JUNE 1993
WORKING PAPER 46

Aid Flows and Policy Reforms:
A General Equilibrium Analysis of Adjustment and the Poor in The Gambia

Paul A. Dorosh and Mattias K. A. Lundberg

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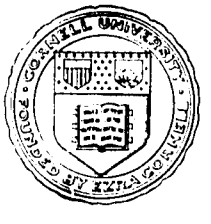

AID FLOWS AND POLICY REFORM:

A GENERAL EQUILIBRIUM ANALYSIS OF ADJUSTMENT AND THE POOR IN THE GAMBIA

Paul A. Dorosh
Mattias K. A. Lundberg

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CFNPP is funded by several donors including the Agency for International Development, the World Bank, UNICEF, the United States Department of Agriculture, the New York State Department of Health, The Thrasher Research Fund, and individual country governments.

Preparation of this document was financed by the U.S. Agency for International Development under USAID Cooperative Agreement AFR 000-A-0-8045-000.

Supported by AID

 ISBN 1-56401-146-1

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This document was word processed by Mary Getsey. The manuscript was edited by Peter Hoover. The text was formatted by Gaudencio Dizon. The cover was produced by Jake Smith.

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDIX TABLES

LIST OF ABBREVIATIONS

BCEAO	Banque Centrale des Etats de l'Afrique de l'Ouest
CES	Constant Elasticity of Substitution
CET	Constant Elasticity of Transformation
CGE	Computable general equilibrium
CSD	Central Statistics Department
ERP	Economic Recovery program
GAMS	General Algebraic Modeling System
GDP	Gross domestic product
GOTG	Government of The Gambia
GPMB	Gambia Produce Marketing Board
GUC	Gambia Utilities Corporation
IMF	International Monetary Fund
ODA	Official Development Assistance
SAM	Social accounting matrix
SDR	Special Drawing Rights
UNDP	United Nations Development Program
WHO	World Health Organization

1. INTRODUCTION

Like many countries in sub-Saharan Africa, The Gambia experienced severe external shocks in the early eighties. World prices of its major export good, groundnuts, fell, and drought reduced agricultural yields. As world credit markets tightened, foreign borrowing became increasingly difficult. The country's economic policies, including fiscal deficits, pricing policies, and large levels of foreign borrowing in previous years, also contributed to the economic decline and a balance-of-payments crisis. To address this crisis, the Economic Recovery Program (ERP) was launched in 1985, bringing about substantial changes in economic incentives through liberalization of agricultural marketing, changes in tariffs, and a devaluation of the exchange rate. To a large degree the program was a success. The ERP and subsequent changes in exogenous factors (i.e., the end of the drought) helped bring about a sharp gain in national income in The Gambia by the late eighties. How these policies and external shocks affected income distribution, in particular the welfare of the poor, in The Gambia is the focus of this paper.

The Gambia is one of Africa's smallest, poorest, and most densely populated countries. In 1989-90, the total population was estimated at 862,000, or roughly 76 people per square kilometer, with an annual per capita gross domestic product (GDP) of about US$ 260. More than two-thirds of the population live in rural areas, and the vast majority of the population is engaged in rain-fed agriculture. Groundnuts, the most important crop, are produced primarily for export, and other crops (cereals, fruits, and vegetables) are produced primarily for domestic consumption (Jabara forthcoming).

The Gambia's heavy trade dependence makes it vulnerable to shifts in international terms of trade. Most manufactured goods, almost all processed foods, and nearly 20 percent of available primary food crops are imported. One-third of all imports, with a value equal to more than 10 percent of GDP, are re-exported to Senegal through cross-border trade. The open borders make Senegal's agricultural price policy, in particular the producer price of groundnut, an important factor in determining farmer incomes and The Gambia's own exports of processed groundnut products.

Using a computable general equilibrium (CGE) model with a disaggregated household structure, we analyze the implications for income distribution of the structural adjustment process in The Gambia. Our intention is to shed light on the most important elements of The Gambia's experience with policy reform during the 1980s, and to understand the impact of each of these elements on economic growth and income distribution.

In Chapter 2 we present a brief description of the structure of the Gambian economy. Chapter 3 discusses The Gambia's experiences during the past decade of policy reform and structural adjustment, with specific emphasis on policies that had the greatest impact. Chapter 4 presents the Gambia CGE model in detail. Model simulations of external shocks and policy measures undertaken as part of the ERP are presented in Chapter 5. Conclusions are found in Chapter 6. The appendix contains details concerning the social accounting matrix (SAM) used in this study.

2. THE ECONOMY OF THE GAMBIA

In this chapter, a brief description of the economy of The Gambia is presented, focusing on the structure of production and distributional issues.[1] Much of the data presented come directly from the SAM (Jabara, Lundberg, and Sireh Jallow 1992), which forms the database for the CGE model.[2]

PRODUCTION ACTIVITIES

Table 1 presents value added by production activity, both in dalasis and as a percent of the total. In 1989-90 nearly 30 percent of GDP was provided by agriculture, 6 percent by industry, and 64 percent by the services sectors. Almost 60 percent of foreign exchange earnings came from the re-export trade to nearby countries such as Senegal and Guinea. Hotels and other services related to the tourism industry (part of the private services sector in Table 1) account for nearly 17 percent of exports. Exports of groundnuts and groundnut products together make up 13 percent of exports.

Agriculture

The agricultural sector is dominated by small farms that use labor-intensive technology. Although there is little tractor mechanization, most farms have access to animal traction and to simple improved technology (Jabara and Lundberg 1991). Groundnuts occupy more than half of all cultivated area in The Gambia: more than 96,000 hectares were planted to groundnuts during 1987-88 (Kinteh 1990). The value added by groundnuts for the SAM year (1989-90) was nearly D 160 million, equal to about 80 percent of the value of production.

The majority of groundnut production is exported, both as seed and processed products (groundnut cake and oil). Until recently, all official exports of groundnuts and processed groundnuts were strictly controlled by the Gambia Produce Marketing Board (GPMB). No data are yet available on private official exports of groundnuts, and for the model base year (1989-90) all official exports are assumed to have been handled by the GPMB. In addition to formal

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[1] The discussion draws heavily from a more detailed presentation found in Jabara (1990).

[2] The social accounting matrix presents a consistent set of accounts integrating data on production, income, and expenditure flows. The SAM used in the model differs slightly from the version in Jabara, Lundberg, and Sireh Jallow (1992). The modifications are described in Appendix 1.

Table 1 – Value Added and Exports by Sector

	Type of Value						Total		Exports	
	Skilled	Unskilled	Informal	Formal	Land	Housing	Dalasis	(percent)	Dalasis	(percent)
Agriculture	2.3	443.0	0.0	6.6	91.4	0.0	543.4	29.8	131.3	10.9
Groundnuts	0.0	118.6	0.0	0.0	39.9	0.0	158.5	8.7	71.0	5.9
Rice	0.0	33.4	0.0	0.0	9.7	0.0	43.1	2.4	0.0	0.0
Coarse Grains	0.0	90.3	0.0	0.0	11.4	0.0	101.7	5.6	0.0	0.0
Fruits/Vegetables/Roots	0.0	80.0	0.0	0.0	10.3	0.0	90.3	5.0	35.9	3.0
Livestock/Fishing/Forestry	2.3	120.7	0.0	6.6	20.2	0.0	149.8	8.2	24.4	2.0
Industry	28.2	25.4	33.3	24.4	0.0	0.0	111.3	6.1	102.9	8.5
Groundnut Processing	5.4	4.0	0.0	13.4	0.0	0.0	22.9	1.3	86.0	7.1
Manufacture and Industry	22.8	21.5	33.3	11.0	0.0	0.0	88.5	4.9	17.0	1.4
Services	391.7	299.3	148.2	144.2	0.0	184.3	1,167.6	64.1	973.6	80.6
Construction	26.9	10.2	8.1	28.9	0.0	0.0	74.2	4.1	0.0	0.0
Transport, Communications, and Utilities	38.3	41.0	13.4	65.9	0.0	0.0	158.6	8.7	43.2	3.6
Domestic Informal Trade	19.4	26.4	13.7	1.6	0.0	0.0	61.0	3.3	0.0	0.0
Domestic Formal Trade	55.7	82.1	36.7	22.3	0.0	0.0	196.9	10.8	0.0	0.0
Re-export Trade	56.6	83.4	60.0	0.0	0.0	0.0	200.0	11.0	723.2	59.9
Private Services	59.8	37.5	16.2	25.5	0.0	0.0	139.0	7.6	207.3	17.2
Public Services	135.0	18.8	0.0	0.0	0.0	0.0	153.8	8.4	0.0	0.0
Urban Housing	0.0	0.0	0.0	0.0	0.0	95.0	95.0	5.2	0.0	0.0
Rural Housing	0.0	0.0	0.0	0.0	0.0	89.2	89.2	4.9	0.0	0.0
Total	422.2	767.7	181.4	175.3	91.4	184.3	1,822.3	100.0	1,207.8	100.0

Source: Gambia SAM adapted from Jabara, Lundberg, and Sireh Jallow (1992).

exports, a large share of annual groundnut production (estimated to be 34 percent of supply in the SAM) is traded illegally to Senegal.[3]

Coarse grain production includes findo, millet, sorghum, and maize, of which millet is the largest by volume and area cultivated. Domestic rice is considered superior to imported rice, but two-thirds of the total rice available in The Gambia is imported. The majority of domestic paddy is grown in the alluvial plains of the Gambia River basin. Less than 12 percent of the total area devoted to paddy production was irrigated (in 1987-88), but that area produced more than 30 percent of total domestic paddy.

Fruits, vegetables, and roots production (i.e., market gardening) provide income for urban as well as rural households, with more than 10 percent of total value added in the sector accruing to urban households. Unlike the agricultural sectors, the combined livestock, forestry, and fishing sectors pay indirect taxes in the form of licenses for fishermen and permits for wood-collecting in government-owned forests. Wood is sold as charcoal and for firewood, to carpenters, and also as "roofing sticks," which are primarily sold in rural areas.

Agricultural exports make up only 11 percent of total exports by value. Some commercially harvested fish is exported to Europe, but most fish exports, and all exports of fruits and vegetables, remain within West Africa. Parallel market exports of groundnuts to Senegal make up more than half of total agricultural exports, but only six percent of total exports.[4]

Industry

The Gambia's industrial base is small in both scale and scope. Groundnut processing is carried out almost exclusively by the mills of the parastatal GPMB. Two-thirds of GPMB output by value (oil and cake) is exported, and one-third (primarily oil) is consumed domestically. Exports of groundnut products by the GPMB are larger in value than exports of groundnuts, but these too are only seven percent of total exports.

Other industries include large private soft-drinks and brewing industries, the medium- and large-scale production of some intermediate inputs (e.g., oxygen distillation for welding), and myriad small-scale informal activities, such as tailoring, furniture making, and blacksmithing. These informal-sector activities are in total larger than the few formal-sector activities, and this is reflected in the relatively larger share of returns to informal entrepreneurial capital

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[3] Other estimates of this trade range from 25 percent to more than 50 percent of total production (Puetz and Von Braun 1990).

[4] Processed groundnuts are classified as an industrial product, and exports are treated accordingly.

than to formal capital in the SAM. Overall, the returns to factors in industry are more or less evenly divided between capital (52 percent) and labor (48 percent).

Services

The services sectors in total provide the largest share of GDP. The majority of these activities are non-traded, but the single largest activity, both in terms of gross output and domestic value added, is the re-export trade. As with the informal cross-border exports of groundnuts, the volume of re-export trade depends on price distortions in neighboring countries (primarily Senegal) and the effectiveness of border patrols along the Senegal-Gambia border. According to unpublished data from the Central Statistics Department (CSD), as much as 90 percent of some imported commodities such as tea and textiles are re-exported to Guinea and Senegal (CSD 1991a). The re-export trade accounts for nearly 60 percent of all exports.

The re-export trade is also the largest of the informal services activities. In the SAM year (1989-90) there were no formal or large-scale firms engaged in the re-export trade. This is due in part to the nature of the activity: The Gambia acts as an entrepôt, and goods are exported directly without finishing or remanufacture. Thus no domestic value added is generated in the re-export goods sector other than the returns to labor and entrepreneurial capital involved in transportation and marketing.

Formal trade includes the sale of agricultural inputs by the Gambia Cooperative Union (GCU) and the activities of the Gambia National Trading Corporation (GNTC) as well as the activities of private medium- and large-scale traders. Informal trade consists primarily of the sale of food and food products in urban areas. Communications and utilities services are provided exclusively by the Gambia Telecommunications Company Ltd. (GAMTEL) and the Gambia Utilities Corporation (GUC), two parastatal agencies. Transportation services are provided by two parastatal agencies, a few formal-sector private firms, and myriad informal-sector taxi, truck, and river transport operators. This combined account provides the greatest share of value added to corporate (formal) capital. The construction account is also a combination of formal- and informal-sector activities, which are distinguished by size and structure of production.

Private services includes a broad range of formal and informal activities, producing a mixture of traded and non-traded goods. The output of hotels and restaurants is primarily consumed by tourists, and is therefore considered exported. Tourism is the second largest source of foreign exchange income, after the re-export trade. The sector expanded greatly in the eighties: the number of tourists visiting The Gambia more than doubled between 1979-80 and 1990-91 (Dieke 1993).

Other services, such as private and religious education, personal care, and private health care, are not traded. Public services in the SAM are taken

directly from the Government's budget estimates from 1989-90, and modified to reflect some minor accounting differences between the model and the Government budget. Housing services record the returns to the stock of housing, estimated to be 10 percent per year.

Income Sources and Distribution[5]

On average, per capita incomes in urban areas in The Gambia are 2.9 times those in rural areas (Table 2). Defining the poor as households in the lower 70 percent of total household expenditures within each region, per capita incomes of the urban non-poor are 6.7 times those of the rural poor.

Urban households in The Gambia receive far more income from wage labor than do rural households. Including the imputed value of own-family labor on farms and informal sector enterprises, the difference is smaller, with the urban poor receiving 83.7 percent of their income from labor and the rural poor, 69.1 percent. Entrepreneurs are found in all urban income classes, and both the wealthiest and the poorest urban households are likely to be entrepreneurs.

Agriculture provides a greater share of total household income for the poorest rural households, and poorer households are less likely to have secondary off-farm sources of income. Transfers from abroad and from urban areas are a major source of income for rural households.

Income distribution in The Gambia is comparable to the rest of West Africa: the Gini coefficient calculated from per capita incomes for the entire sample is 0.371, and within the urban and rural groups the Gini coefficient is 0.333 and 0.251, respectively.[6] On average, urban incomes are one-and-one-half times larger than rural incomes. This difference is due primarily to the relatively low level of education of rural household heads and limited employment opportunities in rural areas (Jabara and Lundberg 1991). Per capita expenditures are more equitably distributed than incomes. The Gini coefficient for per capita expenditures is 0.304 for all The Gambia, 0.277 for the urban population, and 0.179 for rural households.

By far the most important item in the household's consumption basket is food, which constitutes nearly 60 percent of total household expenditure in urban areas, and nearly 67 percent in rural areas. Urban households spend a larger budget share on transport, consumer durables, education, and health care, while

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[5] The descriptions of Gambian households in this section draw heavily from Jabara et al. (1991).

[6] The Gini coefficient measures the cumulative distribution of any variable (such as income) over any population. It ranges from zero to one, with zero indicating perfectly equal distribution and one indicating perfectly unequal distribution.

Table 2 – Income Shares in The Gambia, 1989-90

	Urban Poor	Urban Non-Poor	Urban Total	Rural Poor	Rural Non-Poor	Rural Total	The Gambia Total
Labor Income							
Skilled	41.6	40.8	41.2	2.5	5.7	4.0	24.0
Unskilled	42.1	24.5	32.7	66.6	44.3	56.2	43.6
Entrepreneurial Income	5.5	24.4	15.6	3.7	4.8	4.2	10.3
Housing	7.2	6.7	6.9	12.1	9.5	10.9	8.8
Land Rents	0.9	0.2	0.5	6.7	15.1	10.6	5.2
Interest Received	0.5	0.6	0.5	0.4	0.1	0.2	0.4
Transfers	2.2	2.9	2.6	8.0	20.5	13.8	7.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Population (in thousands)	172.9	74.1	247.0	430.5	184.5	615.0	862.0
Per Capita Income (thousands of dalasis/person)	2.55	6.80	3.83	1.01	2.06	1.33	2.04

Source: Gambia SAM adapted from Jabara, Lundberg, and Sireh Jallow (1992).

the budget share paid to rent (and imputed rent) and household repairs is higher among rural households. As expected, the share of food in the budget declines as income increases. All household classes have positive savings.

