on food the nutrient intake can vary enormously because of different food composition (see section 11.3) and preparation.

Births (B) are determined by a "biological supply function" in the spirit of Easterlin, Pollak, and Wachter (1980) or Rosenzweig and Schultz (1983, 1987), as dependent on contraceptive use (C_m^c),[9] the efficiency of the mother and father in using contraceptives as related to their education (S_m, S_f) and endowments (E_m, E_f), their fecundity as related to their health and nutritional status and their endowments ($H_m, H_f, N_m, N_f, E_m, E_f$),[10] and the frequency of intercourse (F):

$$B = B(C_m^c, S_m, S_f, H_m, H_f, N_m, N_f, E_m, E_f, F) \tag{5}$$

If nutrition does affect births there can be a medium-term impacts of macro-economic adjustment policies through changing (presumably reducing) population growth both through fertility and mortality.

The number of household members (I) equals births minus mortality (M) minus other net outflows (O_i):

$$\mathrm{I} = B - \sum_i M_i - O_i \tag{6}$$

Other net outflows may occur because of migration, marriages, etc. that are not modeled easily within this simple framework.

The second constraint is on time and monetary resources, as is summarized in a full-income budget constraint in which the P_c refer to prices that incorporate money and time costs:

$$\sum_i W_i \bar{T}_i + Y = \sum_i P_f C_i^f + \sum_i P_n C_i^n + \sum_i W_i T_i^1 + \sum_i (W_i T_i^s + \Delta A_i). \tag{7}$$

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9 Ccm is an element of Cnm under the assumption that the contraceptive method used is used by the mother.

10 Bongaarts (1980) and Menkin, Trussell, and Watkins (1981) review the literature on the impact of nutrition on fecundity and conclude that there is not a biological effect except in cases of severe malnutrition. Nevertheless, there may be a positive association between nutrient intakes and fertility for behavioral reasons if, for example, frequency of intercourse depends on health status. Easterlin and Crimmins (1985) and Wolfe and Behrman (1987a) present estimates consistent with such a possibility.

The left side of (7) gives the total value of full income: the total time of each household member $\bar{T}_i$ valued at the relevant wage (W_i) plus net income from all sources other than labor of members of the household (Y). The right side gives total resource expenditures: the sum of consumption ($P_c C_i^f + P_n C_i^n$) plus the value of leisure time ($W_i T_i^l$) plus time spent in schooling ($W_i T_i^s$) plus asset changes (ΔA_i) for all individuals in the household.

Under the assumption that the underlying functions have the desirable characteristics, the first-order conditions for the constrained maximization lead to reduced-form demand relations:

$$V = f(Z)$$

$$\text{where } V = (C_i^f, T_i, C_i^n, N_i, H_i, B, M_i, F, \Delta A_i \ldots); \quad \text{for all } i=1,\ldots, I, \text{ and}$$

$$Z = (P_c, W_i, Y, E_i, R, \bar{A}_i, S_m, S_f, \ldots); \quad \text{for all } i=1,\ldots, I. \tag{8}$$

The dependent variables (V) include, among others, the food consumption, health, nutrient intake, and time use of all household members, and births, mortality, and asset accumulation. The right-side variables (Z) include all of the prices (Pc), wages (Wi), household net income (Y), the general environment (R), and all predetermined assets of the household—all individual endowments (E_i), schooling for the adults (S_m, S_f), and initial assets($\bar{A}_i$).

These reduced-form demand relations are what determine the food consumption, nutrient intake, and health status of the individuals in the household—given their broadly defined assets—in response to income and price changes induced by macroeconomic adjustment policies. Estimates of them are required to evaluate the behavioral changes of households in response to variations in the market and policy regimes (due to such adjustment policies) in which they operate.

Eight general features of these reduced-form relations merit mention. First, all of the prices and predetermined assets (both broadly defined) enter into each of the reduced-form relations. That means, for example, that predetermined endowments for all household members (i.e., E_i and $\bar{A}_i$ for all i=1,...,I and S_f and S_m) enter into the determination of each outcome of interest for each individual. Second, the above model is presented for one period. For empirical applications, however, lags, dynamics, and adjustment processes are important. Theory provides little guidance regarding these processes, other than the observations that increasing adjustment costs may preclude complete immediate adjustment and that adjustment should proceed so that the marginal gains equal the marginal costs. Third, prices broadly defined have a time component and also reflect the local availability of goods and

services. Many direct governmental human resource policies, in fact, work directly through these components of prices. For example, the total price of "free" health care may be substantial if waiting or travel time is great or if a service is not available locally. Studies of health service utilization in the Philippines by Akin et al. (1985a,b), for example, suggest that these dimensions of prices affect health service use and health outcomes more so than nominal prices do. Fourth, there may be important interactions between some of the right-side variables. For example, Rosenzweig and Schultz (1982) find that the effect of mother's education in reducing child mortality and fertility in Colombia is diminished with improvements in local health infrastructure. Likewise Barrera (1989) reports that anthropometric indicators of child health are more responsive to mother's education in communities in the Bicol region of the Philippines that lacked health infrastructure, though in contrast Strauss (1989) reports positive complementarities for such child health indicators between mother's education and local health infrastructure in the Ivory Coast. Fifth, from a long enough time perspective many of these prices are endogenous if individuals can change the prices that they face by migrating. For example, if expected wages are higher and other human resource investment prices lower in the central metropolis than in other urban and rural areas, a person or a household can change the prices faced by migrating between such areas. However, migration is a costly activity undertaken under considerable uncertainty, so fairly long-run price expectations are relevant. For short-term food and nutritional status responses to macroeconomic adjustments, migration is not likely to be a response for most vulnerable households, though it may be for some at the margin. Sixth, some of the variables posited to be of relevance are difficult to observe; if they are not controlled in the estimation and are correlated with observed variables, biases will result in the estimated impact of the included variables. The best documented possibility of such phenomenon is years of schooling partially proxying for unobserved schooling quality and childhood family background related abilities and motivation.[11] Seventh, the above relations are for individual household members and may differ across different types of household members identified by sex, age, or other characteristics.[12] If the coefficients of the price and income variables

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11 Behrman and Birdsall (1983, 1985); Behrman and Taubman (1976); Behrman, Hrubec, Taubman, and Wales (1980); Behrman and Wolfe (1984a, 1987a, 1987c, 1989); and Wolfe and Behrman (1986, 1987a, 1987b).

12 Behrman (1988b, 1988c, 1989b), Folbre (1984a, 1986), Horton (1988), Kakwani (1986), Rosenzweig and Schultz (1983), Sen (1984), and Sen and Sengupta (1983), among many others, discuss gender and birth order differences in intrahousehold food and nutrient allocations.

affected by macroeconomic adjustment policies differ across household members, the impact of macroeconomic adjustment policies differ across household member. Eighth, parameters also may differ across households depending on their income levels with, for example, lower-income households more responsive to price changes than higher-income households. If this is the case, nutritionally vulnerable households may adjust their food and nutrient intakes and health status more in response to macroeconomic adjustment policies than do higher-income households.

11.1.2 Price and Income Responses in Nutrient Demands

It is useful to clarify further the nature of these responses a priori since they probably play major roles in determining the impact of macroeconomic adjustment policies on nutrient intakes and, therefore, on health status.

11.1.2.1 Price Responses . The general perception seems to be that the nutritional impact of an increase in the price of a food is negative. However, this is not necessarily the case. To illustrate this point, consider the demands for foods in relation (8). For simplicity, consider only one nutrient, one individual and suppress the i subscript), two foods (and use the subscripts 1 and 2 to refer to the respective foods), and suppress the variables other than food prices and income:

$$P_1C_1^f = a_{11}P_1 + a_{12}P_2 + b_1Y$$
$$P_2C_2^f = a_{21}P_1 + a_{22}P_2 + b_2Y \tag{8a}$$

The own-price responses, a_{11} and a_{22}, normally are negative. In order for the sum of the left side to equal the sum of the right side (given that total food expenditure $=P_1C_1^f + P_2C_2^f = (b_1 + b_2)Y$), there are restrictions on the parameters: $a_{11} + a_{21} = 0$, $a_{12} + a_{22} = 0$, and $b_1 + b_2 =$ the share of total food expenditure in income. Now assume that the nutrient production function in (4) can be represented by a linear function:

$$N = \varphi_1C_1^f + \varphi_2C_2^f + \varphi_3S_m + \varphi_4E_m \tag{4a}$$

This is a common approximation (though usually with $\varphi_3 = \varphi_4 = 0$), with φ_1 and φ_2 being the food-to-nutrient conversion factors. Substitution of (8a) into (4a) gives:

$$N = a_{11}\left(\varphi_1 - \varphi_2\frac{P_1}{P_2}\right) + a_{12}\left(\varphi_1\frac{P_2}{P_1} - \varphi_2\right) + \left(\frac{\varphi_1 b_1}{P_1} + \frac{\varphi_2 b_1}{P_2}\right)Y + \varphi_3S_m + \varphi_4E_M \tag{8b}$$

This version of the reduced-form demand relation for nutrients provides a convenient framework within which to summarize price effects on nutrition. Note that if the conditions are such that there is no impact of the food price of interest on real income, the direction of the effect of changing a food price (P_1 or P_2) on nutrition intake (N) is a priori ambiguous. In the two food case, for example, the impact of changing P_1 on N is positive, zero, or negative depending on whether $\left|a_{12}\varphi_1 P_2^2\right|$ is less than, equal to, or greater than $\left|a_{11}\varphi_2 P_1^2\right|$. The impact of increasing P_1 on N is more likely to be positive the greater the substitution between foods relative to own-price effects (i.e., the larger a_{12} is relative to $\left|a_{11}\right|$), the larger the nutrient content of the substitute relative to the commodity the price of which is raised (i.e., the larger φ_2 is relative to φ_1 if P_1 is changed), and the greater the own price is relative to the substitute price. (These results carry over to the n food case with appropriate modifications so that the food of interest is compared with the other n–1 foods; for at least one food the effect of changing a particular price has to be negative and for at least one food the effect of the same price change has to be positive.) But if nominal income is constant, then, in addition to the price effect just discussed, there is an income effect since real income declines due to a rise in food price. The addition of this standard income effect from the consumption side implies that the total consumption side impact of a food price rise is more likely to be negative than positive. However, if the household is a producer as well as a consumer of the food with the increased price, this induces an additional positive price effect on the consumption of the nutrient through the production income effect. This effect will be stronger (1) the larger the coefficient of income in (8b); (2) the larger the share of the product of concern in income; (3) the greater the supply response of that product to the increased price and the less the reduction in other substitute products (which may depend on the time horizon of relevance given production and investment gestation periods); and (4) the smaller the share of production that is consumed by the household instead of sold. The addition of this effect may make any (or all) of the price effects that would be negative with nominal income constant, positive with the production income effect incorporated. Therefore it is possible that a farm household that produces most of the foods that it consumes has only positive nutrient responses to increases in consumption prices once this income effect is incorporated.

11.1.2.2 Income. The standard Engel result is that the response of food expenditures to income increases is relatively large for poor populations, with income elasticities close to unitary, though declining at higher income levels. If fixed food-to-nutrient conversion factors are applied to fairly aggregate food expenditure systems, nutrient demand elasticity estimates are obtained of the same magnitude as the food expenditure elasticity with respect to income. This result has been

obtained from such a procedure, for example, by Murty (1983), Murty and Radhakrishna (1981), Pitt (1983), and Strauss (1984) for a number of low-income developing country samples from Asia and Africa. Partially on the basis of such evidence the conventional wisdom seems to be that nutrient intakes improve substantially with income increases. The World Bank (1981, p. 59), for example, articulates this view forcefully: "There is now a wide measure of agreement on several broad propositions. ... Malnutrition is largely a reflection of poverty: people do not have income for food. Given the slow income growth that is likely for the poorest people in the foreseeable future, large numbers will remain malnourished for decades to come. ... The most efficient long-term policies are those that raise the income of the poor." However, there are some observations that the price paid per nutrient may increase substantially with income even for fairly poor populations (e.g., Radhakrishna, 1984 and Pitt, 1983 give examples for India and Bangladesh, respectively). This may occur because at the margin such people may value highly nonnutritive qualities of foods (e.g., taste, appearance, status value, smell, variety, degree of processing) that are not necessarily strongly positively associated with nutrient contents, as suggested by Shah (1983), Behrman and Wolfe (1984b), and Behrman and Deolalikar (1988a, 1989a, b) or because they face a nutrient subsistence constraint as discussed in Behrman, Deolalikar, and Wolfe (1988). As Behrman and Deolalikar (1987) show, the elasticity of nutrients with respect to income equals the elasticity of food expenditure with respect to income minus the elasticity of the marginal nutrient price with respect to income. If the last elasticity is large, the elasticity of nutrients with respect to income may be small. Whether this is the case is an empirical question to which section three below returns.

11.1.3 Household Income Determined Simultaneously with Nutrient Consumption

The above formulation in section 11.1.1 assumes that income generation can be treated separably from consumption/ demand. However, if there are health and nutrition impacts on labor productivity (or for farm/firm production, sufficiently incomplete markets),[13] the separability assumption is not valid. If consumption cannot be treated separately from income generation for such reasons, there are additional production relations of relevance for wages and/or farm/firm production:

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[13] Leibenstein (1957), Mazumdar (1959), Stiglitz (1976), and Bliss and Stern (1978) among others have emphasized the productivity link possibility. Barnum and Squire (1979), Lau, Lin, and Yotopoulos (1978), and Singh, Squire, and Strauss (1986) and the references therein discuss extensively the farm/firm-household model due to incomplete markets.

$$W_i = W(H_i, N_i, S_i, E_i, ...); \quad \text{for all } i=1,...,I, \tag{9}$$

$$Q = Q(H_i, N_i, S_i, E_i, T_i, ...); \quad \text{for all } i=1,...I, \text{ where Q is farm/firm product.} \tag{10}$$

If there are such labor productivity effects, macroeconomic adjustment policies may affect wages and income for these reasons in addition to their impact through aggregate demand changes. Also in relation (8) the exogenous determinates of income (i.e., all the firm/farm product and input prices) must be included in the reduced-form demand relations for all the outcomes determined by the household (or income must be treated as endogenous in a quasi-reduced form relation, using these product output and input prices as instruments).

Of course there is no reason why such effects are limited to market productivity. There may be labor productivity effects also in household production that underlie relation (8). Also there may be labor productivity effects in other activities, such as in schooling:

$$S_i = S(H_i, N_i, E_i, ...); \quad i=1,..., Ic \tag{11}$$

If so then nutrient and health status changes in response to macroeconomic adjustment policies may affect longer-run educational investments in children.

11.1.4 Endogeneity of Interhousehold Transfers

Interhousehold income transfers appear to be relatively more important in some developing countries than in more industrialized economies (e.g., Geertz, 1963; Scott, 1976; Collier, 1981; Booth and Sundrum, 1984; Hart, 1986; Ravallion and Dearden, 1988; Kusnic and DaVanzo, 1986; Behrman and Deolalikar, 1988b). Ravillion and Dearden (1988) recently have extended a model of the allocation of international aid among recipient countries in Behrman and Sah (1984) to estimate the preferences underlying such transfers. For simplicity they focus on total after transfer income (Y_j^*) and other attributes (X_j) of each of J households in a community (in contrast to the more detailed individual attributes in equation 1 above) and posit interhousehold altruism within a community so that preferences for a donor household (indicated by the subscript d) are:

$$U_d^* = U^*(Y_1^*, X_1, ..., Y_d^*, X_d, ..., Y_j^*, X_j) \tag{12}$$

Through a constrained maximization process they derive transfer functions that determine donations and receipts of each household as dependent on the household's characteristics, including post-transfer income. If such transfers are important and if they are responsive to income, health, and nutritional status of potential recipient households, they may serve to ameliorate substantially the negative effects of macroeconomic adjustment policies on nutritionally vulnerable households. They effectively work through Y in relation (8) and are another reason (in addition to those in section 11.1.3) why Y perhaps should be treated as endogenous in the reduced-form or relation (8).

11.2 Some Data Issues

To explore the impact of macroeconomic adjustment policies on food and nutrient consumption and health status, good estimates are desirable for these dependent variables of the reduced-form relations in (8), modified as necessary by the other considerations discussed in the rest of section 1. Data are required for at least the households that are nutritionally most vulnerable. If the results are to be incorporated into an overall analysis of the economy and if responses differ across different types of households (or if it is desirable to explore such a possibility), these data are required for a random sample of households. Now consider some special features of desirable data with references to the reduced-form in (8).

11.2.1 Major Dependent Variables of Concern

Food consumption (C_i^f) is readily available in numerous data sets. The primary difficulty is obtaining sufficiently disaggregated data so that the effects of possible compositional changes on nutrient intakes (see section 11.1.2) can be represented. A second problem pertains to obtaining individual instead of household data if intrahousehold allocation is important. Beyond the measurement error in obtaining total household food consumption (which may be considerable in households that produce large proportions of their food or in cases in which individuals obtain much of their food on their own), there are additional errors in obtaining information about allocation of food among household members. To the extent that these measurement errors are random, they do not affect estimated impact of the right-side variables in the reduced-form relation for food consumption. But they may be systematic, for example, if more food is given (or said to be given) to the more vulnerable or to those whom it is thought are supposed to be favored (e.g., males) in the presence of observers, if food preparers understate the extent to which they allocate food while preparing it, or if respondents overstate out of pride the food consumed by the household. Such systematic errors may well cause systematic bias in estimated coefficients, with the last possibility, for instance, causing underestimates of income effects.

Nutrient intakes (N_i) typically are calculated by applying fixed food-to-nutrient conversion factors to foods (as in (4), but with $\varphi_3 = \varphi_4 = 0$). This procedure effectively assumes that the impact on nutrients for a given food is independent of the preparer. If more schooled and better endowed food preparers systematically tend to preserve more (less) of the nutritive qualities in their food preparation, this procedure systematically understates (overstates) the relative nutrition obtained by members of their households, resulting in downward (upward) biases in the coefficient estimates for mother's schooling and endowments in the reduced form for nutrients and opposite biases in similar coefficient estimates in the reduced form for health. For this reason, in addition to the concern about disaggregation and composition mentioned above regarding N_i^f, it is desirable that foods be disaggregated as finely as possible.

Because of gender and age differences (and possibly other differences) in many studies nutrient requirements are utilized in empirical estimates. These are intended to control for different nutrient usage for different individuals at the same activity level. There has been considerable controversy over the use of these requirements in part because of intrapersonal variations over time and in part because of possible physiological adaptations to moderate shortfalls in nutrient intakes (see Behrman, 1989a; Behrman and Deolalikar, 1988c; Payne, 1985; Payne and Culter, 1984; Seckler, 1980, 1982; Srinivasan, 1981, 1985a, 1985b; Sukhatme, 1982 and the references therein). For the estimation of the reduced-form determinants of nutrient intakes random measurement error and systematic measurement error that is not associated with the right-side variables (e.g., if requirements are overstated by 10 percent for everyone) in nutritional requirements is not likely to cause biases because the requirements typically are used to standardize the dependent variable, nutrient inputs. Systematic measurement errors that are correlated with right-side variables, of course, cause biases in the estimates of the coefficients of those variables. For the estimation of structural relations in which standardized nutrition is a right-side variable (e.g., for health, fertility, wages, firm/farm production, schooling) even random measurement errors cause biases in the estimated input of nutrition (towards zero).

