IMPLICATIONS OF MACROECONOMIC POLICY FOR THE POOR IN NIGERIA: A GENERAL EQUILIBRIUM ANALYSIS

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1. INTRODUCTION

Stabilization and structural adjustment have been major policies in Nigeria since at least the mid-1980s, when the Babangida government promoted a national debate on the merits of adopting an IMF-sponsored reform package. The apparent public consensus which emerged was firmly against the proposed economic reforms, for reasons of anticipated negative impacts on real incomes and for reasons of national sovereignty. Nigeria nevertheless proceeded to institute its own adjustment program with many of the "standard" features of reforms promoted by external donors throughout sub-Saharan Africa, including exchange rate devaluation, trade reforms, fiscal belt-tightening, and liberalization of export crop marketing.

Macroeconomic data suggests that these generally unpopular reforms were largely successful, despite uneven performance regarding fiscal deficits and inflation. Between 1986, when a second-tier foreign exchange market (SFEM) was introduced, and 1992, real GDP growth averaged five percent per year. Despite this growth, however, real gross domestic income per capita remained 38 percent below the peak achieved in 1981, when there was a boom in world oil prices and massive foreign borrowing.[1] Given the higher incomes achieved earlier, the reforms are not perceived as a great success by many Nigerian households.

Since 1992, policy reversals have taken place, including a large expansion of government deficit spending and the reimposition of foreign exchange controls. Debate over economic policy continues, not only over macroeconomic outcomes, but also over the impact of policy reforms on real household incomes, particularly those of Nigeria's poor. Does exchange rate liberalization help or hurt the poor? How are the poor affected by oil price shocks? Who benefits from increases in government recurrent expenditures? This paper attempts to shed light on these questions through policy simulations with a computable general equilibrium (CGE) model of Nigeria's economy.

A paucity of reliable data is an important constraint on policy analysis in Nigeria, although the situation has improved somewhat since the early 1960s, when planners in the Nigerian government were forced to make decisions in the absence of hard data related to economic costs and returns of proposed development projects.[2] Major policy issues facing Nigeria today also require immediate attention. In particular, choices regarding fiscal, trade, and exchange rate policies have important effects not only on gross national product, but also on incomes of poor households. While it would be far preferable to conduct the economic analysis with a richer and more reliable data base, policy choices must and will be made before such data is available. It is with a realistic view regarding the strength of the data, together with a sense of the urgency and the importance of major policy decisions, that this analysis is attempted.

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[1] Bevan, Collier, and Gunning (1992) provide estimates of the roles of oil revenue shocks and net capital inflows in accounting for the real income declines in Nigeria from 1981 to 1992.

[2] This data situation was reflected in the often cited title, *Planning Without Facts: Lessons in Resource Allocation from Nigeria's Development* (Stolper 1966).

Nevertheless, given the uncertainty surrounding much of the data used in the national accounts, especially regarding agricultural production and trade, the question rightly arises: "Why use a CGE model?" The answer is threefold. First, a general equilibrium framework is the most appropriate analytical tool for tracing effects of relative price changes and, in particular, changes in the real exchange rate on household incomes and expenditures. Second, the magnitude of the external shocks and policy changes is so large that even an aggregated model with only approximate data, in conjunction with appropriate sensitivity analysis, is likely to give a good indication of the major impacts on household groups. Third, by utilizing the existing data in constructing a consistent data base for the model (a social accounting matrix, or, "SAM"), data needs are highlighted, suggesting priorities for further efforts at data collection and analysis.

The methodology and the data used in constructing the SAM for the model are described in section 2, along with equations of the CGE model, itself. Section 3 presents a series of simulations of the impacts of exchange rate and fiscal policies, and world oil price shocks on real incomes of households in Nigeria. Section 4 consists of dynamic simulations designed to show the impacts of external shocks and the combination of policies enacted over the 1987 through 1992 period. Conclusions and policy implications comprise section 5. The appendices contain details of the construction of the social accounting matrix (Appendix 1), model equations and parameters (Appendix 2), and additional tables describing simulation results (Appendix Tables 10–17).

2. METHODOLOGY: DATA AND STRUCTURE OF THE CGE MODEL

This section describes the CGE model used for simulations of the impacts of policy changes and external shocks on households in Nigeria. The Nigeria CGE model is a variant of the "neoclassical structuralist" model described in Dervis, de Melo, and Robinson (1982) and later applied to Cameroon (Benjamin and Devarajan 1985; Condon, Dahl, and Devarajan 1987) and other developing countries.

A social accounting matrix (SAM) of economic flows in Nigeria's economy in 1987 is the data base for the model. The SAM is constructed from an input-output table consistent with the 1987 national accounts (Federal Office of Statistics, n.d.), supplemented by data from a national household survey in 1985 and agricultural production estimates for 1987 (Awoyomi, n.d.). Details of the construction of the SAM are found in Appendix 1.

Nine production activities are specified in the SAM, each producing its own commodity (Table 1). The three crop sectors (grains, export crops, and other crops), together with livestock, comprise the agricultural economy, which accounted for 35.6 percent of GDP in 1987. The industrial sectors consist of three activities: food processing, petroleum extraction and refining, and other industry. Private services include marketing and transportation. In 1987, the petroleum sector accounted for 25.0 percent of value-added and 78.9 percent of total exports.

Three types of labor (rural, urban informal, and urban formal) are modeled. The supply of urban formal labor is fixed in each of the simulations. The urban informal labor market is assumed to be linked to the rural labor market so that the percent difference between the real wages in the two markets is constant. Labor is free to move between the urban informal and rural labor markets, and the total labor supply (urban informal plus rural labor) if this integrated labor market is fixed. Appendix Tables 10–17 give results of simulations using an alternative assumption of fixed labor supply in all three labor markets and no direct linkage between real wages in these markets.

Capital is fixed in the short run (one year) and is updated with additions of new investment net of depreciation in the dynamic model simulations. Only aggregate capital enters the production functions, but returns to capital are allocated among five types of capital (farm capital/land in the Northern, Middle-Belt, and Southern regions of the country and non-agricultural capital in the formal and informal sectors).

The model specifies nine institutions: six households, formal enterprises, government, and the Rest of World (ROW). Poor and non-poor urban household groups are defined as urban households in the lower 1/3 and upper 2/3 of the national per capita expenditure distribution from the 1985/86 household expenditure survey (see World Bank [1993]) (Table 2). Per capita incomes of the urban non-poor households are 2.5 times those of urban poor households. Per capita incomes of the rural poor, comprised of households in the lower 1/3 of the national per capita expenditure distribution from each of the three geographical regions (North, Middle-Belt, and South), are 659 Naira, approximately 62 percent of the national average. The rural non-poor make up the sixth household group, including rural households from throughout the country.

Table 1 — Value Added by Production Activity, Nigeria 1987

Production Activity	Value Added (Mn Naira)	Value Added Percent
1. Grains	4259	3.9
2. Export crops	2240	2.0
3. Nontradable food	27,033	24.5
4. Livestock	5660	5.1
Subtotal: Agriculture	39,192	35.6
5. Food processing	2834	2.6
6. Other industry	5841	5.3
Subtotal: Non-oil industry	8675	7.9
7. Private services	29,499	26.8
8. Public administration	5314	4.8
Subtotal: Services	34,813	31.6
9. Petroleum	27,522	25.0
Total	110,202	100.0

Source: Nigeria 1987 SAM.

Table 2 — Household Incomes, Nigeria 1987

	Population		Income	Income per capita	Savings/ Income
	(millions)	(percent)	(bn Naira)	(Naira/person)	(percent)
Urban	32.2	36.4	47.1	1,465	0.17
Poor	10.2	11.6	7.4	722	0.08
Non-poor	22.0	24.8	39.8	1,811	0.19
Rural poor	27.8	31.5	17.3	620	0.08
North	13.0	14.7	7.6	586	0.08
Middle	3.9	4.4	2.7	693	0.08
South	10.9	12.3	6.9	635	0.08
Rural non-poor	28.4	32.1	30.7	1,082	0.16
Nigeria total	88.4	100.0	95.1	1,076	0.15
Total poor	38.0	43.0	24.6	648	0.08
Total non-poor	50.4	57.0	70.5	1,400	0.18

Source: Nigeria 1987 SAM.

In the Nigeria CGE model, value added generated by each production activity is specified as a constant elasticity of substitution (CES) production function; quantities of intermediate inputs are modeled as fixed shares of the quantity of output produced.[3] Elasticities of substitution between capital and labor are chosen so as to give conservative magnitudes for elasticities of supply in the non-oil private sector.[4] Production of petroleum products and government services are fixed.

Internationally traded goods are treated as imperfect substitutes for goods domestically produced and consumed. A constant elasticity of substitution (CES) aggregation function defines the composite of imports and home goods (Armington 1969). Similarly, a constant elasticity of transformation (CET) aggregation is used to define a composite production good of export goods and goods produced for domestic consumption. Petroleum products are modeled differently: exported products are assumed to be perfect substitutes for locally consumed products, and the quantity of oil exports is fixed exogenously. Elasticities of substitution and levels of trade and domestic production are given in Appendix Table 10. Nigeria is assumed to be a price-taker both for imports and exports.

Incomes of households derive from their ownership of factors of production and access to rents (Table 3).[5] Earnings from formal labor accrue only to the urban non-poor households. Incomes of the poor derive from unskilled labor, informal sector capital, and land. The value of household consumption of each product is a fixed share of total consumption, and savings is a linear function of income. Household budget shares and savings rates are given in Appendix Table 6.

Government recurrent expenditures are fixed in real terms. Savings determines the level of private investment. The value of investment by sector of destination is assumed to be a fixed share of total fixed investment; the composition of investment goods required to produce a unit of capital in each activity is likewise fixed.

Foreign exchange controls and the associated licensing of imports are modeled as an implicit tariff on imports, equal to the premium on foreign exchange in the parallel market, adjusted for import tariffs. The rents generated from these quotas are assumed to accrue to urban non-poor households and, in the case of non-competitive imports of intermediate goods, to the firms receiving the goods. The price of exports is determined using the official exchange rate, except for smuggled exports, which earn the border price measured at the parallel exchange rate and avoid explicit export taxes. In the simulations where smuggling is modeled, the percentage of exports smuggled is set exogenously.