Calorie intake per adult equivalent among both rural and urban households appears to meet the requirements given by the World Health Organization (WHO) in 1985 (Jabara et al. 1991), but significant malnutrition exists among children, especially in rural areas. Nearly five percent of children in urban areas, and nearly 10 percent of rural children were found to be severely malnourished. In addition, more than 20 percent of urban children and more than 30 percent of rural children show evidence of long-term malnutrition, as measured by stunting (Jabara et al. 1991; Tolvanen 1992).

The rate of population growth has declined during the past decade, from 3.5 percent per year between 1973 and 1983 to just under three percent per year between 1983 and 1990 (World Bank 1982; 1989). The growing population continues to exert considerable pressure on scarce land and other resources, and rural-urban migration intensifies the demands on urban areas (Jabara 1990).

3. ECONOMIC CRISIS AND POLICIES FOR RECOVERY

The seeds of The Gambia's economic crisis were planted during the 1970s. Until that time, The Gambia had experienced positive real growth in GDP per capita as a result of modest policies and a favorable external environment. Policies instituted during the 1970s overwhelmed the public sector and left the economy vulnerable to shocks, which came as the twin apocalyptic horsemen of many African economic crises: drought and a decline in the international terms of trade.

The history of The Gambia's crisis and recovery can be divided into three periods: the slide into crisis during the late 1970s, the distress of the early 1980s, and the recuperation which began with the Economic Recovery Program of 1985--86. As illustrated in Figure 1, the economic collapse in The Gambia was severe in both magnitude and swiftness. From 1975 to 1980, the current account plummeted from equilibrium to a deficit worth more than 30 percent of GDP.[7]

THE ORIGINS OF THE CRISIS

The First Development Plan of 1976–81 boosted investment in basic social and economic infrastructure. This investment program was funded primarily by highly concessional foreign loans, but also by government budget surpluses and domestic borrowing. An estimated 40 percent of total development expenditure was channeled to the creation of new state-owned enterprises, and the number of parastatals doubled during that period.

In addition to the spending on the development program, the Government of The Gambia (GOTG) increased recurrent expenditure and imports. The number of established posts in the government doubled. Consumption of imports increased rapidly, and exports were no longer able to generate sufficient foreign exchange to pay for the increased imports.

The Gambia's foreign debt increased sevenfold in real terms during that period, from 13 to more than 80 percent of GDP. But the burden of the development plan, combined with an expanded recurrent expenditure, was heavier than the GOTG and the donor agencies had expected. Funds were taken from the reserves of the GPMB to cover some of the shortfall (primarily to subsidize the operation of newly established parastatals).

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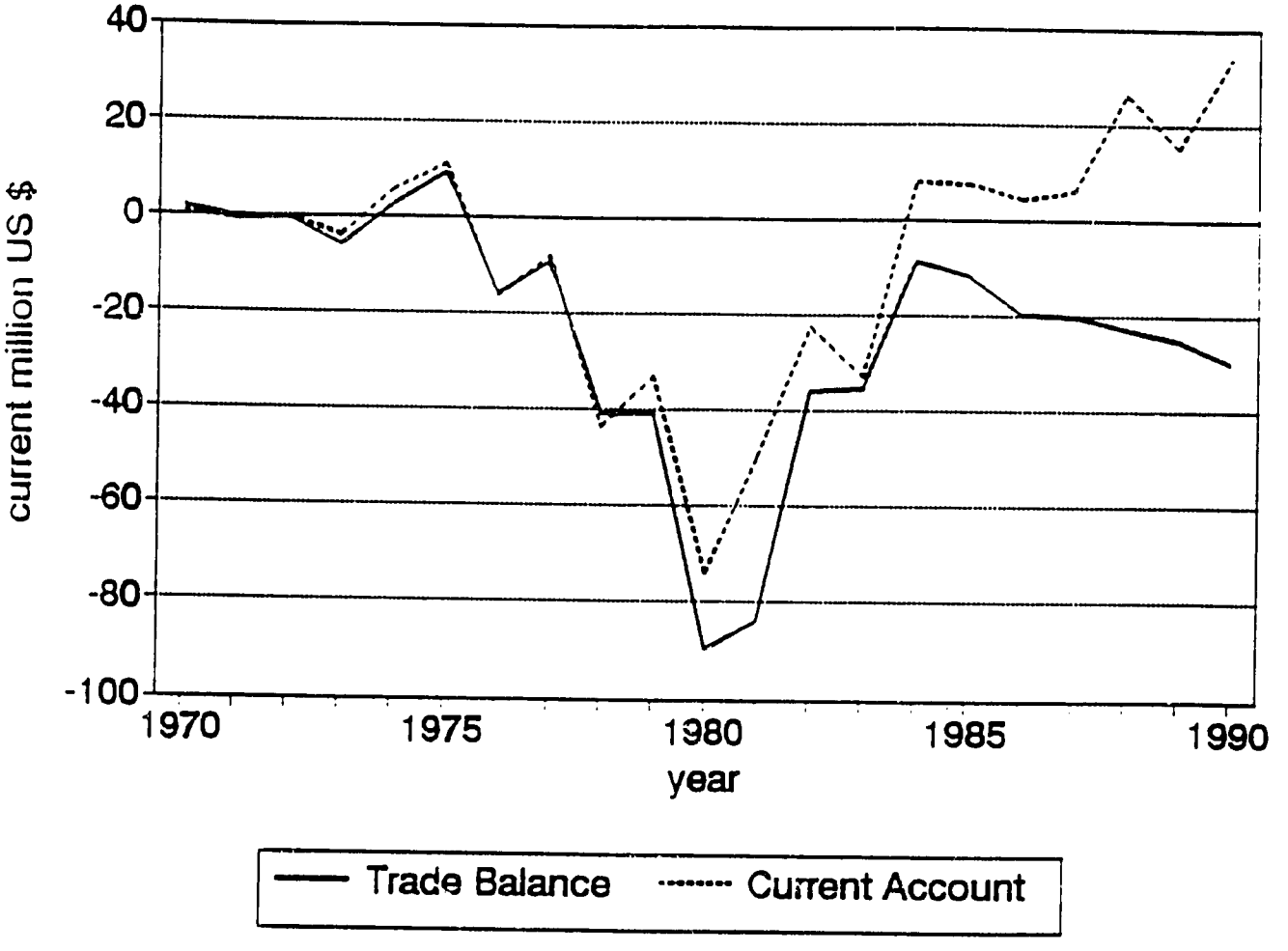
[7] This section draws heavily from Jabara (1990) and Jabara, Lundberg, and Sireh Jallow (1992). Exceptions are explicitly noted.

Figure 1 — The Gambia: Balance of Payments



Source: IFS, various issues.

Low producer prices, which permitted the implicit taxation of the groundnut sector, reduced incentives for producers, and groundnut production began to decline. The Gambia's balance of payments, which had previously been more or less in balance, plunged into deficit in 1976 (see Figure 1). The current account deficit reached its nadir in 1980 at more than US$ 70 million, or 30 percent of GDP. At the same time, government commitments to the development program and a structurally higher level of recurrent expenditures doubled the overall public-sector deficit. By the end of this period, the GOTG and its parastatal agencies were overextended, and were unable to intervene to relieve the effects of the drought and the exogenous shocks that followed.

THE DEPTHS OF THE CRISIS

Although export earnings and real GDP continued to fall in the early 1980s, increased foreign aid and foreign borrowing postponed the total collapse of the economy. Between 1979 and 1982, net official development assistance (ODA) and total external debt doubled. Ironically, the increase in foreign financing may have been partly responsible for the severity of the crisis, since it allowed the government of The Gambia to maintain its ambitious investment program and high levels of consumption.[8]

Under an International Monetary Fund standby agreement in February 1982, the GOTG attempted to increase government receipts and reduce consumer subsidies, in part by eliminating explicit price ceilings for urban consumers, and by increasing producer prices. At the same time, foreign assistance declined, requiring the GOTG to cut expenditures even more sharply. Higher debt service payments and an expanded wage bill reduced the GOTG's room for manoeuvre, forcing a reduction in the provision of services and the consumption of imports.

As a condition of the standby agreement, the GPMB increased the producer prices for groundnuts for the 1982–83 season. Higher producer prices combined with good weather to achieve a record harvest, but that year the world groundnut price collapsed, plunging the GPMB into debt. The GPMB was forced to borrow to pay for groundnut purchases, since their reserves had been used by the GOTG to finance the earlier public investment program. As a result, domestic credit grew 45 percent in 12 months.

The crowding-out of domestic loanable funds and the continued decline of domestic foreign exchange reserves began a self-perpetuating loss of confidence in the banking system. The loss of confidence depressed bank deposits, which further reduced confidence in the system. The overvalued dalasi encouraged traders to transfer private foreign revenues directly into foreign banks, or to

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[8] In July 1981, the GOTG survived a violent revolt and attempted coup d'etat, which reduced foreign exchange earnings from tourism. A desire to preclude further unrest may have influenced the government's decisions to maintain high levels of recurrent expenditure. See McPherson and Radelet (1991).

purchase dalasis on the parallel market. Low producer prices also encouraged farmers to sell groundnuts illegally across the border to Senegal, reducing the receipts of the GPMB.

A second standby agreement was arranged for early 1984. Under this arrangement, the dalasi was devalued for the first time since 1974, by 25 percent. Although significant, this devaluation was not sufficient to completely equilibrate the foreign exchange market, and there remained a small premium in the parallel market. Groundnut producer prices were increased coincidentally, but the domestic price increase was outweighed by the devaluation, and the incentive remained for farmers to export illegally to Senegal. Late rains and pests reduced the groundnut harvest, and official groundnut exports collapsed, therefore worsening The Gambia's current account deficit. The GPMB tried to remedy the situation by further increasing the groundnut producer price, but the price increase came too late in the season to affect farmer behavior.

As part of the second standby agreement, the GOTG reduced expenditures on consumer subsidies, raised interest rates, and attempted unsuccessfully to raise revenues. But the GOTG was unable to meet the repayment schedule to the IMF and other official creditors, and the standby agreement was suspended. Reduced revenues forced the GOTG to seek additional foreign (commercial) financing of domestic expenditures, boosting domestic money supply, and quickly eliminating the benefits of the earlier devaluation. By the summer of 1985, the parallel rate for the dalasi was 50 percent higher than the official rate.

The end of this period marked the low point in the crisis. By early 1986, the total external debt had increased to nearly twice the value of GDP, and payments arrears were more than twice official export earnings. Government consumption (primarily the wage bill) had reached unsustainable heights. The overvalued dalasi and low world prices reduced government foreign exchange receipts from groundnuts, and low domestic producer prices encouraged farmers to sell illegally to Senegal, where the producer price was maintained at a level higher than the world price. Real GDP per capita during the middle 1980s had declined to the levels of the early 1970s.

Economic Recovery

Real structural changes were necessary to boost foreign exchange receipts, to compensate for declining world groundnut prices, to discourage capital flight, and to encourage growth and diversification in the private domestic productive base. Therefore, in 1985–86 the GOTG introduced the ERP. The ERP had three basic components: price and exchange rate liberalization, public-sector rationalization, and demand management. Because The Gambia was in arrears to the IMF, the ERP was introduced without support from either an IMF standby agreement or additional assistance from bilateral donors (Radelet 1992).

In the first year of the ERP, most retail prices were decontrolled, import duties were raised, export duties were reduced or eliminated, and the dalasi was

allowed to float freely. Prices for public and parastatal monopoly services were raised and subsidies were reduced on other services. The groundnut producer price was increased 58 percent in July 1985, before the time of planting. The price was raised another 12 percent in November, the start of the harvest and buying season, and increased by an additional 15 percent at the end of the season (January 1986), to D 1,260 per ton. The intention was to bring prices in The Gambia more in line with those in Senegal and on the world market, but in practice the impact of these price changes was wiped out by coincidental changes in the exchange rate.

In January 1986, the GOTG floated the dalasi to recapture the foreign exchange that had fled into the parallel market. During the first month of interbank foreign exchange auctions, the official exchange rate fell by 49 percent. By March, the dalasi had dropped to D 10 to the British pound, and by October 1986, the official market rate was nearly identical to the exchange rate on the parallel market. Fortunately, a decline in world rice prices beginning in mid-1986 helped ease the adverse effects of the devaluation on urban households.[9]

Many urban households suffered directly from the ERP as the Gambian government reduced the size of the public sector by reducing expenditure, laying off workers, freezing wages, and selling off parastatal enterprises. Between 1985 and 1987, nearly a quarter of the government labor force was eliminated. However, the reduction in government expenditure was smaller than the reduction in official foreign assistance, and the GOTG was again forced to borrow from commercial banks. The lower level of government consumption and lower incomes from the poor harvest combined to hold real GDP constant; and the collapse of foreign exchange earnings from reduced groundnut exports widened the external current account deficit.

The doubling of producer prices for groundnuts throughout the crop year (1985–86) was not sufficient to completely counteract the drastic depreciation of the dalasi in the parallel market, and there remained a significant price incentive to export groundnuts illegally to Senegal. In addition, poor weather contributed to a much smaller groundnut harvest. Conditions improved significantly during the following year (1986–87), as better weather led to increased agricultural production and the world price for exported groundnuts rose.

In consultation with the IMF, the GPMB raised the producer price for groundnuts more than 40 percent, to D 1,800 per ton. This made the domestic producer price higher than the export price and higher than the producer price in Senegal. The goal was to keep domestic production within the official marketing system and discourage farmers from selling in the parallel market, thus increasing the foreign exchange earnings of the GPMB. The GPMB was expected to lose money in the short run, but the IMF agreed to cover part of the forecast

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[9] The importance of the decline in rice prices at this crucial juncture for the political acceptability of the ERP is emphasized by Radelet (1992).

losses, with the remainder made up from additional revenue from increased tariffs on imported fuel and rice. But because of the good harvest, the GPMB's expenses were higher than anticipated, and the shortfall was financed by additional commercial borrowing.

The IMF and other agencies encouraged the GOTG to implement policies that would benefit the re-export trade, also with the intention of increasing foreign exchange earnings. Import duties were reduced on some re-exported items, such as textiles, tomato paste, cement, and some manufactures. Government payments of wages and salaries were reduced, but overall expenditure increased as a result of higher debt-service payments and the implementation of a new Public Investment Program, which expanded government development expenditures.

In order to reduce the subsidy to the GPMB, and to keep the domestic price in line with a lower world price, the producer price for groundnuts was reduced by nearly 20 percent in 1987-88. The GOTG tried to alleviate the worst effects of the collapse in prices by eliminating the groundnut export tax. In addition, as part of the general trend towards privatization, groundnut marketing and exporting were liberalized: private traders could now buy from farmers and export directly.

The GOTG began the second phase of the ERP during 1988-89, again with the support of donor agencies, and after reaching a debt rescheduling agreement with the London Club of creditors in January. The primary objective of this phase was to improve the performance of the government and parastatal agencies, to make the parastatals attractive for sale, or simply to eliminate them and transfer their functions to the private sector. Efforts at improving the operating efficiency of the government and its remaining parastatal agencies had begun a year earlier with the setting of performance targets for the GPMB, the GUC, and the Gambia Ports Authority (GPA). Other agencies were reformed, and user fees were implemented or raised for some services, such as health care.

Despite a deterioration in the weather with a consequent decline in agricultural production, real GDP grew by 5.2 percent in 1989-90 and was 19.4 percent higher than in 1984/85, before the onset of the ERP. During the reform period, exports of groundnut products had likewise increased, by 49 percent in Special Drawing Rights (SDR) terms. The current account deficit including official transfers was only 2.7 percent of GDP, down from 6.4 percent in 1983-84. Including grants, the government budget now showed a surplus equal to 2 percent of GDP, compared with a deficit of 9 percent of GDP in 1984-85.[10] Only the large increase in foreign debt, from an average of US$ 198.3 million dollars in 1981-83 to US$ 330.0 million in 1987-89 diminished the luster of the economic recovery.

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[10] The above data are from IMF (1992a).