Health status (H_i) is difficult to measure. In various socioeconomic data sets it typically is represented by such variables as anthropometric measures, recall or clinical data on illness experience, and recall data on time lost from normal activities. There is some literature claiming that one or another of these indicators is better for a particular purpose (see Behrman and Deolalikar, 1988c for a brief survey and references). Under the assumption that various such indicators refer to the same underlying basic health status, some recent studies pertaining to health in developing countries have posited that it is a latent variable with a number of imperfect

indicators and random normal measurement errors (e.g., Behrman, 1988c; Behrman and Deolalikar, 1988d; Behrman and Wolfe, 1989; Wolfe and Behrman, 1984, 1987a). Such a procedure yields information about the relative associations of various health status indicators with the latent health status variable within a particular system of relations. It uses the available information more efficiently than would be done using just a single indicator. But the weights on various indicators are conditional on the system specified, including the stochastic assumptions. Alternative weights might result from different systems or if emphasis were placed on distinct dimensions of health rather than the commonality of various imperfect indicators.

Two further points warrant emphasis. First, for some health status indicators—most notably the anthropometric measures—there arises a standardization problem that is parallel to that for nutrient requirements, with similar implications regarding measurement errors and biases. Second, at times some of what is being called here indicators of health status are referred to as indicators of nutritional status—again, the anthropometric measures are a leading example. Although this may seem to be merely a matter of semantics, such a use is unfortunate and confusing. Nutrient intakes are but one input in the health status production function of relation (2) and, as discussed following that relation in section 11.1.1, are not necessarily positively correlated with health status. Therefore it is peculiar to refer to indicators of the output of that health production process as if they were associated with one of a number of inputs.[14]

Mortality (M_i) can be viewed as the result of letting health status decline below some critical level as discussed with regard to relation (3). Household-level mortality data usually are recall data, though in a few panel data sets there are repeated censuses. The major measurement problem with these data is a probable undercount of perinatal mortality, which is likely to be systematically associated (inversely) with variables such as schooling, endowments, income, health, and nutrition—thus resulting in an underestimate of the impact of such variables on infant mortality in estimated relations.

Associated with mortality (as well as other forms of exit from the household) is a selectivity problem with the food consumption, nutrition, and health status data. Such data are available only for the individuals in the household at the time of data collection. This may lead to a selectivity problem. If, for example, more sickly (less

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14 For further discussion of measurement problems for both nutrient intakes and health status, see Behrman and Deolalikar (1988c).

well-endowed) infant girls are more likely to have died prior to the data collection than less well-endowed infant boys, the information on surviving children may misrepresent the determinants of the nutritional health status of girls versus boys and the impact of right-side variables in the reduced-form relations on nutrient intakes and health status. In principle, some selectivity control in the spirit of Heckman (1976, 1979) could be used to eliminate this bias, but data are rarely available to do this and the author is unaware of any study that actually does it.

11.2.2 Other (Possibly) Dependent Variables

Several outcomes other than health status, as discussed in the first section, may be affected directly by nutrient intakes and, thus, by macroeconomic adjustment policies through nutrition. These and any special data problems associated with them will be briefly discussed.

Wages (W_i) may be endogenous to the household nutrient allocation and health decision, as discussed in section 11.1.3. If they are not, they may be important right-side variables in the reduced-form relations (8), representing the cost of time of various household members. The biggest problem regarding wages is that they are not observed for individuals who do not participate in labor markets, including those who concentrate in home or own farm/firm production.[15] One possibility is to use information on reservation wages, but such data rarely are available and could suffer from systematic biases even if they were. A second possibility is to control for selectivity, once again as suggested by Heckman (1976, 1979) and others.

Nonearnings income (Y) includes, inter alia, any firm/farm net income and transfers. The measurement problems regarding income, particularly for nonmarket income in societies in which tax systems do not force adoption of systematic accounting systems and many people are illiterate or innumerate, are well known and need not be repeated here. If, as a result, income is measured with random error and is treated as determined separably from consumption, the result may be to cause an underestimate of the effect of income on the outcomes of interest. If measurement error is systematic it is hard to be sure of the exact nature of the bias since reported income may tend to be relatively underestimated both by the poorest members of society (e.g., due to erratic receipt of income, more non market activities, and less literacy and numeracy) and by the richest members of society (e.g., due to tax evasion).

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15 Income from the latter, even for labor-intensive informal sector activities, includes returns to inputs other than labor alone.

Time use (T_i) may be affected significantly by macroeconomic adjustment programs through nutritional and health status if nutrient and health status cause a relative shift in the marginal returns among various time uses: labor force participation, own firm/farm work, household production, schooling, and leisure. Data on time use is available in an increasing number of data sets. Because of variation in time use over time, recall error, and joint activities (especially for women), measurement error certainly exists in such data. However, it is not obvious that such measurement errors are systematic. If they are random, they do not affect the estimates of the structural relations that determine the impact of nutrient intakes and health status on time use, but they do bias towards zero the estimated impact of time use on outcomes such as health status in relation (2).

11.2.3 Right-Side Variables in the Reduced-Form Relations

Prices (P_c) are likely to be an important channel through which macroeconomic adjustment policies alter household behavior and determinants of food consumption, nutrient intakes, and health status. Three important aspects of prices mentioned above are noted here: (1) in principle all consumption prices should be included in the reduced-form estimates, (2) if there is simultaneous firm/farm production, all farm/firm product and input prices should be included, and (3) prices include time costs and transportation costs, not just monetary costs. If there are excluded relevant variables representing any of these three dimensions of prices and the excluded variables are correlated with included variables, omitted variable bias results. Probably such biases are most likely in the estimated impact of other prices or perhaps of income or of the environment.

Adult schooling (S_i) and endowments (E_i) for all household members enter into all of the reduced forms. These variables are not likely to be affected in the short run by macroeconomic adjustment policies (though schooling for children well may be). If these variables are correlated with included right-side variables, however, it is important that they be included in the estimates in order to avoid omitted variable bias in the estimates of the impact of other variables. Perhaps the most likely candidate for such biased estimates are the wage and income variables. Schooling, as measured by the years or grades of schooling, is widely available in socioeconomic data sets. Recent studies suggest that the quality of schooling is also important (e.g., Behrman and Birdsall, 1983, 1985; Heyneman and Loxley, 1983; Heyneman and White, 1986), and that, in standard studies of the impact of schooling, years of schooling partially represents schooling quality. Other studies suggest that schooling also may be representing unobserved components of endowments related to the parents' childhood family background (e.g., Behrman and Taubman, 1976; Behrman, Hrubec, Taubman, and Wales, 1980; Behrman and

Wolfe, 1984c, 1987a, 1987b, 1989; Wolfe and Behrman, 1984, 1986, 1987a, 1987b). To the extent that years of schooling well represents schooling quality and unobserved endowments, its inclusion in the reduced forms controls for these variables. True, the coefficient of schooling is biased, but that is not important for the present purpose (though it is critical if the objective is to explore the returns to schooling).

The environment (R) often is not represented very well in socioeconomic data sets. The result may be omitted variable bias if important observed variables are associated with dimensions of the environment. If it is the case, for example, that unobserved swampy conditions are correlated with the intensity of observed and not completely successful malaria eradication programs, the failure to control for the environment may make it appear that the presence of a malaria eradication program causes malaria.

11.3 Relevant Recent Empirical Studies

The primary relations to which the analytical framework of the first section points are reduced-form expressions for household food consumption, nutrient intakes, and health status as in relation (8). A discussion of some recent estimates of these will now begin. Then the author turns to other selected estimates, mostly of various structural relations, that shed some light on other relevant dimensions of the impact of macroeconomic adjustment programs in developing countries on household food and nutrient consumption and health status.

11.3.1 Reduced-Form Relations for Food and Nutrient Consumption and Health Status

11.3.1.1 Food Consumption. There are large numbers of estimates of reduced-form demand relations for food consumption in developing countries. Examples of such estimates include studies by Pinstrup-Andersen, de Londoño and Hoover (1976), Pinstrup-Andersen and Caicedo (1978), Timmer and Alderman (1979), Murty and Radhakrishna (1981), Murty (1983), Pitt (1983), Strauss (1984), Quisumbing (1985), and Behrman and Deolalikar (1987). Most of the recent estimates have placed emphasis on cross-equation constraints within a system framework and include food prices and income but not the other right-side variables in relation (8). The failure to control for endowments, environment, schooling of adults, and initial assets probably tends to result in an upward bias, if anything, in the estimated impact of income. On the other hand, income probably has considerable measurement error (see section 11.2.2), the systematic component of which probably biases the income coefficient upwards (if the dominant feature is relative understatement of income in poorer households) and the random component of which probably biases the estimated income coefficient downward. It is hard to

know what the total effects of these biases on the income coefficient are. Given the probable importance of the income response in assessing the magnitude of the impact of macroeconomic adjustments on household food consumption, further exploration of these relations with panel data sets that permit better representation of permanent income and better control for unobserved fixed effects such as endowments and the environment might be useful.

The results to date are fairly uniform in suggesting substantial income and price responses in food consumption demands for lower-income households often with smaller elasticities as incomes rise (Pinstrup-Andersen, 1985a surveys many of these studies). The own-price responses generally are negative and relatively large in comparison with cross-price responses. Such results suggest that, if macroeconomic adjustment policies reduce incomes and cause price rises for some basic foods due to a reduction in food subsidies and devaluation, the responses in food consumption of many poor households is considerable and larger than that of richer households. Of course, some poor households are also producers of basic food staples and so may have real income increases, though Trairatvorakul (1985) suggests that even in Thailand, with its broadly based rice production, the number of poor households that would benefit from increased rice prices is relatively small.

11.3.1.2 Nutrient Consumption. Possible biases in the income coefficient estimate also hold for the nutrient reduced-form estimates, though some of the existing estimates control for unobserved fixed endowments and environment by using adult sibling or panel data (e.g., Behrman and Deolalikar 1987, 1989a; Behrman and Wolfe 1989; Wolfe and Behrman 1987a,b). In addition, there probably is systematic bias in the nutrient intake measures noted in section 11.2.1 due to the failure to control for food preparer endowments and schooling, which, if it results in an understatement of nutrient intakes in households with better endowed food preparers, implies a probable downward bias in the estimated income coefficient.

Estimates of nutrient demand relations generally either have (1) estimated first food expenditure systems at a fairly high level of aggregation and translated the results into nutrient elasticities using fixed food-to-nutrient conversion factors at that level of aggregation (e.g., Pinstrup-Andersen, de Londoño, and Hoover 1976; Pinstrup-Andersen and Caicedo 1978; Murty and Radhakrishna 1981; Pitt 1983; Strauss 1984) or have (2) estimated directly the reduced-form relations for nutrients with the nutrient measured generally based on fixed food-to-nutrient conversion factors at a much greater level of disaggregation (e.g., Timmer and Alderman 1979; Ward and Sanders 1980; Williamson-Gray 1982; Wolfe and Behrman 1983, 1987a,b; Greer and Thorbecke 1984; Behrman and Wolfe 1984a, 1987a; Pitt and Rosenzweig 1985; Garcia and Pinstrup-Andersen 1987; and Kumar 1987).

There is some evidence that estimated nutrient elasticities with respect to income decline as income increases. Nevertheless, the estimates of nutrient elasticities in different studies vary more widely than explained by this phenomenon: for calories, from a low of 0.0 to 0.1 (Wolfe and Behrman 1983 for Managua, Nicaragua; Pitt and Rosenzweig 1985 for Indonesia; Behrman and Deolalikar 1987 for rural south India; Bouis and Haddad, 1989 for the Philippines) to a high of 0.9 (Strauss, 1984 for rural Sierra Leone). A major factor in explaining such variance in these estimates seems to be the different level of aggregation at which food-to-nutrient conversion factors are applied in the two procedures outlined in the previous paragraph. As is mentioned in section 11.1.2 above, Behrman and Deolalikar (1987) show formally that the nutrient elasticity with respect to income equals the food expenditure elasticity with respect to income minus the elasticity of the nutrient price with respect to income. The first procedure almost ignores the last term by applying fixed food-to-nutrient conversion factors at high levels of aggregation, thus assuring a priori that the nutrient elasticities are about the same as the food elasticities with respect to income. The second procedure applies the fixed food-to-nutrient conversion factors at a much more disaggregated level and thereby allows more compositional changes as income rises. Recent studies that compare both procedures (e.g., Knudsen and Scandizzo 1979; and Greer and Thorbecke 1984; Alderman 1986; Behrman and Deolalikar 1987, 1988a; Garcia and Pinstrup-Andersen 1987; Kumar 1987) find high nutrient elasticities with respect to income (i.e., about 0.8) with the first procedure, but much lower estimates (half as much or less) with the second procedure.[16]

Therefore our tentative conclusion is that, although food expenditure elasticities with respect to income almost are unitary for low-income households, nutrient elasticities with respect to income are much lower for the same households. Therefore, reductions in income for such households as a result of macroeconomic adjustment programs are likely to lead to much less reduction in nutrient intakes than might appear to be the case from the food consumption estimates, because such households substitute cheaper for more expensive nutrients. Because of such substitutions, the nutrient impact of macroeconomic adjustment programs may be much less than often is assumed, but the welfare impact still may be considerable because people give up other desirable food attributes when they undertake such substitutions.

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16 In an important paper that became available only as this study was about to go to press, Bouis and Haddad (1989) argue that much of the difference in such estimates is due to measurement error.

The impact of a food price increase on nutrient consumption, ceteris paribus, may be negative or positive because of induced substitution among foods with different nutrient contents (as is shown in section 11.1.2). Recent studies by Pitt (1983) for Bangladesh, Pitt and Rosenzweig (1985) for Indonesia, and by Behrman and Deolalikar (1989a) for India indicate a mixture of negative and positive price effects as suggested by relation (8b), though with some tendency for the responses to price increases for the basic staples to be negative. The study by Behrman and Deolalikar has two additional interesting features. First, the price effects are larger, with a control for fixed effects with panel data, which they conjecture to reflect an association between the environment and agricultural supplies that masks part of the price response in standard estimates. Second, the price responses in nutrient demands for females are less algebraic than those for males.

With respect to nutrient responses to food prices it is tentatively concluded that these responses are considerable in a number of cases for poor households, but more complicated than often is assumed, with some positive responses to some food increases. Nevertheless increases in basic staple prices due to reduced subsidies or devaluation as part of macroeconomic adjustment programs are likely to lead to significant declines in the nutrient intakes of poor consumers.

11.3.1.3 Health Status. As has been suggested above, the estimation of reduced-form health status relations is difficult for several reasons: measurement errors in indicators of health status may be considerable, the timing of effects of changes in right-side variables is uncertain and lags may be considerable, the roles of basal metabolism and time use may be important but difficult to measure, and the environment and endowments both may have important unobserved components.

We are aware of but a few studies that effectively estimate reduced-form relations for health as in relation (8) with very satisfactory representations of prices. Pitt and Rosenzweig (1985) present estimates for days ill in a recent period for Indonesian men and women; and Behrman and Deolalikar (1988d) estimate such relations with a multiple-indicator anthropometric latent variable representation of health status for men, women, girls, and boys in rural south India (and with control for unobserved fixed effects such as in endowments or the environment using differenced panel data). These studies suggest that there are some limited significant price responses but no income responses in reduced-form health determination relations. Taken at face value they imply more limited impact of macroeconomic adjustment programs on health status through prices and income than on food or nutrient consumption. But the author suspects that, if anything, they understate such responses because of the estimation problems noted above. A few recent estimates of demand for modern health care support such a conjecture in that they suggest

fairly substantial responses to money and time prices (e.g., Birdsall and Chuhan, 1986; Schwartz, Akin, and Popkin, 1987; Gertler, Locay and Sanderson, 1987). However, such support is not overwhelming; various estimates of health production functions do not indicate much of a significant role for nonnutritive health related inputs nor for nutrient intakes in health status production (see Behrman and Deolalikar 1988c and Behrman 1989a for surveys of such studies).

Thus, at this point, there seems to be little basis for arguing from systematic empirical studies that macroeconomic adjustment policies strongly affect measured health status.

11.3.1.4 Mortality. As suggested above mortality can be considered to be an extreme and irreversible form of poor health. Some studies find a significant impact of prices broadly defined on mortality. Merrick (1985), for example, reports a negative impact of piped water on Brazilian infant mortality. Rosenzweig and Schultz (1982) find that in urban (but not rural) areas of Colombia, child mortality is strongly affected by public health programs (particularly clinics) in households with less educated mothers. Thus these results support the possibility—more than do the direct health status estimates—that macroeconomic adjustment programs may have a significantly negative impact on infant and child health and mortality through reducing public health services (or effectively raising their prices).

11.3.2 Other Relevant Empirical Estimates of (Mostly) Structural Relations

11.3.2.1 Wage and Farm/Firm Production Functions. As discussed in section 11.1.3, if macroeconomic adjustment programs affect nutrient intakes and health status, they may have additional effects through the impact of health and nutrition on labor productivity. Although such possibilities long have been considered, most investigations are limited by the failure to control for simultaneity—that is, to separate out the extent to which higher income results in better nutrient intakes and health rather than vice versa. Recent studies by Strauss (1986) for Sierra Leone, Sahn and Alderman (1988) for rural Sri Lanka, and Behrman and Deolalikar (1989c) and Deolalikar (1988) for rural south India better control for this simultaneity (Deolalikar also controls for unobserved fixed effects). They suggest a significant impact of nutrients and health status on labor productivity, though the Behrman and Deolalikar results suggest that there are such returns only for males, given the nature of the seasonal gender division of tasks.

11.3.2.2 Household Preference Function Estimation. The nature of the household preference functions may have some important implications for understanding the impact of macroeconomic adjustment programs on household consumption and nutrient intakes and on health status. A few recent studies shed some empirical light on these characteristics.[17]

Behrman (1988b, c, 1989b) presents estimates of a separable part of the preference function in (1) that is defined over the health status of children in the household, as represented by multiple anthropometric indicators, for rural south India. His estimates suggest that during the (relatively) surplus season there are no gender or birth order preferences and that parents basically compensate for (rather than reinforce) endowment differentials. This latter result means that nutrient intakes are inversely associated with health status (as is suggested in the discussion of the health production function in section 11.1.1). In the lean season, in contrast, there are gender and birth order preferences, and parents allocate nutrients so as to reinforce endowment differentials. Thus when food is scarcest the nutritionally most vulnerable are most exposed to malnutrition risk, a result which may carry over to conditions resulting from macroeconomic adjustment programs.

Ravallion and Dearden (1988) estimate critical parameters pertaining to interhousehold transfers in relation (12) for rural and urban households in Java. For rural households their results suggest significant aversion to inequality with substantial transfers, intensified if there is ill health. For urban households there is much less inequality aversion and no special response to ill health, but there is a significant response to unemployment. Thus their results suggest that private interhousehold transfers may ameliorate some of the negative effects of macroeconomic adjustment policies, particularly if ill health in rural areas or unemployment in urban areas is associated with such policies. Such transfers improve the household income, food consumption, and welfare of poorer households. But the above results suggest that they may not have much impact on nutrient intakes or health status, given the low or insignificant elasticities of nutrient intakes and health with respect to income. However, their estimates do not permit differentiation of altruistic from other (e.g., insurance) motives and attribute to the former what may belong the latter (see Behrman and Deolalikar 1988b).

11.3.2.3 Schooling for Children. As is indicated in equation (11) in section 11.1.2 schooling productivity may be affected positively by nutrient intakes and health status. Recent studies by Jamison (1986) and Moock and Leslie (1986) report

17 These studies depend on the assumption that as an approximation there is a unified household preference function. See footnote 3.

positive associations between school performance and nutrient status in China and Nepal, respectively. However, they do not convincingly demonstrate causality since they do not recognize the simultaneity in nutrient and schooling investments. They also do not control for unobserved endowments, which might account for both good nourishment and good schooling performance. Therefore, it is concluded that there is only very speculative evidence regarding the possibility that macroeconomic adjustment programs, through nutrition, affect longer-run educational investments in children.