In the model simulations, prices of commodities adjust to equate supply and demand. Labor markets clear through adjustment in real wages, except in the simulations where the real wage in the

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[3] Appendix 2 lists the model equations and variables

[4] The implicit partial equilibrium elasticities of supply (calculated assuming fixed wage rates) are 0.3 for grains, export crops, and livestock; 0.4 for other food crops and food processing; 0.5 for other industry (which is assumed to be operating substantially below capacity); and 0.63 for private services. See Dorosh (1994) for details of the methodology for this calculation.

[5] The share of each household in total income earned by each factor of production is given in Appendix Table 5.

Table 3 — Household Income Shares, Nigeria 1987

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	Total Nigeria
Labor income							
Rural	0.0	0.0	79.1	66.9	73.0	42.9	27.4
Urban informal	83.1	28.0	0.0	0.0	0.0	0.0	18.2
Urban formal	0.0	19.9	0.0	0.0	0.0	0.0	8.3
Returns to land							
North	4.1	1.5	16.0	0.0	0.0	12.9	6.4
Middle	3.5	1.3	0.0	28.9	0.0	11.9	5.5
South	5.3	2.0	0.0	0.0	22.5	16.5	8.2
Informal capital	4.0	9.5	4.9	4.2	4.5	15.9	10.3
Dividends	0.0	37.7	0.0	0.0	0.0	0.0	15.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Population (mns)	10.2	22.0	13.0	3.9	10.9	28.4	88.4
Per capita income ('000 Naira/person)	722	1811	586	693	635	1082	1076

Source: Nigeria 1987 SAM.

urban informal sector is fixed and employment varies. Savings determines private investment given fixed values of real government expenditures. In most model runs, the nominal exchange rate and foreign savings are also fixed exogenously, leaving changes in the aggregate price index to bring about movements in the real exchange rate and equilibrium in the ROW accounts. Note that in the base SAM for 1987, foreign savings are -4.3 billion dollars, indicating a large capital outflow from the country.

In the dynamic simulations, capital stock is updated each year according to the previous period's net investment by sector. The base level labor supply is also increased exogenously by a constant population growth rate.

3. POLICY SIMULATIONS

This section examines the effects of several major economic policies on income distribution in Nigeria. Foremost among the policy measures affecting household incomes is exchange rate policy, in particular the choice between a market-determined exchange rate and a regime of foreign exchange controls leading to a parallel market for foreign exchange. A major focus of the static CGE simulations in this section is the deleterious impact of foreign exchange controls on output and income distribution under various combinations of external shocks and complementary policies.

Simulations 1 and 2 isolate the effects of exchange rate policy on the economy by modeling a reversal of the exchange rate reforms of the mid-1980s under alternate assumptions for smuggling of export crops. The interactions between exchange rate policy, oil price shocks, and changes in government spending are illustrated in simulations 3 through 7. Simulations 3 and 4 show the effects of an oil price shock under both a liberalized and a controlled market for foreign exchange. Simulation 5 models the effects of reductions in government spending. The combined effects of an oil price shock and a cut in government spending under alternative exchange rate regimes are shown in simulations 6 and 7. Finally, the last three simulations show the impacts of other factors influencing Nigeria's economy: cocoa export taxes (simulation 8), world cocoa prices (simulation 9), and foreign capital outflows (simulation 10).

IMPACTS OF FOREIGN EXCHANGE CONTROLS — SIMULATIONS 1 AND 2

The liberalization of the market for foreign exchange, which began with the introduction of the Second Tier Foreign Exchange Market (SFEM) in late 1986, brought about large changes in relative prices and a reduction in rents associated with a sharp reduction in the spread between the official and parallel (or open market) exchange rates. Simulation 1 models the effects of reintroducing the foreign exchange controls, with no other change in real government spending, capital inflows, or world prices. The nominal exchange rate is fixed at 1.0 Naira per dollar (75 percent below the 1987 level of 4.0 Naira per dollar), and the premium between the official and parallel exchange rate is set exogenously at 300 percent (approximately equal to the premium before the liberalization in 1986). Rents associated with rationed imports are assumed to accrue to the urban non-poor. Intermediate imports are obtained by firms at a price determined by the official exchange rate.

Two alternative assumptions for parallel market exports are modeled. In simulation 1, 20 percent of agricultural exports (mostly cocoa) are assumed to be smuggled and sold at a border price computed with the parallel exchange rate. In simulation 2, there is no smuggling of export crops.

In simulation 1, reimposition of foreign exchange controls with urban unemployment and smuggling of export crops brings about a sharp appreciation of the official real exchange rate (66.0 percent),[6] thus lowering prices and reducing incentives for production of exports (Table 4). Production of export crops falls by 7.7 percent and real GDP falls by 1.1 percent. Since oil exports are held fixed, the decline in total exports is equal to only 0.5 percent of base GDP.[7] Government revenues in Naira (as a percent of GDP) fall steeply (9.2 percent), mainly as the direct result of valuing foreign exchange earned from royalties and taxes on oil exports at an appreciated official exchange rate. The counterpart of this loss in Naira revenues is the economic rent gained by recipients of foreign exchange at the official exchange rate. Rents associated with foreign exchange rationing, which are zero in the liberalized regime (the base simulation), rise to 10.0 percent of the base GDP. Investment as a share of GDP falls by 0.7 percent as the decline in government Naira revenues reduces funds available for investment.

The decline in economic activity has a large negative effect on incomes of poor households. Real wage payments fall by 13.4 percent for informal sector urban labor and by 10.8 percent for rural labor. The real wage rate falls by 11.7 percent in both urban informal and rural labor markets, but employment drops by 2.0 percent in the urban informal labor market (due in part to the fall in demand for construction services and other investment goods), while rising by 1.0 percent in the rural labor market. As shown in Table 5, the decline in real incomes of the urban poor is due almost entirely to a decline in wages earned in the informal labor market (contributing 9.85 percent of the total 11.08 percent decline in real incomes measured using the national consumer price index as a deflator). Prices of goods consumed by the urban poor rise less than the national consumer price index, however, so that their total real income decline is only 9.73 percent. Similarly, declines in labor incomes account for a major part of the 6.6 to 9.9 percent decline in real incomes of the rural poor. For rural south poor households, the fall in returns to land (reflecting reduced value of production of export crops), reduces their real incomes by 1.63 percent. In contrast, real incomes of the urban non-poor group rise by 11.2 percent, largely due to rents associated with the rationing of foreign exchange, which more than compensate for losses in real incomes from labor, informal sector capital, or dividends (payments from firms).

With no smuggling of tree crop exports (simulation 2), the adverse consequences of the real exchange rate appreciation on cocoa farmers are exacerbated. The larger decline in returns to land in the South reduces real incomes of small farmers in the South by 2.10 percent in simulation 2, compared with 1.63 percent in simulation 1 (Table 6).[8] Overall, real incomes of the rural south poor fall by 10.1 percent, compared with 9.1 percent in simulation 1. Real incomes of the urban non-poor rise by 12.0

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[6] The real exchange rate reported in the model results is calculated simply as the nominal exchange rate deflated by the consumer price index. Although this measure only approximates the relative price of tradables to nontradables in the economy, it is most commonly used in empirical assessments of Nigeria's economy, given the lack of price data on a representative basket of nontradable goods and services. Alternative definitions using baskets of traded and nontraded goods in the model give similar results.

[7] Exports are evaluated at the base exchange rate (4.02 Naira per dollar).

[8] Large cocoa farmers included among the rural non-poor also experience an income decline as returns to land account for a 1.54 percent fall in their real incomes in simulation 2, compared to 1.19 percent in simulation 1.

Table 4 — Reversal of Exchange Rate Reforms: Simulations 1 and 2

	Simulation 1	Simulation 2
	(percentage change)[a]	
Real GDP	-1.1	-1.2
Consumption / GDP	-0.4	-0.4
Investment / GDP	-0.7	-0.7
Government consumption / GDP	0.0	0.0
Government revenue / GDP	-9.2	-9.1
Exports / GDP[b]	-0.5	-0.5
Imports / GDP[b]	-0.5	-0.6
Foreign savings / GDP[b]	0.0	0.0
Rents / GDP	10.0	10.3
Relative prices		
Real exchange rate	-66.0	-65.0
Exchange rate premium (level, percent)	300.0	300.0
Real wage payments		
Rural labor	-10.8	-11.7
Urban informal labor	-13.4	-14.1
Urban formal labor	-27.0	-26.4
Real incomes		
Urban poor	-9.7	-10.4
Urban non-poor	11.2	12.0
Rural north poor	-9.9	-10.5
Rural middle poor	-6.6	-7.0
Rural south poor	-9.1	-10.1
Rural non-poor	-10.5	-11.2
All Nigeria	-1.1	-1.2

Notes: Simulation 1 — smuggling equals 20 percent of tree crop exports; Simulation 2 — no smuggling. [a] Percentage change from base simulation. [b] Exports and imports valued at base simulation (1987) exchange rate.

Source: Model simulations.

Table 5 — Income Decomposition: Simulation 1 — Reversal of Exchange Rate Reforms

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	All Nigeria
	(percentage change in real household income)						
Rural and informal urban labor	-9.846	-3.322	-9.378	-7.929	-8.652	-5.081	-5.401
Formal urban labor	0.000	-5.374	0.000	0.000	0.000	0.000	-2.247
Land — North	-0.098	-0.036	-0.378	0.000	0.000	-0.305	-0.152
Land — Middle	0.020	0.007	0.000	0.165	0.000	0.068	0.031
Land — South	-0.383	-0.142	0.000	0.000	-1.629	-1.194	-0.593
Informal capital	-0.777	-1.855	-0.956	-0.811	-0.882	-3.105	-2.003
Dividends	0.000	-5.618	0.000	0.000	0.000	0.000	-2.348
Rents	0.000	27.876	0.000	0.000	0.000	0.000	11.653
Transfers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	-11.083	11.535	-10.712	-8.575	-11.163	-9.617	-1.059
Consumer price effect	1.356	-0.351	0.807	2.008	2.039	-0.898	0.000
Total	-9.729	11.182	-9.907	-6.572	-9.127	-10.519	-1.124

Note: Reversal of exchange rate reforms; elastic labor supply in urban informal sector; smuggling equals 20 percent of tree crop exports.

Source: Model simulations.