SUMMARY

The economic crisis in The Gambia was both severe and tumultuous. It might be said that external circumstances conspired against the GOTG and its initial attempts at policy reform in the early 1990s, as bad weather and adverse shifts in terms of trade reduced real incomes and exports. But responsibility for The Gambia's recent economic turbulence cannot be laid exclusively on exogenous factors. Policy changes, such as those designed to encourage groundnut production, were not coordinated with exchange rate measures. Fiscal policy and external borrowing was arguably too expansive in the early eighties. Finally, although The Gambia began its reform process independently, without direct assistance or support from donor agencies, foreign assistance certainly played a pivotal role in both the crisis and its alleviation. Foreign aid receipts reached a peak of 70 percent of GDP in 1986 as the associated foreign debt rose to nearly twice the level of GDP. Disentangling the effects of the drought, changes in terms of trade, pricing policy, fiscal policy, and foreign capital inflows on The Gambian economy and households requires a formal model such as the one presented in the next chapter.

4. THE GAMBIA CGE MODEL

In this chapter, the structure of the Gambia CGE model is outlined. The discussion follows that in Dervis, de Melo, and Robinson (1982) and in Condon, Dahl, and Devarajan (1987).[9] First, we present equations for production activities, and import demand and export supply of commodities. Then, we describe equations for incomes, expenditures, and savings of households and other institutions. Equations for investment and foreign savings follow, along with a discussion of model closure. Equations for the dynamic runs and a section on model parameters conclude the chapter.

PRODUCTION

Real output ($XPTACT_j$) of each activity is a function of capital (K_j), labor of skill level LC ($L_{LC,j}$), and intermediate inputs (Q_{ij}).[10] Assuming that the quantities of intermediate inputs (Q_{ij}) per unit of output ($XPTACT_j$) are fixed, (i.e., the input-output coefficients [a_{ij}] are constants), the production function is:

$$XPTACT_j = f(L_{LC,j}, K_j, Q_{ij}) = f(L_{LC,j}, K_i, a_{ij}\, XPTACT_j) \qquad (1)$$

Following neo-classical theory, producers in the model maximize profits given the technology available (represented by the production function) and prices of factors of production, inputs, and outputs. Profits are defined as:

$$PROFIT_j = P_j(1 - tprod_j) \cdot XPTACT_j - \sum_i P_i a_{ij}\, XPTACT_j - \sum_{LC} w_{LC,j}\, L_{LC,j} - r_j K_j \qquad (2)$$

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[9] A similar presentation for a CGE model for Madagascar is found in Dorosh (forthcoming).

[10] Nine factors of production are modeled: four types of labor (skilled and unskilled labor in both rural and urban areas); four types of capital (urban and rural informal sector capital, and corporate capital surplus and interest); two types of land (belonging to poor and rich farmers); and urban and rural housing. In the production functions of the model, however, all capital in a given activity is combined to form a single capital stock.

where P_i (P_j) is the price of good i (j) and $tprod_j$ is the tax on production, $w_{LC,j}$ is the wage rate paid to labor of type LC in sector j, and r_j is the rate of return on capital in sector j.

The first-order conditions for profit maximization are obtained by differentiating equation 2 by $L_{LC,j}$ and k_j, to get:

$$P_j(1 - tprod_j) \cdot (\partial f/\partial L_{LC,j}) - \sum_i P_i \cdot a_{ij}(\partial f/\partial L_{LC,j}) - w_{LC,j} = 0, \quad (3)$$

and

$$P_j(1 - tprod_j) \cdot (\partial f/\partial K_j) - \sum_i P_i \cdot a_{ij}(\partial f/\partial K_j) - r_j = 0$$

or

$$PVA_j (\partial f_j/\partial L_{LC,j}) = w_{LC,j}$$
$$PVA_j (\partial f/\partial K_j) = r_j$$

where

$$PVA_j = P_j - tprod_j - \sum_i P_i \cdot a_{ij}. \quad (4)$$

In the Gambia model, $f(L_{LC,j}, K_j)$ is a constant elasticity of substitution (CES) production function, with four types of labor ($LC = 4$),

$$XPTACT_j = AD_j \left[\sum_{LC} \alpha_{LC,j} L_{LC,j}^{-\rho_j} + \left[1 - \sum_{LC} \alpha_{LC,j}\right] K_j^{-\rho_j} \right]^{-1/\rho_j} \quad (5)$$

where the elasticity of substitution σ_j is equal to $1/(1 + \rho_j)$. Manipulating the first-order conditions for profit maximization (Equation 3) gives:[11]

$$\frac{K_j}{L_{LC,j}} = \left[\frac{(1 - \sum_{LC} \alpha_{LC,j})}{\alpha_{LC,j}} \right]^{\sigma_j} \left[\frac{W_{LC,j}}{r_j} \right]^{\sigma_j} \quad (6)$$

with the rate of return on capital r_j defined by

$$r_j = \left[1 - \sum_{LC} \alpha_{LC,j}\right] \cdot AD_j^{-\rho_j} \cdot K_j^{\rho_j - 1} \cdot PVA_j \cdot XPTACT_j^{1+\rho_j}. \quad (7)$$

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[11] See Dorosh (forthcoming) for details of the derivation.

Equations 6 and 7, the result of the profit maximization in equation 3, are included in the model equations in the General Algebraic Modeling System (GAMS) program.[12]

For each labor skill-type, total labor demanded by all activities must equal labor supply (LS_{LC}), which is exogenously given.

$$\sum_j L_{LC,j} = LS_{LC} \tag{8}$$

Aggregation of Production Activities

In the Gambia model, two sets of quantities and prices are defined in the production block, in order to distinguish between production activities and the commodities produced. In principle, each of the 16 activities in the model could produce more than one commodity; in practice, given the structure of the Gambia SAM, each activity produces only one commodity.[13] Output of commodity i, is a fixed proportion ($OUTMAT_{ji}$) of the total output of the activity, ($XPTACT_j$). Given the one-to-one mapping of activities to commodities, $OUTMAT_{ji} = 1$ for $i = j$ and 0 for $i \neq j$. Total domestic production of each commodity (XPT_i) is the sum of the production of commodity i by all activities:

$$\sum_j XPTACT_j \cdot OUTMAT_{ji} = XPT_i \tag{9}$$

The price of activity j ($PPTACT_j$) is thus defined so that the total value of the output of the activity is equal to the sum of the values of the commodities produced:

$$PPTACT_j \cdot XPTACT_j = \sum_i PPT_i \cdot OUTMAT_{ji} \cdot XPTACT_j \tag{10}$$

or

$$PPTACT_j = \sum_i PPT_i \cdot OUTMAT_{ji}$$

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[12] In the Gambia model, for a given skill type, the wage rate can vary across sectors by a constant factor, $WDIST_{LC,j}$. Thus in the model, $w_{LC,j}$ in equation 6 is replaced by $w_{LC} \cdot WDIST_{LC,j}$.

[13] In all, there are 17 commodities. In addition to the 16 activities shown in Table 1, non-competitive imports are a separate commodity.

where PPT_i is the factory gate price for commodity i. Given the structure of production in the Gambia SAM, $PPTACT_j = PPT_i$ for $i = j$.

IMPORT DEMAND AND EXPORT SUPPLY

The standard small-country assumption in simple commodity trade models is that the world price is fixed (i.e., that the country modeled is a price-taker) and that the domestic good is a perfect substitute for the internationally traded commodity, so that the law of one price holds. Given the high level of aggregation in an economy-wide model, the assumption of perfect substitutability between domestic goods and internationally traded goods is not reasonable for most sectors. Thus for importables, an alternative formulation, first proposed by Armington (1969), is used.[14]

First a composite commodity (XT_i) is defined as a CES function of imported goods (M_i) and domestically produced commodities (XPD_i):[15]

$$XT_i = AC_i \cdot (\delta_i M_i^{-\rho_i} + (1 - \delta_i)\ XPD_i^{-\rho_i})^{-1/\rho_i} \tag{11}$$

Given equation 10, each consumer chooses M_i and XPD_i in order to minimize the cost of obtaining a unit of XT_i,

$$\begin{aligned} PC_i \cdot XT_i = {} & PPD_i \cdot (1 + margdf_i + margdi_i + dsalrate_i) \cdot XPD_i \\ & + PM_i \cdot (1 + margmf_i + margmi_i + isalrate_i) \cdot M_i, \end{aligned} \tag{12}$$

where PC_i is the user's price of domestic absorption for commodity i, PPD_i is the producer price of output for good i sold domestically, $margdf_i$ and $margdi_i$ ($margmf_i$ and $margmi_i$) are percentage formal and informal marketing margins for

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[14] The following discussion of import demand and export supply is drawn from Dervis, de Melo, and Robinson (1982: 221–230) and Condon, Dahl, and Devarajan (1987: 6–9).

[15] For non-competitive imports, domestic production (and local sales) are zero, so equation 11 becomes $XT_i = AC_i^{-\rho_i}\delta_i^{-\rho_i}M_i = k_i M_i$. In order to calibrate the model so that prices are equal to one in the base solution, k_i must equal the marketing margin and sales tax mark-up, $1 + margmf_i + margmi_i + isalrate_i$.

domestic goods (imports),[16] $dsalrate_i$ ($isalrate_i$) is the indirect tax rate for domestic goods (imports), and PM_i is the cost, insurance, and freight (CIF) price plus import tariffs. The solution to this cost minimization yields:

$$M_i / XPD_i = (PPD_i' / PM_i')^{\sigma_i} (\delta_i / 1 - \delta_i)^{\sigma_i}, \tag{13}$$

where

$$PPD_i' = PPD_i \cdot (1 + margdf_i + margdi_i + dsalrate_i)$$

and

$$PM_i' = PM_i \cdot (1 + margmf_i + margmi_i + isalrate_i) .$$

Equation 12 expresses the ratio of imported goods to domestically produced goods as a function of relative prices of imported and domestically produced goods, where $\sigma_i = 1/(1 + \rho_i)$ is the "trade substitution" elasticity. The larger the value for σ_i, the greater the sensitivity of the share of imports in total supply to price changes. In the limit, with σ_i equal to infinity (i.e., imports and domestic goods are perfect substitutes), PPD_i must equal PM_i if imports and domestic production are both non-zero.

The Gambia's demand for imports is assumed to be too small to affect world prices, so the world price of imports expressed in foreign currency (PWM_i) is fixed exogenously. The domestic price of imports is determined by:

$$PM_i = PWM_i(1 + tm_i)ER, \tag{14}$$

where tm_i is the import tariff on import good i and ER is the nominal exchange rate expressed in dalasis per unit of foreign currency (US$).

Likewise, the domestic FOB price of exports (PE_i) is equal to the exogenous world FOB price in US$ (PWE_i) converted to domestic currency, less export taxes:

$$PE_i = PWE_i \cdot ER/(1 - TE_i) \tag{15}$$

where TE_i is the export tax.

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[16] Formal and informal sector marketing margins are included because the cost structure and quality of marketing services varies between the formal and informal sectors.

Analogous to import goods, export goods and goods produced and consumed domestically may not be perfect substitutes because of the relatively high level of aggregation in the model (e.g., both fish and cattle are included in the livestock and fishing sector of the model). Following Condon, Dahl, and Devarajan (1987), a constant elasticity of transformation (CET) function between domestically consumed goods (XPD_i) and exported goods (E_i) is used:

$$XPT_i = AT_i \cdot \left(\gamma_i E_i^{\psi_i} + (1 - \gamma_i) XPD_i^{\psi_i}\right)^{1/\psi_i} \tag{16}$$

where ψ_i is the elasticity of transformation. Total revenues from sales for domestic use and exports are:

$$PPT_i \cdot XPT_i = PPD_i \cdot XPD_i + \frac{PE_i}{(1 + margxf_i + margxi_i)} \cdot E_i, \tag{17}$$

where $margxf_i$ and $margxi_i$ are formal and informal sector marketing margins for the exports of goods i. Maximizing total revenues (equation 17) given the aggregation function (equation 16) gives the following export supply function:

$$\frac{E_i}{XPD_i} = \left[\frac{PE_i'}{PPD_i} \cdot \frac{(1 - \gamma_i)}{\gamma_i}\right]^{\phi_i} \tag{18}$$

where

$$PE_i' = \frac{PE_i}{1 + margxf_i + margxi_i}$$

and

$$\phi_i = \frac{1}{\psi_i - 1}.$$

The equations for non-traded goods are simpler than those for traded goods. For non-importable goods, the aggregation equation (equation 10) becomes:

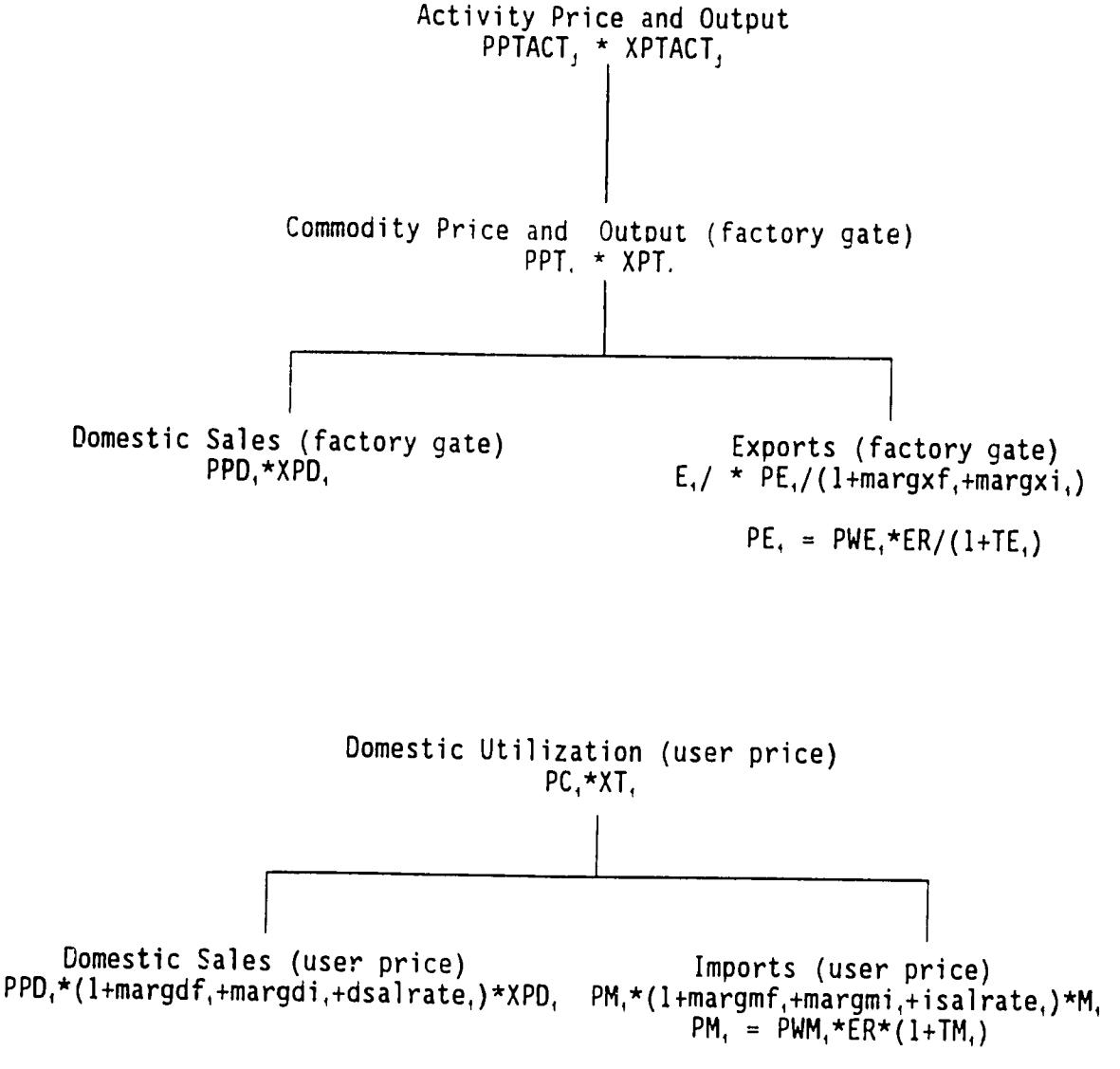
$$XT_i = XPD_i. \tag{19}$$

For non-exportable goods, equation 16 reduces to:

$$XPT_i = XPD_i. \tag{20}$$

Figure 2 summarizes the relationships between the variables describing domestic, imported, and exported quantities and the corresponding prices in the model.

Figure 2 — The Gambia: Structure of Price and Quantity Aggregations



INCOMES AND EXPENDITURES

Value added generated by the production activities in the model is paid to factors of production: labor and capital (including land). Factor payments are allocated to institutions (households and formal enterprises) according to the ownership of factors by each institution.