11.3.2.4 Births. Even in the fairly short run, as is noted above in section 11.1.1, changes in family size may affect the pressure on total household resources, with a variety of feedbacks. If nutrition and health status are affected by macroeconomic stabilization programs and affect fertility, then this may be another channel through which such programs affect the welfare of households. The author is not aware of any birth production function estimates (relation 5) that satisfactorily incorporate the impact of nutrition and health. Noted instead is some indirect evidence consistent with such a possibility in the reduced-form estimates in Wolfe and Behrman (1987a), who find that as income increases, nutrition improves, contraceptive use increases, and fertility increases. Easterlin and Crimmins (1985) also find that at low income levels income increases are associated with increased contraceptive use and higher fertility, which they attribute to improved nutrition and health, though neither is included explicitly in their analysis. Thus there is some suggestive evidence that if macroeconomic stabilization programs worsen household nutrition and health status, there is some counter tendency to lessen pressure on household resources through reduced fertility in addition to increased mortality.

11.4 Concluding Remarks

To explore the possible impact of macroeconomic stabilization programs on household food and nutrient consumption and health status requires an extended analytical framework and good empirical estimates of critical parameters because of the complexities of the a priori possibilities. The author has focused on but one, albeit important, analytical link in this process: how can one model and test empirically household responses in the determination of food and nutrient consumption and health status to changes in the market and policy environment in which they operate as a result of the macroeconomic stabilization program?

Presented first is an analytical framework for analyzing relevant household behavior. It is argued that the relationships of primary interest are reduced-form demand relations for food consumption, nutrient intakes, and health status. The right-side variables in these relations include all the relevant prices (broadly defined) and income (though this may be endogenous) that are likely to be the major channels through which macroeconomic adjustment policies affect households: money

prices may rise, public services may decline, wages and other income may fall, unemployment may increase. But there are also other right-side variables in these relations—most notably individual endowments, the environment, and adult schooling—that may need to be controlled to avoid biases in the estimate of the impact of the critical price and income intermediating variables. Also discussed more briefly are some relations of secondary interest that capture the impact of nutrition and health status on labor productivity and births and the nature of interhousehold transfers.

After discussing data problems selected recent empirical estimates are surveyed. For food consumption there are a number of studies that suggest significant and fairly substantial price (with negative own-price responses) and income responses, with both tending to be larger in absolute magnitude for poorer households. The general lack of controls for endowments, environment, and adult schooling may mean that income effects are overstated, though random measurement errors in income tend to work in the opposite direction. Nevertheless the existing studies are robust in suggesting that if food prices increase and income drops as a result of macroeconomic adjustment policies, food expenditures and welfare of poor households are likely to be affected substantially and negatively.

The estimates of nutrient intake determinants also indicate strong price responses but much less in the way of income responses. Apparently the latter result is because even people in poor households substitute considerably among nutrient sources with different marginal nutrient unit costs when their income changes due to their interest in nonnutrient food attributes. Over moderate ranges of changes, at least, the declines in nutrient demand due to income falls resulting from macroeconomic adjustment programs even for poor households apparently are not substantial. The nutrient responses to prices, though substantial, are not always inverse; increases in some nonstaple food prices in fact may improve nutrition by inducing substitution of cheaper, more nutritious foods for more expensive, less nutritious foods. Therefore, moderate general food price increases resulting from macroeconomic adjustment programs may not worsen the nutrition of the poor as much as often assumed because substitution mitigates both the pure price and income effects. Increases in the prices of basic staples for the poor, however, are likely to have a significant negative impact on nutrient intakes. Even if nutrient intakes are not affected much by price and income changes due to macroeconomic adjustment policies, the welfare of the poor is negatively affected by the reductions in their real purchasing power due to such changes.

The estimates of reduced forms of health and mortality indicate some response to prices broadly defined, but these tend to be fairly limited and there does not seem to be much evidence of a large income response. The relevant prices include the

availability of public health services, so if these are cut as part of macroeconomic adjustment programs there may be some fairly immediate, though limited, measurable health impact. All in all available studies do not support an assertion of there being strong health effects of observed variables that affect household behavior and that are likely to be affected by macroeconomic adjustment programs (though health care input demands do appear to be affected more by price changes). Perhaps this result reflects the relatively great difficulties of measuring health status of biases due to inadequate controls for the total range of prices, endowments, and dimensions of the environment. Perhaps it reflects the complexities and lags in the health production process. Whatever the cause, currently available estimates do not suggest strong impacts of macroeconomic adjustment policies on health and mortality.

Other estimates that were reviewed suggest that if nutrient intakes and health are affected by macroeconomic adjustment policies, such effects may influence labor productivity of poor populations and, much more speculatively, school productivity and births. Also, private interhousehold transfers appear to mitigate some of the possibly negative income effects that otherwise might result from macroeconomic adjustment programs.

We conclude with six observations. First, based on currently available estimates it appears that there may be significant negative welfare effects on many poor households of macroeconomic adjustment policies, as reflected in the considerable adjustments and reductions in food consumption that such households may make in response to price and income changes. For example, there may be considerable substitution of less for more preferred foods. However, it is not clear that there are likely to be major impacts on nutrient intakes or on health status. Effects through income variables, moreover, may be mitigated somewhat by interhousehold transfers, though these may be limited if most households are affected negatively by a restrictive macroeconomic program. If nutrition is affected negatively, however, it may affect labor productivity and even births.

Second, based on studies to date the author wonders if the emphasis on nutrients (as opposed to food or health status) is not overstated. On a priori grounds, as argued in section 11.1.2, it would seem that food consumption and health status directly affect welfare, not nutrient intakes per se. Nutrients are presumably of interest primarily because of their impact on health. However, at least for moderate changes in prices and income the impact on nutrient intakes is limited, and the impact of

nutrition on health status as inferred through the reduced forms for health is much less.[18] There is some case for nutrients being of interest because of their estimated productivity effects (which may be thought of as reflecting very short-run health status), but this does not seem to be the primary basis for most people's concern.

Third, the fact that nutrient responses to income are so limited and those to prices substantial suggests that the poor households being studied may not perceive themselves to be as malnourished as often is claimed (this point is argued by Payne 1985; Payne and Cutler 1984; Seckler 1980, 1982; Srinivasan 1981, 1985a, b; Sukhatme 1982; and others). If these people perceived themselves to be so malnourished, why would they not increase their nutrient intakes with income rises by consuming more of the same foods? And if they were malnourished and therefore primarily consuming foods that are sources of low cost nutrients, would not their nutrient responses to prices of other foods be minimal?

Fourth, all of these comments relate to the relatively moderate price and income differences experienced in the samples, not to drastic changes.

Fifth, such conclusions are also tentative and, except for those referring to food consumption, are based on relatively few studies. Our knowledge is particularly limited regarding the determinants of health status. Gains in understanding might be considerable by using better data (e.g., better health indicators; longitudinal data to capture lags and control for unobserved fixed effects; broader information on endowments, prices, and environments) to explore further the reduced-form health determinants.

Sixth, households are heterogeneous. Poor households have been focused on and it is assumed that they face increased prices and reduced income as a result of macroeconomic adjustment programs. But some poor households may have increased real incomes if, for example, they are producers (or employed by producers) of agricultural products whose prices rise because of devaluation and reduction of import barriers that previously favored manufacturing production or if they obtain formal sector jobs because of expanded employment therein due to real wage reductions. Therefore, poor households should be disaggregated for this analysis. Moreover, since the effects of macroeconomic adjustment programs may be transmitted in part through markets, the demands and supplies of middle- and upper-income households also have to be part of the overall analysis.

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18 Estimates of the health production function in relation (2) also reveal very little, if any, impact of nutrients on health status. See Behrman and Deolalikar (1988c) for a survey of such studies.

12. CONSUMER REACTIONS TO WORSENED ECONOMIC CONDITIONS AND TO COMPENSATORY FOOD AND NUTRITION PROGRAMS: EVIDENCE FROM BRAZIL

Philip Musgrove

12.1 Introduction

As stated in chapter one, the impact of macroeconomic adjustment policies on the poor is brought about by changes in prices, wages and employment, and government expenditures. This divides the problem in two: discovering how either a crisis or an adjustment program translates into changes in prices, wages, employment, and public expenditure, and then working out how those variables cause changes in people's nutritional condition. This chapter addresses only the second part of that task; and since it is based on existing research, it deals only with the objective of reviewing empirical evidence (and interpreting it), not with the creation of a framework for analyzing the overall problem or of a model for quantifying the effects of interest.

The research in question occurred between April 1983 and late 1988 and has been aimed at evaluating a number of federal government programs in Brazil that either subsidize basic foodstuffs or directly distribute food to beneficiaries. Attention has focused on a subsidy program and two food supplementation schemes with minor reference to various other programs, some of which did not exist when this research began. The Pan American Health Organization has supported this research in Brazil as part of a larger effort to learn how well subsidy and donation programs work in Latin America and the Caribbean (PAHO, 1988) so as to determine what changes, if any, are needed in the Organization's nutrition-related technical assistance. The Brazilian evaluation effort (Musgrove, 1989) has required, in order to judge the impact of the programs studied or to test some of the hypotheses on which they are based, research on food consumption functions (Musgrove, 1987) on the

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structure of prices (Musgrove and Galindo, 1988) and on the actual operation of the programs (Oliveira and Medeiros, 1985), which PAHO has also supported.

From these studies and the large amount of preexisting research consulted in this effort (see the Bibliography to Musgrove, 1989) I intend to look at two questions germane to the subject of this book. First, how do consumers appear to react to changes in food prices and incomes so far as their consumption of food is concerned? There is nothing new in posing this question or in trying to answer it with consumer survey data, but the results may be of interest since they are the first to use the disaggregated, family-level data from the 1974-75 Estudo Nacional das Despesas das Famílias (ENDEF) survey of income, expenditure, and nutritional status in 55,000 Brazilian households, and, since the consumption functions were designed to allow price and income effects to vary with the level of price and income, also with family size. The parameters derived from these functions have already been used to estimate the likely effects of subsidies and donations (Musgrove, 1989, ch. 6), to discuss the effect of increasing family size on per capita consumption, and to compare urban and rural consumption patterns (Musgrove, 1987). The data suffer from two important limitations: they are now twelve years old, there having been no comparably large and detailed survey in the meantime, and they do not show individual food consumption but only household totals. The ENDEF data include anthropometry for children under the age of six, but that measure of nutritional status, while of more interest than food consumption alone, cannot sensibly be related to one week's consumption, particularly in the absence of data on intrafamily distribution of food. In the results given here only the data for the northeast region of Brazil are used: these refer to almost 15,000 households in seven states, including three metropolitan areas. This geographic limitation increases homogeneity of consumption habits and avoids the problem, which seems to have appeared in previous analyses (Gray, 1982) using the aggregated ENDEF data, of possible correlations between prices and habits across regions of the country.

The second question is, how do consumers appear to react—in particular, what happens to nutritional status—when they are offered a compensatory program in the form of a food subsidy or a food supplement? (So far as any increase in their food intake is concerned there are no direct measures, and so the best available estimates come from the consumption function estimates already mentioned.) Here the evidence comes from a variety of sources, some of which constituted serious attempts at evaluation of nutritional outcomes, and some of which incidentally yielded information about beneficiaries' behavior. This information is sometimes fragmentary and hard to interpret, but it helps describe the likely effects of programs designed to compensate for the effects of macroeconomic adjustments. The Brazilian programs have traditionally been regarded as "emergency and transitory" (Arruda, 1980), not in relation to a short-term crisis or adjustment but as a way to

protect the poor while waiting for a more successful and more equitable economic development policy to reach them. For present purposes, however, that distinction is unimportant. There is also a good deal of evidence about how the Brazilian government has acted to expand or multiply programs in recent years, sometimes with an explicitly compensatory aim, although serious evaluation of the new programs has yet to begin (Campino, 1987). This sort of information, even more qualitative and incomplete so far as results are concerned, is useful as an antidote to supposing that once a proper analysis has been made of the problem, there will be an efficient and successful public response.

The rest of this chapter is organized according to the two questions just posed. The next section summarizes the findings of the consumption-function estimation, and the third section discusses a number of the findings from the evaluation of donation and subsidy programs, including some of the ancillary results that went into the evaluation. Section 12.4 offers some concluding thoughts on the subject of this book.

12.2 Food Consumption as a Function of Price and Expenditure

The consumption function estimated has the form

$$\log Q = B_0 + B_1 \log X + B_2 \log P + B_3 \log N + B_4 (NP/X) \tag{1}$$

where Q is total household consumption of the food in question, P is the price of that food as actually paid by the household, X is total household expenditure, and N is the number of household members, without adjustment for differing nutritional requirements as a function of age or sex. The term NP/X, which combines all the independent variables, can be interpreted as the reciprocal of maximum possible per capita consumption if all of expenditure were devoted to that one food.The introduction of this term means that elasticities are not constant but depend on the levels of all three variables. Expressing either quantity consumed or expenditure in per capita terms (q and x, respectively) changes only the coefficient of family size. Assuming family size not to change, a reduction of total expenditure from X to $X^* = SX$, where S is a share less than 100 percent, changes consumption of a given food (in either total or per capita terms) by

$$\log Q^* - \log Q = \log(Q^*/Q) = B_1 \log S + B_4 (1/S - 1)(NP/X), \tag{2}$$

whereas an increase in the price P of the food by 100R% will change consumption by

$$\log Q^* - \log Q = \log(Q^*/Q) = B_2 \log(1 + R) + B_4 R(NP/X). \tag{3}$$

The terms in B_4 appear because the income and price elasticities are not constant at B_1 and B_2 respectively; for large changes in the variables the formulas shown are exact. These terms in NP/X also mean that specific values of N, P, and X must be chosen when evaluating the changes in consumption as well as specifying the amounts S and R of income or expenditure and price change. N is chosen to equal six members, which is close to the mean household size observed in the survey, and P is set equal to the average price paid by all households who actually bought the particular food. X then needs to be set equal to a level corresponding to poverty. Since the poverty of interest is that which threatens nutritional adequacy, it makes sense to define X relative to the cost of obtaining enough calories from a few basic foods. Rice and beans are the most basic foods for combining calories and protein in Northeast Brazil, so their prices define the level of expenditure required to eat adequately. For rural households per capita expenditure x = X/N needs to equal at least 500 cruzeiros of August 1974 (or 3,000 cruzeiros for a family of six), assuming everything to be spent on rice and beans, while a level of 1,000 cruzeiros (6,000 cruzeiros for a family of six) would allow the family to get by on just half their total expenditure (with total food spending being, of course, somewhat higher, because families would also buy some other foods). The lower of these two lines therefore defines extreme poverty, people who could barely get enough to eat before any crisis struck, while the higher one defines a population poor but possibly well nourished, who would be pushed into nutritional insufficiency by even a fairly small reduction in income or increase in food prices. For this reason the 1000 cruzeiro level is taken as the poverty line in this analysis. Urban families at that level of per capita spending would be worse off than those in rural areas, because the prices of traditional basic foodstuffs were, in 1974-75, higher in cities, and in general this pattern was still valid ten years later (Musgrove and Galindo, 1988). All the parameter values and the prices necessary to evaluate expressions (2) and (3), as well as the poverty line calculations, are given in Musgrove (1989, tables 1 and 2).

To judge how much people might suffer under a reduction of income (or an increase in food prices), one needs to consider a discrete change, large enough to be significant but not so large as to plunge all the nonpoor into destitution. The size of the change should also bear some relation to the magnitude of real income losses in the recession of the early 1980s. For these reasons expressions (2) and (3) are calculated assuming a 20 percent reduction of income (S = 0.8), and food price

increases of 25 percent (R = 0.25) on the presumption that relative food prices would, if anything, increase slightly in a crisis or an adjustment program, so that if prices rose 20 percent on average, food prices might rise one-fourth more. With these substitutions the expression for the percentage reduction in food consumption becomes

$$(Q - Q^*)/Q = (q - q^*)/q = 1 - \exp(-0.22314B_1 + 0.00025B_4P) \tag{4}$$

for a 20 percent reduction in total expenditure and

$$(Q - Q^*)/Q = (q - q^*)/q = 1 - \exp(0.22314B_2 + 0.00025B_4P) \tag{5}$$

for a 25 percent increase in the price of that food with no other price changes. Table 12.1 shows the results of these calculations for 15 foodstuffs in metropolitan and in rural areas of the Northeast.

A few of the results reflect the fact that some of the foods studied are inferior, with consumption first rising as income increases and then declining as consumers substitute foods that offer better taste or that combine protein with the cheap calories of the inferior product. This explains the very small effect of income changes on consumption of cornmeal and manioc flour, traditional foods of the very poor that contain almost nothing but calories. There are also apparently perverse price effects for raw milk in urban areas and for margarine in rural areas. In both cases very close substitutes exist (pasteurized milk, lard, and vegetable oils), and a better estimation would probably have to take account of the prices of those substitutes. With these exceptions it appears that, in general, expenditure reduction leads to a decline in consumption of 5 percent to 15 percent while an increase in price of 25 percent would cause an even greater reduction, sometimes exceeding 20 percent. Of course, part of the reduced intake of one food whose relative price rises can be offset by more consumption of a close substitute. Nonetheless, the substantial income effects imply that consumers cannot simply avoid the consequences of price increases by eating less-preferred foods; while the inferiority of pure calorie foods means that, even if total calorie intake can be protected when income falls, the quality of the diet is sure to suffer. Overall these estimates suggest that poor households are fairly vulnerable to adverse economic changes of even modest size. As was indicated earlier it is unfortunately not possible to turn these estimates of reduced food intake into projections of likely changes in nutritional status, because the latter depends on cumulated intake over long periods, on the distribution of food among family

Table 12.1 - Percentage Reductions in Consumption of Specific Foods Associated with a Reduction of 20% in Expenditure or an Increase of 25% in Price in Metropolitan and Rural Areas of Northeast Brazil

		Consumption Reduction Due To:	
Foodstuff	Location	Income Reduction m	Price Increase
Rice	Metropolitan	11.8	24.2
	Rural	13.0	27.8
Cornmeal	Metropolitan	1.2	16.0
	Rural	4.3	14.0
Manioc flour	Metropolitan	-1.8 (increase)	12.6
	Rural	0.6	6.9
Pasta	Metropolitan	14.7	22.9
	Rural	3.4	13.0
White sugar	Metropolitan	10.7	14.5
	Rural	11.8	[illegible].9
Brown sugar	Metropolitan	-7.4 (increase)	15.1
	Rural	10.3	18.8
Beans	Metropolitan	10.3	11.9
	Rural	5.0	11.7
Beef (with	Metropolitan	15.8	18.4
bone in)	Rural	11.1	4.3
Dried beef	Metropolitan	10.8	14.9
	Rural	13.0	12.6
Salted fish	Metropolitan	6.9	5.8
	Rural	6.8	7.0
Eggs	Metropolitan	13.2	12.8
	Rural	7.8	9.7
Raw milk	Metropolitan	6.5	27.8
	Rural	5.5	15.2
Pasteurized	Metropolitan	8.9	-4.4 (increase)
milk	Rural	7.0	[illegible]
Soybean oil	Metropolitan	23.6	13.4
	Rural	15.4	7.9
Margarine	Metropolitan	17.6	16.6
	Rural	12.2	-3.1 (increase)

SOURCE: Original calculations are based on Musgrove (1989, table1).
NOTE: Date is from 1974-75.

members, and on many other variables, particularly, in the case of infants and small children, on how often, how severely, and how long they are sick.