Table 6 — Income Decomposition: Simulation 2 — Reversal of Exchange Rate Reforms, No Smuggling

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	All Nigeria
	(percentage change in real household income)						
Rural and informal urban labor	-10.484	-3.538	-9.987	-8.444	-9.214	-5.411	-5.751
Formal urban labor	0.000	-5.259	0.000	0.000	0.000	0.000	-2.199
Land — North	-0.096	-0.036	-0.371	0.000	0.000	-0.299	-0.149
Land — Middle	0.030	0.011	0.000	0.247	0.000	0.101	0.047
Land — South	-0.494	-0.183	0.000	0.000	-2.098	-1.538	-0.765
Informal capital	-0.791	-1.891	-0.974	-0.826	-0.899	-3.164	-2.041
Dividends	0.000	-5.550	0.000	0.000	0.000	0.000	-2.320
Rents	0.000	28.788	0.000	0.000	0.000	0.000	12.034
Transfers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	-11.836	12.343	-11.332	-9.024	-12.211	-10.311	-1.143
Consumer price effect	1.445	-0.366	0.867	2.019	2.074	-0.938	0.000
Total	-10.391	11.977	-10.464	-7.002	-10.138	-11.248	-1.209

Note: Reversal of exchange rate reforms; no smuggling.

Source: Model simulations.

percent (versus 11.2 percent in simulation 1), as the elimination of smuggling increases government intake of foreign exchange and rents accruing to those receiving foreign exchange at the official exchange rate.

Under the alternate assumption of no direct link between rural and urban informal labor markets (i.e., fixed supply of labor in both the rural and informal urban labor markets, with real wages in these markets adjusting independently of one another), the reimposition of foreign exchange controls has even more adverse consequences for the urban poor (simulation 1a in Appendix Tables 11 and 12). Wage payments for urban informal labor fall by 17.1 percent in real terms, under the assumption that urban labor does not seek employment in rural activities as demand for urban labor falls. Real incomes of urban poor households fall by 14.3 percent, compared with only 9.7 percent in simulation 1. By contrast, real incomes of rural poor households fall by only 5.2 to 8.0 percent (compared to a decline of 6.6 to 9.9 percent in simulation 1), because under these labor market assumptions no additional labor is supplied to the rural labor market as urban employment opportunities diminish.

Together, the above three simulations suggest that reversal of trade liberalization has sharply negative consequences, both for overall economic output and for poor households. Under alternative specifications of the urban labor market and of the extent of smuggling of export crops, poor households lose from the imposition of foreign exchange controls and an appreciation of the real exchange rate. In contrast, those with access to foreign exchange at the official exchange rate benefit from the economic rents received — rents equal to 10.0 to 10.3 percent of GDP in 1987!

WORLD OIL PRICE SHOCKS — SIMULATIONS 3 AND 4

In simulations 3 and 4, a 20 percent decline in the world price of oil is modeled with the quantity of Nigeria's exports fixed. In simulation 3, under a liberalized foreign exchange regime, the real exchange rate adjusts to re-equilibrate the supply and demand for foreign exchange.[9] Simulation 4 models the oil shock with the reimposition of foreign exchange controls: the real exchange rate is fixed, foreign exchange for imports is rationed, and a parallel market for foreign exchange emerges.

In both simulations, the decline in oil prices causes a large decline in real GDP (5.6 to 5.8 percent, Table 7). Investment as a share of base GDP also falls, by 3.8 to 4.1 percent. Under a liberalized foreign exchange regime (simulation 3), the real exchange rate depreciates by 45.6 percent.[10] Declines in real incomes are small: 2.3 to 3.4 percent for all household groups except the rural south poor. For this latter group, the large real exchange rate depreciation raises prices of export crops and returns to land (by an amount equal to 2.3 percent of household income in the base SAM) so that real incomes fall by only 1.2 percent (Table 8). Modeling a fixed supply of labor in the urban informal and rural sectors (simulation 3a in Appendix Table 11) exacerbates the drop in real incomes of the urban poor (7.9 percent

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[9] Simulation 3a shows the effects of the oil price shock with a freely adjusting real exchange rate as in simulation 3, but with a fixed supply of labor in both the urban informal and rural labor markets (Appendix Tables 11 and 13).

[10] The real exchange rate depreciation with fixed labor supplies in the urban informal and rural sectors is nearly identical: 46.0 percent.

Table 7 — World Oil Price Decline: Simulations 3 and 4

	Simulation 3	Simulation 4
	(percentage change)[a]	
Real GDP	-5.8	-5.6
Consumption / GDP	-1.7	-1.8
Investment / GDP	-4.1	-3.8
Government consumption / GDP	0.0	0.0
Government revenue / GDP	2.2	-3.2
Exports / GDP[b]	-0.7	-1.0
Imports / GDP[b]	-0.7	-1.0
Foreign savings / GDP[b]	0.0	0.0
Rents / GDP	0.0	6.2
Relative prices		
Real exchange rate	45.6	0.0
Exchange rate premium (level, percent)	0.0	81.7
Real wage payments		
Rural labor	-3.4	-10.0
Urban informal labor	-6.6	-14.4
Urban formal labor	0.5	-12.4
Real incomes		
Urban poor	-2.6	-8.6
Urban nonpoor	-2.3	6.2
Rural north poor	-3.4	-9.6
Rural middle poor	-2.9	-7.4
Rural south poor	-1.2	-7.3
Rural nonpoor	-2.8	-9.5
All Nigeria	-2.5	-2.6

Notes: Simulation 3 — 20 percent decline in world oil price; simulation 4 — 20 percent decline in world oil price, no depreciation of official real exchange rate. [a] Percentage change from base simulation. [b] Exports and imports valued at base simulation (1987) exchange rate.

Source: Model simulations.

Table 8 — Income Decomposition: Simulation 3 — World Oil Price Decline

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	All Nigeria
	(percentage change in real household income)						
Rural and informal urban labor	-3.871	-1.306	-3.687	-3.118	-3.402	-1.997	-2.123
Formal urban labor	0.000	0.100	0.000	0.000	0.000	0.000	0.042
Land — North	0.067	0.025	0.260	0.000	0.000	0.210	0.104
Land — Middle	0.054	0.020	0.000	0.445	0.000	0.182	0.084
Land — South	0.535	0.198	0.000	0.000	2.274	1.667	0.829
Informal capital	-0.580	-1.387	-0.714	-0.606	-0.659	-2.320	-1.497
Dividends	0.000	0.148	0.000	0.000	0.000	0.000	0.062
Rents	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transfers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	-3.794	-2.202	-4.141	-3.278	-1.787	-2.258	-2.499
Consumer price effect	1.167	-0.099	0.780	0.338	0.596	-0.572	0.000
Total	-2.628	-2.299	-3.362	-2.937	-1.191	-2.828	-2.518

Note: 20 percent decline in world oil price.

Source: Model simulations.

versus 2.6 percent in simulation 3), because in this case, urban laborers cannot participate in rural labor markets as urban labor demand declines.

The poor suffer more from an oil price shock when restrictions on foreign exchange are imposed (simulation 4). Real incomes of urban poor households fall by 8.6 percent, while real incomes of the rural poor decline by 7.3 to 9.6 percent when the real exchange rate is not allowed to depreciate (simulation 4). In the absence of foreign exchange rationing (simulation 3), these declines are only 1.2 to 3.4 percent for all urban and rural poor household groups. With rationing, the exchange rate premium on the parallel market is 81.7 percent, producing sizable rents (equal to 6.2 percent of real base year GDP) which enable real incomes of the urban non-poor to rise by 6.2 percent despite the general economic decline.

Thus, an oil price shock has serious negative consequences for investment and household incomes. As the simulations indicate, however, preventing adjustment of the real exchange rate through foreign exchange controls does not mitigate the adverse effects of the oil shock. Instead, the poor bear more of the burden of the oil shock through severe declines in real incomes (declines are six percent greater for the rural poor), than if adjustment to the shock is achieved through real exchange rate depreciation.

REDUCED GOVERNMENT SPENDING — SIMULATIONS 5, 6, AND 7

Sharp declines in world oil prices in the mid-1980s and again in the early 1990s reduced Nigeria's government revenues, creating large fiscal deficits. In an effort to reduce the budget deficit, government recurrent expenditures were cut substantially in 1992. The effects of a 20 percent reduction in government recurrent expenditures are modeled in simulation 5, holding world oil prices constant.[11] In simulations 6 and 7, both world oil prices and real government recurrent expenditures are reduced by 20 percent. In simulation 6, the real exchange rate is allowed to adjust freely; in simulation 7, foreign exchange controls are imposed so that there is no depreciation of the real exchange rate.

With no change in oil prices, the effects of reduced government spending on the economy are small (simulation 5, Table 9). As government recurrent expenditures are cut, total savings in the economy increase, thus permitting a small increase in investment: investment as a share of GDP rises by 0.5 percent. Only households dependent on formal sector wage payments (the urban non-poor) suffer a decline in real incomes as reduced demand for formal sector workers reduces their real wage payments by 1.8 percent. This fall in labor earnings accounts for essentially all of the 0.3 percent decline in real incomes of the urban non-poor.

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[11] Supply of labor in the urban formal sector is also reduced to reflect the large decline in government employment. Given a decline in government recurrent expenditures of 57.6 percent in 1992 and a fall in real wage rates in the government sector of 42.2 percent (calculated from data on nominal government wage rates in Montenegro and Thomas [forthcoming]), the fall in government employment is approximated as $1 - (1 - 0.576)/(1 - 0.422) = 26.6$ percent. With government accounting for about 0.67 of the estimated formal sector labor force in 1987, the decline in employment in 1992 equals 17.9 percent of the formal sector labor force in 1992.