Households

The total income of household *h* has three basic components: wages, returns to capital and land, and transfers received from both domestic institutions and the rest of the world (ROW). The amount of labor income received by a particular household depends on the employment status of its members and the skill distribution within the household. The total salary paid to labor of a certain skill category *LC* ($LCSAL_{LC}$) is given by:

$$LCSAL_{LC} = \sum_{j} WDIST_{LC,j} \cdot W_{LC} \cdot L_{LC,j} \tag{21}$$

Similarly, total returns to capital of type *kc* are given by:

$$RETK_{kc} = \sum_{j} (PVA_j \cdot XPTACT_j - ACTSAL_j) \cdot shrkc_{kc,j} \tag{22}$$

where $shrkc_{kc,j}$ is the constant share of total returns to capital in activity *j* paid to capital of type *kc*, and $ACTSAL_j$ is total salaries paid in activity *j*:

$$ACTSAL_j = \sum_{LC} (W_{LC} \cdot WDIST_{LC,j} \cdot L_{LC,j}) \tag{23}$$

The total income for household *h* equals:

$$Y_h = \sum_{LC} (shrlc_{LC,h} \cdot LCSAL_{LC}) + \sum_{kc} (shrkc_{kc,h} \cdot RETK_{kc}) + \sum_{INST} TRANSFER_{h,INST} \tag{24}$$

where $shrlc_{LC,h}$ is the share of labor of type *LC* owned by household *h*, $shrkc_{kc,h}$ is the share of capital of type *kc* owned by household *h*, and $TRANSFER_{h,INST}$ are transfers received by household *h* from institutions *INST*.[17]

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[17] In all, the model specifies seven institutions: four households (urban rich, urban poor, rural rich, and rural poor), formal enterprises, government and the rest of the world.

The consumption of commodity i by household h is assumed to be a fixed share of total expenditure:

$$PC_i \cdot CD_{ih} = CLES_{ih} \cdot YD_h \tag{25}$$

where CD_{ih} stands for real consumption of commodity i by household h and YD_h is the disposable income of the household. This disposable income is defined as total household income (Y_h) minus the savings ($SAVHH_h$), income tax ($tdir_h \cdot Y_h$), and all transfer payments made by the household to the other institutions in the economy ($TRANHH_h$):[18]

$$YD_h = Y_h - SAVHH_h - TRANHH_h - tdir_h \cdot Y_h \tag{26}$$

and

$$TRANHH_h = \sum_{INST} TRANSFER_{INST,h} \tag{27}$$

Total consumption of commodity i (CD_i) is just the sum of the consumption of commodity i across households h:

$$CD_i = \sum_h C_{ih}. \tag{28}$$

The aggregate consumer price index ($PINDEX$) is computed as a weighted average of user prices for composite goods. Thus:

$$PINDEX = \sum_i \theta_i \cdot PC_i, \tag{29}$$

where θ_i is the share of consumption of good i in total private consumption in the base data. Household savings (S_h) are determined as a linear function of household income:

$$S_h = SO_h + MPS_h \cdot Y_h, \tag{30}$$

where SO_h is a constant and MPS_h is the marginal propensity to save as a function of income. Total household savings ($TOTHHSAV$) and rural household savings ($RURHHSAV$) are defined as simple summations across households:

$$TOTHHSAV = \sum_h SAVHH_h \tag{31}$$

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[18] Institutions includ all households, formal enterprises, government, and the rest of the world.

and

$$RURHHSAV = \sum_{rh} SAVHH_{rh}. \tag{32}$$

Government Current Accounts

Government expenditure demand by commodity (GD_i) is a fixed share ($GLES_i$) of real total government current expenditure *(GDTOT)*, which is given exogenously:

$$GD_i = GLES_i \cdot GDTOT \tag{33}$$

Government revenues (*GR*) are equal to import tariffs *(TARIFF)*, export duties *(DUTY)*, indirect taxes on production *(PRODTX)*, indirect taxes on domestic commodities *(DSALETX)*, sales taxes on imported goods *(ISALETX)*, direct taxes on households *(DIRTX)*, and transfers from other institutions ($TRAN_{adpub,inst}$; which includes income taxes on formal sector enterprises).

$$GR = TARIFF + DUTY + PRODTX + DSALETX + ISALETX + DIRTX + \sum_{inst} TRAN_{adpub,inst}, \tag{34}$$

$$TARIFF = \sum_i tm_i \cdot PWM_i \cdot M_i \cdot ER, \tag{35}$$

$$DUTY = \sum_i TE_i \cdot PE_i \cdot E_i, \tag{36}$$

$$PRODTX = \sum_j tprod_j \cdot PPTACT_j \cdot XPTACT_j, \tag{37}$$

$$DSALETX = \sum_i dsalrate_i \cdot PPD_i \cdot XPD_i, \tag{38}$$

$$ISALETX = \sum_i isalrate_i \cdot PM_i \cdot M_i, \tag{39}$$

$$DIRTX = \sum_h tdir_h \cdot Y_h. \tag{40}$$

Government savings are defined as:

$$GOVSAV = GR - \sum_{i} PC_i \cdot GD_i - \sum_{INST} TRANSFER_{INST,ADPUB}, \quad (41)$$

where $TRANSFER_{INST,ADPUB}$ stands for transfer payments made by the government to all other institutions.

Formal Enterprises

The income of formal enterprises *(YENTF)* consists of earnings from returns to capital plus transfers received from other institutions:

$$YENTF = \sum_{kc} shr_{kc,CORPS} \cdot RETK_{kc} + \sum_{INST} TRAN_{CORPS,INST}. \quad (42)$$

Savings of formal enterprises *(ENTFSAV)* is equal to their income less transfers (dividends, insurance payments, etc.), which are exogenous, and income taxes:

$$ENTFSAV = YENTF - \sum_{INST} TRANSFER_{INST,CORPS} - tdir_{CORPS} \cdot YENTF. \quad (43)$$

National Income

Total GDP *(YGDP)* is equal to value added plus indirect taxes:

$$YGDP = \sum_{j} PVA_j \cdot XPTACT_j + PRODTX + TARIFF + DUTY + DSALETX + ISALETX. \quad (44)$$

INVESTMENT DEMAND

In the Gambia model, the level of total private investment is determined by the pool of savings available. Government investment is exogenous.

Private investment by commodity (ID_i) is calculated as a fixed proportion of the investment by sector of destination (DK_j):

$$ID_i = \sum_{J} IMAT_{ij} \cdot DK_j, \quad (45)$$

where $IMAT_{ij}$ is the capital composition matrix. The unit price of new capital (investment) for sector j, PK_j, is equal to the sum of the costs of all investment goods i used to create a unit of capital in sector j:

$$PK_j = \sum_i PC_i \cdot IMAT_{ij}. \tag{46}$$

The value of investment by sector of destination ($PK_j \cdot DK_j$) is in turn assumed to be a fixed share (KIO_j) of urban investment plus a fixed share ($RKIO_j$) of rural non-government investment (equal to rural household savings):

$$PK_j \cdot DK_j = KIO_j \cdot (SAVINGS - RURHHSAV - TOTDSTK - VGOVIVT) + RKIO_j \cdot RURHHSAV, \tag{47}$$

where *SAVINGS* is total savings, *RURHHSAV* is rural household savings, *TOTDSTK* is the value of total change in stocks, and *VGOVIVT* is the value of government fixed investment. Total private investment (*DKTOT*) is simply the sum of private investment in each activity:

$$DKTOT = \sum_j DK_j. \tag{48}$$

Total savings (*SAVINGS*) is equal to the sum of total household savings *(TOTHHSAV)*, government savings *(GOVSAV)*, savings of formal enterprises *(ENTFSAV)*, and foreign savings *(FSAV)* multiplied by the exchange rate *(ER)*:

$$SAVINGS = TOTHHSAV + GOVSAV + ENTFSAV + FSAV \cdot ER. \tag{49}$$

Change in the stock of each commodity ($DSTK_i$) is assumed to be fixed in real terms, so that the value of total change in stocks is:

$$TOTDSTK = \sum_i PC_i \cdot DSTK_i. \tag{50}$$

The quantity of government investment by commodity ($PC_i \cdot GID_i$) is modeled as a fixed share (GIO_i) of total real government investment *(GOVIVT)*:

$$GID_i = GIO_i \cdot GOVIVT. \tag{51}$$

Total value of government investment *(VGOVIVT)* is:

$$VGOVIVT = \sum_i PC_i \cdot GID_i. \tag{52}$$

Depreciation *(DEPRECIA)*[19] is assumed to be a fixed percentage $(DEPR_j)$ of the value of the capital stock in each activity j:

$$DEPRECIA = \sum_j DEPR_j \cdot PK_j \cdot K_j. \tag{53}$$

THE CURRENT ACCOUNT AND FOREIGN SAVINGS

The current account equation defines foreign savings (expressed in terms of foreign currency) as the total value of imports and transfers from The Gambia less the total value of exports and transfers from the rest of the world:

$$\begin{aligned} &\sum_i PWM_i \cdot M_i + (1/ER) \sum_{INST} TRANSFER_{ROW,INST} \\ &= \sum_i PWE_i \cdot E_i + (1/ER) \sum_{INST} TRANSFER_{INST,ROW} + FSAV. \end{aligned} \tag{54}$$

SUPPLY-DEMAND BALANCE AND CLOSURE

Total demand equals total supply for each commodity:

$$XT_i = INT_i + CD_i + GD_i + ID_i + GID_i + DST_i, \tag{55}$$

where intermediate inputs (INT_i) are the sum of the intermediate uses of commodity i across all activities j:

$$INT_i = \sum_j a_{ij} \cdot XPTACT_j. \tag{56}$$

For goods produced by the informal trade sector (commodity 10), equation 55 is modified to include marketing margins on exports *(MARGXIT)*, imports *(MARGMIT)*, and domestic production *(MARGDIT)*:

$$INT_{10} = \sum_j a_{10,j} XPTACT_j + (MARGXIT + MARGMIT + MARGDIT) / PC_{10}, \tag{57}$$

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[19] In the dynamic model, depreciation in period t reduces the capital stock in period $t + 1$. In the with-in period (static) solution of the model, the depreciation variable *DEPRECIA* is calculated for accounting purposes only, and does not enter into any other equations. Household incomes, savings, and investments are all measured in gross terms in the model; they are not net of depreciation.

where

$$MARGXIT = \sum_i PE_i \cdot margxi_i / (1 + margxi_i) \cdot E_i, \tag{58}$$

$$MARGMIT = \sum_i PM_i \cdot margmi_i \cdot M_i, \tag{59}$$

and

$$MARGDIT = \sum_i PPD_i \cdot margdi_i \cdot XPD_i. \tag{60}$$

Equations for marketing the formal trade sector (commodity 11) are completely analogous, with separate variables for formal marketing margins (*MARGXFT*, *MARGMFT*, and *MARGDFT*) replacing the informal marketing margin variables.

Closure of the Model

Altogether, there are 582 variables in the Gambia model (Table 3).[20] Four-hundred-eighty-seven equations are listed in Table 4, where each equation is matched with an endogenous variable contained in the equation. Although the model equations are solved simultaneously and in general each variable is found in more than one equation, the pairing of equations and variables is useful for understanding the structure of the model.

Only 486 (487 - 1) equations are independent; the 487th equation is redundant by Walras' Law,[21] and can be dropped. This leaves 582 variables and only 486 equations. More restrictions to the model, in the form of more equations or making more variables exogenous, are necessary to "close" the model.

A number of restrictions are implicit from the above presentation of the equations of the model. For certain activities (mostly agricultural), no skilled

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[20] The GAMS solution algorithm used requires that the model be set up in the general form of maximizing an objective function given a set of constraints. Thus one other equation is added (*OBJ*), defining the objective variable *OMEGA* as a constant. See Condon, Dahl, and Devarajan (1987).

[21] Walras' law states that under certain conditions for the production and demand functions, satisfied by the functional forms chosen here, if there are k commodities and the excess demand equations for $k-1$ of the commodities are satisfied (equal to zero), then the excess demand equation for the k^{th} commodity will also be satisfied. Intuitively, this can be seen by considering that if total income in the economy equals total expenditure, then knowing expenditure on $k-1$ commodities and total expenditure is sufficient to determine the expenditure on the k^{th} commodity. See Henderson and Quandt (1980), Varian (1978), and Dervis, de Melo, and Robinson (1982).

Table 3 — Variables of The Gambia CGE Model

Variable	Number of Variables: Symbol	Number	Exogenous	Equation
PPD	I	17		EQUIL
PM	I (IM)	6		PMDEF
PE	I (IT)	8		PEDEF
PK	IACT	16		PKDEF
PPT	I	17		SALES
PPTACT	IACT	16		PPTDEF
PC	I	17		ABSORPTION
PVA	IACT	16		ACTP
PINDEX		1		PINDXDEF
PWM	I (IM)	6	6	
PWF	I (IT)	8	8	ESUPPLY
TM	I (IM)	6	6	
TEX	I (IT)	8	8	
ER		1	1	
XT	I	17		ARMINGTON, XSN
XPT	I	17		XPTDEF
XPD	I	17	2	CET, XXDSN
XPTACT	IACT	16		ACTIVCES
E	I (IT)	8		EDEMAND
M	I (IM)	6		COSTMIN
K	IACT-1	16	16	
WA	LC	4	4	LMEQUIL
LS	LC	4	4	
L	IACT, LC	64	25	PROFITMAX
RETR	IACT	16		RETURN
INT	I	17		INTEQ, INTEQCOMM
MARGXIT, MARGXFT		2		MARGXIDEF, MARGXFDEF
MARGMIT, MARGMFT		2		MARGMIDEF, MARGMFDEF
MARGDIT, MARGDFT		2		MARGDIDEF, MARGDFDEF
DST	I	17	17	
CD	I	17		CDEQ
CDHH	I x H	68		CONHHEQ
TRANHH	H	4		TRANHHEQ
SAVHH	H	4		SAVHHEQ
YGDP		1		GDP
ACTSAL	IACT	16		ACTSALDEF
RETK	KC	8		RETKDEF
LCSAL	LC	4		LCSALDEF
Y	H	4		YHDEF
YENTF		1		YENTFDEF
ENTFSAV		1		SAVENTFEQ
TOTHHSAV		1		TOTHHSAVEQ
RURHHSAV		1		RURHHSAVEQ
GD	I	17		GDEQ
ID	I	17		IEQ
GR		1		GREQ
TARIFF		1		TARIFFDEF
PRODTX		1		PRODTXDEF
DUTY		1		DUTYDEF
DSALETX		1		DSALETXDEF
ISALETX		1		ISALETXDEF
DIRTX		1		DIRTXDEF
GDTOT		1	1	
GOVIVT		1	1	
VGOVIVT		1		VGOVIVTDEF
GOVSAV		1		GRUSE
GID	I	17		GIDEF
DEPRECIA		1		DEPREQ
SAVINGS		1		TOTSAV
FSAV		1	1	CAEQ*
DK	IACT	16		PRODINV
DKTOT		1		DKTOTDEF
TOTDSTK		1		TOTSTKDEF
OMEGA		1		OBJ
Total		582	96	

* One equation can be eliminated by Walras' law. CAEQ is usually omitted.