Turned around to describe transfers that effectively increase income or subsidies that lower food prices, these same estimates suggest that either kind of compensatory program can have some substantial impact on household food intake. Such estimates depend, of course, on the assumption that a transfer of food is treated just like a transfer of income of equal value and that, when the price of food is reduced, its quality and the other costs associated with acquiring it do not change, so that subsidized food is a perfect substitute for food purchased at full market price. These assumptions, which have seldom been directly tested in Brazil, are discussed further in section 12.3. To summarize, if people affected by an economic crisis or by an economic adjustment that cuts their incomes or makes food more expensive react along the cross-sectional consumption function, then the effects of such loss of purchasing power are likely to be substantial. To offset or prevent such effects would require a change in behavior, such as making more efficient use of the food budget or improving hygiene or health care sufficiently so that nutritional status could be protected even with less intake of food. There is little evidence about how efficient poor Brazilian consumers are or could be expected to be—in part because the ideology of government assistance programs assumes that beneficiaries are rational and know what to eat, and this "propoor" stance has not often been questioned (Musgrove, 1986). If the question is whether the poor know that rice and beans are good for you and cheap, then the answer is undoubtedly yes; but the answer becomes less certain if it is asked whether these same households know their children's health and nutritional requirements and satisfy those requirements so far as their resources allow. The only direct estimate of efficiency in food buying (without considering intrafamily distribution) shows that families typically come close to minimizing the cost of the combination of nutrients they actually buy but do not necessarily buy the nutrients they need most (Rosenberg, 1976). There have been no adequately controlled longitudinal studies of how families react to worsened economic circumstances, and inferences from a cross-section may be misleading.

12.3 Nutritional Status and Compensatory Food Subsidies and Donations

Brazil in recent years had one food subsidy program, PROAB (Projeto de Abastecimento de Alimentos Básicos em Áreas de Baixa Renda, or Program of Basic Food Supply in Low-Income Areas), which operated in eight capital cities of the northeast. Up to eleven basic foodstuffs (the number available has varied slightly through time) are sold to participating retailers, who agree to sell to final consumers at fixed prices which typically represent a subsidy of about 20 percent. Buyers are not identified, and there is no limit to the amount a consumer can purchase (but

there are limits on retailers' purchases to prevent reselling), so the only targeting of the program is its limitation to poor neighborhoods, where better-off customers presumably will not come to shop. There was no evaluation of PROAB's impact on food consumption or on nutritional status through 1987. The program was preceded, however, by a similar experimental scheme, PINS (Programa Integrado de Nutrição e Saúde, or Integrated Nutrition and Health Program), which operated only in Recife during 1978-80. In this experiment families were registered to participate in the subsidy and were given what amounted to ration cards allowing them to purchase up to a maximum amount per fortnight of just four basic foods. PINS was not evaluated as to its effect on food consumption, but the children up to age six in the participating families were weighed at yearly intervals, so it was possible to evaluate changes in nutritional status during their participation (Nunes da Silva, 1985).

During the same period there have been two substantial federal food donation programs, both of which register individual beneficiaries and give a monthly ration that is supposed to provide a fixed percentage of the calorie requirements of the particular individuals—pregnant women, nursing mothers, and infants from age six months up to three or more years—to be benefitted. One program, PNS (Programa de Nutrição em Saúde, or Program of Nutrition in Health, since rechristened PSA, Programa de Suplementação Alimentar, or Supplementary Feeding Program) provides some of the same "natural" or traditional foods as are used in the subsidy program; the other, PCA (Programa de Complementação Alimentar, or Complementary Feeding Program), has until recently always used specially formulated foods that are intended to provide a more balanced supplement and also to reduce "dilution" or consumption by family members other than the intended beneficiaries. Both these programs have been evaluated as to changes in nutritional status of participating children (Legião Brasileira de Assistência and UNICEF, 1982; Rios, 1981) and also with respect to their effect on birthweight for participating pregnant women (Legião Brasileira de Assistência, 1985; Instituto Nacional de Alimentação e Nutrição, n.d.). Neither has been studied directly for its effect on food consumption. There have also been studies of other aspects of these programs, such as the determinants and regularity of participation by the intended beneficiaries (Kalil et al., 1984; Lerner et al., 1985).

Table 12.2 summarizes most of what has been learned about changed nutritional status of children in these programs, based on studies in Brasilia (PCA), Salvador (PNS), and Recife (PINS) during the late 1970s. Except for PCA, where the evaluation was conducted after only six months of operation, the results are classified by the length of time a child was registered in the program. These results are not very encouraging: there is always a considerable fraction of beneficiaries whose nutritional status worsened while they were receiving the supplement or

Table 12.2 - Changes in Nutritional Status of Children Participating in Supplementation or Subsidy Programs in Brazil, by Program, Anthropometric Criterion, and Time in the Program, 1976-80

	Final Nutritional Status				Change in Status		
		Malnourished[a]					
Initial Status	Normal	1	2 and 3	Total	None	Better	Worse
1. Weight for Age							
PCA[b] (6 months)							
Normal	589	56	6	651	589	–	62
Malnourished 1	170	196	12	378	196	170	12
2 and 3	12	33	12	57	12	45	–
Total	771	285	30	1086	797	215	74
PNS[c] (6-24 months)							
Normal	693	203	7	903	693	–	210
Malnourished 1	198	509	66	773	509	198	66
2 and 3	21	148	167	336	135	197	4
Total	912	860	240	2012	1337	395	280
PNS (24-48 months)							
Normal	480	121	8	609	480	–	129
Malnourished 1	296	558	71	925	558	296	71
2 and 3	68	272	155	495	113	376	6
Total	844	951	234	2029	1151	672	206
PINS[d] (12 months)							
Normal	2261	849	48	3158	2261	–	897
Malnourished 1	477	2141	248	2866	2141	477	248
2 and 3	36	350	510	896	451	426	19
Total	2774	3340	806	6920	4853	963	1164
PINS (24 months)							
Normal	1636	843	65	2544	1636	–	908
Malnourished 1	467	1456	224	2087	1456	407	224
2 and 3	55	333	310	698	261	426	11
Total	2098	2632	599	5329	3353	833	1143
2. Weight for Height							
PNS (6-24 months)							
Normal	985	63	6	1054	985	–	69
Malnourished 1	145	34	9	188	34	145	9
2 and 3	31	20	13	64	7	56	1
Total	1161	117	28	1306	1026	201	79
PNS (24-48 months)							
Normal	450	32	6	488	450	–	38
Malnourished 1	128	26	2	156	26	128	2
2 and 3	35	4	0	39	0	39	0
Total	613	62	8	683	476	167	40

Table 12.2 - (Continued)

3. Height for Age							
PNS (6-24 months)							
Normal	303	210	72	585	303	-	282
Malnourished 1	58	209	146	413	209	58	146
2 and 3	18	65	225	308	152	114	42
Total	379	484	643	1306	664	172	470
PNS (24-48 months)							
Normal	125	89	17	231	125	-	106
Malnouished 1	70	110	44	224	110	70	44
2 and 3	30	64	134	228	91	118	19
Total	225	263	195	683	326	188	169

SOURCE: Musgrove (1989, table 33).

[a]"Malnourished 1" refers to first-degree (mild malnutrition, and "2 and 3" to second- or third-degree (moderate or severe) malnutrition according to the Gomez or Waterlow classifications. [b]PCA: Brasilia, 1987, children up to 3 years old. [c]PNS: Salvador, 1976-80, children up to 3 years old. [d]PINS: Recife, 1978-80, children up to 6 years old.

subsidy, and some of these children were slightly malnourished to begin with. In a few cases the number who got worse exceeds the number whose status improved. This outcome is most dramatic in the case of height-for-age, which was measured only in PNS, but it also occurs in the weight-for-age measure in the subsidy program (PINS). It appears that when food is donated, improvements in status become more frequent relative to deterioration as a child stays in the program longer. This occurred in PNS with all three anthropometric criteria. It did not happen, however, in the subsidy program.

These results are contaminated by the presence of many children with normal nutritional status who could worsen but could not improve. They are hard to interpret because nothing is known about what happened to the beneficiaries' economic circumstances during their participation. The authors of one evaluation of PINS (Cavalcanti et al., 1984) believe that economic deterioration during 1978-80 overwhelmed any good effect the subsidy might have had, so that the program did no more than slow the impoverishment of participants. They also report that many families ceased to participate, because of the difficulty of accumulating cash for the days when subsidized purchases were allowed; people could not, as they later could in the PROAB subsidy, buy whenever they wish or buy from any of a large number of retailers. Part of the fault for this poor result lies with the rigidity of the experimental program. The outcome may also indicate the importance of regularity, and not just elapsed time, of participation. Finally, even if it is true that the PINS experiment was overwhelmed by economic recession, that is hardly a good omen for any program intended to compensate for precisely such an event. Unfortunately

no evaluation of any of the programs has kept track of changes in participants' economic situation. Another complication of the data in table 12.2 is that they mix children of different ages, whereas worsening of nutritional status—slowed or stopped growth—is concentrated in the second half of the first year of life, when breastfeeding has usually stopped and diarrhea and other diseases have begun to affect food intake and utilization. The next four tables attempt to take account of one or more of these complicating factors.

Tables 12.3 and 12.4 limit the analysis to children under one year of age upon entering the program. A comparison between table 12.3 and table 12.2 indicates that these children are most likely to worsen in nutritional status. The subsidy program, which did not include any health care or nutritional information (except for one subset of families who had to bring their children for a checkup each month), seems to have done little to offset the tendency for children in this age group to slow down in growth. Staying in the program for the full two years increased slightly the share of children whose status worsened, but it also increased the share who improved at the expense of the group in which there was no change. However, this occurred mostly because the group that participated for the full two years included fewer children with normal initial status; those worse off were slightly less likely to abandon the program. To the extent that infants are at greatest risk of dying from malnutrition, this result suggests that simply making it a little easier to buy food, without any health care improvements or any change in parents' knowledge and behavior, does little to reduce that risk. Table 12.4 reports on three anthropometric criteria for the donation program and shows clearly that the sharpest deterioration occurs in height-for-age as children's growth slows or stops. The results for weight-for-height show more improvements and less worsening, and those for weight-for-age are intermediate. It also appears that stunting is concentrated in the first two years of life and can sometimes be reversed if a child stays in the program long enough. That is encouraging, but it does not suggest that quick and dramatic results are obtained for malnourished infants. Two years is still short term, but it implies that to reverse or offset the effects of an economic recession might require compensatory programs for some time after the recession itself was over.

Tables 12.3 and 12.4 include many initially normal children. These are excluded from table 12.5; children are still classified by age at entry to the program, and data are given for both the subsidy and the donation. Worsening of status (weight-for-age) is concentrated among the children who were under a year old at the start, with worse results—unsurprisingly—for the subsidy. Many children gained some weight under either program without reaching normal status. Finally, table 12.6 classifies changes in nutritional status not according to age or to time in the program, but to the number of times a mother actually received the supplement of food intended for her child. (These data refer to São Paulo rather than Salvador and so

Table 12.3 - Changes in Weight for Age among Children Initially under One Year Old, Participating in the Experimental Subsidy Program (PINS), by Length of Time in Program, 1978-80

	Final Nutritional Status				Change in Status		
		Malnourished					
Initial Status	Normal	1	2 and 3	Total	None	Better	Worse
One year in program							
Normal	501	383	36	920	501	–	419
Malnourished 1	46	173	84	303	173	46	84
2 and 3	8	47	56	111	56	55	0
Total	555	603	176	1334	730	101	503
Two years in program							
Normal	357	411	47	815	357	–	458
Malnourished 1	50	169	75	294	169	50	75
2 and 3	14	56	34	104	24	78	2
Total	421	636	156	1213	550	128	535

SOURCE: Musgrove (1989, table 33).

Table 12.4 - Changes in Nutritional Status of Children Initially between 6 and 12 Months Old, Participating in Food Donation Program, (PNS), by Anthropometric Criterion and Time in Program, 1976-80

	Weight-for-Age	Weight-for-Height	Height-for-Age
Initial Status			
Normal	822	734	521
Malnourished 1	567	142	266
Malnourished 2	205	43	108
Malnourished 3	50	16	40
Total	1644	935	935
Changes in 6-24 months			
None	651	504	285
Better	145	101	37
Worse	196	39	322
Total	992	644	644
Changes in 24-48 months			
None	388	170	107
Better	163	50	47
Worse	101	20	86
Total	652	240	240

SOURCE: Musgrove (1989, table 32).

Table 12.5 - Changes in Weight for Age Among Initially Malnourished Children, by Program, Age at Entry, and Time in Program, 1976-1980

	Change in Status					
	Improved to Normal	Partly Better	Totally Better	None	Worse	Total
Donation (PNS)						
6-24 months in program						
Aged 6-12 months	82	63	145	263	41	449
Aged 12-36 months	137	113	250	381	29	660
24-48 months in program						
Aged 6-12 months	81	82	163	179	31	373
Aged 12-36 months	283	226	509	492	46	1047
Subsidy (PINS)						
12 months in program						
Aged 0-12 months	54	58	112	214	88	414
Aged12-72 months	459	332	791	2378	179	3348
24 months in program						
Aged 0-12 months	64	64	128	193	77	398
Aged 12-72 months	398	307	705	1524	158	2387

SOURCE: Musgrove (1989, table 34).

do not describe the same beneficiary population as in tables 12.2, 12.4, and 12.5, and the period is 1980-82 instead of 1976-80.) During twenty-four months a registered mother should have collected her supplement twenty-four times, but many came much less often. What is most evident in table 12.6 is the lack of any marked relation between changes in nutritional status and the frequency or regularity of participation: for example, the share of children who worsened is nearly independent of frequency. The reason for this seems to be that the beneficiaries use the program as a last resort, because it is bothersome to go pick up the food, the ration is small, and the food is often of poor quality (Lerner et al., 1985). Thus the people who drop out or attend irregularly tend to be those who need the supplement the least, or think they do. It does not matter whether these differences among beneficiaries are relatively permanent or reflect month-to-month changes in economic situation. It is known that the poor urban families use these programs as a means to supplement quite irregular incomes (Motta and Scott, 1983; Haguette, 1982); it appears that they treat the food ration as a supplement in bad months but do not bother with it when income seems to be adequate. To the extent that families can discriminate correctly, this is good news, because it means that people will take

Table 12.6 - Changes in Weight for Age among Children Participating in Food Supplementation Program (PNS) in Two Municipalities of São Paulo, by Frequency of Receipt of Food, 1980-82

	Final Nutritional Status				Change in Status		
		Malnourished					
Initial Status	Normal	1	2 and 3	Total	None	Better	Worse
Fewer than 6 Times (out of maximum of 24)							
Normal	291	114	9	394	271	–	123
Malnourished 1	84	199	57	340	199	84	57
2 and 3	20	56	83	159	76	79	4
Total	375	369	149	893	546	163	184
6-11 Times							
Normal	1188	342	30	1560	1188	–	372
Malnourished 1	184	641	143	968	641	184	143
2 and 3	22	119	132	273	117	149	7
Total	1394	1102	305	2801	1946	333	522
12-17 Times							
Normal	713	261	31	1005	713	–	292
Malnourished 1	170	473	105	748	473	170	105
2 and 3	29	99	100	228	87	137	4
Total	912	833	236	1981	1273	307	401
18 or More Times							
Normal	506	166	21	693	506	–	187
Malnourished 1	131	327	62	520	327	131	62
2 and 3	20	60	69	149	61	84	4
Total	657	553	152	1362	894	215	253

SOURCE: Musgrove (1989, table 31).

emergency help only when they really need it, and so a compensatory food program will waste fewer resources on those who do not need help. The unattractiveness of the program perhaps ensures that people will not stay in it when they should leave and will make room for someone worse off. However, since beneficiaries are automatically dropped from a donation program when they stop nursing or when their children reach the upper limit for age (now three years), overstaying their benefits cannot be a long-term problem. The real difficulty with irregular participation is that beneficiaries who do not claim their rations still take the places otherwise available to other needy families. Moreover, the evidence discussed previously—of worsened nutritional status among program participants—suggests that the choice of when to participate is not often well made; or that, if it is, the program is too small

or too little integrated with health care and educational interventions to prevent malnutrition for those children in greatest nutritional need. Certainly there is little evidence to suggest that whenever a family falls below the economic threshold at which it can still eat adequately, a subsidy or donation like those analyzed here can reliably prevent malnutrition among young children.

The evaluations discussed here are quite incomplete (and most other evaluations of these and similar programs in Brazil are still more limited), so that it is hard to be sure what impact the programs may have had. The correct comparison is to what would have occurred in the absence of the program, but only one exercise (Nunes da Silva, 1985) has tried to estimate such a counter-factual effect: it appears from that estimation that the tendency to nutritional deterioration between six and twenty four months of age is normally even worse than was observed among the subsidy participants. Supposing the actual effects to be as small as they seem from the variety of evaluations discussed here, there are many possible explanatory factors—the small size of the ration, which is meant to provide 20 percent to 40 percent of the calorie requirements of specific beneficiaries; substantial, if usually unreported, intrafamily dilution (Ferriani, et al., 1985), which reduces what the intended beneficiary gets; irregular participation, which reduces the program's potential good effect; concurrent, often adverse, economic changes; and frequent illness.

To oversimplify somewhat, the government's actions determine the maximum potential benefit to be derived from participation in a compensatory program, and then the client's behavior—and some factors largely beyond his control—determines how much of that potential is realized. It is evident in the Brazilian case that the potential has sometimes been much less than expected simply because of inefficiency in the way a program is operated. For example, the foods to be subsidized or given away are occasionally not available; or are of such poor quality that the beneficiary will accept them only in order to receive the other foods offered; or, because the wholesale price is higher than necessary, only a fraction of the intended subsidy is actually passed on to the consumer when the final price is compared to the supermarket price (Oliveira and Medeiros, 1985). The quality problem seems to have been generally worse in the donation program; the subsidy customer can take his business elsewhere, at relatively little cost. But inefficiency is just as much a problem in the subsidy scheme. The evidence of scarcity—high prices and costs to the consumer of obtaining the subsidized or free food—suggests that the food acquired through a program is not regarded as a perfect substitute for food bought through ordinary commercial channels. Unfortunately, that undermines the usefulness of the consumption-function estimates as a basis for predicting the effects of a donation or subsidy, since those functions are based on purchased food. No evaluation has yet been able to take account of all the factors, both on the

government's side and in the responses of the beneficiaries, so as to determine how large the real impact is and to discover why it is not larger.

12.4 Concluding Reflections

What do all these estimates and observations tell us about the problem at hand—namely, predicting the effects of macroeconomic adjustments (whether deliberately induced or not) on poverty and nutritional status—so that something can be done to offset or compensate those effects? The easy answer is, not much. Reducing poor people's incomes or raising the price they must pay for food will reduce their food consumption, without our being sure of the consequent effects on health and nutritional status. Offering them a small subsidy or a supplementary ration will enable some children to improve in status but will not prevent others from worsening. Perhaps these conclusions are already known and are now supported by a few more numbers.

At the risk of claiming more than the numbers really can support, I want to suggest that this answer is too easy, that more can be, or has been, learned from trying to evaluate food and nutrition programs in Brazil. First of all, it is important to see whether fairly small and quite likely income reductions can be expected to substantially affect consumption of calorie-rich basic foods, because to the extent that such effects exist, one cannot suppose that the poor will offset any economic deterioration by simply rearranging their diet. In the case of northeast Brazil it appears that urban consumers have somewhat more scope than rural households for such dietary changes and in that sense should be better able to protect themselves by substituting one food for another. Unfortunately, at a given income level they have already introduced more substitution and variety into their diet than a typical rural family, and that may be why calorie malnutrition is more of an urban than a rural problem in Brazil (Musgrove, 1989).