Table 9 — Reduced Government Spending with World Oil Price Decline: Simulations 5, 6, and 7

	Simulation 5	Simulation 6	Simulation 7
	(percentage change)[a]		
Real GDP	-0.9	-4.8	-6.5
Consumption / GDP	-0.1	-1.6	-1.9
Investment / GDP	0.5	-1.9	-3.3
Government consumption / GDP	-1.3	-1.3	-1.3
Government revenue / GDP	0.0	2.1	-3.3
Exports / GDP[b]	0.0	-0.7	-1.0
Imports / GDP[b]	0.0	-0.7	-1.0
Foreign savings / GDP[b]	0.0	0.0	0.0
Rents / GDP	0.0	0.0	6.2
Relative prices			
Real exchange rate	-0.1	48.6	0.0
Exchange rate premium (level, percent)	0.0	0.0	82.3
Real wage payments			
Rural labor	0.1	0.2	-9.8
Urban informal labor	0.1	-1.1	-14.2
Urban formal labor	-1.8	-39.4	-14.4
Real incomes			
Urban poor	0.0	0.9	-8.5
Urban non-poor	-0.3	-7.8	5.8
Rural north poor	0.0	0.2	-9.5
Rural middle poor	0.0	-0.8	-7.4
Rural south poor	0.0	1.6	-7.2
Rural non-poor	0.1	0.6	-9.4
All Nigeria	-0.1	-2.9	-2.7

Notes: Simulation 5 — 20 percent reduction in government recurrent expenditures; simulation 6 — 20 percent reduction in government recurrent expenditures, 20 percent decline in world oil price; simulation 7 — simulation 6 with no depreciation of official real exchange rate.
[a] Percentage change from base simulation. [b] Exports and imports valued at base simulation (1987) exchange rate.

Source: Model simulations.

With fixed labor supply in all sectors (simulation 5a, Appendix Table 11), the impacts of the cut in government spending are again small. Real wage payments in the urban formal labor market fall by only 1.8 percent, as in simulation 5. Real incomes of urban poor households increase slightly (0.2 percent) as increased demand for informal urban labor does not elicit an increase in labor migration from rural areas, so real wages in the urban informal sector rise.

The combined effects of a 20 percent decline in the world price of oil exports and a 20 percent reduction in government recurrent expenditures are much larger (simulations 6 and 7). In both simulations, real GDP falls sharply, but the decline is largest with the imposition of foreign exchange controls (6.5 percent in simulation 7 compared with 4.8 percent in simulation 6). In avoiding a real exchange rate depreciation, the imposition of foreign exchange controls results in an exchange rate premium of 82.3 percent and allows rents to rise to 6.2 percent of GDP (simulation 7). Thus, the real incomes of the urban non-poor rise by 5.8 percent in this scenario in spite of the decline in real government spending. Of course, within the group of urban non-poor households, there may be many households that do not receive rents associated with foreign exchange controls and suffer losses in real incomes because of lower real wages in the formal labor market.

Allowing the real exchange rate to depreciate (by 49 percent in simulations 6) results in a much better outcome for poor households. Real incomes of the urban poor fall by 8.5 percent with foreign exchange controls (simulation 7) compared to a slight increase of 0.9 percent in simulation 6. Similarly, the rural poor suffer losses of real income between 7.2 and 9.5 percent when the real exchange rate is not permitted to depreciate (simulation 7), compared to small changes in real income ranging from -0.8 percent to 1.6 percent with the real exchange rate depreciation (simulation 6).

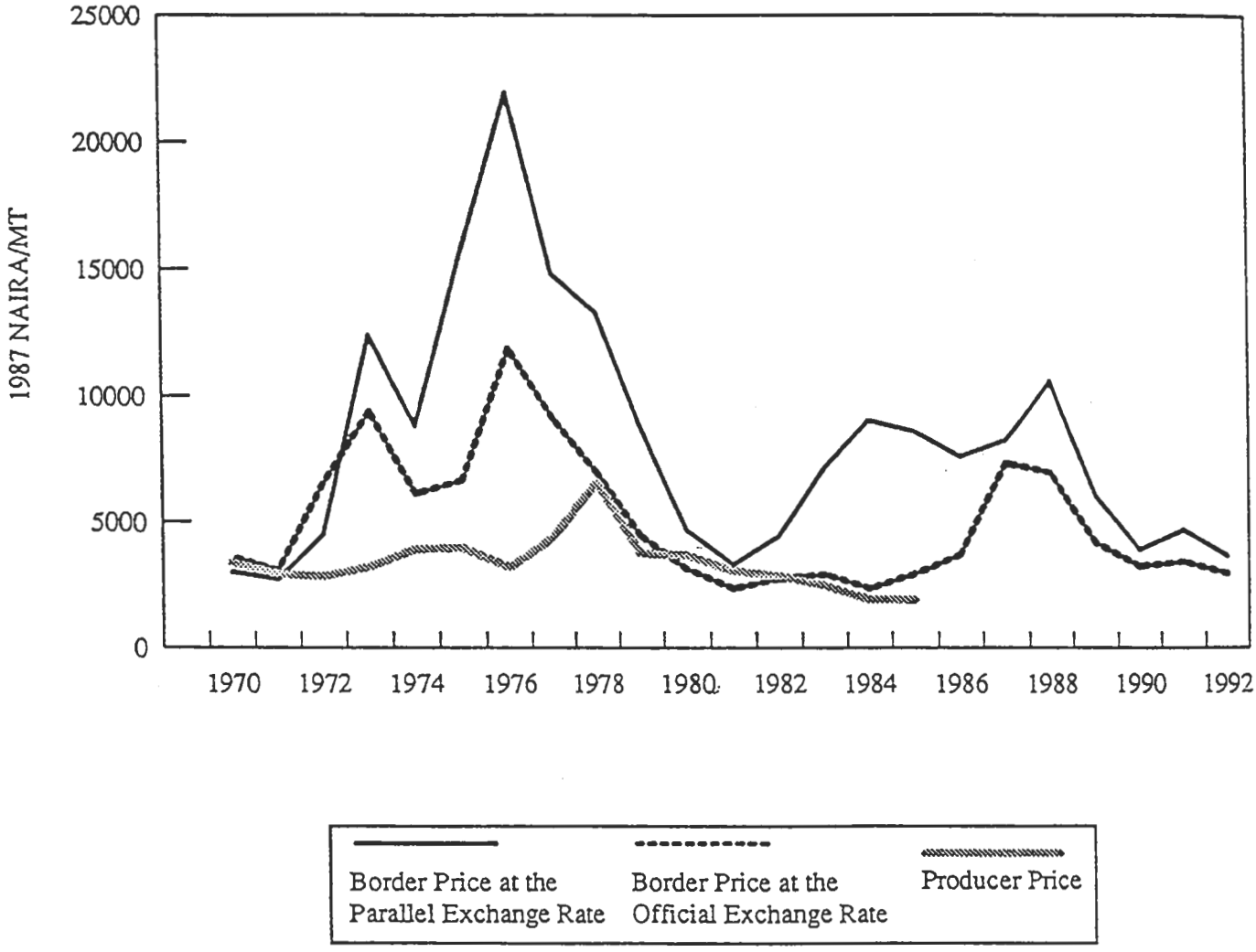
EFFECTS OF CHANGES IN COCOA PRICES AND TAXES — SIMULATIONS 8 AND 9

Agricultural exports have been heavily taxed in Nigeria through product-marketing boards (prior to 1986) and through appreciation of the real exchange rate. Official producer prices for cocoa were kept 36.3 to 73.1 percent below border prices (measured at the official exchange rate) from 1972 to 1977 (Figure 1). Moreover, the appreciation of the official real exchange rate represented a further tax on exports. This latter tax remained important even after explicit export taxes were reduced in 1978 and export crop marketing was liberalized in 1986.

Simulation 8 shows the effects of an increase in the explicit tax rate on cocoa to 75 percent of the border price, a rate approximating that in the mid-1960s (Table 10). A liberalized foreign exchange market with 20 percent of export crops smuggled is assumed. In this scenario, export crop production falls by 14.5 percent and the fall in returns to land in the South accounts for 1.9 percent of the 2.8 percent decline in real incomes of the rural south poor. This 2.8 percent decline in real incomes represents an average over all households included among the rural south poor. For the subgroup that are cocoa farmers (less than half of these households), the decline in real incomes would be larger.

Simulation 9 shows the effects of a 20 percent decline in the world cocoa price with a liberalized foreign exchange market and no smuggling (Table 10). The macroeconomic effects of this price decline are minimal (i.e., the real exchange rate depreciates by only 3.7 percent), because cocoa exports make up only a small (5.3 percent) share of total exports. Returns to land in the South decline by an amount

Figure 1 — Real Cocoa Prices in Nigeria, 1970–1992



Sources: Jaeger (1992); IMF (1994).

Table 10 — Effects of Cocoa Export Tax and World Price Decline: Simulations 8

	Simulation 8	Simulation 9
	(percentage change)[a]	
Real GDP	-0.1	-0.3
Consumption / GDP	-0.6	-0.2
Investment / GDP	0.5	0.0
Government consumption / GDP	0.0	0.0
Government revenue / GDP	1.5	0.6
Exports / GDP[b]	-0.1	-0.1
Imports / GDP[b]	-0.1	-0.1
Foreign savings / GDP[b]	0.0	0.0
Rents / GDP	0.0	0.0
Relative prices		
Real exchange rate	5.3	3.7
Exchange rate premium (level, percent)	0.0	0.0
Real wage payments		
Rural labor	-2.0	-0.8
Urban informal labor	-0.8	-0.5
Urban formal labor	3.2	1.6
Real incomes		
Urban poor	-1.3	-0.6
Urban non-poor	0.7	0.3
Rural north poor	-1.0	-0.5
Rural middle poor	-0.8	-0.4
Rural south poor	-2.8	-1.1
Rural non-poor	-2.0	-0.9
All Nigeria	-0.8	-0.3

Notes: Simulation 8 — 75 percent tax on cocoa exports, 20 percent smuggling; simulation 9 — 20 percent decline in world price of cocoa, no smuggling.
[a] Percentage change from base simulation; [b] Exports and imports valued at base simulation (1987) exchange rate.

Source: Model simulations.

equal to 0.69 percent of initial incomes of the rural south poor, contributing to a 1.1 percent decline in real incomes of the rural south poor as a group.

The above two simulations indicate that while the macroeconomic effects of changes in world cocoa prices or domestic pricing policy are small, there are nevertheless substantial adverse effects on cocoa farmers of negative shocks and high taxation. Moreover, these effects do have some spillover to other poor households through impacts on the labor market.

REDUCED FOREIGN CAPITAL OUTFLOWS — SIMULATION 10

Foreign capital outflows from Nigeria have been very large in recent years, due both to capital flight and foreign debt servicing. This outflow of capital represents a significant loss of potential funds for investment and other domestic spending, with important implications for growth and income distribution. In simulation 10, net foreign capital outflows are eliminated, representing a gain in foreign savings of 4.5 percent of GDP as compared with the historical 1987 level (Table 11). Under this scenario, real incomes in Nigeria rise by an average of 1.1 percent, with real incomes of the poor increasing by 1.8 to 3.0 percent. Surprisingly, real incomes of the urban non-poor fall slightly, by 1.0 percent.