Table 4 — Equations of The Gambia CGE Model

Equation Name	Equation Number	Number of Equations: Symbol	Number of Equations: Number	Variable
ACTP	4	IACT	16	PVA(IACT)
ACTIVCES	5	IACT-1	16	XPTACT(IACT)
RATIOKL	6		39	L(IACT,LC)
RETURN	7	IACT	16	RETR (IACT)
LMEQUIL	8	LC	4	WA(LC)
XPTDEF	9	I	17	XPT(I)
PPTDEF	10	IACT	16	PPTACT(IACT)
ARMINGTON	11	IM	6	XT(IM)
ABSORPTION	12	I	17	PC(I)
COSTMIN	13	IM-1	5	M(IM)
PMDEF	14	IM	6	PM(IM)
ESUPPLY	18	IT-1	7	PWE(IT)
PEDEF	15	IT	8	PE(IT)
CET	16	IT	8	XPD(IT)
SALES	17	I	17	PPT(I)
XSN	19	INM	11	XT(INM)
XXDSN	20	INX	9	XPD(INX)
LCSALDEF	21	LC	4	LCSAL(LC)
RETKDEF	22	KC	8	RETK(KC)
ACTSALDEF	23	IACT	16	ACTSAL(IACT)
YHDEF	24	H	4	Y(H)
CONHHEQ	25	I*H	68	CDHH(I,H)
TRANHHEQ	27	H	4	TRANHH(H)
CDEQ	28	I	17	CD(I)
PINDXDEF	29		1	PINDEX
SAVHHEQ	30	H	4	SAVHH(H)
TOTHHSAVEQ	31		1	TOTHHSAV
RURHHSAVEQ	32		1	RURHHSAV
GDEQ	33	I	17	GD(I)
GREQ	34		1	GR
TARIFFDEF	35		1	TARIFF
DUTYDEF	36		1	DUTY
PRODTXDEF	37		1	PRODTX
DSLETXDEF	38		1	DSALETX
MSALETXDEF	39		1	MSALETX
DIRTXDEF	40		1	DIRTX
GRUSE	41		1	GOVSAV
YENTFDEF	42		1	YENTF
SAVENTFEQ	43		1	ENTFSAV
GDP	44		1	YGDP
IEQ	45	I	17	ID(I)
PKDEF	46	IACT	16	PK(IACT)
PRODINV	47	IACT	16	DK(IACT)
DKTOTDEF	48		1	DKTOT
TOTSAV	49		1	SAVINGS
TOTSTKDEF	50		1	TOTDSTK
GIDEF	51	I	17	GID(I)
VGOVIVTDEF	52		1	VGOVIVT
DEPREQ	53		1	DEPRECIA
CAEQ	54		1	FSAV
EQUIL	55	I	17	PPD(I)
INTEQ	56	J-2	15	INT(J)
INTEQFORT	57		1	INT("FORTR-P")
INTEQINFT			1	INT ("INFTR-P")
MARGXIDEF, MARGXFDEF	58		2	MARGXIT, MARGXFT
MARGMIDEF, MARGMFDEF	59		2	MARGMIT, MARGMFT
MARGDIDEF, MARGDFDEF	60		2	MARGDIT, MARGDFT
OBJ			1	OMEGA
Total equations			487	
Closure				
ER.FX			1	
K.FX		IACT	16	
DST.FX(I)		I	17	
PWM.FX		IM	6	
PWE.FX		IT	8	
LS.FX		LC	4	
L.FX(LC,IACT)			25	
TM.FX(IM)		IM	6	
TEX.FX (IT)		IT	8	
FSAV.FX			1	
GDTOT.FX			1	
GOVIVT.FX			1	
Total exogenous variables			96	
XPD.FX ("REEXP-P")			1	
XPO.FX ("NCIMP-P")			1	
Total equations plus exogenous variables			697	
Total variables			696	

Note: One equation is redundant by Walras' law.

labor enters production. In these (25) cases, no labor demand equations are specified, and it is necessary to set labor demand to zero. Domestic sales of local production of non-competitive imports (for which no local production exists) and re-exports are likewise fixed at zero. Total supply of labor for each of the four labor types is also fixed exogenously. Capital stock in each of the 16 activities is specified as an exogenous variable, with its level set equal to the base case value. Changes in stock (DST_i) are fixed exogenously for each of the 17 commodities. World prices (expressed in foreign currency) for the six imported goods and eight exported goods are also fixed. Finally, in the GAMS code, TM_i and TEX_i are specified as variables (to make it easy to run policy simulations involving changes in trade taxes), but are fixed exogenously for all six imported and eight exported commodities. This gives 578 (486 + 25 + 2 + 4 + 16 + 17 + 6 + 8 + 6 + 8) restrictions (486 independent equations and 92 exogenous variables) for 582 variables.

The remaining four restrictions determine the closure of the model. Typically, the real values of government investment *(GOVIVT)* and government expenditure *(GDTOT)* are set exogenously. Of the three remaining variables, the aggregate price index *(PINDEX)*, the nominal exchange rate *(ER)*, and foreign savings *(FSAV)*, two must be fixed exogenously. Fixing both *PINDEX* and *ER* sets the real exchange rate *(ER/PINDEX)* and allows foreign savings to be determined endogenously. Letting foreign savings vary across policy simulations, however, makes comparison of the real income results hard to interpret. There is often a tradeoff between higher foreign savings (more foreign debt) and higher current income. A more common closure, and the one adopted for the simulations, is to fix *ER* and *FSAV*, and let *PINDEX* vary.

Other closures are possible, but a solution to the model does not necessarily exist for all possible values of a given set of exogenous variables. For example, since together *ER* and *PINDEX* define the real exchange rate and essentially determine the current account balance (the negative of the level of foreign savings, *FSAV*), there may not be a solution to the model if *ER* and *PINDEX* are set at their base levels, *FSAV* is fixed at a level 50 percent below its base value, and another formerly exogenous variable (e.g., the tariff on manufactured imports) is made endogenous. Although the system of equations would still involve 582 variables and 582 independent restrictions, no level of tariff on manufactured goods could reduce total imports enough to improve the current account balance by 50 percent.

Other closures could be implemented with minor changes to the model. One possibility would be to fix private investment exogenously and allow the marginal propensity to save of one or more household groups to vary in order to achieve the savings investment balance.

Equations of the Dynamic Model

In a multi-period ("dynamic") simulation, the model is solved for each year of the simulation sequentially, using the values for the previous year's solution to update capital stocks. No forward-looking behavior or expectations are modeled, and in this sense, the model is not truly dynamic.

Capital stocks in each sector are updated using an exogenous rate of depreciation ($DEPR_j$),[22] gross private investment (DK_j), and gross government investment by sector (GDK_j):

$$K_{j,t+1} = K_{j,t} \cdot (1-DEPR_j) + DK_j + GDK_j \ . \tag{61}$$

Government investment by sector (GDK_j) is a fixed share ($GKIO_j$) of total government investment:

$$GDK_j = GKIO_j \cdot GOVIVT. \tag{62}$$

Labor supply is updated using an exogenous growth rate, equal to the overall population growth rate (3.0 percent) for each of the four types of labor (skilled urban and rural, unskilled urban and rural):

$$LSO_{LC,t} = LSO_{LC,t} \cdot (1 + LSGR_{LC,t}), \tag{63}$$

where $LSGR_{LC,t}$ is the exogenous growth rate of labor supply of type LC.[23]

Parameters of the Model

Many of the coefficients in the model, such as the tables of input-output coefficients (IO_{ji}), and distribution of returns to capital and labor by household type $shrkc_{kc,h}$ and $shrlc_{LC,h}$, derive directly from the base data, the 1989–90 Gambia social accounting matrix (Jabara, Lundberg, and Sireh Jallow 1992). Other coefficients, such as AD_j (equation 5) or AC_i (equation 6) are implicit in the base data, given the functional forms used in the model equations and other parameter choices. These coefficients are calibrated so that the model reproduces the base SAM when no exogenous variables are changed.[24] A third class of parameters, which are independently chosen by the user of the model, are discussed below.

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[22] A depreciation rate of 2.0 percent is used for most sectors.

[23] The intercept in the savings equation, SO_h in equation 30, is increased at the rate of growth of population as well.

[24] See Dorosh (forthcoming) for a detailed discussion of the calibration of a similar model.

With CES production functions, the elasticity of substitution (σ_j) is specified independently. This parameter is related to the short-run elasticity of supply (the percentage change in supply given a 1 percent change in price of output), assuming the sector is small enough so that changes in its labor demand have no effect on wage rates. Intuitively, if labor does not easily substitute for capital, a change in output price can lead to only small changes in output in the short run when capital is fixed and only labor inputs can vary. The values for σ_j shown were set such that the short-run elasticities of supply would correspond to the values shown in Table 5, values that imply rather inelastic supply response in most sectors.[25]

The substitution parameters used in the aggregation of imported and domestic goods (σ_i) determine import demand elasticities given the shares of domestically produced goods in total consumption (equation 11). Similarly, the substitution parameters (ψ_i) used in the aggregation of exported and domestic goods (equation 16) determine export supply elasticities given the share of domestic sales in total sales of domestically produced goods. A high value of σ_i or ψ_i indicates the goods are close substitutes. For each commodity, σ_i and ψ_i are assumed to have the same value. A value of 2.0 was assigned to domestically produced or consumed goods which are close substitutes for goods traded with the world market or with Senegal (groundnuts, rice, coarse grains, fruits and vegetables, groundnut products and re-exports). An intermediate value of 0.9 was assigned to livestock, manufactured goods, construction (including carpentry), and transport. For both formal and informal trade, σ_i and ψ_i take a value of 0.4.[26]

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[25] Because the algebraic expression relating the short-run elasticity of supply to the elasticity of substitution and other CES parameters is very complex, the supply elasticities shown in Table 5 were estimated numerically, using the marginal productivity condition for labor demand (equation 5) and the production function (equation 6).

[26] These parameter values are similar to those used in the Cameroon model (Condon, Dahl, and Devarajan 1987). See Michel and Noel (1984) for a discussion of empirical estimates of trade parameters.

Table 5 — Elasticities of Substitution by Activity

Sector	Labor Share of Value Added	Elasticity of Substitution	Supply Elasticity[a]
1. Groundnuts	0.748	0.269	0.80
2. Rice	0.776	0.232	0.80
3. Coarse Grains	0.888	0.190	1.50
4. Fruits/Vegetables/Roots	0.886	0.194	1.50
5. Livestock/Forestry	0.821	0.175	0.80
6. Groundnut Products	0.412	2.129	1.50
7. Manufacturing	0.500	0.800	0.80
8. Construction	0.500	0.800	0.80
9. Transport/Communications	0.500	0.800	0.80
10. Domestic Informal Trade	0.750	0.500	1.50
11. Domestic Formal Trade	0.700	0.643	1.50
12. Re-export Trade	0.700	0.643	1.50
13. Private Services	0.700	0.643	1.50
14. Public Services	1.000	0.800	—[b]

Note: Output of rural and urban housing is a function only of capital stock.

[a] The supply elasticity shown for each product is a partial equilibrium elasticity, assuming no changes in wage rates or prices of other products.

[b] Essentially all value added generated by the public services sector accrues to labor. In the model, output of the public service sector is determined by exogenous demand for government services.

Source: Authors' calculations.

One other major parameter, the marginal propensity to save for households (MPS_h), can be chosen independently of the SAM. In the simulation runs for this paper, however, the marginal propensity to save is set equal to the average savings rate from the SAM.

5. STRUCTURAL ADJUSTMENT IN THE GAMBIA: POLICY SIMULATIONS

The Gambian economy underwent a marked transformation in the mid-eighties as changes in terms of trade, foreign aid, and government policies affected incentives for production, consumption, and investment. To shed light on the impacts of the various external and policy shocks on household incomes, the CGE model outlined in chapter 4 is used to simulate The Gambian economy during the major period of the Economic Recovery Program, 1985–1990.

The simulations presented here compare the effects of the various shocks with a base run that models the path of the economy with no changes in world prices, foreign capital inflows or government spending in real terms (Appendix Table 3). Shocks simulated include changes in government spending, movements in world prices of grounduts and rice, and changes in taxes on these commodities. The roles of foreign aid inflows and the drought are highlighted with separate runs.

SIMULATION 1: NO ADJUSTMENT (CUTBACKS IN FOREIGN AID)

In the mid-eighties, The Gambia borrowed substantial amounts of funds from international donors — loans that provided the resources for government investments designed to spur economic development. In the absence of the Economic Recovery Program, donor funding would likely have diminished to a level sufficient to cover only interest payments due on past loans, a decline in foreign aid of about US$ 18 million (Radelet 1990: 155). Simulation 1 models the economy without the ERP by reducing foreign savings by US$ 18 million relative to the base run in each year of the simulation. Government investment spending is reduced by the same dalasi value as the reduction in foreign aid inflow.

Reductions in foreign aid result in sharp declines in real incomes and investment in Simulation 1 (Table 6). Smaller inflows of foreign aid (foreign savings) reduce the total pool of savings in the economy available for investment. Since government investment is exogenously reduced by the same value, there is no direct impact on the supply of savings available for private investment. However, the decline in investment spending reduces aggregate demand, and in particular, demand for construction services and other investment goods. Government investment falls by 66.5 percent and total investment falls by 51.3 percent in year 1 (1986) relative to the base run. The construction sector, heavily dependent on investment demand, experiences a collapse in output of similar magnitude (51.8 percent).

Lower aggregate demand also leads to lower prices of non-traded goods, (including construction), while prices of traded goods tend to remain unchanged since they are tied to world prices. Thus, the real exchange rate, the relative price of traded to non-traded goods, approximated here by the nominal exchange

Table 6 — Simulation 1: No Adjustments (Reduced Foreign Aid)

	Year 1	Year 5
GDP	-2.5	-5.4
Consumption	-2.0	-7.0
Total Investment	-51.3	-40.8
Private Investment	-20.7	-8.1
Public Investment	-66.5	-66.5
Government Consumption	0.0	0.0
Government Revenues	-1.4	-3.5
Real Exchange Rate	3.6	5.0
Exports	7.8	4.1
Imports	-5.6	-8.1
Foreign Savings	-128.6	-128.6
SECTORAL PRODUCTION		
Agriculture	0.1	-3.1
Industry	-11.5	-14.9
Services	4.8	2.6
Public Administration	-4.7	-4.8
Total production	-0.7	-3.3
HOUSEHOLD INCOMES		
Urban Poor	-2.3	-7.6
Urban Non-Poor	-1.4	-7.3
Rural Poor	-1.1	-7.4
Rural Non-Poor	-1.9	-3.3
TOTAL	-1.7	-6.6

Source: Model simulations.

rate divided by the GDP deflator, rises (depreciates) by 3.6 percent in year 1 (5.1 percent in year 5). This shift in relative prices leads to increased production of traded agricultural goods (groundnuts, rice, vegetables). Overall agricultural production increases by 0.2 percent, while industry (including construction) falls by 11.5 percent. Exports of groundnuts (to Senegal) and groundnut products through Banjul rise by 1.5 and 7.5 percent, respectively, in year 1. Overall exports increase by 7.8 percent in year 1, while imports, discouraged by the higher prices, fall by 5.6 percent.

All household groups suffer a loss of real income when foreign capital inflows decline.[27] Initially, the urban population suffers most from the decline in foreign saving and investment spending in urban areas. Real incomes of the urban poor fall by 2.4 percent in year 1. The decline in real incomes of the urban non-poor is slightly less (1.5 percent), because returns to urban entrepreneurial capital actually rise by 3.7 percent in real terms. Rural households suffer only small declines in real income initially, as the real exchange rate depreciation leads to increased production of tradable agricultural goods. Over time, however, the effects of reduced government investment in agriculture lead to reduced real wages for unskilled rural labor, while returns to land increase. As a result, by year 5 real incomes of the rural poor have fallen by 7.4 percent relative to the base run, similar to the declines in real incomes of urban households (who are adversely affected by the lower urban capital stock). Rural large landowners (the rural non-poor) gain relative to other groups in the economy because of the increase in returns to land, although their income is still 3.3 percent lower than in the base run in year 5.

SIMULATION 2: REDUCED GOVERNMENT EXPENDITURES

In Simulation 2, the historical pattern of government real expenditures is modeled. Real recurrent expenditures are reduced by 16.3 percent in 1985 of Simulation 2; real government investment is 37.4 percent lower than the base run in 1985 (Table 7).

The decline in government spending frees up total savings for private investment, which more than doubles.[28] Total investment increases by 13.6 percent. Although real GDP is slightly lower than the base case in the first three years of the simulation, the additional capital stock created from higher levels of investment result in a gain in real GDP of 0.7 percent relative to the base run by year 5.

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[27] The population of each household group grows at an exogenous growth rate in each dynamic simulation. Reported percentage changes in household real incomes compared to the base run thus reflect percentage changes in both total incomes and in per capita incomes.

[28] Implicity, net borrowing by the government from the banking sector is reduced, making more funds available for private investment.

Table 7 — Simulation 2: Reduced Government Spending

	Year 1	Year 5
GDP	-0.9	0.6
Consumption	-0.9	0.5
Total Investment	13.5	9.1
Private Investment	115.8	63.5
Public Investment	-37.3	-33.6
Government Consumption	-16.3	-9.9
Government Revenues	1.1	2.5
Real Exchange Rate	0.0	0.4
Exports	0.6	2.2
Imports	0.6	2.2
Foreign Savings	0.0	0.0
SECTORAL PRODUCTION		
Agriculture	0.0	-1.1
Industry	2.7	2.1
Services	0.2	3.5
Public Administration	-17.4	-11.3
Total production	-0.7	1.1
HOUSEHOLD INCOMES		
Urban Poor	-2.0	1.9
Urban Non-Poor	-1.6	1.5
Rural Poor	0.1	-1.3
Rural Non-Poor	0.4	0.4
TOTAL	-0.8	0.7

Source: Model simulations.