In the second place, we clearly do not know enough about how reductions in food consumption translate into changes in nutritional status or health, particularly when we know little about people's burden of sickness before they suffer economic adversity or about how the distribution of food within the household changes when some adjustment must be made. There is no doubt that the economic factors that have so large an effect on both food consumption and nutritional status are easier to measure and much easier to build into analytical models than some of the other determinants such as past sickness and intrafamily behavior, but that does not mean that those factors do not matter. In fact they appear to have very large and generally underestimated consequences for nutritional status (Shrimpton, 1982). The disappointing, and highly varied, results of the food programs studied probably depend in part on not controlling for families' incomes, but they must also reflect the importance of these other causes of malnutrition. This seems particularly evident

in the way that the programs can improve the status of children over a year old more readily than they can prevent deterioration of nutritional status for infants.

In the third place, how a subsidy or supplementation program is actually operated and how consumers react to it matters greatly. One can estimate the current calorie shortfall in a poor population from a budget study and even use consumption function estimates to project how that shortfall might increase under different assumptions about income and price changes, as the World Bank did in guessing how large an income transfer might be needed to eliminate malnutrition in Brazil (World Bank, 1979). But even if such estimates are reasonably accurate, they give rather little idea of how much malnutrition would actually be reduced or prevented by making that amount of food available. Brazilian experience seems to show that consumers do not treat such food as a perfect substitute for what they can buy commercially, that they react to the nonmonetary costs of obtaining donated food, that the benefit to them can be much smaller than the cost to the government of providing the food, that they use donations particularly as a last resort, and that they do not necessarily understand how food consumption and health care interact to determine whether their children grow normally or not.

Two conclusions appear to follow from this. One is that an analytic modeling exercise needs to take account of the noneconomic determinants of nutritional status more than has been done in the past. Otherwise the exercise will be able to say something about how macroeconomic adjustments affect poverty, but it will have little to offer in explaining nutrition. The nature and effectiveness of likely compensatory programs also need to be built into the analysis, rather than using the model to say what compensatory results are needed without being able to say how they might be achieved by some feasible combination of policies. The other conclusion is that much thought should be given to redesigning adjustment programs to have less painful effects and trying to offset those effects by such programs as food subsidies or supplementation. What we know so far tells us very little about how much of each type of effort to make or what part of the population might benefit most from one or the other approach. It would probably be a mistake to assume that different ways to protect the poor are equally helpful.

13. POVERTY, FOOD SECURITY, AND POLICY REFORM IN AFRICA

David E. Sahn

13.1 INTRODUCTION

Current orthodoxy concerning sub-Saharan Africa (SSA) seems to revolve around three related propositions: first, many of the countries are facing an economic crisis of enormous magnitude characterized by unsustainable imbalances in their internal and external accounts as well as low levels of living standards as manifested in indicators like high prevalence of malnutrition and food insecurity; second, there is a need for macroeconomic and sectoral adjustment policies to correct the economic imbalances, and adjustment must involve considerable concessionary financing and major efforts to reduce market distortions that arise from government policy and the rules and regulations that guide economic agents; and third, the efforts at adjustment will inevitably compound the suffering of the poor.

The first of these propositions is the least contentious. It is manifested in the declining per capita growth rates in Africa as well as burgeoning deficits in the current account deficit throughout the 1970s and the beginning of the 1980s. Similarly, indications are that the proportion of the population suffering the ravages of food insecurity declined only slightly during the past 15 years, and, owing to population growth, the actual numbers of food insecure persons increased from 81 million in 1969-71 to 99 million in 1971-81 (FAO, 1985).[1] More recent estimates from the mid-1980s put the number of food insecure at 104 million (World Bank, 1988). The sobering macroeconomic and aggregate food security statistics provide evidence of the human toll this economic stagnation has wrought. They do not, however, give any clues into the etiology of the economic and social crises; and

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1 These figures assume a calories threshold that corresponds to 1.4 times the Basal Metabolic Rate (BMR). Alternative estimates at 1.2 BMR place the number of malnourished at 57 and 70 million, respectively, for the two periods.

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despite that trends in real incomes, budget deficits, and food insecurity show no sign of sustained improvement during the 1980s, such data do not indicate whether policy reform has mitigated or exacerbated the problem.

To amplify, the causes of the economic failures and imbalances throughout most of SSA are indeed complex. They rest partially with the policy-makers, in particular, the discrimination against and neglect of agriculture has generally been the most damaging of the distortions introduced. Blaming policy, however, is not to disregard the role of exogenous shocks, such as drought, falling commodity prices, instability in financial markets, and the recession in developed countries, which, coupled with increased protectionism, reduced the demand for and prices of imports from developing countries. Although developing countries should not shoulder the entire burden of their economic failures especially in light of the contribution of developed country policies to a less than hospitable international economic environment, the poor economic performances during the 1970s and early 1980s have militated against the continuation of existing policies in developing countries. The role of the government sector and the distortions in markets and resource allocation throughout much of SSA requires redress. This is regardless of how much of the burden of adjustment should and will be assumed by developed countries through efforts such as reducing trade barriers and the U.S. coming to grips with its own trade and budget deficits.

The need for and nature of policy reform efforts vary from one country to the next. In broad terms these efforts aim to restore the external and closely related internal financial account balances. This can be achieved, on the one hand, through fiscal and monetary restraint to bring domestic demand into alignment with aggregate supply (i.e., stabilization). The stabilization policies that attempt to reduce expenditures most often operate through efforts to reduce government expenditures and monetary and credit policies that scale back the level of aggregate demand. Another important aspect of stabilization efforts are expenditure-switching policies, especially devaluation of the local currency. Expenditure switching will alter relative prices and work through the economy in a complex and somewhat unpredictable fashion, altering incentives and the composition of production and demand in a fashion that is expected to reduce imports while stimulating exports. When coupled with institutional reforms and changes in the rules and regulations that govern the operation of economic agents, expenditure switching also falls under the broad heading of structural adjustment. This latter enterprise is designed to be expansionary in output through reducing distortions, altering the production structure, and increasing incentives in order to induce an increase in productivity. A key element of both stabilization and structural adjustment policies is the associated, albeit conditional, financing. In the case of the former credits are provided in order to keep the treasury solvent in the short term, and in the case of structural adjustment

the financial resources fund the investment and recurrent expenditures that are a prerequisite to inducing short- and long-term gains in the level of output.

While the stabilization efforts are most often associated with the IMF and structural adjustment is most often regarded as the domain of the World Bank, in practice the two often go hand in hand. They are closely linked in terms of policy and outcome. That is, structural adjustment is more likely to succeed in a stable economic environment; and many policies associated with structural adjustment (e.g., devaluation, privatization of subsidized marketing enterprises) will simultaneously be expansionary in terms of supply while serving the objective of reducing aggregate demand.[2] Since the measures associated with reforms of public investment programs, exchange rate policy, public enterprises, pricing and marketing, credit and tax policies, and so forth are difficult to dichotomize into those associated with stabilization and structural adjustment, the remainder of this chapter will simply lump them together under the broader framework of macroeconomic adjustment and policy reform.

To better understand the links between adjustment and food security, however, a few important points are highlighted. First, macroeconomic adjustment is not generally an option, but a necessity. Countries facing serious disequilibriums have no choice but to adjust. One can safely assume that by the time a government reaches an accord with the IMF in particular, its freedom in policy-making has been dramatically reduced. Not only have they exhausted sources of capital from the private sector, but the situation they find themselves in implies a deterioration in their account balances that by definition will entail some sacrifice. Which segments in society will suffer, however, is far from clear.

The options available to government are essentially limited to exerting some influence over the path and pace of reform. In fact even in the absence of a Bank or Fund sponsored program countries do adjust, often without the benefit of the external financing. From the perspective of some governments this is preferable to compliance with the conditions of international institutions that they argue do not have the country's best interest at heart. The extent to which the refusal to adhere to the conditions set forth by the donors is an effort to protect the rents received by government officials and their constituency is a subject that is best left to the political scientists.

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2 There are also potential conflicts between stabilization and structural adjustment, at least in terms of timing if not objectives. For instance, trade liberalization associated with structural adjustment may aggravate the balance-of-payments problem in the short-term.

Second, despite adjustment often being associated with the types of policies outlined above, in practice the process varies dramatically from country to country. In particular there is considerable divergence in the prior conditions, objectives, pace and timing, duration of effort, level of financing, changes in external environment, nature of conditionalities, degree of implementation and sustainability, and consequent performance at both the macro and micro levels of adjusting countries.

Given that there is not a group of sound empirical research studies on the impact of adjustment on food security that employs counterfactual analysis to determine what would have occurred in the economy in the absence of adjustment, the remainder of this discussion will aspire to more modest objectives, mixing theory with the analysis of trends in an attempt to extract some salient insights into the links between adjustment and food security in sub-Saharan Africa. The focus will be on the two main requirements of food security: (1) adequate availability of food, and (2) the ability of households to grow and/or purchase adequate quantities to provide for good health, growth, and normal activity.

13.2 FOOD PRODUCTION AND AVAILABILITY

Many of the measures associated with adjustment, whether sectoral or macroeconomic reforms, are expected to bring about an improvement in the agricultural terms of trade. In particular expenditure-switching policies, such as devaluation of the exchange rate and reducing protection of industry, will tend to raise incentives for the production of tradable goods, be they exportables or import substitutes. Other adjustment measures such as institutional reforms that reduce the role of parastatals that are usually associated with levying heavy implicit taxes on farmers are expected to stimulate agriculture. Of course, like most policies that cut with a two-edge sword, devaluation of the exchange rate and policies such as reducing government subsidies will concurrently cause some hardships for certain farmers through raising fertilizer prices or increasing the price of credit. However, commercial policies that liberalize imports of fertilizer, tools, and other agricultural products that are often rationed are expected to improve their availability. Likewise, even if the official price of credit increases, households that previously were not able to get any credit except at high black market rates will stand to benefit. Quite simply, greater availability of inputs and credit, even at higher prices, is a potential net benefit for agriculture to offset the losses incurred as prices rise. The poor farmers in particular are expected to benefit, given the experience that successful rent-seekers are likely to be the politically favored, i.e., larger commercial farmers and upper-income households.

Given that policy reform will bring about improvements in the agricultural terms of trade, there are a series of factors that will determine whether food production

and availability at the national level can be expected to increase and whether the food insecure will benefit from such changes.

13.2.1 Exchange Rate Policy

As intimated above, exchange rate policy is the central pillar of many adjustment programs that seek to alter relative prices and raise incentives for producers. The feasibility of effectuating and sustaining real devaluation, however, has been the subject of considerable debate. Quite simply, while countries have and continue to nominally depreciate their currencies, it has been argued that real exchange rate changes have not been so easy to achieve. This is because of the pressure that devaluation places on the prices of non-tradables, bringing about a general inflation that fails to raise significantly the price of tradables relative to non-traded goods (see, for example, Godfrey, 1985; World Bank 1986a; World Bank 1986c).

In order to arrive at a more up-to-date assessment, the movement of real exchange rates was examined in SSA. Twenty-three out of the 30 countries had depreciated their currency between 1983 and 1987. Of those, 14 had done so by more than 20 percent (table 13.1). With the exception of Liberia, all of these 14 have received adjustment loans from the World Bank, but not all received financing from the IMF. While the real exchange rate depreciated by less than 20 percent in countries with and without adjustment programs financed by the Bank and/or IMF, the important point is that virtually all countries are adjusting, and there is a marked trend toward removing distortions in exchange rates.

13.2.2 Supply Response

Given the progress being made on the exchange rate front, there are a number of other points that will determine the level and nature of the supply response. First, although devaluation and other efforts at expenditure switching may alter relative prices, the speed at which adjustments take place may be slow. There may be structural impediments limiting factor mobility. In particular, the process of making investments in the production of tradables whose relative prices have increased will not be instantaneous. This is to say nothing of the fact that the potential returns may be years rather than weeks away. This is not only true in manufacturing but in agriculture as well, especially for perennial export crops like coffee, cocoa, and palm oil. Price stickiness will also retard the pace at which expenditure switching policies alter incentives to shift and/or increase production. But most important, high capacity utilization in the tradable sector will dampen the size and rate of the supply response.

Second is that, although price-oriented adjustment may raise incentive prices to farmers, the aggregate as opposed to individual crop response is expected to be quite limited (Bond, 1983; le Carillon and Morrisson, 1986; Strauss, 1984; Martin and

Table 13.1 - Changes in the Real Exchange Rate Between 1983 and 1987

Countries that:	Devalued More Than 20%	
Burundi	Mauritania	Tanzania
Gambia	Niger	Zaire
Ghana	Nigeria	Zambia
Liberia	Sierra Leone	Zimbabwe
Madagascar	Somalia	
	Devalued Between 10% and 20%	
	Ethiopia	
	Malawi	
	Swaziland	
	Devalued Less Than 10%	
Botswana		Lesotho
Burkino Faso		Togo
Kenya		Uganda
	Appreciated	
Cameroon		Gabon
Central African Republic		Mali
Congo		Senegal
Cote d'Ivoire		

SOURCE: Calculated from exchange rate series of the International Monetary Fund.

Crawford, 1988; Singh and Janakiram, 1986). One prominent reason is that the returns to private inputs into production are largely conditioned by public inputs, including investment in research, extension, and other measures that will increase access to credit and use of improved technology that saves costs and increases productivity. Price-oriented adjustment that ignores these issues, along with other constraints such as labor bottlenecks during the period of planting and harvesting and poor marketing infrastructure, is not expected to generate a large increase in aggregate output.

Enhancing public inputs into agriculture requires that the treasury finance the construction of roads, development of communication systems, training of extension agents, building of market facilities, performing of agricultural research, and so forth. All of these initiatives represent a financial burden most countries in SSA can ill-afford, even if levels of total expenditures do not decline in response to the burgeoning budget deficits and debt problems. But more important, investment implies a tradeoff with transfers and present consumption. The capital stock of most

SSA countries is likely to be inadequate, depleted, or inappropriate given their comparative advantage and external circumstances. Therefore, it is difficult to conceive of large increases in output if policy involves reducing present investment as a mechanism of redistributing the costs of adjustment to the future. All of this clearly implies the need for large sums of concessionary financing to improve rural infrastructure and agricultural support services.

A second factor that may limit the supply response to expenditure-switching policies revolves around the possibility of circumventing or ignoring distorted prices that are a consequence of misguided policies. There is considerable evidence that parallel markets in developing countries arise in response to trading restrictions and price controls (Lipton, 1987; Abikar, 1987). In these parallel markets the returns to farmers more closely reflect the supply and demand conditions that would prevail in the absence of government control and often offer incentive prices to farmers that are not observed in official markets.

13.2.3 The Shifting to Export Crops

The issue of supply response in agriculture is important in terms of affecting both the aggregate food production as well as household incomes, a subject discussed in greater detail below. However, in addition to the level of production and incomes, policy reform's impact on food security has another important dimension: food availability. While agriculture may benefit from improved incentives and may prove responsive to price incentives, the issue of how resources are allocated between the production of food for domestic consumption versus the production of export crops is also important. In particular, the critical concern is that devaluation will encourage production of export crops rather than food crops that will augment food availability and improve food security.

While meriting some attention, the contention that producing agricultural goods for export represents a food security risk deserves careful scrutiny (Pinstrup-Andersen, 1985b). First, most food crops are tradables. Incentives for their production will rise commensurate with cash crops. Second, evidence suggests that countries that have increased production of basic food staples have also increased land allocated to non-staple cash crops (von Braun and Kennedy 1986; Weber et al., 1988). This indicates that the same price and non-price factors that promote greater cash-cropping will also promote increased food production for domestic consumption. And most important is that even if policy reform stimulates production of agricultural and non-agricultural goods destined for export, the additional foreign exchange can be used to bolster imports and domestic food availability.

A number of legitimate concerns, nonetheless, arise in the context of increased commercialization of agriculture. For example, the shift to cash cropping may involve changes in the control over resources within the household (von Braun, de

Haen and Blanken, 1988; Kennedy and Cogill, 1987; von Braun, Puetz and Webb, 1989). To the extent that the preference ordering of women implies a greater interest in household food security, and to the extent that commercialization involves men exerting greater control in agriculture, cash-cropping may result in undesirable outcomes. Similarly, if income becomes more lumpy or if the marginal propensity to consume out of earned income is lower than income in the form of home consumption (Massel, 1969; Kumar, 1977; Alderman, 1989a, 1989b), the shift to cash crop production may have deleterious consequences even though the aggregate level of income is increased. A final important threat implied by cash cropping is a shift away from food production that causes a country to go from a position of being a net exporter to being a net importer of important commodities. To the extent that the country follows the practice of border pricing, this may imply a large increase in the price of the good if, as is often the case, there is a large gap between CIF and FOB prices.

While these caveats are important, the preponderance of evidence indicates that increased cash cropping will improve household food security (Sahn, forthcoming; Kennedy and Cogill, 1987; von Braun, Puetz and Webb, 1987). However, all of these studies examine food security in a static sense, and fail to explore issues such as the considerable instability in the international prices of important export crops such as sugarcane, coffee, and cocoa. It is important for government to mitigate these risks through stabilization schemes. Similarly, there is a risk of transitional food security prior to the stream of returns flowing from the substantial and long-term investments that are required to move into the production of many export crops, especially perennials such as coffee and cocoa. Government can facilitate this transition through fostering easier access to capital and credit to small farmers willing to shift into commercialized export-oriented agriculture.

13.3 FOOD PRICES AND HOUSEHOLD INCOME

Prices and incomes are the two major determinants of household food security. To the extent that adjustment results in higher prices of goods in the consumption bundle of the poor and/or lower income households, these groups are at greater risk of increased chronic food insecurity, defined as a lack of access to enough food for health, growth, and activity.

13.3.1 Food Prices

Prices affect the poor both in their role as producers and consumers. As discussed above, it is reasonable to expect that adjustment will turn the terms of trade in favor of agriculture and raise producer prices. This will be favorable to farmers who market their surplus and indirectly to those who benefit through higher incomes as wage laborers. There is, however, legitimate concern that the food security of the

poor will suffer as a consequence of higher relative and real producer and consumer food prices. This is based on evidence from countries such as Malawi, where the small landholdings of most farm households precludes their selling any surplus and forces them to be reliant on the market to purchase a large share of their calories (Sahn, Arulpragasam, and Merid, 1989). Similarly, evidence from Cameroon shows that the bottom 40 percent of the farms account for only three percent of agricultural sales (Blandford and Lynch, 1989) and that these households purchase much of their food in the market place. Similar findings have been reported in Mali, Rwanda, Senegal, Somalia, and Zimbabwe, where the net purchasers (i.e., purchases in excess of sales) of staple cereals range from a low of 15 percent in Zimbabwe to as high as 66 percent in Rwanda (see table 13.2). Data from these same countries also show that 50 percent of the marketings of the major cereals come from as few as two percent of the farms in Rwanda and as many as eight percent of the farms in Mali (Weber et al., 1988).

The policy implications of a high proportion of households being net purchasers of food and the marketed surplus increasingly concentrated in a small sub-set of the rural population need to be carefully considered. It seems clear that in addition to the urban poor, an increasing number of rural poor are net purchasers of food and rely on wages and transfers as their main sources of income. Given that the poor are not expected to gain as much as larger commercial farms from higher producer prices, and they will suffer more as a consequence of increasing consumer prices because they purchase a larger share of what they consume and display higher price elasticities of demand (Alderman, 1986; Sahn, 1988), policies that raise food prices are a direct threat to the food security of the poor.

In practice the actual effects of adjustment on consumer prices is difficult to predict. This is well illustrated by a number of examples. In Somalia, for example, the foreign exchange auction coupled with liberalizing grain marketing increased dramatically the imports of cereals concurrently with an improved harvest, thereby holding down prices (Sahn and Alderman, 1987). The free market price of rice in Ghana was already largely determined by supply and demand conditions rather than official pronouncements prior to the beginning of the economic recovery program.

In Mali prices did not increase despite the priority given to, and accomplishment of reducing, the universal subsidy. This was a consequence of the bumper harvest in 1985 coupled with large inflows of food aid and lower international cereal prices (Humphreys, 1986).