Three major effects determine these outcomes. First, reduced capital inflows increase the total savings available for domestic investment. As domestic investment spending rises, demand for labor, especially unskilled labor in the construction and private services sectors, increases. Real wage payments thus rise by 2.8 percent for rural labor and 5.4 percent for urban informal labor. Second, reduced capital outflows result in an appreciation of the real exchange rate as more foreign exchange is available to pay for imports. Imports rise by 0.9 percent of GDP while exports, hurt by the appreciation of the real exchange rate, fall by 0.2 percent of GDP. Third, the appreciation of the real exchange rate reduces the real Naira value of oil exports, thus reducing returns to capital in the petroleum sector by 13.9 percent and government tax revenues as a share of GDP by 4.0 percent. Formal sector real wage payments decline by 7.5 percent along with the diminished profitability of the oil sector.

Table 11 — Effects of Reduced Foreign Capital Outflows: Simulation 10

	Simulation 10 (percentage change)[a]
Real GDP	-0.1
Consumption / GDP	0.9
Investment / GDP	3.6
Government consumption / GDP	0.0
Government revenue / GDP	-4.0
Exports / GDP[b]	-0.2
Imports / GDP[b]	0.9
Foreign savings / GDP[b]	4.5
Rents / GDP	0.0
Relative prices	
Real exchange rate	-28.8
Exchange rate premium (level, percent)	0.0
Real wage payments	
Rural labor	2.8
Urban informal labor	5.4
Urban formal labor	-7.5
Real incomes	
Urban poor	2.4
Urban non-poor	-1.0
Rural north poor	3.0
Rural middle poor	2.6
Rural south poor	1.8
Rural non-poor	2.9
All Nigeria	1.1

Notes: Simulation 10: No net foreign capital outflows.
[a] Percentage change from base simulation. [b] Exports and imports valued at base simulation (1987) exchange rate.

Source: Model simulations.

4. DYNAMIC SIMULATIONS

This section analyzes the effects of government policy and external shocks on household incomes over time. First, the CGE model is used to simulate the path of the Nigerian economy from 1987 through 1992. These results, which incorporate levels of key macroeconomic and sectoral variables as inputs to the analysis, give an indication of how real incomes of various household groups evolved over this period. A series of counterfactual simulations of alternative policy measures, focusing on exchange rate policy, the effects of oil shocks, and capital inflows, are then presented and compared with the base simulation.

THE BASE RUN, 1987–1992

The dynamic base run of the model, simulation D0, simulates the path of the Nigerian economy from 1987 through 1992. Real government expenditures and total investment are fixed at their historical levels for the six years simulated. Likewise, the nominal exchange rate and the exchange rate premium are fixed at their historical levels, with the aggregate price level remaining endogenous. Foreign savings, the world prices of oil and export crops, and the quantity of oil exports are also exogenous. Total factor productivity of each production sector is augmented in each year of the simulation according to historical trends. Labor supply in each labor market is assumed to grow by 2.8 percent (the rate of population growth) and is fixed exogenously in each year of the simulation.

The model simulates real GDP growth slightly less than the historical rates in the first three years of the simulation (1988–1990), but produces slower (but still positive) growth than historical patterns in 1991 and 1992. Simulated average real GDP growth from 1987 to 1990 is 5.6 percent per year, compared with 7.3 percent per year, historically. The simulated 1990–1992 growth rate is only 1.5 percent, compared with the historical 4.6 percent (World Bank 1994).[12]

Real incomes of all households increase over time in the base run as average per capita incomes rise by 10.8 percent from 1987 through 1992 (Table 12). Although real incomes of the urban non-poor households rise more slowly than real incomes of other households (because of lower oil revenues and reduced government expenditures in the latter years of the simulation), the gap between incomes of poor and non-poor households changes only slightly (Figure 2). In the first year of the simulation, 1988, the urban non-poor enjoy large gains in rents as foreign exchange controls, reflected in the spread between parallel and official exchange rates, are reimposed. Their real incomes rise despite a decline in world

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[12] One reason for the discrepancy between the model solution and the preliminary World Bank estimates of GDP in 1992 may be an overstatement of growth in the services sector in the World Bank estimates. The low value of GDP in the model solution is due in part to a simulated decline in the public services sector as real government recurrent expenditures (set exogenously to historical levels) are cut by more than 57.6 percent. The 4.1 percent rise in real value added of the services sector in the World Bank preliminary estimates implies a very large gain in the output of private services to offset the decline in public services.

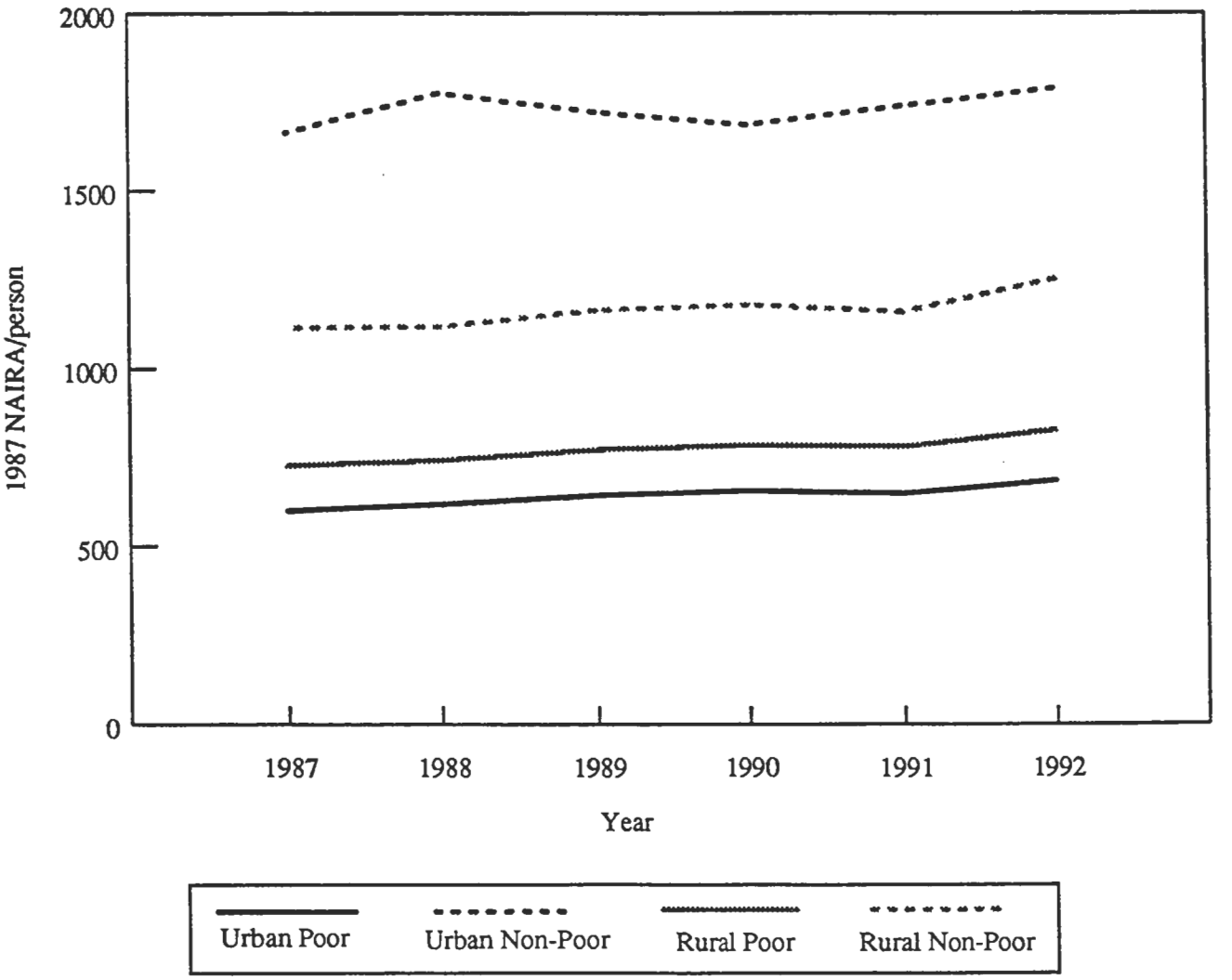
Table 12 — Base Run: Simulation D0, 1987–1992

	1987	1988	1989	1990	1991	1992
	(percentage change relative to 1987 historical levels)					
Real GDP	0.0	6.7	13.7	17.8	19.2	21.5
Consumption	0.0	6.4	11.2	14.5	18.1	31.9
Investment	0.0	9.4	27.1	40.6	51.6	54.7
Government consumption	0.0	3.7	0.2	20.2	40.0	-40.6
Government revenue	0.0	-11.7	2.7	29.6	-2.8	-10.5
Exports (in dollars)	0.0	-9.4	23.5	69.5	47.1	50.1
Imports (in dollars)	0.0	-1.0	9.9	32.6	58.4	79.1
Foreign savings / GDP[a]	-3.9	-1.1	-6.1	-10.6	-3.3	-1.9
Rents / GDP[b]	0.0	3.4	2.8	0.2	1.6	0.4
Relative prices						
Real exchange rate	0.0	-14.6	-21.8	-24.3	-47.0	-53.1
Exchange rate premium[c]	0.0	33.7	29.2	1.9	16.5	4.1
Real wage payments						
Rural labor	0.0	5.2	14.4	21.4	25.0	39.9
Urban informal labor	0.0	6.4	18.3	27.7	31.2	48.8
Urban formal labor	0.0	-10.2	-21.3	29.7	53.4	-60.1
	(1987 = 100)					
Real per capita incomes						
Urban poor	100.0	102.8	107.1	109.3	108.0	113.9
Urban non-poor	100.0	106.8	103.6	101.3	104.5	107.6
Non-rent income	100.0	97.6	95.6	100.7	100.0	106.5
Rural north poor	100.0	102.8	107.6	110.2	109.3	116.6
Rural middle poor	100.0	102.8	105.7	107.2	106.9	112.6
Rural south poor	100.0	101.2	104.6	106.2	105.5	110.9
Rural non-poor	100.0	100.3	104.5	105.7	104.1	112.4
All Nigeria	100.0	103.5	104.6	104.6	105.2	110.8

Notes: [a] Absolute level of foreign savings (evaluated at the official exchange rate) as a share of GDP, in percentage terms. [b] Absolute level of rents as a share of GDP, in percentage terms. [c] Exchange rate (Naira per dollar) premium in the parallel market (percent).