The shift in composition of spending from the public to private sector has little impact on the real exchange rate in this simulation. Agricultural production suffers over time from the decline in government investment; year 5 agricultural output is 1.2 percent less than in the base run. Output of the industrial and service sectors, which benefit from increased private investment, are 2.2 and 3.6 percent higher the base run in year 5.

Changes in real income are small in this scenario. Initially, incomes fall by 2.0 percent for the urban poor and 1.6 percent for the urban non-poor, as expenditures by the government on urban wages and goods fall. Rural incomes rise slightly because private investment expenditures spur the construction and carpentry sectors — sectors that have stronger rural linkages. By year 5, however, the increased levels of private investment, mainly in urban activities, lead to gains in urban real incomes. With lower public investment in rural activities, real incomes of the rural poor fall by 1.4 percent while real incomes of the rural non-poor stagnate.

SIMULATIONS 3 - 6: GROUNDNUT PRICES AND POLICY

Changes in world prices of groundnuts (FOB Banjul), Senegal's producer price, and producer prices in The Gambia were all important factors behind the large fluctuations in protection/taxation of the groundnut sector in The Gambia. In the early eighties, producer prices were kept low relative to border prices, resulting in a large implicit export tax of over 50 percent in 1985 (Table 8). Unfortunately, the substantial increase in producer prices in 1986 and 1987 coincided with a sharp decline in world prices of groundnut products, so that domestic prices rose to almost twice the border price in 1987. Sharp reductions in producer prices combined with rising world prices eliminated the export subsidy by 1989. Throughout the period, Senegal's producer price, converted to dalasis using the parallel exchange rate, was greater than The Gambia's producer price except for 1987.

Simulations 3 through 6 shed light on some of the effects of these movements in world prices and producer prices. The effects of movements in Senegal's producer prices and world export prices are shown in simulations 3 and 4. Simulation 5 models changes in implicit export taxes/subsidies. The combined effects of all three factors (Senegal's producer price, world export prices, and implicit export taxes) are given in simulation 6.

In dollar terms, Senegal's producer price of groundnuts rose significantly after 1985 (Figure 3). Simulation 3 shows the effects of the 45.8 percent increase in 1986 and the high Senegal prices in subsequent years. Higher prices for exports to Senegal result in an increase in groundnut production of 9.9 percent. Cross-border groundnut exports increase by 71.0 percent, while exports of groundnut products through Banjul decrease by 18.8 percent. The increased income from groundnut exports leads to increased spending on non-traded goods and an appreciation of the real exchange rate by 1.6 percent. Reduced exports of groundnut products reduce export tax revenues and government net savings, leading

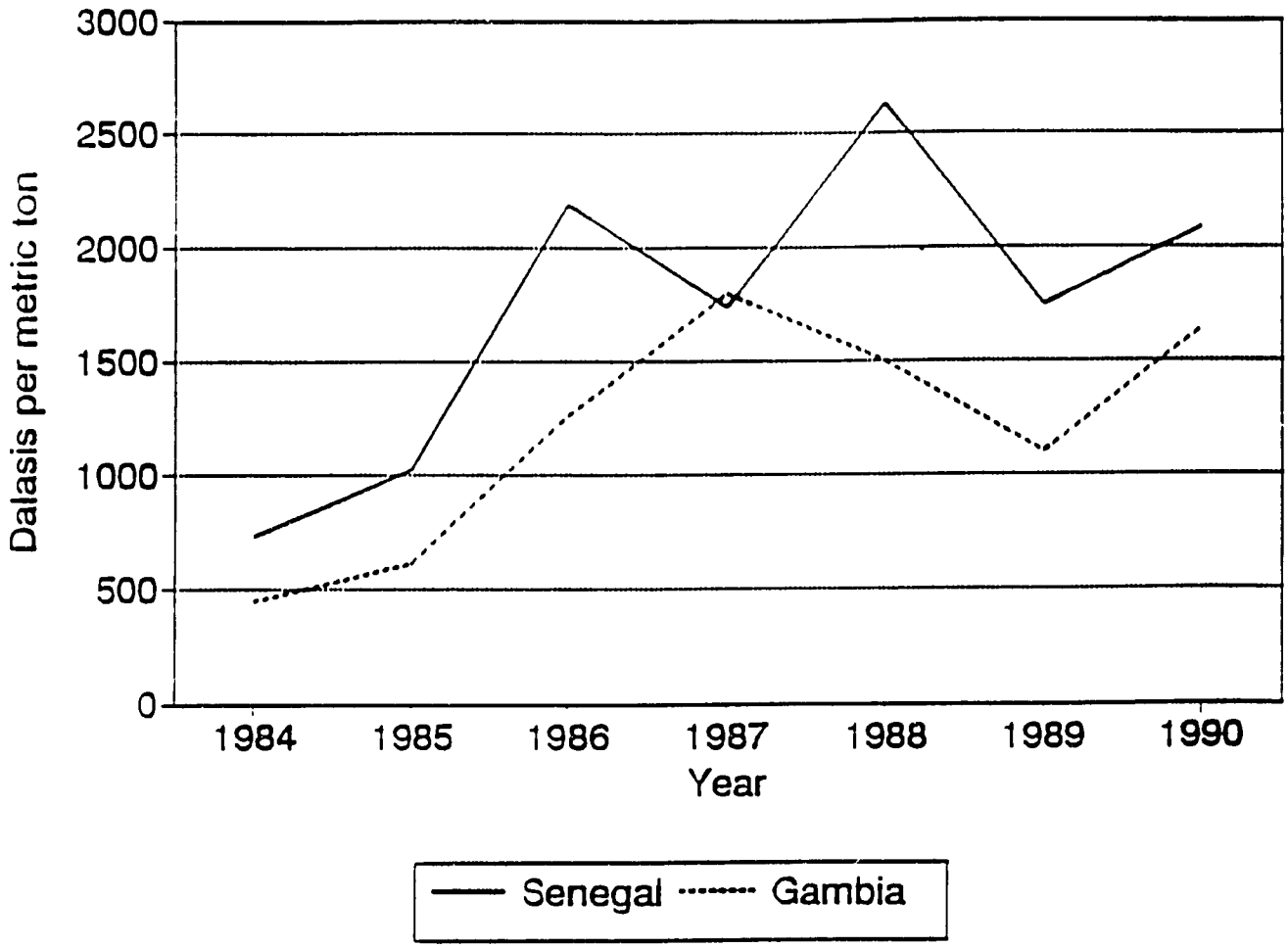
Table 8 — Domestic and World Prices for Groundnuts

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Gambia Producer Price D/ton	Senegal Producer Price CFA/ton	Senegal Producer Price D/ton	Price Ratio (3)/(1)	Domestic Price Banjul D/ton	FOB Banjul $/ton	FOB Banjul D/ton	Implicit Export Tax Percent
1984	450	70	731	1.63	933	588.0	2,105	125.7
1985	620	80	1,026	1.65	1,229	467.4	1,804	46.9
1986	1260	90	2,186	1.73	2,337	241.6	1,677	-28.2
1987	1800	90	1,742	0.97	3,235	219.5	1,552	-52.0
1988	1500	90	2,639	1.76	2,883	249.4	1,674	-42.0
1989	1100	70	1,754	1.59	2,373	302.0	2,292	-3.4
1990	1650	70	2,088	1.27	3,257	331.0	2,608	-19.9

Notes: Producer prices are for unshelled groundnuts.
Calculations use parallel exchange rate.
Domestic price Banjul is unshelled groundnuts adjusted for transformation and marketing costs.
Calculations use official exchange rate.
The implicit export tax is defined as [(7)/(5) - 1] * 100.

Source: Jabara (1990), IMF (1987), IMF (1988), BCEAO (various issues), Cowitt (1985), and authors' calculations.

Figure 3 — Groundnut Producer Prices: The Gambia and Senegal, 1984-1990



Source: Table 8.

to a drop in private investment as the total pool of savings in the economy diminishes. Urban household incomes fall as groundnut processing declines by 13.5 percent and the construction sector slumps slightly. Real incomes of the rural poor and rural non-poor rise by 4.2 and 3.9 percent, respectively, although total agricultural output at constant prices increases by only 0.5 percent (Table 9).

In Simulation 4, the decline in world prices of groundnut products, FOB Banjul, is modeled, holding Senegal's price constant (Figure 4). Groundnut production falls 11.2 percent as world prices of groundnut product exports decline by 48.3 percent in year 1. Cross-border trade becomes relatively more remunerative and groundnut exports to Senegal increase by 30.0 percent. Real GDP declines by 3.1 percent as the terms of trade shock reduce real incomes for farmers and export tax revenues for the government (Table 10). Total investment falls by 12.0 percent and output of the construction sector declines by 12.6 percent. Lower overall export earnings lead to a 3.9 percent depreciation of the real exchange rate. Re-export trade increases by 6.7 percent, however, largely because of the real exchange rate depreciation resulting from falling world groundnut prices. Not surprisingly, rural incomes fall most with the decline in groundnut prices, by 4.0 percent for the rural poor and 3.6 percent for the rural non-poor. Urban incomes change little in the first year of the simulation, but the sharp declines in investment reduce capital stock over time, so that by year 5 urban incomes fall by 1.8 percent for the urban poor and 1.1 percent for the urban non-poor.

Simulation 4 assumes that changes in the world price of groundnut products lead directly to changes in producer prices, since the export tax rate (implicit in official producer prices paid by the GPMB) is held fixed. In Simulation 5, this rate is varied as world prices of groundnut products (FOB Banjul) change. In the first year of the simulation, the border price of groundnut products (before tax) actually increases by 5.8 percent despite the 48 percent decline in the world price of groundnut products, as the 46.9 percent export tax becomes a 28.2 percent export subsidy.[26] In contrast to Simulation 4, exports of groundnut products increase by 12.4 percent relative to the base run and unofficial cross-border exports decrease by 3.5 percent. Government net revenues decline even further, despite the increase in exports of groundnut products, since the export tax on groundnuts is replaced by an export subsidy. The result is an even greater drop in total savings and investment to 17.5 percent below the base case level. With the change in export tax policy, the burden of the decline in world groundnut prices falls mainly on the urban population, as lower investment spending reduces urban incomes by 0.9 and 0.7 percent for the poor and non-poor groups, respectively. Rural producers see little change in real incomes, thanks to the offsetting domestic tax policy.

Over the five years of the simulation, the export tax and domestic producer prices vary sharply according to the historical pattern. In year 5, the

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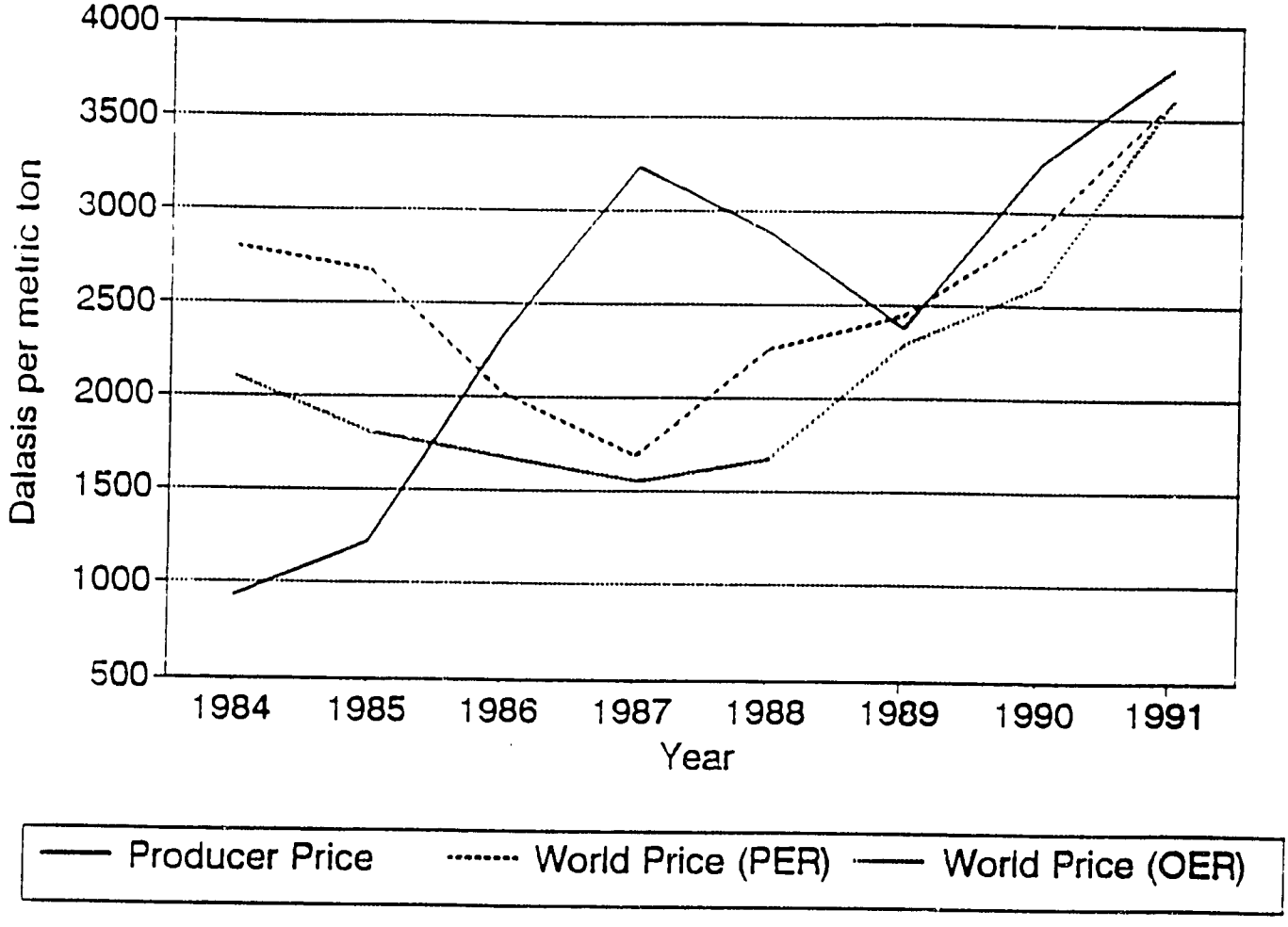
[26] Both the export tax and the export subsidy are measured as a percentage of the FOB price. See Table 8.

Table 9 — Simulation 3: Increased Groundnut Prices in Senegal

	Year 1	Year 5
GDP	0.6	0.4
Consumption	1.1	0.7
Total Investment	-0.6	-0.4
Private Investment	-1.7	-0.9
Public Investment	0.0	0.0
Government Consumption	0.0	0.0
Government Revenues	-2.9	-2.1
Real Exchange Rate	-1.6	-1.1
Exports	1.1	0.7
Imports	1.1	0.7
Foreign Savings	0.0	0.0
SECTORAL PRODUCTION		
Agriculture	0.5	0.4
Industry	-1.7	-1.3
Services	-0.0	-0.0
Public Administration	0.1	0.0
Total Production	-0.3	-0.2
HOUSEHOLD INCOMES		
Urban Poor	-1.8	-1.5
Urban Non-Poor	-1.4	-1.1
Rural Poor	4.1	3.0
Rural Non-Poor	3.9	2.8
TOTAL	0.8	0.5

Source: Model simulations.

Figure 4 — The Gambia: Groundnut Border Prices, 1984-1990



Notes: Producer price is farmgate price plus marketing costs to FOB Banjul.
World price (PER) is calculated at the parallel exchange rate.
World price (OER) is calculated at the official exchange rate.

Source: Table 8.