Likewise in many other countries the magnitude of price increases has been much less than one would expect by comparing official prices with those that exist after adjustment. In Tanzania agricultural marketing reforms have reduced official consumer food subsidies dramatically. However, the impact upon the poor was

Table 13.2 - Market Participation Profile for Rural Households in Selected African Locations

Location (year)[a]	Crop(s)	Market Involvement Indicator: Net Buyers	Market Involvement Indicator: No Net Sales or Purchases	Market Involvement Indicator: Net Sellers	Percent of Total Production Marketed (Excluding Gifts)	Sales Concentration Indicator: Percent of Total Market Sales 50%	70%	80%
		(% of Households)			%	(% of Households)		
Mali (1985-86)	Coarse Grain	39	13	48	8	8	16	23
Senegal (1986-87	Coarse Grain	30	40	29	5	7	11	15
Somalia (1986-87	Maize	61	0	39	57	—	13	20
Rwanda (1986-87)	Beans Sorghum	73 66	5 9	22 33	10 21	2 2	4 4	6 5
Zimbabwe (1984-85)	Maize (communal sector)	15-25[b]	18-30[b]	67-45[b]	40[c]	—	10[c]	—

SOURCES: Table adapted from Weber et al., 1988, data are from USAID/MSU research conducted under Food Security in Africa Cooperative Agreement in the following locations:

Mali: Sample of 190 farm households in 16 villages in CMDT and OHV zones(Dione).
Senegal: Sample of 215 farm households in 15 villages in Southeastern Region (Goetz).
Somalia: Sample of 308 farm households in 10 villages of middle and lower Shebelle Region (Wehelie).
Rwanda: Nationally representative sample of 1000 farm households(Loveridge).
Zimbabwe: Sample of 204 farm households in 12 villages of low and high rainfall smallholder farming regions (Rohrbach).

[a]All years represent average or better rainfall periods.
[b]Ranges represent conditions in smallholder farming regions with high and low rainfall.
[c]National estimate for smallholder communal sector.

minimal because, before the beginning of the economic recovery program, maize, rice, and wheat prices on the open market where the poor engaged in transactions exceeded official prices by two- or three-fold (Amani et al., 1988), and access to cheap food was by and large limited to wealthier households primarily in urban areas (Horton, 1985). Likewise, increases in real prices in Malawi have not been observed since the beginning of the efforts at policy reform, partially reflecting that the price in retail markets far exceeded the official selling price of the agricultural parastatal as well as the government's continued exertion of direct controls on market prices (Sahn, Arulpragasam and Merid, 1989). Even in Madagascar, where there was a marked increase in prices in the wake of devaluation and efforts to reform agricultural marketing, the impact on consumers was lessened owing to the fact that parallel market prices increased less than official subsidized prices (Dorosh, Bernier, and Sarris, 1990).

While it is beyond the scope of this paper to provide detailed explanations for movements in prices throughout SSA, two important points are emphasized. The first concerns the pervasiveness of parallel markets, where prices generally more closely reflect the scarcity value of the commodity. Explicitly subsidized food is usually quantity rationed, not being available at low prices to a large share of consumers; and, similarly, implicit subsidies such as overvalued exchange rates are generally limited in coverage because a large share of transactions occur at shadow or parallel market exchange rates. As a consequence the poor, especially in rural areas, are likely to be little affected by purported price increases that follow from reform efforts. Second is that liberalization of marketing arrangements, changes in price policy, and changes in tariffs and indirect taxes often play a more crucial role in determining retail prices than movements of exchange rates or even changes in explicit subsidies paid for by the treasury.

Third, the movement of international prices coupled with other exogenous events, such as the level and timing of food aid shipments and the weather, exert considerable influence on domestic prices faced by the consumer and may result in price movements that do not conform to expectations in the wake of efforts to reform food product markets and budgeting policy. Fourth, before drawing any conclusion concerning the impact of movements in the prices of tradable cereals on the poor, it is important to analyze the marginal propensities to consume non-traded goods such as roots, tubers, and course grains that in much of Africa still represent a large share of the consumption bundle especially for the rural poor. Finally, the importance of consumer price movements as a determinant of food security is largely conditioned by the extent to which the household relies on the market for food, rather than home consumption, in-kind payment, or transfers from friends and relatives. While a more thorough analysis of these issues is recommended, it is clear that the urban rather than the rural poor are at greatest risk in the face of price oriented

adjustment policies. Of course this sets up the dilemma of whether to initiate efforts to protect the urban poor, which may have a variety of negative externalities such as encouraging rural to urban migration. Furthermore, until more is known about the sources of income and patterns of expenditures of urban poor in Africa's towns and cities, it is difficult to draw firm conclusions as to how adversely they will be affected by price oriented reforms.

13.3.2 Incomes

The incomes of the food insecure are derived from a variety of sources. Prominent among these are agricultural sales, wages (in cash and in-kind), profits and transfers, and remittances. While in theory the effect of adjustment on incomes will be determined by the production and consumption characteristics of the household (e.g., the household's marginal propensity to consume, ownership of assets, and factor endowment), theory would suggest that macroeconomic adjustment will lead to a decline in wages and government transfers, although agricultural profits may rise as the terms of trade shift in favor of agriculture, and remittances will likely be reduced. There is a need, however, to examine these in more detail before drawing any clear inferences on how policy reform will affect food security and poverty.

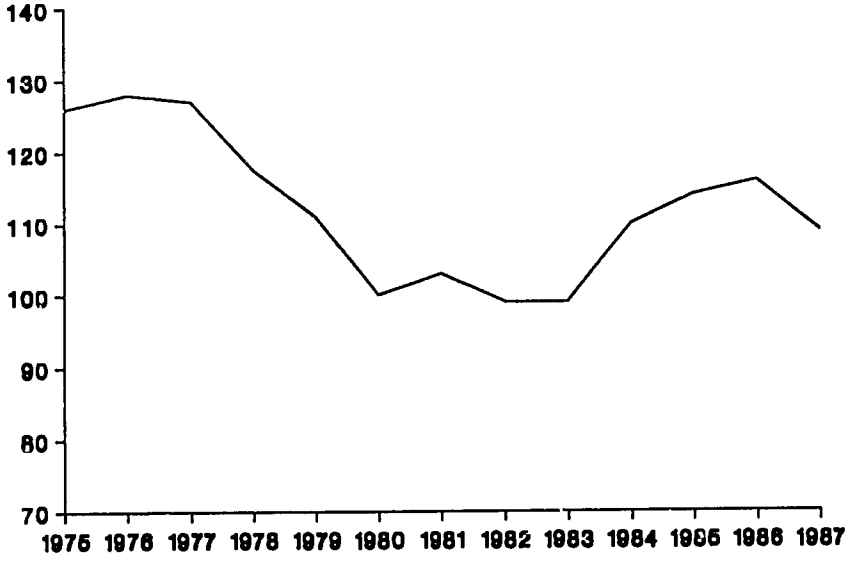
13.3.2.1 Agricultural Sales. In the previous section it was emphasized that a decreasing number of commercial farms are generating most of the marketed surplus of food. Consequently net purchasers of food in rural and urban areas stand to loose from a proportional increase in farm-gate and retail prices. In considering that assumption, a number of qualifications arise. First, a significant number of poor households in many countries produce and sell many crops and will see their incomes rise as a consequence of higher farm-gate prices. Empirical analysis to quantify the net effect of raising prices, by crop, is clearly an important research priority.

Second, despite that many small farmers are net purchasers of food and will be hurt by higher food prices, they still may be net sellers of export crops. This was observed in Côte d'Ivoire where the production of coffee, cocoa, and cotton was an important source of income for low income households (Sahn, 1989). Raising returns to export crops therefore represents a potential strategy for both directly and indirectly (through wage payments) increasing the incomes of the food insecure without subjecting net purchasers to higher food prices in their role as consumers. Of course this simple scenario is contingent upon the shift to export crop production not having deleterious consequences in terms of raising domestic food prices and changing intra-household dynamics in a way that will reduce the desire to purchase an adequate diet. The effect of higher prices for export crops on food security is therefore another empirical question in need of further research.

In order to cast some light on how price incentives have changed in SSA during the past few years, figure 13.1 presents data on real producer prices for agricultural exports. The important lesson is that the real prices of export crops fell by 25 percent between 1977 and 1980, the years prior to adjustment. Since then some recovery was noticed during the period 1983 to 1986. However, this was short lived as seen in the down-turn in 1987 (Jaeger and Humphreys, 1988.

As with all other aggregate data these patterns vary widely from one country to the next. Some countries undergoing adjustment have made strides in increasing incentives (e.g., Ghana, Niger), while there have been failures among other countries with donor-financed adjustment programs (e.g., Sierra Leone, Somalia). Still other countries displayed mixed evidence regarding changes in real export crop prices (e.g., Malawi). The important point is that there is evidence of policy changes in SSA resulting in some, albeit not large and not sustained, increases in producer incentives and, consequently, incomes of export crop producers. Once again, however, there is a need to examine these price movements crop-by-crop and country-by-country and thereafter relate them to the income characteristics of

Figure 13.1 - Real producer prices for agricultural exports expressed as indices (1980=100).



SOURCE: Jaeger and Humphreys (1988)

producers before drawing any firm conclusion on the impact of pricing policies on food insecurity.[3]

13.3.3 Wages and Business Profits

Even if the poor are net purchasers of staple foods, it is not always the case that in the short-term, let alone the long-term, they will suffer as a consequence of higher producer incentives leading to increased food production. That is, the urban and rural poor alike may see gains through changes in the labor market and through increased demand for goods and services they produce.

The impact of adjustment on wages, especially the role of devaluation, is determined by the relative factor intensities in traded versus non-traded sectors, the consumption propensities, and the extent to which output changes occur in various sectors. However, unless adjustment brings about an increase in productivity, either employment or real wages relative to the price of tradable goods must fall in order to reduce the trade deficit. If there are no gains in productivity, employment stays the same, and real wages do not fall, a country's competitive position will remain the same, and the trade balance will not improve.

Departing from theory, wages in agriculture are most likely to rise when increased production is not primarily an artifact of mechanization and other technologies that are biased in favor of high levels of capital investment. But even when improved production incentives and technological change have mixed effects on agricultural wages, adjustment that raises output may have a positive impact on the rural nonfarm economy and on nearby towns and proximal cities. That is, even if agricultural wages do not increase following price-oriented adjustments and restructuring of the agricultural economy, growth in the service sector, commerce, and small-scale manufacturing may prove highly beneficial to low income, net food-purchasing households. Factors such as the increased demand for agricultural inputs and new opportunities in transporting, marketing, and processing of agricultural output offer the prospect for large increases in incomes of low-income households. As discussed by Peter Hazell in this volume the magnitude of these forward and backward linkages and to whom the benefits accrue are expected to differ significantly and be conditioned by a variety of non-agricultural policy factors

3 While real price movements are of great concern given the focus of this chapter on food insecurity, these price movements say nothing about the implicit level of taxation of farmers. Doing so requires comparing prices to export parity, preferably taking into account the level of overvaluation of the currency. Although Jaeger and Humphreys (1988) calculate nominal protection coefficients, the fact that they do not account for the extensive overvaluation of exchange rate limits greatly the value of the exercise for judging levels of taxation.

as well as infrastructure, human capital, and the resource base. Increasing the forward and backward linkages that will be generated from a more dynamic agriculture is clearly an important priority for policy makers.

The actual evidence on real wages and profits in sub-Saharan Africa is extremely limited. For the most part wage data is confined to public sector and minimum wages. Few if any countries have performed comprehensive rural labor market surveys, let alone collected data routinely on wages in agriculture. In a similar vein, data on earnings outside of large enterprises are extremely rare, especially in the "informal sector," where large shares of the urban poor presumably are employed. The only information on wages available from SSA is information about minimum wages, supposedly set and administered by the government.

Such wage data from a few selected countries have been used as the basis for arguing that adjustment is having a negative impact on poverty (see for example Jamal and Weeks, 1988; Cornia, Jolly, and Stewart 1987).

While a review of such data from a large number of countries corroborates such findings (Starr, 1987), it is also true that declines in minimum wages represent a long-term secular trend that began long before macroeconomic adjustment programs responded to the economic crises throughout much of the region. More important, however, is that while declining minimum wages may indicate that the food security of those engaged in the formal sector has been imperilled, there is no basis for assuming that this applies to the vast majority of the poor. One reason is that legislated minimum wages are ignored in most countries. This is often the case even for the salaries of civil servants and enterprises in the modern section. But more important, the majority of the food insecure in Africa are the rural poor, largely engaged as subsistence farmers and agricultural workers, or informal sector urban workers whose remuneration bares little resemblance to trends in official minimum wages. Furthermore, as wages have declined, households have developed coping mechanisms. These may include diversifying their sources of income through relying on remittances from their villages, engaging in a secondary occupation, or having spouses and children enter the labor force. Of course this is not to suggest that there are not important repercussions of declining real minimum wages. These may be negative, such as worker productivity and morale falling as workers seek secondary and alternative sources of income. Similarly, child care may suffer as more women enter the labor force to compensate for the real wage declines. Alternatively, because of the narrowing gap between urban and rural wages in SSA (Jamal and Weeks, 1988), there may also be positive side effects, such as stemming rural-to-urban migration. The reduction of the income gap between urban wage earners and rural households would also be expected to improve the national income distribution. Jamal and Weeks (1988), however, assert that, rather than viewing the

decline in urban relative to rural wages as positive, it is an artifact of a growing split between the rich and poor, urban and rural alike. As a consequence, they argue, the income distribution within sectors has been increasing. The need for further research to examine these issues and the role of adjustment in affecting these trends is important to understanding the changing characteristics of the food insecure.

13.3.4 Transfers and Subsidies

While the effect of adjustment on food insecurity is largely mediated by how prices and incomes are affected, an important element of many adjustment efforts is the reduction in excess demand through contractionary monetary and fiscal policies. Once again the impact of such policies on food insecurity are difficult to predict. However, the most direct and potentially harmful path through which contractionary measures will be felt is reducing food subsidies and, to a lesser extent, subsidies on productive inputs.

In the case of subsidies on food the main question as alluded to above is the extent to which the poor have access to low-priced food, rather than paying high parallel market prices. Evidence on the incidence of subsidies across income classes is very limited in SSA. This is unlike Latin America and Asia, where food subsidies have been shown to confer positive nutritional benefits on the poor, especially in urban areas, despite high levels of leakage to wealthy households (Pinstrup-Andersen, 1985b). However, there is good reason to be skeptical about the effectiveness of subsidies in reducing food insecurity in SSA, given that in many countries (e.g., Ghana, Madagascar, Malawi) the relevant marginal price for the poor, especially in rural areas, is the high parallel market price. While there are examples, in Zambia and perhaps Sierra Leone, where the rapid removal of subsidies represented a potential threat to the urban poor, there is little disagreement over the need to reduce expensive untargeted subsidies. While the food security costs of such subsidy removal efforts may be low, the political impediments will likely prove monumental.

As intimated above subsidies take many forms besides food. For example, credit subsidies have been responsible for negative real interest rates in many SSA countries. Policies that raise the price of credit can be assumed to have a more negative impact on the capital-intensive manufacturing sector. Since raising the cost of credit directly affects agriculture and the larger commercial farms usually are the big users of credit, it is they who will be effected adversely. In fact macroeconomic adjustment that ends such policies as subsidized credit, which encourages mechanization and inappropriate technical change, offers some prospect for indirectly raising the welfare of the poor through increased demand for labor.

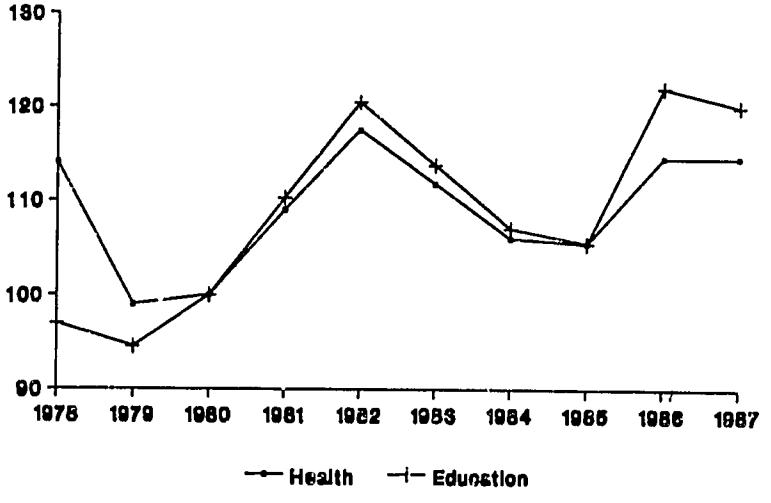
With other subsidies, especially those that take the form of expenditures on health and education, there is legitimate concern that reduction in spending will have

deleterious impacts. For example, there is growing evidence that the poor are highly responsive to changes in the price of health care (Alderman and Gertler, 1988; Gertler and van der Gaag, 1988). This would imply that any effort to reduce the subsidy on primary health care will reduce utilization of clinics and health care facilities, jeopardizing the nutritional status of the poor.

Two important hypotheses, however, need to be considered before substantiating an adverse impact of adjustment as mediated through a decline in health care and education. First, the poor are the recipients of social sector spending. Second, adjustment reduces spending in the social sectors. The evidence on the former indicates that throughout much of SSA services are highly skewed toward tertiary health care and higher education that primarily benefit upper income groups.

An examination of figure 13.2 does not indicate any long-term erosion in the real level of spending on health or education. Indeed there was a temporary decline in health and education expenditures of approximately 10 percent in real value terms between 1982 to 1985. This corresponded to the worsening aggregate economic performance during this period of draught, food shortages, and growing deficits. There is some evidence, however, that a recovery has taken place, spurred by a general improvement in the macroeconomies of many countries. It is also noteworthy that these data reveal a decline in health and education spending in many countries prior to the beginning of donor financed adjustment programs. This adds

Figure 13.2 - Government expenditures on education and health expressed as indices (1980=100).



some credence to the proposition that social sector expenditures were simply another victim of the broad-based economic problems that recovery programs are designed to address. It awaits to be seen, however, if recovery will be rapid enough to reverse the longstanding recurrent expenditure crisis that is debilitating the delivery of services in SSA.

In sum, demand-reducing policies represent a potential threat to the food security of the poor, as mediated by reductions in subsidies on food, credit, and inputs, as well as in government expenditures on health and education. There is to date, however, little evidence that the poor have suffered large losses as a consequence of adjustment through these channels. The poor were not likely the major beneficiaries of a majority of government spending before policy reform, and there is little evidence of contraction of government spending in the wake of adjustment.

13.4 POLICY IMPLICATIONS

The data presented above challenge the orthodoxy that adjustment programs represent a serious threat to national or household food security. Despite policy reform's limited ability to reverse the economic stagnation in much of SSA, the assertion that macroeconomic adjustment has posed a widespread threat to national and household food security is far from compelling. By and large, critics of policy reform have based their argument on the data showing that hunger and malnutrition are endemic problems in SSA and that many of these countries also have donor-financed economic recovery programs. This type of spurious correlation has led to the incorrect conclusion that adjustment is responsible for the low level of living standards and is not an appropriate component of a well-conceived food security strategy. In fact the discussion of theory and the limited empirical evidence presented belie the generalization of adjustment exacerbating food security problems, whether it be through reducing food production and availability, raising food prices, bringing about large declines in wages, or reducing subsidies and social sector spending.