Source: Model simulations.

Figure 2 — Per Capita Household Incomes: Nigeria Base Simulation, 1987–1992



Source: Model Simulations.

oil prices and the value of Nigeria's petroleum exports. Later, despite the recovery in world oil prices, their real incomes fail to rise as sharply as the other household groups because of declines in government expenditures on wages and salaries (1989 and 1992) or large increases in investments of firms which reduce household dividends (1989–1991).

Real per capita incomes of the poor rise in each year of the simulation except in 1991, when foreign exchange controls are reimposed as world oil prices fall (Figure 3). Gains in per capita real incomes range from 10.9 to 16.6 percent for poor households, due mainly to substantial increases in real wage payments over time. Because of the adverse effects of the appreciation of the real exchange rate over time on export crops, real per capita income gains of the rural south poor are lower than those of other poor households.

SIMULATION D1: TRADE LIBERALIZATION

As illustrated in the static simulations in section 3, trade liberalization has positive effects on both overall output and income distribution. Unfortunately, after the liberalization of the foreign exchange market in 1986 and 1987, de facto foreign exchange controls were reimposed in later years. Simulation D1 models the path of the Nigerian economy under the counterfactual scenario of a liberalized market for foreign exchange with no quantitative restrictions on imports over the entire 1987 to 1992 period (Table 13).

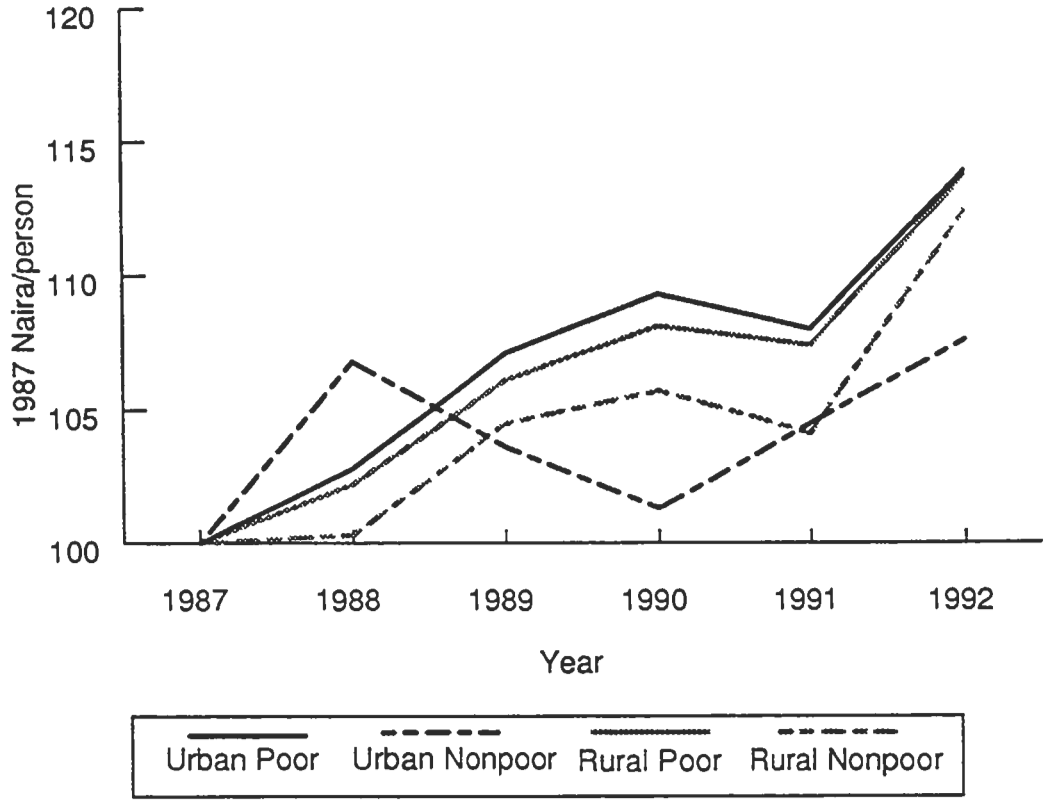
As in the static simulations, the poor tend to benefit from the liberalization. Real incomes of the rural poor are 1.0 to 2.3 percent higher in 1988 and 1989 with the liberalization, as the elimination of rents from foreign exchange and the real exchange rate depreciation of 22.2 to 24.6 percent (relative to the levels in the base run in these years) increases demand for rural labor and returns to land. Similarly, real incomes of the urban poor are 2.3 percent (1988) and 1.6 percent (1989) higher under liberalization than in the base simulation.

Thus, complete liberalization of foreign exchange markets has positive effects on both growth and equity over time, but given that the distortions in the foreign exchange market were not very large after 1989, the gains from further complete liberalization in these later years would have been rather small. The simulation also suggests, however, that had the distortions that existed in 1988 and 1989 been allowed to continue, real incomes of the poor would have been one to two percent lower than those possible with a liberalized regime in each year from 1988 to 1992.

SIMULATIONS D2 AND D3: HIGHER WORLD OIL PRICES

How much better would Nigeria's economy have performed in the absence of adverse movements in world oil prices in the late 1980s? To address this question, simulations D2 and D3 model an increase in world oil prices by 20 percent over their historical levels of each year of the simulation. In simulation D2, a liberalized foreign exchange regime is assumed, while in simulation D3, the premium on foreign exchange in the parallel market is set at 30 percent, thus simulating foreign exchange restrictions that prevent the official exchange rate from fully adjusting to changes in market conditions.

Figure 3 — Index of Per Capita Household Incomes: Nigeria Base Simulation, 1987-1992



Source: Model Simulations.

Table 13 — Trade Liberalization: Simulation D1

	1987	1988	1989	1990	1991	1992
	(percentage change relative to base simulation)					
Real GDP	0.0	0.1	0.1	0.0	0.2	0.1
Consumption / GDP	0.0	-0.5	-0.3	0.0	-0.2	-0.2
Investment / GDP	0.0	0.5	0.4	0.0	0.4	0.2
Government consumption / GDP	0.0	0.0	0.0	0.0	0.0	0.0
Government revenue / GDP	0.0	2.9	3.6	0.4	1.9	0.5
Exports / GDP[a]	0.0	0.1	0.1	0.0	0.1	0.0
Imports / GDP[a]	0.0	0.1	0.1	0.0	0.1	0.0
Foreign savings / GDP[a]	0.0	0.0	0.0	0.0	0.0	0.0
Rents / GDP	0.0	-3.4	-3.0	-0.2	-1.8	-0.5
Relative prices						
Real exchange rate	0.0	24.6	22.2	1.6	14.1	3.9
Exchange rate premium[b]	0.0	0.0	0.0	0.0	0.0	0.0
Real wage payments						
Rural labor	0.0	2.3	1.6	0.2	1.0	0.3
Urban informal labor	0.0	3.2	2.3	0.3	1.4	0.5
Urban formal labor	0.0	8.4	9.6	0.8	4.6	2.1
Real incomes						
Urban poor	0.0	2.3	1.6	0.2	0.9	0.2
Urban non-poor	0.0	-4.5	-3.6	-0.2	-1.8	-0.7
Rural north poor	0.0	2.3	1.6	0.2	0.9	0.2
Rural middle poor	0.0	1.4	1.0	0.1	0.5	0.1
Rural south poor	0.0	2.0	1.4	0.1	0.8	0.2
Rural non-poor	0.0	2.1	1.3	0.0	0.7	0.0
All Nigeria	0.0	-0.8	-0.7	0.0	-0.3	-0.2

Notes: [a] Exports and imports valued at base simulation (1987) exchange rate. [b] Exchange rate premium (Naira per dollar) in the parallel market (percent).

Source: Model simulations.

With the increase in the value of oil exports and a liberalized foreign exchange regime, the supply of foreign exchange rises, leading to an appreciation of the real exchange rate averaging 22.2 percent relative to the base run over the period 1987 to 1992 (Table 14). (The appreciation is especially small in 1988, 1989, and 1991, since in these years, there was a substantial premium on the parallel market modeled in the base run.)

The appreciation relative to the base run is even larger with foreign exchange controls (averaging 38.3 percent from 1987 to 1992), given the simulated 30 percent premium on foreign exchange in the parallel market (Table 15). Rents as a share of GDP average 1.8 percent over the six years, contributing to the 2.5 percent average gain in real incomes of the urban non-poor.

Not surprisingly, real incomes of most households increase in most years in both simulations (Figure 4). The major exception is the urban non-poor, who have higher real incomes under a regime of foreign exchange controls than with higher oil prices with trade liberalization because of a loss of rents. The poor, however, fare better under a liberalized foreign exchange regime. Real incomes are 3.1 to 5.3 percent higher in each year for the urban poor in simulation D2 with trade liberalization, compared with changes of 1.8 to 3.5 percent in simulation D3 with foreign exchange controls. Similarly, rural poor households enjoy gains of 2.9 to 6.0 percent relative to the base run in each year from 1988 to 1992 with trade liberalization, compared with 1.9 to 4.2 percent relative to the base run over the same period with foreign exchange controls.

SIMULATION D4: REDUCED OUTFLOW OF FOREIGN CAPITAL

Outflows of foreign capital, whether private capital flight or required debt servicing, hindered Nigeria's economic performance and lowered household incomes throughout the 1980s and early 1990s. In simulation D4, the effects of reducing the foreign capital outflow are modeled by fixing capital outflows to the level of 1987 total government payments on debt servicing (4.0 million dollars per year).

Reducing the outflows (i.e., increasing the net inflows) of foreign capital generally leads to an appreciation of the real exchange as increased spending in the domestic economy raises the relative price of non-tradables to tradables. However, trade liberalization in itself results in a depreciation of the real exchange rate (as in simulation D1). Thus, the real exchange rate appreciates substantially relative to the base run in years where the exchange rate premium in the base run was small (e.g., 1987, 1989, and 1990) and appreciates less (1991 and 1992) or even depreciates (1988) relative to the base run in years where the exchange rate premium in the base run was large (Table 16).