Table 10 — Simulations 4 and 5: Lower World Groundnut Prices (FOB Banjul)

	Lower World Price Simulation 4		Lower World Price with Change in Export Tax Simulation 5	
	Year 1	Year 5	Year 1	Year 5
GDP	-3.1	-3.2	-3.2	-3.7
Consumption	-1.6	-2.4	-0.5	-0.9
Total Investment	-12.0	-8.8	-17.4	-17.2
Private Investment	-36.2	-20.1	-52.5	-39.1
Public Investment	0.0	0.0	0.0	0.0
Government Consumption	0.0	0.0	0.0	0.0
Government Revenues	-5.9	-5.5	-15.7	-21.3
Real Exchange Rate	3.9	3.2	1.1	-1.3
Exports	-1.7	-2.2	-2.1	-3.5
Imports	-1.7	-2.2	-2.0	-3.5
Foreign Savings	0.0	0.0	0.0	0.0
SECTORAL PRODUCTION				
Agriculture	-0.8	-0.5	0.1	0.6
Industry	-8.5	-7.1	-2.9	-0.3
Services	3.2	1.3	1.3	-3.3
Public Administration	-0.0	-0.0	0.0	0.1
Total Production	-0.6	-1.2	0.0	-1.5
HOUSEHOLD INCOMES				
Urban Poor	0.2	-1.7	-0.9	-5.2
Urban Non-Poor	0.6	-1.1	-0.7	-4.9
Rural Poor	-4.0	-3.3	0.2	3.6
Rural Non-Poor	-3.5	-3.1	-0.2	3.1
TOTAL	-1.3	-2.2	-0.4	-1.3

Source: Model simulations.

combination of a recovery in world groundnut prices (relative to year 1) and low export taxes increases groundnut producer prices by 18.6 percent in real terms compared to the base run. Rural household incomes are 3.7 percent higher than the base run for the rural poor and 3.2 percent higher for the rural non-poor. Urban household incomes are 5.0 to 5.2 percent lower than in the base run, since urban capital stocks decline (the result of several years of lower investment).

The total effects of movements in world prices and changes in implicit export taxes/subsidies on groundnuts are shown in Simulation 6 (Table 11). Overall, the rural population enjoys significant gains in real incomes as producer prices for groundnuts increase. Real producer prices are on average 25.3 percent higher than in the base run for the five-year simulation as a whole, and groundnut production increases by an average of 12.0 percent. There is a sharp contrast in the change in incomes of urban and rural households. By year 5 of the simulation, real incomes of the rural poor are 5.7 percent higher than in the base run; real incomes of the urban poor (who are less poor and less numerous than their rural counterparts) are 5.7 percent lower.

SIMULATIONS 7 AND 8: RICE PRICES AND POLICY

Prior to the liberalization of rice marketing in mid-1985 as part of the ERP, wholesale distribution of imported rice was a monopoly of the GPMB; retail prices of imported rice were also fixed. Although rice imports were taxed at 23 percent, this tariff was not completely passed on to domestic rice consumers. Subsidies to the GPMB covering its losses on distribution of imported rice reduced the net taxation.[27]

World rice prices fell in 1986 shortly after the liberalization of the dalasi in January. This happy coincidence helped reduce the retail price of rice in Banjul, after the initial doubling of prices that accompanied the devaluation. World prices fell by nearly 41 percent from 1984 to 1986,[28] then rose to a level approximately 30 percent higher than the 1985 level by 1988, before stabilizing somewhat. As world prices rose, the rice import tariff was reduced, cushioning the impact of higher world prices on domestic consumers.

Simulation 7 shows the effects of changes in the world price of rice on the Gambian economy (Table 12). Overall production, savings, and investment change very little in any year, since the rice production sector is small in terms of value added and rice accounts for only a small share of total imports. Changes

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[27] The subsidies were less than 23 percent of the CIF value of rice imports, so that domestic prices were still somewhat higher than border prices. See Jabara (1990: 98–100).

[28] The FOB BangKok price for 100 percent brokens fell from US$ 214/ton in 1984 to US$ 126/ton in 1984 (Johm 1988: 42).

Table 11 — Simulation 6: Combined Effects of Changes in Groundnut Prices and Policy

	Year 1	Year 5
GDP	-2.0	-2.8
Consumption	0.6	-0.0
Total Investment	-14.6	-15.4
Private Investment	-44.1	-35.1
Public Investment	0.0	0.0
Government Consumption	0.0	0.0
Government Revenues	-15.3	-20.5
Real Exchange Rate	-0.7	-2.1
Exports	-0.5	-2.4
Imports	-0.5	-2.3
Foreign Savings	0.0	0.0
SECTORAL PRODUCTION		
Agriculture	0.5	0.7
Industry	-4.1	-1.1
Services	1.1	-2.9
Public Administration	0.1	0.1
Total Production	-0.3	-1.5
HOUSEHOLD INCOMES		
Urban Poor	-2.5	-5.6
Urban Non-Poor	-2.0	-5.2
Rural Poor	4.2	5.7
Rural Non-Poor	3.7	5.4
TOTAL	0.4	-0.5

Source: Model simulations.

Table 12 — Simulations 7 and 8: Changes in World Rice Prices and Import Tariffs

	New Rice Price Simulation 7		New Rice Price with Lower Import Tariff Simulation 8
	Year 1	Year 5	Year 5
GDP	2.25	-1.51	-1.43
Consumption	3.24	-2.16	-1.41
Total Investment	0.24	-0.20	-2.55
Private Investment	0.73	-0.46	-5.79
Public Investment	0.00	0.00	0.00
Government Consumption	0.00	0.00	0.00
Government Revenues	2.99	-2.93	-3.90
Real Exchange Rate	2.51	-1.74	-0.61
Exports	0.25	-0.25	0.28
Imports	0.25	-0.25	0.28
Foreign Savings	0.00	0.00	0.00
SECTORAL PRODUCTION			
Agriculture	-0.01	-0.01	0.01
Industry	0.14	-0.13	-0.67
Services	0.02	-0.02	0.20
Public Administration	-0.01	0.01	0.01
Total Production	0.04	-0.04	-0.06
HOUSEHOLD INCOMES			
Urban Poor	2.84	-2.80	-1.70
Urban Non-Poor	1.24	-1.25	-0.86
Rural Poor	3.09	-3.09	-1.65
Rural Non-Poor	2.40	-2.39	-1.39
TOTAL	2.33	-2.33	-1.38

Source: Model simulations.

in consumer prices, rather than changes in macro- variables, dominate the results.

In year 1, the world rice price drops 27.3 percent, leading to a 20.2 percent decline in the average real price of rice for consumers. Rice imports increase by 44.7 percent, with overall imports increasing by only 0.2 percent. Although lower rice prices discourage production, which drops by 6.6 percent, lower consumer prices contribute to a real exchange rate depreciation of 2.5 percent and a gain in real incomes averaging 2.3 percent. As world prices rise in the latter years of the simulation, real incomes fall below those in the base period.

In Simulation 8, changes in both world prices and import tariffs are modeled. Since there were only minimal changes in rice import tariff rates until 1989 (year 4 of the simulation), only year 5 results are shown in Table 12. Lowering the import tariff on rice from 30 percent to 10 percent (comparing simulations 7 and 8) helps offset the decline in real incomes associated with higher import prices of rice for all household groups. Real incomes decline by an average of 1.4 percent in Simulation 8 relative to the base run, a 1 percent improvement compared to Simulation 7, but lower tariffs reduce government revenues and total investment. Total investment falls by 2.6 percent in year 6 of Simulation 8, compared to a drop of only 0.2 percent in year 6 of Simulation 7.

SIMULATION 9: COMBINED EFFECTS OF CHANGES IN POLICY AND TERMS OF TRADE

Simulation 9 (Table 13) shows the combined effects of changes in policy (reduced government expenditures and changes in trade taxes on groundnuts and rice) and terms of trade (world prices of groundnuts and rice). There is a pronounced difference in the total effects on urban and rural household groups. For urban groups, the negative effects of reduced government expenditures in year 1 and lower world prices for groundnuts (FOB Banjul) outweigh the benefits of lower prices for imported rice. Real incomes decline by 1.86 percent for the urban poor and 2.47 percent for the urban non-poor. Rural households enjoy income gains of 7.58 and 6.67 percent for the poor and non-poor, respectively, and the effects of higher groundnut prices in Senegal and lower world rice prices dominate. In the dynamic simulation, real income gains are less for rural households, and real income losses larger for urban households, due mainly to the effects of the increase in world rice prices over the period modeled.

SIMULATION 10: EFFECTS OF THE DROUGHT

In Simulation 10, productivity of crop production (groundnuts, rice, coarse grains, and vegetables and roots) is exogenously increased by 10 percent over the base run productivity, to simulate the effects of an end to the drought.[29]

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[29] The 10 percent figure follows that used by Radelet (1990).

Table 13 — Simulation 9: Combined Effects of Changes in Policy and Terms of Trade

	Year 1	Year 5
GDP	-0.6	-3.4
Consumption	2.9	-0.7
Total Investment	-0.4	-8.4
Private Investment	73.6	23.4
Public Investment	-37.3	-33.6
Government Consumption	-16.3	-9.9
Government Revenues	-12.0	-21.2
Real Exchange Rate	2.2	-2.2
Exports	0.4	0.3
Imports	0.4	0.3
Foreign Savings	0.0	0.0
SECTORAL PRODUCTION		
Agriculture	0.4	-0.4
Industry	-1.0	0.2
Services	1.5	1.1
Public Administration	-17.3	-11.2
Total Production	-0.8	-0.3
HOUSEHOLD INCOMES		
Urban Poor	-1.8	-4.8
Urban Non-Poor	-2.4	-4.0
Rural Poor	7.5	2.4
Rural Non-Poor	6.6	4.2
TOTAL	1.8	-1.0

Source: Model simulations.

Simulated production of these crops increases by 9.3 to 12.3 percent in year 1, while overall agricultural production (including livestock and forestry) rises by 6.7 percent (Table 14). Cross-border exports of groundnuts increase by 18.4 percent, and exports of groundnut products increase by 11.9 percent. In spite of a small decline in real prices of crops, real incomes in the rural sector rise by 4.7 percent for the rural poor and 3.5 percent for the rural non-poor. Urban households also benefit somewhat, particularly the urban poor, for whom the decline in food prices is more important given the larger share of food in total expenditures (44.7 percent for the urban poor versus 32.8 percent for the urban non-poor).[30]

Overall, real GDP is 2.0 to 2.3 percent higher in each year of the simulation due to the end of the drought. Real investment is only 2.1 percent greater in the base run, since much of the increase in real incomes accrues to rural households with low savings rates (2.6 percent for rural poor households compared with a national average of 7.5 percent).

SIMULATION 11: INCREASED CAPITAL INFLOWS

Simulation 11 (Table 15) parallels Simulation 1 (reduced capital flows). Historically, capital inflows after the introduction of the ERP in 1985 were not only maintained at the pre-ERP level, but were considerably higher. The balance of trade deficit was on average US$ 11.5 million higher from 1986 to 1990 (US$ 23.6 million) than in 1985 (US$ 12.1 million) (IMF 1992b).

As foreign savings increase in Simulation 11, total savings and investment rise substantially (by 15.6 percent in year 1 and 32.3 percent in year 5) and the real exchange rate appreciates by 1.8 percent in year 1 and 4.9 percent in year 5. Because of the additional investment, real GDP is 3.1 percent higher than in the base run in year 5, compared to only 0.6 percent higher than the base run in year 1.

The rural poor gain little from the inflow of foreign capital in this scenario. With government investment held fixed in real terms, increased foreign capital only enables additional private investment, which is concentrated in urban activities. Moreover, the real exchange rate depreciation tends to depress rural incomes. Incomes of the rural poor increase by only 1.9 percent over the base run level in year 5; incomes of the urban poor are 6.8 percent higher.

SIMULATION 12: TOTAL PACKAGE

Simulation 12 models the combined effects of the policy changes and external shocks discussed in simulations 2 through 11. Real GDP is 2.0 percent higher than in the base run in both year 1 and year 5 (Table 16). Rural households

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[30] The budget shares for food given above do not include expenditures on non-competitive imports.

Table 14 — Simulation 10: End of the Drought

	Year 1	Year 5
GDP	2.0	2.2
Consumption	2.4	2.7
Total Investment	2.1	2.0
Private Investment	6.3	4.6
Public Investment	0.0	0.0
Government Consumption	0.0	0.0
Government Revenues	1.3	1.5
Real Exchange Rate	-0.4	-0.5
Exports	0.3	0.5
Imports	0.3	0.4
Foreign Savings	0.0	0.0
SECTORAL PRODUCTION		
Agriculture	6.7	6.9
Industry	2.0	2.1
Services	-1.1	-0.9
Public Administration	0.0	0.0
Total Production	1.1	1.3
HOUSEHOLD INCOMES		
Urban Poor	1.0	1.3
Urban Non-Poor	0.5	0.7
Rural Poor	4.6	4.8
Rural Non-Poor	3.4	3.6
TOTAL	2.2	2.4

Source: Model simulations.

Table 15 — Simulation 11: Increased Capital Inflows

	Year 1	Year 5
GDP	0.5	3.1
Consumption	0.9	4.9
Total Investment	15.5	32.3
Private Investment	46.8	73.4
Public Investment	0.0	0.0
Government Consumption	0.0	0.0
Government Revenues	0.4	2.9
Real Exchange Rate	-1.8	-4.9
Exports	-2.9	-4.4
Imports	1.9	6.7
Foreign Savings	46.1	117.2
SECTORAL PRODUCTION		
Agriculture	-0.0	-0.3
Industry	3.3	8.8
Services	-1.9	-0.9
Public Administration	-0.0	-0.0
Total Production	-0.1	1.6
HOUSEHOLD INCOMES		
Urban Poor	0.8	6.8
Urban Non-Poor	0.6	5.7
Rural Poor	0.5	1.9
Rural Non-Poor	1.0	3.3
TOTAL	0.7	4.6

Source: Model simulations.

Table 16 — Simulation 12: Total Policy Package and External Shocks

	Year 1	Year 5
GDP	2.0	1.9
Consumption	6.5	6.6
Total Investment	16.4	27.5
Private Investment	124.4	105.2
Public Investment	-37.3	-33.6
Government Consumption	-16.3	-9.9
Government Revenues	-11.3	-16.7
Real Exchange Rate	-0.0	-7.0
Exports	-2.1	-3.2
Imports	2.7	7.9
Foreign Savings	46.1	117.2
SECTORAL PRODUCTION		
Agriculture	7.3	6.3
Industry	3.8	12.0
Services	-1.3	-0.6
Public Administration	-17.3	-11.2
Total Production	0.1	2.9
HOUSEHOLD INCOMES		
Urban Poor	-0.2	2.9
Urban Non-Poor	-1.4	2.2
Rural Poor	13.3	9.1
Rural Non-Poor	11.6	10.8
TOTAL	4.9	5.8

Source: Model simulations.

benefit substantially: real incomes of rural households rise by 13.3 and 11.6 percent for the rural poor and non-poor, respectively, in year 1. Real incomes of urban households fall slightly in year 1, but the increase in urban capital stocks resulting from the large increase in private investment lead to more than a 2 percent gain in urban real incomes in year 5.

The relative importance of the various policy changes and external shocks on real incomes is indicated in Table 17. For the rural population, drought, the increase in Senegal's groundnut prices, and the decline in world rice prices in year 1 are the major factors behind the large gains in real incomes. Changes in government policies — reducing government expenditures, lower export taxes on groundnuts — have relatively small, but positive effects of rural incomes. The real income gains for year 5 are smaller than for year 1 because world rice prices are higher than in the base run in the latter years of the simulation.

For urban households, government policies had a more significant, but generally negative effect on real incomes. Cuts in government expenditures lowered urban wage incomes and reductions in export taxes on groundnuts led to diminished construction activity by reducing total savings and investment in the economy. Increased foreign savings inflows helped offset the latter effect, however. Changes in terms of trade had much smaller effects. By year 5 of the simulation, the crucial role of foreign capital inflows on urban income stands out. Only the reduction in government expenditures, (which permits increased private investment), the end of the drought, the reduction in import tariffs on rice, and the increase in foreign savings had positive effects on urban incomes, with the effects of the first three factors being relatively small. Apart from the effects of the increase in foreign capital inflows, which added 6.8 percent and 5.8 percent to real incomes of the urban poor and non-poor, respectively, real incomes would decline by more than 3 percent in year 5.