While many critics of policy reform have built their opposition on a tenuous foundation, proponents of adjustment should be less than sanguine about the accomplishments to date. Adjustment is not a short-term initiative that will rapidly fuel the restoration of equilibria in the internal and external accounts. Not only does the evidence on aggregate growth and budget deficits indicate a less-than-stellar economic performance of many countries under adjustment, but there is no reason to expect that widespread and sustainable improvements in food security have occurred either. This, however, should not be a surprise. Adjustment programs have just recently begun in many countries. Their levels of financing differ dramatically, the prior conditions precipitating adjustment vary widely, there is often a great divergence between plans for adjustment and their actualization, and there are a

variety of lags between changing policies and the ability of markets to respond. While it is difficult to draw firm conclusions, especially given the poor quality of statistics and paucity of household survey data, a variety of important lessons are worth highlighting.

First, sustained improvements in food security cannot be made unless the economic stagnation that precipitated the need for adjustment is rectified. Second, since availability of private capital is increasingly scarce, the World Bank and the IMF must play an essential role.

Third, to the extent that the economic imbalances in SSA can be addressed through raising output rather than contracting demand, the incomes of most groups will benefit. However, many argue that export-oriented growth facilitated by policies that remove distortions in the rate of exchange and commercial policy will do little to improve the welfare of the poor. This skepticism must be challenged, since the potential for poverty alleviation through according priority to improved aggregate economic performance, not to be construed as a laissez-faire or trickle-down approach to development, is considerable. This is perhaps best illustrated by the cases of countries such as Taiwan, Korea, and even Botswana, which have fostered a high degree of equality despite pursuing outward-looking, market-oriented policies. While their experiences have only limited application to the African context, there is nonetheless considerable scope for integrating welfare concerns into a growth-oriented approach to development. Whether it be efforts to afford a degree of stability to input and product prices, redistribute assets concurrent with efforts to raise return to all factors, provide incentives for investment in order to raise returns to factors owned and controlled by the poor, or reorient the structure of service delivery to better address the needs of the food insecure, there is latitude for following growth policies which by their very nature are biased in favor of those in greatest need.

Of course the argument that growth-oriented adjustment programs can confer considerable benefits on the poor is not to be confused with the viewpoint that improving food security is achieved primarily through getting prices right, letting the market-place operate unfettered, and raising agricultural production. Concerning the former issue of the role of prices, increasingly the conflicts and limitations of price policy are being understood. This dilemma is perhaps most poignant when viewed in terms of short-term versus long-term food security objectives. The large numbers of net purchasers of food, the increasing concentration of the surplus in the hands of the few, and the responsiveness of the poor to changes in prices admonish caution in pressing for higher prices. On the other hand, the taxation of agriculture has stifled development. Despite the links between the objectives of raising food production and directly raising incomes of the poor becoming increas-

ingly tenuous, countries that have discriminated heavily against agriculture have paid a price in terms of chronic food deficits and rural poverty. However, this discrimination was rarely confined to price policy. Rather, pervasive shortcomings included the failure to promote modern agricultural technology to raise productivity and lower costs, foster efficient marketing arrangements for both domestic food crops and high value export crops, and provide vital infrastructure and information to farmers.

Finally, the structure of production will condition the ways in which production-oriented policies in general and adjustment programs in particular affect the food security of the poor. In cases of a strong duality in the structure of production where a few large producers are responsible for the bulk of commercial output and most small farmers produce largely for subsistence with primitive technology, unless adjustment alters the structure of production concurrent with other moves to raise production, the rich will likely benefit disproportionately. However, if policy reform can address the features of the rural economy that have discriminated against small scale producers, efforts that raise output will probably improve food security. So, for example, ending subsidies enjoyed by rent-seekers whether on credit, fertilizer, or agricultural products, and instead using limited financial resources to boost the supply of inputs, equipment, and credit to smaller farmers will go a long way toward raising incomes of the poor.

The extent to which price and non-price oriented policies that raise agricultural production will generate incomes indirectly for the poor is an important empirical issue. It not only requires examining the levels of output change, disaggregated by farm size, it is also important to examine the effect on wages and off-farm employment. The forward and backward linkages in agriculture also should be compared with alternative means of promoting income generation through manufacturing and informal sector activities.

In addition, to better integrate food security objectives with policy reform processes, a more accurate identification of the functional groups of at-risk households is necessary. An improved knowledge of their behavior in their roles as consumers and producers and their participation in various markets that will be affected by policy change must follow. The improved knowledge of consumer behavior and, in particular, the marginal propensities to purchase different goods and services along with a better understanding of the sources of income and the determinants of wages, labor supply, marketable surplus, and so forth, will allow one to predict how incomes and consumption will be affected by changes in output, factor payments, and related factors. However, before looking at the impacts of adjustment both on poverty and income instability, determining the ways in which the relevant input, product, and financial markets are affected by adjustment

presents an even greater challenge. All of this implies that efforts should be made to both follow trends in terms of the policy performance and consequent outcomes in adjusting countries as well as develop models that will allow policy-makers to simulate the impacts of various alternative adjustment paths. This latter exercise will help us understand what would have happened in the absence of adjustment (i.e., the counterfactual) but, more important, will provide badly needed insights into alternative policies to realize more preferable outcomes in terms of the growth and equity tradeoffs that so frequently confront policy-makers.

14. THE POOR DURING ADJUSTMENT: A CASE STUDY OF THE CÔTE D'IVOIRE

Paul Glewwe and Dennis de Tray

Previous chapters have discussed the nature of structural adjustment programs and their likely effect on the poor and the necessary features of policies aimed at protecting the poor in countries where structural adjustment programs are under consideration. In this chapter the discussion moves from general considerations to a specific example—the vulnerability of the poor to structural adjustment policies in the Côte d'Ivoire and safeguards to protect them during transition. The Côte d'Ivoire is an especially useful example because (1) it is currently undertaking a rigorous program of structural adjustment; (2) its experience may have implications for other sub-Saharan African countries, many of which face the same difficult choices as the Côte d'Ivoire; and (3) there exist recent comprehensive household survey data, the Côte d'Ivoire Living Standards Survey (CILSS), on which to base a thorough investigation.[1]

14.1 Overview of Structural Adjustment in the Côte d'Ivoire, 1980-85

The government of the Côte d'Ivoire's stabilization program began in late 1981 in response to severe macroeconomic imbalances in several areas (World Bank, 1987a). By 1980 external conditions and a massive public investment program had produced a government deficit amounting to 11.9 percent of Gross Domestic Product (GDP) and exhausted foreign exchange reserves. To remedy these imbalances the government began a lengthy and painful process of cutting public expenditures. The Ivorian economy responded by contracting sharply from 1980 to 1984: per capita GDP fell by 26.2 percent, per capita private consumption by 22.6 percent. Matters were made even worse by a severe drought in 1983, but by 1985

1 See Ainsworth and Muñoz (1986) and Grootaert (1986) for a description of these data.

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the economy had stabilized. Growth rates were positive, and government revenues exceeded expenditures.

Since 1985 the government has been gradually implementing policies that can be described as transitional or adjustment oriented. These policies are designed to bring about structural changes in the economy that will underpin long-run economic growth. Increased growth is to be attained by reducing government support for inefficient sectors in the economy and by reducing restrictions on economic activities, especially those for which the Côte d'Ivoire is thought to have a comparative advantage in the international market.

The present Ivorian structural adjustment program makes recommendations in several areas. First, there is a general emphasis on continuing organizational reforms within the various government ministries to improve their management and planning capabilities. Second, the government plans to raise prices to producers of agricultural commodities while reducing subsidies on agricultural inputs. Third, industrial policies concentrate on establishing a uniform rate of effective protection for most industrial sectors and the eventual elimination of import quotas and other quantitative restrictions. We discuss policy recommendations that may directly affect the poor in more detail below.

14.2 The Poor in the Côte d'Ivoire in 1985

Identification of the poor using household survey data requires that households be ranked according to some criterion. Perhaps the most common criterion is income, particularly per capita income, but this measure of household welfare can be faulted on both theoretical and empirical grounds. From a theoretical point of view, households' welfare levels are determined by the consumption of goods and services, not by income. Households with unusually high incomes at the time the survey was taken may save some of it for future years, while those with unusually low incomes may dissave to maintain their level of welfare. In order to smooth these transitory changes in income, welfare should be measured in terms of consumption rather than income. At a more practical level it is often very difficult to calculate even moderately accurate annual incomes in developing countries, since many households, especially among the poor, operate family businesses or farms for which they do not keep records or costs and revenues.

In this chapter the welfare levels of households are measured by adjusted per capita consumption levels, with children receiving smaller weights than adults when

Table 14.1 - Expenditure and Income of Poor and Nonpoor (Thousands of CFA Francs per year)

	Per Capita Expenditures		Per Capita
	Adjusted	Unadjusted	Income
Poorest 10%	70.0	45.0	52.5
Poorest 30%	113.1	70.0	78.8
Wealthiest 70%	461.8	285.0	283.3
All Ivorians	357.0	220.5	221.9

family size is determined.[2] It is noteworthy that the CILSS consumption data capture a wide range of implicit expenditures, such as imputed rents in urban areas, consumption of own products on the part of farm households, and the use value of durables. These nonmarket expenditures are particularly important when comparisons are made between urban and rural households.[3]

The first issue regarding the poor is to assess how poor they really are. Basic data on per capita consumption, both adjusted (smaller weights for children) and unadjusted, and per capita income are given in table 14.1. In this and subsequent tables two poverty lines will be drawn, one which identifies the poorest 10 percent of the population and another the poorest 30 percent. As measured in adjusted per capita terms, consumption for the poorest 10 percent of Ivorians is less than 20 percent of consumption for the average Ivorian; the poorest 30 percent consume about one third of the national average. Given the decline in consumption levels that often results, at least initially, from adjustment programs, concern with the poor in the Côte d'Ivoire would seem well justified.

Table 14.2 shows where the poor are located geographically. It demonstrates a crucial point emphasized throughout this chapter: the poor in the Côte d'Ivoire are found overwhelmingly in rural areas. While 59 percent of all Ivorians live in rural areas, 86 percent of the poorest 30 percent of the population and 96 percent of the poorest 10 percent of the population are found there. This means that the effect of structural adjustment on the poor in the Côte d'Ivoire is primarily a matter of its effect on rural areas, and thus that policies for safeguarding them must be feasible

2 The weights for children in the adjusted per capita consumption measure are 0.2, 0.3, and 0.5 for children aged 0-6, 7-12, and 13-17 years, respectively.

3 See Glewwe (1987) for details on the calculation of household expenditures and a more detailed argument for using adjusted per capita consumption expenditures to measure household welfare.

Table 14.2 - Location of the Poor by Region

	Poorest 10%	Poorest 30%	Wealthiest 70%	All
Abidjan	2.0	3.5	25.3	18.8
Other urban	2.0	10.8	27.5	22.4
West Forest	8.1	11.2	16.9	15.2
East Forest	31.3	34.4	20.6	24.7
Savannah	56.8	40.1	9.8	18.9

in rural areas. It is possible, however, that those poor who do live in urban areas are more negatively affected by structural adjustment programs than the rural poor. This issue is taken up below.

14.3 Potential Effects of Recommended Policies on the Poor

Government policies can affect households in three ways: (1) by changing incomes from employment; (2) by changing market prices of consumption goods; and (3) by changing the level or quality of government services. In this section recently proposed Ivorian government adjustment policies are assessed in terms of their likely effects on the poor, beginning with policies that affect employment incomes.[4]

14.3.1 Incomes from Employment

To understand how the poor will be affected by structural adjustment programs, one needs to investigate their sources of income. There are two ways that Ivorian structural adjustment policies can immediately affect incomes of the poor households: through changes in government employment and through changes in prices of agricultural outputs and inputs. The Ivorian government decided to freeze the wages of government workers, so that continued inflation would produce

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4 Since the survey data available are from 1985, we have chosen to evaluate the likely effects of recently proposed adjustment phase policies on the poor in the Cote d'Ivoire. Although it would be most interesting to assess what happened to the poor between 1980 and 1984, no comparable data exist with which to do this (Glewwe, 1986).

Table 14.3 - Occupation and Employer of Heads of Households

	Poorest 10%	Poorest 30%	Wealthiest 70%	All
Employer				
None	0.3	0.1	1.5	1.1
Government	1.1	1.6	15.6	11.4
Parastatal	0.0	0.0	1.8	1.3
Private	1.0	3.2	16.4	12.5
Self-employed	97.7	95.1	64.7	73.8
Occupation				
None	0.3	0.1	1.3	0.9
Agricultural	92.3	87.5	48.6	60.3
Sales/Service	5.1	7.8	25.9	20.5
Production/ Construction	0.8	2.3	5.8	4.7
White Collar Management	0.0	1.5	16.1	11.7
Other	1.6	0.9	2.3	1.9

NOTE: All figures are weighted by household size and thus indicate the number of people who lived in households where the head had a particular characteristic.

declines in their real wages. In addition, some workers were to be dropped from government payrolls in an effort to improve efficiency.

Table 14.3 examines heads of household categorized by occupation and type of employer.[5] The table supports two important conclusions: first, most poor Ivorians live in households in which the head is self-employed. In contrast, the number of household heads who work for the government is very small. Even if all heads of poor households who work for the government lose their jobs only about 2 percent of the poorest 30 percent of the population and 1 percent of the poorest 10 percent would be affected.

Second, table 14.3 shows that almost all poor Ivorians live in households whose heads work in agriculture, which suggests that policies aimed at the agricultural sector are especially likely to affect the poor. This statistic may, however, be misleading because the table looks at only one worker per household. Households

5 If the designated household head is not working, the occupation of the main earner is used. For those who hold more than one job, the main occupation in the past twelve months is used.

with heads who work in agriculture may have other members who do not work in agriculture or who are not self-employed. This possibility is examined in table 14.4. Over 75 percent of the poorest 30 percent of Ivorian households have all workers doing agricultural work, while only 10 percent of these households had no workers in agriculture. Similarly, 89 percent of the poorest 30 percent had all workers as self-employed, while only 1.5 percent had no self-employed workers.

14.3.2 Adjustment Policies and the Rural Poor

Since most poor households are headed by self-employed cultivators, any assessment of the short-term effects of structural adjustment on the poor must look particularly carefully at agricultural policy. For the most part government agricultural policy changes associated with the structural adjustment program will lead to an improvement in the rural-to-urban terms of trade by increasing real farmgate prices of many cash crops (cocoa, coffee, and rice) and by removing export taxes on rubber, oil palm, coconut oil, cotton, and pineapple. Offsetting these gains are plans to drop the provision of free inputs to irrigated rice producers, particularly fertilizers and seeds, to remove fertilizer subsidies to cotton growers, and to reduce emphasis on the production of sugar.

On net these policy changes are likely to help rural residents. We include an analysis of their effects here on the grounds that the ability of the poor to weather structural adjustment depends on both the program's negative and positive effects on the poor.

Table 14.5 presents information on who grows which crops and, for those who do, how much land (hectares per capita) is devoted to the particular crop. From the point of view of the poorest 10 percent and 30 percent of the population, the most important crops affected by government policies are cocoa, coffee, oil palm, cotton, and rice. In terms of incidence on the poor, policies promoting cotton are attractive because that crop is grown almost exclusively by the poor (though not all of the poor cultivate it). Coffee is grown by 34 percent of the poorest 10 percent of Ivorians and 41 percent of the poorest 30 percent, while cocoa is grown by 25 percent and 34 percent of these groups, respectively. The analogous figures for oil palm are 13 percent and 17 percent. Taking all three tree crops together, 39 percent of the poorest 10 percent of the population and 52 percent of the poorest 30 percent grow at least

Table 14.4.1 - Total Number of Workers in Households Relative to Agricultural Workers

Workers Relative to Agricultural Workers (Poorest 30%)

Number of agricultural workers

	0	1	2	3	4	5	6	7	8	9	10	>10
0	1											
1	11	7										
2	14	5	40									
3	3	5	6	41								
4	3	1	6	5	59							
5	4	0	2	1	3	48						
6	1	0	0	0	2	6	32					
7	1	0	0	2	0	0	4	28				
8	0	0	0	0	0	0	0	2	13			
9	0	0	0	0	0	0	0	1	1	11		
10	0	0	0	0	0	0	0	1	0	1	10	
>10	0	0	0	0	0	0	0	0	0	1	2	24

Table 14.4.2 - Total Number of Workers in Households Relative to Self-employed workers

Workers Relative to Agricultural Workers (Poorest 30%)

Number of self-employed workers

	0	1	2	3	4	5	6	7	8	9	10	>10
0	1											
1	3	15										
2	2	7	50									
3	0	2	2	51								
4	0	0	3	4	67							
5	0	0	2	1	2	53						
6	0	0	0	0	2	4	35					
7	0	0	0	0	0	1	2	32				
8	0	0	0	0	0	0	0	1	14			
9	0	0	0	0	0	0	1	0	0	12		
10	0	0	0	0	0	0	0	0	0	1	11	
>10	0	0	0	0	0	0	0	0	0	0	1	26

NOTE: Each cell indicates the number of poor households belonging to the category. Any household along the diagonal has all its working members in agriculture (top panel) or working as self-employed (bottom panel).

Table 14.5 - Crops Grown by the Poor and the Nonpoor

Crop	Poorest 10%	Poorest 30%	Wealthiest 70%	All
Cocoa				
% who farm[a]	25.0	34.2	26.9	34.4
hectares/capita[b]	0.216	0.325	0.559	0.489
Coffee				
% who farm	34.1	41.4	35.8	37.5
hectares/capita	0.452	0.382	0.489	0.454
Oil palm				
% who farm	13.2	16.5	15.7	16.0
hectares/capita	0.159	0.114	0.132	0.126
Coconut				
who farm	1.6	0.8	2.8	2.2
hectares/capita	0.048	0.031	0.109	0.100
Rubber				
% who farm	0.0	0.0	0.7	0.4
hectares/capita	–	–	0.573	0.573
Cotton				
% who farm	27.6	19.8	3.9	8.7
hectares/capita	0.117	0.175	0.291	0.211
Rice				
% who farm	43.9	42.3	26.9	31.6
hectares/capita	0.084	0.138	0.200	0.175
Pineapples				
% who farm	8.5	11.7	13.0	12.6
hectares/capita	0.124	0.080	0.035	0.048
Sugar				
% who farm	0.4	1.2	2.6	2.2
hectares/capita	0.000	0.043	0.021	0.025
% who farm either cocoa, coffee or oil palm	38.9	51.7	43.8	46.3
% who farm either cocoa, coffee, oil palm, or cotton	66.0	69.2	45.2	53.1

[a] "% who farm" is in terms of people who reside in households that grow the crop. Mean hectares/capita is also weighted by household size.

[b] Hectares farmed per capita includes only those households that grow the crop.

one of these three tree crops. In terms of hectares per person, among those poor who do grow these crops, coffee is clearly the most important, particularly for the poorest 10 percent.[6]

These data indicate that increasing prices received by producers of coffee, cocoa, and oil palm will benefit about 40 percent to 50 percent of the poor in the Côte d'Ivoire. This finding offers some optimism for the prospects of the rural poor under the proposed policies, though many of the poor will not gain directly from agricultural policy changes.

Coffee, cocoa, and oil palm are primarily grown in the East and West forest regions of the Côte d'Ivoire, yet a substantial percentage of the poor are found in the northern savannah, an area generally unsuitable for the cultivation of most tree crops. Cotton is the only export crop which is easily cultivated in the savannah, and the figures in table 14.5 indicate that higher producer prices for cotton will benefit about 28 percent of the poorest 10 percent of the population and nearly 20 percent of the poorest 30 percent. It turns out that cotton cultivators rarely grow tree crops[7] so that the three tree crops discussed above, in conjunction with cotton, are grown by 66 percent of the poorest 10 percent and nearly 70 percent of the poorest 30 percent. Thus, providing improved incentives to produce cotton in addition to the three tree crops mentioned above will benefit a majority of the poor in the Côte d'Ivoire. Reductions in fertilizer subsidies to cotton farmers will, of course, have the opposite effect. The recommended policies on the remaining export crops will have little effect on the incomes of the poor since they rarely cultivate these crops.