By providing additions to the total pool of savings, the increase in net capital inflows (i.e., foreign savings) makes possible a large increase in investment so that investment as a share of GDP rises by 2.3 to 8.3 percent relative to the base run in each year of the simulation. The largest gains in investment are in 1989 and 1990, when in the base run capital outflows were largest. Greater investment spending leads to increases in the demand for labor in both the urban informal and rural labor markets, raising real wage payments and household incomes. Real incomes of the urban poor rise by 2.4 to 7.8 percent relative to the base run during the six-year period modeled, while real incomes of the rural poor are higher than the base run by 1.8 to 8.8 percent over the period.

Table 14 — Higher Oil Prices with Trade Liberalization: Simulation D2

	1987	1988	1989	1990	1991	1992
	(percentage change relative to base simulation)					
Real GDP	-0.1	0.2	-0.3	-1.6	-2.0	-2.3
Consumption / GDP	1.9	1.5	2.1	2.6	2.4	3.0
Investment / GDP	2.3	2.6	3.4	3.9	2.4	1.6
Government consumption / GDP	0.0	0.0	0.0	0.0	0.0	0.0
Government revenue / GDP	-2.0	1.3	-0.1	-5.0	-0.2	-1.1
Exports / GDP[a]	0.8	0.9	1.3	1.8	1.6	1.7
Imports / GDP[a]	0.8	0.9	1.3	1.8	1.6	1.7
Foreign savings / GDP[a]	0.0	0.0	0.0	0.0	0.0	0.0
Rents / GDP	0.0	-3.4	-3.0	-0.2	-1.8	-0.5
Relative prices						
Real exchange rate	-27.9	-8.4	-18.6	-36.4	-17.8	-23.8
Exchange rate premium[b]	0.0	0.0	0.0	0.0	0.0	0.0
Real wage payments						
Rural labor	3.3	6.1	6.6	6.2	5.9	4.6
Urban informal labor	5.4	9.0	9.8	9.2	8.5	6.5
Urban formal labor	-2.1	6.9	3.5	-6.2	3.3	1.5
Real incomes						
Urban poor	2.6	5.1	5.3	4.6	4.4	3.1
Urban non-poor	1.5	-3.0	-3.2	-1.3	-1.2	0.1
Rural north poor	3.3	5.7	6.0	5.4	4.9	3.6
Rural middle poor	2.8	4.4	4.8	4.5	3.9	2.9
Rural south poor	1.9	4.7	5.0	4.5	4.0	2.9
Rural non-poor	3.6	5.8	5.8	5.0	4.0	2.7
All Nigeria	2.5	1.8	2.0	2.4	1.9	1.7

Notes: [a] Exports and imports valued at base simulation (1987) exchange rate. [b] Exchange rate premium (Naira per dollar) in the parallel market (percent).

Source: Model simulations.

Table 15 — Oil Shock with Foreign Exchange Controls: Simulation D3

	1987	1988	1989	1990	1991	1992
	(percentage change relative to base simulation)					
Real GDP	-0.3	-0.2	-0.6	-2.0	-2.5	-2.9
Consumption / GDP	2.1	1.9	2.4	2.7	2.6	3.9
Investment / GDP	1.8	1.9	2.7	3.3	1.6	0.0
Government consumption / GDP	0.0	0.0	0.0	0.0	0.0	0.0
Government revenue / GDP	-4.6	-1.3	-3.4	-8.6	-3.0	-3.7
Exports / GDP[a]	0.7	0.8	1.2	1.7	1.5	1.6
Imports / GDP[a]	0.7	0.8	1.2	1.7	1.5	1.6
Foreign savings / GDP[a]	0.0	0.0	0.0	0.0	0.0	0.0
Rents / GDP	3.3	0.2	0.4	3.0	1.5	2.5
Relative prices						
Real exchange rate	-42.0	-26.5	-35.5	-49.9	-35.0	-40.8
Exchange rate premium[b]	30.0	30.0	30.0	30.0	30.0	30.0
Real wage payments						
Rural labor	1.1	3.8	4.8	4.6	4.0	3.3
Urban informal labor	2.3	5.5	7.0	6.6	5.5	4.1
Urban formal labor	-11.8	-4.3	-8.8	-16.0	-5.9	-11.5
Real incomes						
Urban poor	0.4	2.8	3.5	3.1	2.6	1.8
Urban non-poor	5.4	1.2	0.7	1.6	1.8	4.0
Rural north poor	1.1	3.4	4.2	3.8	3.1	2.3
Rural middle poor	1.5	2.9	3.7	3.5	2.8	2.2
Rural south poor	-0.1	2.7	3.5	3.3	2.5	1.9
Rural non-poor	1.4	3.7	4.5	3.9	2.6	2.2
All Nigeria	2.9	2.5	2.7	2.8	2.3	2.9

Notes: [a] Exports and imports valued at base simulation (1987) exchange rate.
[b] Exchange rate premium (Naira per dollar) in the parallel market (percent).

Source: Model simulations.

Figure 4 — Household Real Incomes: Dynamic Simulations, 1987–1992

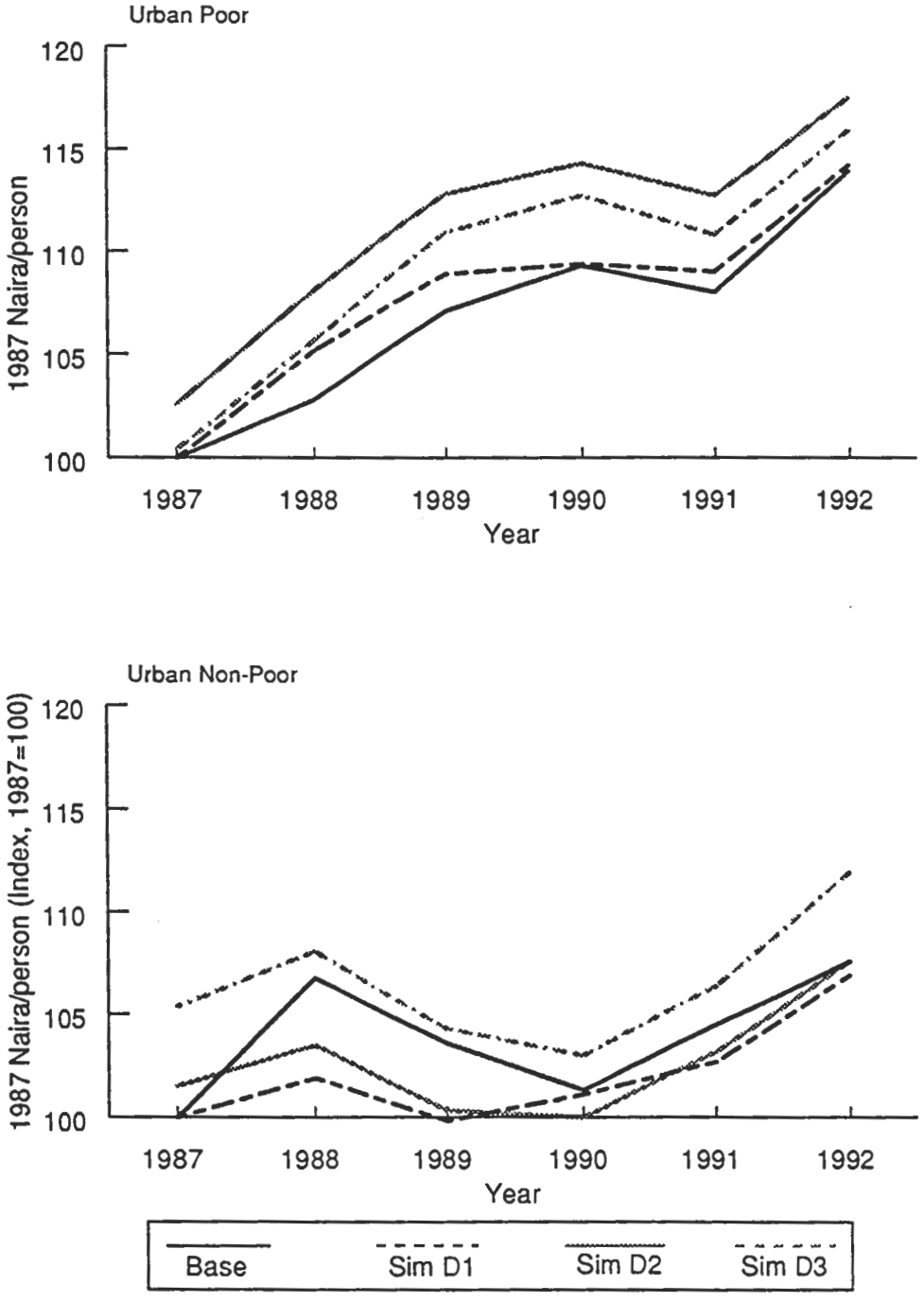
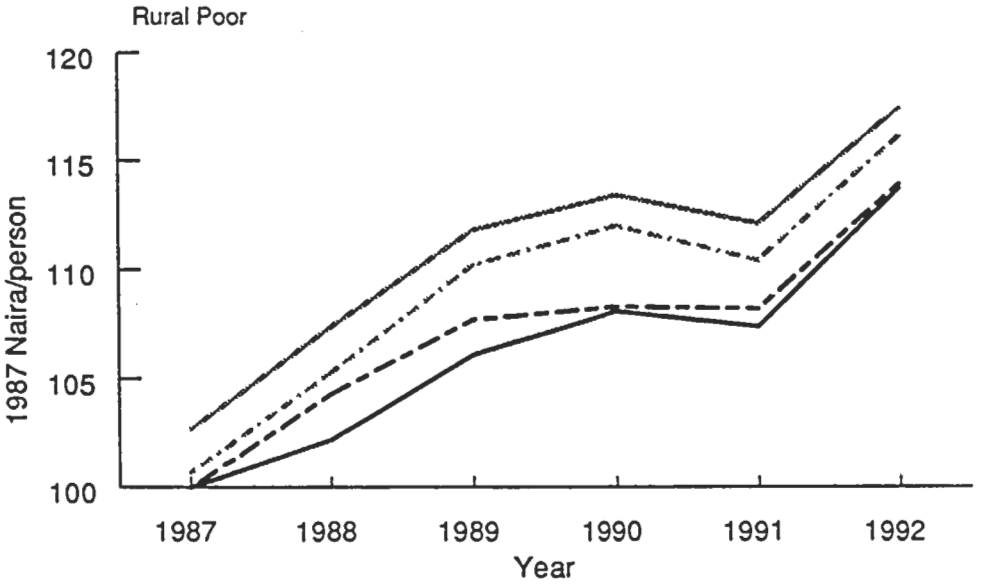