Table 17 – Summary of Simulation Results (Year 1)

Simulations	Real GDP	Household Incomes				
		Urban Poor	Urban Non-Poor	Rural Poor	Rural Non-Poor	All Gambia
No Adjustment	-2.5	-2.3	-1.4	-1.1	-1.9	-1.7
Reduced Government Expenditures	-0.9	-2.0	-1.6	0.1	0.4	-0.8
Higher Groundnut Prices in Senegal	0.6	-1.8	-1.4	4.1	3.9	0.8
Lower Groundnut Export Prices (FOB Banjul)	-3.1	0.2	0.6	-4.0	-3.5	-1.3
Lower Export Tax on Groundnuts	-3.2	-0.9	-0.7	0.2	-0.2	-0.4
Total Groundnut Package	-2.0	-2.5	-2.0	4.2	3.7	0.4
World Rice Price Changes	2.2	2.8	1.2	3.0	2.4	2.3
Lower Rice Import Tariff						
Simulations 2-8 Combined	-0.6	-1.8	-2.4	7.5	6.6	1.8
End of the Drought	2.0	1.0	0.5	4.6	3.4	2.2
Increase Capital Inflows	0.5	0.8	0.6	0.5	1.0	0.7
Total Package	2.0	-0.2	-1.4	13.3	11.6	4.9

Summary of Simulation Results (Year 5)

Simulations	Real GDP	Household Incomes				
		Urban Poor	Urban Non-Poor	Rural Poor	Rural Non-Poor	All Gambia
No Adjustment	-5.4	-7.6	-7.3	-7.4	-3.3	-6.6
Reduced Government Expenditures	0.6	1.9	1.5	-1.3	0.4	0.7
Higher Groundnut Prices in Senegal	0.4	-1.5	-1.1	3.0	2.8	0.5
Lower Groundnut Export Prices (FOB Banjul)	-3.2	-1.7	-1.1	-3.3	-3.1	-2.2
Lower Export Tax on Groundnuts	-3.7	-5.2	-4.9	3.6	3.1	-1.3
Total Groundnut Package	-2.8	-5.6	-5.2	5.7	5.4	-0.5
World Rice Price Changes	-1.5	-2.8	-1.2	-3.0	-2.3	-2.3
Lower Rice Import Tariff	0.1	1.1	0.4	1.5	1.0	1.0
Simulations 2-8 Combined	-3.4	-4.8	-4.0	2.4	4.2	-1.0
End of the Drought	2.2	1.3	0.7	4.8	3.6	2.4
Increase Capital Inflows	3.1	6.8	5.7	1.9	3.3	4.6
Total Package	1.9	2.9	2.2	9.1	10.8	5.8

6. SUMMARY AND CONCLUSIONS

The Gambia has often been cited as an example of successful structural adjustment. Following the implementation of the Economic Recovery Program, real GDP increased by 14.7 percent between 1986 and 1990. The model simulations presented here suggest that there were significant improvements in equity as well. A large part of these improvements in income levels and distribution was the result of changes in exogenous factors and increased capital inflows, not the direct results of policy change.

Radelet (1992) emphasizes the importance of a decline in world rice prices, which happily coincided with The Gambia's exchange rate devaluation in 1985, in the political economy of acceptance of the reforms. The simulations suggest that lower rice prices contributed to a short-run gain in real incomes of 2.8 percent for the urban poor and 2.3 percent for the population as a whole. Even with the benefit of lower rice prices, real incomes of urban households fell by 0.2 and 1.4 percent for the poor and non-poor, respectively, in the model simulations, showing the total effects of all policy changes and external shocks.

In the long run, however, foreign capital inflows played a more important role in the economic recovery. Without an adjustment program, and lower capital inflows, average household incomes in The Gambia decline by 1.7 percent in the static simulation. Because the capital inflows provide funds for investment, the long-term loss in real incomes with reduced capital inflows is even larger (6.6 percent). The increase in foreign capital inflows that accompanied the ERP was especially important for urban households in the long run. Although all households benefited from the increase in economic activity associated with the increased capital inflows, the urban population gained most in the simulations, since much of the new investment was concentrated on urban activities. These increased capital flows in themselves resulted in real income gains of 6.8 and 5.7 percent for the urban poor and non-poor, respectively. Without the capital inflows, urban real incomes would have declined by more than 3 percent.

The biggest gains in real incomes were enjoyed by the rural population.[31] The end of the drought accounted for more than half of the 9.1 percent gain in real incomes of the rural poor in year 5 of the simulations (and about one-third of the real income gain of the rural non-poor). Terms of trade changes, particularly the increase in Senegal's producer prices (expressed in dalasis), more than offset the effects of the decline in world prices of groundnut products. Since the average rural household is a net consumer of rice, the decline in world rice prices also added to rural incomes. In contrast to the urban households, though, short-run capital inflows did not greatly benefit the rural population, since the adverse effects of the accompanying real exchange

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[31] The effects of the removal of fertilizer subsidies are not modeled here.

rate appreciation tended to offset the gains from increased expenditures in the domestic economy.

The model simulations should of course be interpreted with caution, given the numerous assumptions made in constructing the SAM and the model. In particular, the shares of value added of a particular type (e.g., skilled labor or informal sector capital) paid to each type of household are fixed over time and for each policy simulation. Changes in this distribution of factor returns to households would affect the resulting income distributions. The shares of investment by sector of destination are also fixed, so that medium-run effects of policy changes that alter investment incentives may be understated. The role and level of cross-border trade also deserves further analysis.

In spite of these caveats, several general policy lessons emerge from the analysis. First, foreign aid inflows can provide a significant cushion to mitigate the negative effects of adjustment on the urban poor. To the extent that these funds are channeled into rural activities and commodities, there are potential benefits for rural households as well. The Gambia's small size enabled a level of funding in per capita terms that may not be feasible with other countries, however. In absolute terms, The Gambia's levels of foreign aid and borrowing are small when compared to other sub-Saharan countries. In per capita terms, and in comparison to the size of the economy, external support for the adjustment process has been enormous: aid inflows per capita to The Gambia were 3.8 times higher than the average for sub-Saharan Africa in 1987-89 (Table 18).

Second, reduced government expenditures do not necessarily benefit the rural population in the long run if private investment in rural areas is not forthcoming. There remain short-run gains from the depreciation of the real exchange rate associated with lower government spending, but these can be outweighed by declines in government investment in rural areas. Continuing these government investments in agriculture and rural infrastructure plays an important role in raising the incomes of the rural poor.

Third, groundnut pricing policies have large effects on income distribution in The Gambia, with clear tradeoffs between urban and rural incomes. The implicit tax revenues earned from keeping groundnut prices low generate funds for investments that are largely concentrated in urban areas. Rural incomes are especially sensitive to changes in producer prices of groundnuts. The complicating factor is cross-border trade, since an increase in parallel exports limits both the potential gains to urban groups through taxation of groundnuts and the potential losses of producer revenues through sales at low official prices. Similarly, an increase in Senegal's producer price leads to higher rural incomes at the expense of urban incomes as groundnut processing and official exports decline.

The openness of The Gambia's economy has made it especially sensitive to world price shocks and has also limited the effectiveness of its agricultural price policy. Moreover, its dependence on agriculture keeps it vulnerable to changes in climatic conditions. Favorable changes in the weather and in terms

Table 18 — Comparison of Debt and Development Assistance (three-year moving averages)

	The Gambia	Sub-Saharan Africa Average
Net ODA (current US$)		
1975–77	14.0	71.8
1978–80	41.7	130.3
1981–83	52.7	160.3
1984–86	68.0	194.2
1987–89	91.7	284.0
Net ODA per capita (current US$)		
1975–77	25.1	10.1
1978–80	67.7	17.4
1981–83	78.1	19.7
1984–86	90.3	21.7
1987–89	111.6	29.0
Net ODA/GDP (percent)		
1975–77	10.3	1.7
1978–80	19.3	2.9
1981–83	25.1	3.8
1984–86	43.2	5.2
1987–89	44.8	8.8
Total External Debt (current US$)		
1975–77	22.3	398.1
1978–80	89.2	964.8
1981–83	198.3	1,557.5
1984–86	248.5	2,128.1
1987–89	330.0	3,096.3
Total External Debt per capita (current US$)		
1975–77	40.0	57.4
1978–80	144.2	128.7
1981–83	291.9	191.3
1984–86	331.8	238.2
1987–89	401.4	316.2
Total External Debt/GDP (percent)		
1975–77	16.2	9.6
1978–80	40.3	21.4
1981–83	94.7	36.6
1984–86	155.1	56.4
1987–89	160.5	96.1

Sources: World Bank (1992, 1991, and 1981).

of trade played a major role in The Gambia's economic recovery in the eighties. Policy reforms were less important, with the exception of limiting the taxation of agriculture, which had very positive overall income distribution effects. Continued large foreign aid inflows were perhaps the sole indispensable part of the reform process, and are likely to continue to be crucial for sustained and rapid economic growth.

APPENDIX 1
CHANGES MADE TO THE PUBLISHED SOCIAL ACCOUNTING MATRIX (SAM)

This short chapter explains the major changes made to the SAM presented by Jabara, Lundberg, and Sireh Jallow (1992). Most of the modifications simply changed the structure of the matrix by reaggregation and reclassification of accounts. In a few instances, we adjusted actual values.

ACTIVITIES AND COMMODITIES

The earlier published version of the SAM contained no commodity accounts. The output of the different production accounts is consumed directly. That is, the producing sector sells its product directly to the consumer, and incurs the costs of marketing. Marketing margins are included in the original SAM as costs of production, and not explicitly as costs of distribution. In the SAM used for the CGE model, the marketing costs were removed from the production accounts and charged instead to the commodity accounts as explicit marketing margins. Thus, the expenses incurred by the producing accounts are exclusively costs of production.

The creation of commodity accounts with associated explicit marketing margins necessitated the reorganization of the marketing accounts. In the original SAM, the output of the domestic marketing accounts includes domestically produced and imported goods as well as marketing services. Rice, for example, is sold directly to consumers by rice producers (from the "other agriculture" account) *and* is sold to consumers through the two domestic marketing accounts. The original SAM treats the rice marketed through the trade acccounts as the product of the trade accounts. In the new version of the SAM, the three marketing accounts (two domestic and the re-export trade account) produce only marketing services, which are added to the commodities produced by the production accounts, and then sold to consumers. The isolation of the marketing margins make clear the effects on final consumption of commodities in the model simulations.

Similarly, the import of specific commodities was originally mapped to the production accounts, so that the output of rice production, for example, included both imported rice and the rice produced by the sector. In this new version of the SAM, the output of the rice production activity includes only the rice that the activity actually produces. Rice imports are recorded in the rice commodity account, and the duties on imported rice are also paid by the rice commodity account. All imports in the CGE SAM are recorded in the commodity accounts.

The SAM contains 17 commodity accounts, but only 16 production accounts (see Appendix Table 1). The shift of imports to the commodity accounts required the creation of an additional commodity account. The new account, called "non-

competitive imports," is necessary to record the imports of goods for which no substitutes are produced domestically. Because The Gambia has a small and relatively narrow industrial base, this account is both large and broad: it includes everything from engines to plastic sandals to tinned vegetables. These products are used both for intermediate inputs into production and for final consumption. This account is also important because the vast majority of products that are re-exported are considered non-competitive imports.

The classification of some production accounts in the CGE SAM is different from that presented in the original. As Appendix Table 1 shows, the original SAM shows 13 production activities, and the SAM used for the CGE contains 16. In agriculture, the "Other Agriculture" account from the original SAM (row 2) was partitioned into three: Rice, Coarse Grains, and Fruits/Vegetables/Roots. This was done to separate rice (the majority of which is imported) and fruits and vegetables (which are partly exported) from coarse grains. Agricultural Marketing Services from the old SAM was absorbed into the Domestic Formal Trade account, since in the SAM, this account was almost exclusively composed of the activities of the parastatal Gambia Cooperative Union.

Finally, the Private Services account in the original SAM contained the returns to housing stocks. These are not often included in SAMs, but were incorporated here because they are explicitly included in the National Accounts of The Gambia (CSD 1991b). In the SAM for this CGE model, two new categories are created to accommodate the returns to both urban and rural housing.

FACTORS

The original SAM contained 11 factors of production: seven types of labor and four types of capital. The new SAM contains 12, and the ratio of types of factors is reversed: four labor and eight capital. Appendix Tables 1 and 2 show the changes in the factor accounts. The most important change is that the new SAM has eliminated the categories of labor called "self-employed." Instead, the new SAM distinguishes between the labor input and the capital input to entrepreneurial activities.

For non-agricultural activities, entrepreneurial income was first disaggregated into returns to capital and labor, based on an assumption of the capital stock in each activity and the relative returns to capital. The returns to labor were divided into returns to skilled and unskilled labor, according to the ratio of skilled to unskilled labor in the original SAM. The returns to capital from the original self-employment accounts were assumed to accrue entirely to the entrepreneurial capital accounts.

Similarly, returns to rural agricultural self-employment were first divided into returns to labor and returns to land. Secondly, the returns to land and labor were apportioned among non-poor and poor households, according to their share of entrepreneurial income from agriculture presented in the earlier SAM. In addition, since a small portion of agricultural income accrues to urban households, returns to land were further divided accordingly.

CHANGES IN VALUES OF ECONOMIC FLOWS

The GOTG budget document, the original SAM, contains payments to urban unskilled labor (D 2.7 million) and urban skilled labor (D 12.2 million) from the Government's capital account. In the new SAM, the Government's capital account no longer hires labor directly: instead, that account purchases an additional D 14.9 million of current government services, and the GOTG's current account hires the additional labor.

The original SAM also contained some small Government transfer payments to the private sector. These were eliminated, and the GOTG's use of private services was increased accordingly. Finally, the original SAM contained payments abroad by private enterprises. It was assumed that these institutional transfers represented capital flight, and not the direct purchases of imports by domestic private institutions. The transfers were retained in the SAM, but non-competitive imports were reduced accordingly.

Appendix Table 1 – Comparison of SAM Production and Commodity Accounts

No.	Original SAM	No.	CGE SAM
1	Groundnuts	1	Groundnuts
2	Other Agriculture	2	Rice
		3	Coarse Grains
		4	Fruits/Vegetables
3	Livestock/Forestry/Fishing	5	Livestock/Forestry/Fishing
4	Agricultural Marketing Services		
5	Groundnut Processing	6	Groundnut Processing
6	Manufacture/Industry	7	Manufacture/Industry
7	Construction	8	Construction
8	Transport/Communications/Utilities	9	Transport/Communications/Utilit
9	Domestic Informal Trade	10	Domestic Informal Trade
10	Domestic Formal Trade	11	Domestic Formal Trade
11	Re-export Trade	12	Re-export Trade
12	Private Services	13	Private Services
13	Government Services	14	Public Services
		15	Urban Housing
		16	Rural Housing

Sources: Jabara, Lundberg, and Sireh Jallow (1992); CFNPP Gambia CGE model.

Appendix Table 2 – Comparison of SAM Labor and Capital Types

No.	Original SAM	CGE SAM
Types of Labor		
1	Rural Self-employed Agricultural	Urban Skilled
2	Rural Unskilled	Rural Skilled
3	Rural Skilled	Urban Unskilled
4	Rural Self-employed Non-agricultural	Rural Unskilled
5	Urban Unskilled	
6	Urban Skilled	
7	Urban Self-employed	
Types of Capital		
8	Urban Housing	Urban Entrepreneurial
9	Rural Housing	Rural Non-agricultural Entrepreneurial
10	Corporate Capital	Urban Housing
11	Interest Paid	Rural Housing
12		Land Poor
13		Land Non-poor
14		Formal Capital Surplus
15		Formal Capital Interest Payments

Source: Jabara, Lundberg, and Sireh Jallow (1992); CFNPP Gambia CGE model.

Appendix Table 3 – Base Simulation Results

	(Percentage change versus 1985 values)				
	1986	1987	1988	1989	1990
GDP	2.45	4.94	7.47	10.08	12.76
Consumption	2.46	4.93	7.45	10.04	12.71
Total Investment	4.71	9.54	14.51	19.62	24.88
Private Investment	15.64	31.69	48.18	65.13	82.60
Government Investment	-37.60	-17.21	-10.64	-38.48	-39.17
Government Consumption	-16.34	-31.83	-20.52	-13.13	-9.93
Government Revenues	2.49	5.03	7.65	10.35	13.16
Real Exchange Rate	-0.11	-0.20	-0.29	-0.39	-0.48
Exports	2.43	4.88	7.38	9.95	12.62
Imports	2.40	4.82	7.30	9.84	12.48
Foreign Savings	6.45	26.40	11.80	15.39	14.87
SECTORAL PRODUCTION					
Agriculture	3.20	6.44	9.72	13.04	16.42
Industry	3.42	6.83	10.26	13.72	17.25
Services	1.87	3.81	5.83	7.98	10.25
Public Administration	0.08	0.15	0.23	0.31	0.39
Total Production	2.32	4.68	7.09	9.58	12.16
HOUSEHOLD INCOMES					
Urban Poor	1.76	3.54	5.39	7.34	9.43
Urban Non-poor	2.16	4.32	6.53	8.83	11.24
Rural Poor	3.03	6.00	8.95	11.89	14.83
Rural Non-poor	2.41	4.85	7.34	9.88	12.49
TOTAL	2.30	4.61	6.95	9.35	11.84

Source: Model simulations.

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