The other important crop grown by both the poor and the nonpoor affected by the structural adjustment recommendations is rice. Rain-fed and irrigated rice is grown in both the savannah and the forest areas. About 6.6 percent of rice land is irrigated in the savannah, while 1.9 percent is irrigated in the forest regions. The recommended policy on rice would remove input subsidies now received by

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6 These figures on coffee do not account for the age of the trees, an important consideration in establishing their current and future yields. About 15% of the stock of coffee trees in the Cote d'Ivoire are nearing the end of their productive life. However, for the poorest 10% of the population this figure is 26%. Thus, it turns out that poorer farmers are more likely to have older, less productive, coffee farms.

7 About 0.8% of the poorest 30% grew both cotton and either cocoa, coffee, or oil palm. The analogous figure for the poorest 10% is 0.5%.

producers of irrigated rice. Curtailing or eliminating the free provision of inputs for irrigated rice production will hurt farmers who produce irrigated rice but this will be partly offset by a rise in rice prices brought about by increased production costs. Rice farmers who produce rice in unirrigated fields will benefit from any price rise but will not be affected by increased input prices.[8] The figures in table 14.5 reveal that although a large number of households produce rice, the land devoted to rice cultivation among the poor is small relative to land under tree crop cultivation. Most rice cultivators also grow either tree crops or cotton[9] so that any negative effect of recommended rice policies may be offset by the promotion of tree crops and cotton.

In summary, the Ivorian government's policies to promote tree crop and cotton production will benefit a majority of poor households. A possible negative impact of the agricultural policy package would come through removing free inputs for irrigated rice production and the reduction of fertilizer subsidies to cotton cultivators. Yet reduced incentives to grow rice are primarily limited to irrigated rice, which is much less common than rainfed rice in both the forest and the savannah, and the reduction of fertilizer subsidies in cotton is countered by reductions in export taxes on that crop. It is thus reasonable to conclude that the effect of the Ivorian adjustment programs in agriculture will benefit many of the rural poor, with negative effects limited to relatively few poor households.

14.3.3 Adjustment Policies and the Urban Poor

The urban poor, fewer in number and perhaps better off, may face a greater shock from structural adjustment than do their rural counterparts. To explore this possibility we examine the characteristics of those among the poorest 30 percent of the population who are urban residents.[10]

Table 14.6 presents employment data on urban households who fall in the bottom 30 percent of the Côte d'Ivoire welfare distribution. Nearly three fourths of these people live in households where the head is self-employed; 10 percent had government workers as household heads, and no poor households in the sample were headed by parastatal workers. Thus, reductions in government employment can at most effect 10 percent of the poorest 10 percent of the entire urban population, or about 1 percent of the urban population (0.4 percent of the national population).

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8 Unfortunately, the CILSS data do not clearly distinguish between irrigated and unirrigated rice fields.

9 Only 7.4 percent (10.4 percent) of the poorest 30 percent (10 percent) of the population were rice cultivators who were not also cultivating either cocoa, coffee, oil palm, or cotton.

10 This group constitutes about 4% of the entire population and 10% of the urban population.

Table 14.6 - Occupation and Employer of Urban Heads of Households

	Poorest 10.4%	Wealthiest 89.6%	All Urban
Employer			
None	0.7	1.9	1.7
Government	9.8	26.6	24.9
Parastatal	0.0	3.1	2.7
Private	14.8	27.8	26.4
Self-employed	74.7	40.7	44.2
Occupation			
None	0.7	1.7	1.6
Agricultural	39.9	15.3	17.9
Sales/Services	36.5	42.8	42.2
Industry/Crafts	11.6	9.3	9.5
White Collar/ Management	8.9	27.5	25.6
Other	2.5	3.4	3.3

NOTE: All figures are weighted by household size. The poorest 10.4% in urban areas belong to the poorest 30% in the entire country.

In terms of occupations of heads of household, sales and service jobs and agricultural work account for about three fourths of the poor urban population. Only about 12 percent of the urban poor (again about 1 percent of the entire urban population) live in households in which the head works in an industrial or construction job. Thus even among the urban poor, who constitute only a small fraction of all the poor in the Côte d'Ivoire, very few are vulnerable in terms of working for the government or working in an industrial occupation.

14.3.4 Effect on Consumption Patterns

The Ivorian structural adjustment policies that will have the largest effect on household consumption patterns are those to increase prices of rice, sugar, and bread. Rice and sugar prices are to increase to provide incentives to producers while higher bread prices are recommended to reduce balance of payments problems. The effects on the poor of higher prices for rice, sugar, and bread can be discussed using

Table 14.7 - Budget Shares in Household Consumption

Crop	Poorest 10%	Poorest 30% All	Poorest 30% Urban Only	Wealthiest 70%	All
Rice					
Purchased	3.2%	3.9%	7.6%	3.9%	3.9%
Own produce	3.8	4.2	0.7	1.5	1.8
Total	7.0	8.1	8.3	5.5	5.7
Sugar	0.9	0.9	1.1	0.7	0.7
Bread	1.6	1.4	1.7	1.9	1.9
Value of produced and consumed foods as % of total food consumed	60.8	54.2	20.0	20.9	24.9

the data in table 14.7. Changes in the price of sugar will have a negligible effect on welfare levels of the poor because they devote only about 1 percent of their household consumption to sugar. The conclusion also holds for bread, which amounts to less than 2 percent of the household consumption among the poor.[11]

In contrast, rice is a much larger portion of household consumption, with the poorest 10 percent devoting 7.0 percent of their total consumption budget to it and the poorest 30 percent devoting 8.1 percent. These figures include the value of rice produced and consumed by households. In fact, for both the poorest 10 percent and 30 percent of Ivorian households most of the rice consumed is from own production. The negative effects of rising rice prices will thus be offset to a large extent by the fact that many poor households are rice producers.

The urban poor, however, are more vulnerable because they do not produce much of the rice they consume. Generally, as table 14.7 demonstrates, the rural poor are well insulated from changes in government pricing policies on food items—about 61 percent of food consumption (in value terms) among the poorest 10 percent was from food produced by the households, while the corresponding figure for the poorest 30 percent of Ivorian households is 54 percent. In contrast, the urban poor

[11] Here household consumption includes not only money expenditures but implicit expenditures as well, such as consumption of homegrown foodstuffs and imputed rents. If only money expenditures are considered, the small percentages considered in the text are marginally higher, but our conclusion is unaffected.

produce only 20 percent of their food consumption. They are therefore likely to suffer declines in their standard of living, with food price increases making them primary candidates for intervention.

14.3.5 The Provision of Public Services

One area in which the poor may be hard hit is in reductions of health, education, and other services that are provided by the government. In the area of education the government is taking steps to reduce fellowships and stipends to students, particularly those at higher levels of education, while targeting those that remain toward needy students. More generally the governments's structural adjustment program attempts to transfer resources from higher levels of education (secondary and university) to primary education. In the area of health two policies are being pursued: training more nurses relative to the number of doctors, and instituting user fees in public health facilities. As before, the immediate effects of these proposals on the poor will depend on the extent to which they were using these services before any policy changes.

Data on school attendance and the receipt of scholarships by households is presented in table 14.8. As one might expect, school attendance is much higher among wealthier households than poor households, and this is particularly true at the secondary and university levels. Less than 1 percent of household members among both the poorest 10 percent and the poorest 30 percent of the population are enrolled in the university-level education programs. Thus reductions in funding for university education will have very little effect on the poor. If these funds were instead used to improve the quality and availability of primary education instruction, the poor would likely receive substantial benefits. In terms of scholarships received, the impact is roughly the same among the poor and the nonpoor as measured relative to household expenditure levels. However, since the wealthier households have much higher expenditure levels in per capita terms, much more scholarship money is going to wealthier households (whose members are more likely to be in school at high levels of education) than to poor households. Cutting scholarship money across the board will not disproportionately affect the poor, while targeting that money to improve the quality of primary education is clearly to their advantage. Overall, policies for funding changes in education are more likely to benefit the poor than hurt them.

How will the poor be affected if user fees are charged for medical visits and if emphasis is placed on training more nurses relative to doctors? The data in table 14.9 provide some insights. Generally speaking when poor people in the Côte d'Ivoire are sick or injured most of them do not visit any health practitioners, but if they do they are much more likely to see a nurse than a doctor. In contrast, wealthier members of the population often visit medical practitioners when they are sick or

Table 14.8 - School Attendance and Scholarships

	Poorest 10%	Poorest 30% All	Poorest 30% Urban Only	Wealthiest 70%	All
% household members attending school					
a) Excluding children away from home					
Primary	8.0%	11.7%	13.0%	19.7%	17.3%
Secondary	1.0	2.4	6.2	8.4	6.6
University	0.1	0.1	0.2	0.7	0.5
b) Including children away from home					
Primary	8.0	11.5	13.7	19.6	17.2
Secondary	1.8	3.2	6.2	8.9	7.2
University	0.1	0.1	0.2	0.8	0.6
Scholarship money					
As a % household expenditure	0.4	0.8	1.3	0.6	0.6
Per household member (CFA Francs)	156.3	467.3	977.2	1417.6	1137.9

NOTE: Last line is calculated including children away from home as household members.

Table 14.9 - Health Practitioners Contacted by the Poor

	Poorest 10%	Poorest 30% All	Poorest 30% Urban Only	Wealthiest 70%	All
None	66.5%	59.2%	46.5%	44.3%	48.4%
Doctor	2.9	5.5	17.3	21.2	16.8
Nurse	25.3	29.0	33.9	30.3	29.9
Other	5.3	6.3	2.4	4.2	4.9

NOTE: Data include all persons who reported an illness or injury within the last four weeks.

injured, and when they do they see doctors almost as frequently as they see nurses. These trends reflect to a large extent the fact that the poor are disproportionately found in rural areas, where health facilities are less accessible and of lower quality and where few doctors are found. If the emphasis on training nurses over doctors leads to better access to health care in rural areas, most of the poor stand to benefit.

The introduction of user fees will have little effect on the rural poor because they rarely visit health facilities; the effect would be even smaller if the fees were limited to consultations with doctors. These conclusions do not hold for the urban poor, who are more likely to use health facilities than the rural poor and who are almost as likely to visit a doctor as the nonpoor. Of course, the overall effect of user fees depends on how the funds generated will be used. If they are used to provide greater accessibility to medical facilities in rural areas the majority of the poor should benefit, but if they are used to promote modern medical facilities in urban areas only the small proportion of the poor who are in urban areas are likely to receive improved health care.[12]

14.4 Identifying the Poor: Shortcut Methods

Identifying the poor using a consumption-based definition of poverty is a difficult and costly task. Although some people hurt by adjustment programs, such as government workers who lose their jobs, can be directly and immediately identified, finding and protecting most of the poor will be much more problematic. In this section we look for characteristics of the poor which (1) are relatively rare among the nonpoor and thus highly correlated with the incidence of poverty; and (2) are easier to detect than a consumption-based measure of poverty. We label such characteristics "shortcut" definitions of poverty and turn to the CILSS data in both urban and rural areas to see how accurately they identify individual households as poor.

Our shortcut indicators of poverty are two types: some are more easily measured than consumption and might, therefore, lend themselves to a household-by-household assessment of poverty; others involve characteristics of families or individuals in which governments have a direct interest, either for humanitarian or developmental reasons, and for which there may already be programs in place. As an example of the latter, a government nutritional supplement program may require children to qualify on the basis of measurable signs of malnutrition (low weight for height, for example). Our question is whether government planners are justified in

12 See Dor and van der Gaag (1987) for an analysis of health care demand and the distributional effects of imposing user fees.

Table 14.10 - Accuracy of Short-Cut Definitions of Poverty Relative to the Adjusted Per Capita Expenditures Definition

	Percentage of the Population Accurately Identified			
	Poor	Nonpoor	Total	χ^2 Statistic
Urban Côte d'Ivoire				
Height for age	8.70	49.47	58.17	0.2791
Weight of height	8.95	49.01	57.96	0.4649
Per capita floor area	13.26	53.48	63.74	30.8790*
Adult school attainment	13.41	53.69	67.10	31.9716*
Rural Côte d'Ivoire				
Height for age	10.82	51.21	62.03	1.3537
Weight for height	9.56	50.07	59.63	0.0833
Per capita floor area	7.57	47.51	55.28	1.5571
Adult school attainment	11.89	51.71	63.60	9.9035**
Agricultural land per capita	11.94	52.00	63.94	17.5915**

NOTE: An asterisk implies that the null hypothesis, that the shortcut definition is not correlated with the adjusted per capita expenditure definition, can be rejected at the 95% significance level. Two asterisks denote the same at the 99% significance level.

treating all families with eligible children as poor. In other words we investigate whether the presence of malnourished children can serve as an indicator of overall poverty.

By way of illustration we choose four measures from the CILSS survey. For the first type we look at the extent to which overcrowded living quarters is a characteristic of poor and only of poor households, and the extent to which landlessness is a characteristic of the rural poor. For the second type we consider the presence of malnourished children and the educational level of adults. We argue above that adjusted per capita household consumption is the preferred yardstick for identifying the poor. To see whether these proposed shortcut definitions can substitute for this consumption definition, poverty lines were drawn for the poorest 30 percent of the rural population and the poorest 30 percent of the urban population for both the shortcut definitions of poverty and consumption-based definition. The degree of correlation is given in table 14.10. A perfect shortcut definition would identify as poor the same people, and only those people, as the consumption definition, while a very poor shortcut definition would show no correlation.

The per capita floor area definition is significantly correlated with poverty in urban areas, though it still misclassifies about 36 percent of the population. In rural areas it is not correlated at all with the consumption-based standard, which reflects the fact that in rural areas housing is often constructed by the household members

themselves, and the land on which it is located is not in short supply. In rural areas agricultural land per capita is mildly correlated with poverty, yet the low level of accuracy is disappointing. This may stem from the fact that, unlike many other developing countries, land is not scarce in most parts of the Côte d'Ivoire.[13]

The two nutritional shortcut definitions are not correlated with the consumption definition in either urban or rural areas. Thus in Côte d'Ivoire there is little scope for using such a definition to identify generally poor households. One possible reason for this lack of correlation is that malnutrition in the Côte d'Ivoire is not as widespread as in other developing countries. Those countries where it is widespread may find it more useful for purposes of identifying the poor.[14] Finally, adult schooling levels are somewhat correlated with the consumption-based definition of poverty in both rural and urban areas, but a substantial amount of misclassification persists.

Another approach to monitoring the poor during adjustment and designing policies to protect them is based on the concept of socioeconomic groups (SEGs; cf. Pyatt and Roe, 1977, 56-57). Under this approach populations are divided into subgroups, each of which is seen to require a separate and distinct set of policy actions. Examples of typical SEGs are landless agricultural laborers, land-owning farmers, unskilled urban workers, and government employees. The efficacy of this approach depends on two issues: the mobility of populations among the designated groups, and the extent to which the groupings capture a large fraction of variation in welfare. On the first point, if households are highly mobile among groups, then policies directed at one SEG may suffer considerable leakage. On the second point, if the (quantitatively) important variation in welfare in the Côte d'Ivoire is to be found within SEGs, then policies targeted on one or a few of these broad categories may be very costly in terms of leakage of program resources to the nonpoor. They may also miss many poor households found in excluded groups.

Addressing the first issues is beyond the scope of this chapter, but the second issue is taken up in table 14.11. There, for illustrative purposes, the population of the Côte d'Ivoire is divided into the five SEGs listed above, and consumption inequality is analyzed to determine how much of that inequality is accounted for by

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13 The quality of land is probably a more important indicator of household incomes than the physical amount, but the CILSS does not contain the information necessary to incorporate this measure.

14 The point here is that malnutrition (and poor health in general) and poverty are not the same thing. People who are not poor may have bad diets while many poor, especially the rural poor, may consume adequate amounts of food. Given this distinction, some policy-makers may feel that malnutrition itself, instead of general poverty, is the problem which should be confronted.

Table 14.11 - Inequality Decompositions by Socioeconomic Groups

	Theil T	heil L	Log Variance	Percent of Population
Government workers	0.2760	0.2479	0.4477	12.6
Private sector workers	0.2531	0.2338	0.4289	12.5
Self-employed non-agricultural	0.3299	0.3020	0.5703	16.7
Self-employed agricultural coffee/cocoa	0.1853	0.1816	0.3642	27.1
Self-employed agricultural other crops	0.2753	0.2518	0.4698	30.1
Other	0.2024	0.1938	0.3715	1.1
National	0.3467	0.3193	0.5964	100.0
Between-group-effect	0.0841	0.0815	0.1474	
% contribution of between-group effect to overall inequality	24.3	25.5	24.7	

NOTE: These three measures of inequality divide total inequality into the sum of two parts, a weighted average of the inequality found within each of the seven groups (within-group effect) and the level of inequality that would result if each individual were given the average income expenditure level of his or her group (between-group effect). See Glewwe (1987) for details.

differences in the mean consumption levels of these groups and how much is due to differences within the groups. Breaking down overall inequality into within- and between-group components shows that about three-fourths of the variation in consumption occurs within the groups, and only one quarter between them. This implies that in the Côte d'Ivoire targeting policies based on socioeconomic groups will aid many nonpoor and exclude substantial numbers of the poor.

To summarize, it is difficult in the Côte d'Ivoire to identify poor households accurately on a case-by-case basis by using traits that are commonly associated with poverty. This does not preclude the possibility that further investigation may reveal a better shortcut definition or that those used here may perform better in other countries, but the overall picture is a sober one. In addition, the above analysis indicates that policies aimed at specific socioeconomic groups may not be an effective way to protect the poor during structural adjustment. Targeting the poor

who are likely to be hurt by structural adjustment remains a difficult task for which there may be no easy solution.

14.5 Conclusion

This chapter has been directed at an issue of rapidly growing concern in the development community: how to protect the poor during the transition phase of structural adjustment programs. We began by restricting the scope of our analysis to those among the poor who are likely to be adversely affected by adjustment policies. These households, we argue, are least likely to have the resources necessary to weather any negative consequences of structural adjustment. Special temporary policies or programs may be necessary to get them through the period of adjustment, policies that go beyond a country's existing poverty alleviation efforts. We looked at the transitional effects of a specific structural adjustment program, that for the Côte d'Ivoire, to illustrate ways in which household data can be used as a base for establishing policies to protect the poor.

Our empirical work is based on only one African country, so generalizations must be drawn with caution. With that caveat as background we list four general findings from our analysis. First, the immediate effects of structural adjustment policies differ considerably among poor households. In many African countries, and certainly in the Côte d'Ivoire, most of the poor will not be much affected by adjustment policies (and many may actually be helped) because most poor households are rural. Rural households, especially poor rural households, are often well insulated against shocks brought about by adjustment efforts and relatively well situated to deal with such shocks when they do come (mainly through increased own production of food). Second, and following directly from this first finding, the cost to the poor of adjustment programs and the cost to the government of safeguarding the poor may be substantially less than often indicated.

Against these encouraging findings is our third conclusion that identifying the poor, and especially targeting interventions on specific subcategories of them, is no easy feat. The poor are more heterogeneous and widespread than many discussions seem to assume and shortcut methods for identifying them all suffer from serious leakage problems (they either miss many poor or include many nonpoor).

Fourth, and finally, contemporaneous household survey data can be extremely useful for assessing the direct, first-round effects of structural adjustment policies. Such an assessment may prevent the adoption of wasteful programs as well as improve the cost effectiveness of those programs that are adopted. Targeting interventions to those most in need remains, however, a difficult problem that deserves increased emphasis by both researchers and policy program designers.

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