Figure 4 — Household Real Incomes: Dynamic Simulations, 1987-1992 (continued)



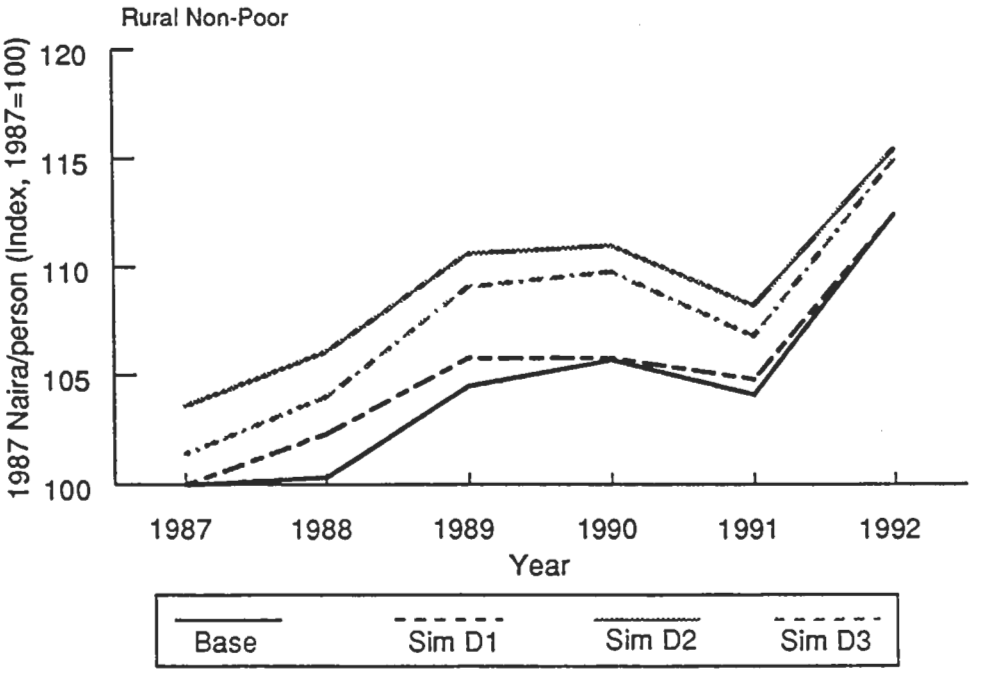


Table 16 — Reduced Capital Outflow with Trade Liberalization: Simulation D4

	1987	1988	1989	1990	1991	1992
	(percentage change relative to base simulation)					
Real GDP	-0.1	0.3	-1.1	-5.6	-2.2	-1.4
Consumption / GDP	0.9	0.0	1.8	3.2	1.1	1.3
Investment / GDP	3.6	2.4	6.1	8.3	4.1	2.3
Government consumption / GDP	0.0	0.0	0.0	0.0	0.0	0.0
Government revenue / GDP	-4.0	1.1	-4.5	-11.7	-2.0	-1.8
Exports / GDP[a]	-0.2	0.0	-0.2	-0.4	-0.1	-0.1
Imports / GDP[a]	0.9	0.5	2.0	4.0	1.8	1.2
Foreign savings / GDP[a]	4.5	2.0	8.9	17.5	7.7	5.2
Rents / GDP	0.0	-3.4	-3.0	-0.2	-1.8	-0.5
Relative prices						
Real exchange rate	-28.8	6.5	-31.9	-55.2	-17.5	-16.4
Exchange rate premium[b]	0.0	0.0	0.0	0.0	0.0	0.0
Real wage payments						
Rural labor	2.8	4.3	8.2	9.8	6.0	4.6
Urban informal labor	5.4	6.7	12.8	15.3	9.5	6.9
Urban formal labor	-7.5	5.2	-8.1	-18.4	0.2	-1.9
Real incomes						
Urban poor	2.4	3.8	6.8	7.8	4.5	3.1
Urban non-poor	-1.0	-5.0	-6.1	-5.6	-3.9	-1.7
Rural north poor	3.0	4.0	7.6	8.8	4.9	3.3
Rural middle poor	2.6	2.9	6.1	7.3	3.8	2.6
Rural south poor	1.8	3.4	6.5	7.6	4.1	2.8
Rural non-poor	2.9	3.3	7.3	8.0	2.4	1.0
All Nigeria	1.1	-0.2	1.7	2.5	0.4	0.5

Notes: [a] Exports and imports valued at base simulation (1987) exchange rate. [b] Exchange rate premium (Naira per dollar) in the parallel market (percent).

Source: Model simulations.

In general, increased net capital inflows benefit all households except the urban non-poor, who may actually suffer real income declines due to the associated real exchange rate appreciation and reduced real value of oil exports, which lead to lower returns to capital and reduced labor demand in the oil sector (see simulation 10). For poor households, however, greater net foreign savings leads to increased real incomes. To the extent that this increase in foreign savings is the result of a decline in capital flight or a decline in debt service due, the simulation suggests that limiting capital outflows in the 1987 to 1992 period, in combination with a liberalized foreign exchange market, would have resulted in substantial gains for poor households.

5. POLICY IMPLICATIONS

Nigeria's economic reforms were adopted in the mid-1980s in the midst of vigorous public debate over structural adjustment and the involvement of foreign donors. In addition to the issue of the appropriate role of the IMF and the World Bank, major concerns were voiced regarding the effectiveness of policy change on the macroeconomic level as well as the implications of reforms for the welfare of households. On a macroeconomic level, the performance of the Nigerian economy up to 1992 was encouraging. Real GDP growth, which fell by 13 percent from 1980 to 1986, grew by an average of five percent per year from 1986 to 1992. At the household level, though, there is considerably less evidence regarding the evolution of household incomes over time.

How household incomes have changed in recent years is an important issue. Yet, the more critical question is: "How did reforms such as liberalization of the foreign exchange market, the scrapping of the export crop marketing boards, and fiscal cuts affect household incomes over this period?" This question regarding the effects of policy on household welfare is of particular significance now that several earlier economic reforms have been reversed.

The simulation results presented in this paper suggest that the major economic reforms, particularly the liberalization of foreign exchange and export crop markets in 1986 and 1987, led to increases not only in overall incomes, but benefited both the urban and rural poor. These households generally had no access to the economic rents associated with the rationing of foreign exchange and import restrictions. Liberalization of the foreign exchange market and the depreciation of the real exchange rate tended to benefit these households since the shift in relative prices led to increases in demand for rural and urban labor. Moreover, for producers of cocoa, the major export crop, the liberalization of export crop marketing combined with the exchange rate reforms resulted in even larger gains in real incomes.

Fluctuations in the world price of oil, of course, had major effects on real incomes. However, the model simulations indicate that the gains for the poor from higher world oil prices are greater when the foreign exchange regime is liberalized than when foreign exchange controls are imposed. Similarly, reductions in the world price of oil hurt the poor less if the real exchange rate is allowed to depreciate than if foreign exchange restrictions prevent a real exchange rate adjustment. Thus while Nigeria's policymakers can do little about the world price of oil, they can limit the adverse effects of declines in world oil prices on household incomes through appropriate trade and exchange rate policies.

There have been losers from Nigeria's adjustment policies as well. Recipients of the rents that result from import licensing and the rationing of foreign exchange experience substantial losses of incomes when the exchange rate and trade regimes are liberalized. In addition, public sector employees who lose their jobs as government spending is cut also suffer from policy reform, particularly if they are unable to find new jobs quickly. It is important to note, however, that households among these two groups (recipients of rents associated with foreign exchange controls and government employees), are generally not amongst the poorest households. Nonetheless, they may have sizable political importance and influence.

Broadly speaking, two key policies stand out as most important in terms of reducing poverty in Nigeria: exchange rate policy (including trade policies involving import restrictions) and fiscal policy. Because controls on foreign exchange lead to rents and an appreciation of the real exchange rate that both hinders growth and has adverse effects on the poor, maintaining a liberalized exchange rate and trade regime should be a central part of Nigeria's development strategy. And since Nigeria's oil wealth potentially can have a direct effect on the country's households through the channels of government revenues and expenditures, government spending should be targeted toward areas that have the greatest potential for achieving growth and poverty reduction. The simulations presented above indicate that cuts in government recurrent expenditures have little adverse effects outside the public sector and its employees. Retargeting of government spending toward development of infrastructure (e.g., rural road networks) and human capital (e.g., through investments in primary health care and education) may be the most effective way of using oil revenues to benefit the poor. Changing spending priorities may be more easily achieved if there is an open and transparent accounting of government revenues and expenditures that enables the Nigerian public to participate more in the decisions regarding the use of oil revenues.

It must be emphasized that the modeling results presented here give only approximate indications of the magnitudes of the effects of policies and shocks on household incomes. The available data are no more than rough estimates of the outputs of key sectors, particularly agriculture and informal sector activities. Small, in-depth surveys of poor households in various regions of the country would greatly contribute to our understanding of the income sources, expenditures, and constraints faced by these households. As data are improved, further efforts at analyzing the effects of policies and external shocks on the sectoral and household level may prove to be a valuable input into government policymaking.

Though the details of the effects of policy reforms on household welfare in Nigeria are not yet known, the main outlines of the impacts of exchange rate liberalization, fiscal cuts, and agricultural marketing reforms appear much clearer. The results here strongly suggest that Nigeria's poor shared in the benefits of the economic growth of the late 1980s and that key elements of the reform package, particularly exchange rate and trade liberalization, are generally pro-poor in the Nigerian context.

APPENDIX 1: CONSTRUCTION OF THE SOCIAL ACCOUNTING MATRIX (SAM)

The heart of the CGE model for Nigeria is a 37 by 37 social accounting matrix which describes the economic flows in 1987: production activities, use of commodities, factor payments, household incomes, government expenditures and revenues, and transactions with the Rest of World (ROW). This annex describes the data and the methodology used to construct the SAM.

PRODUCTION ACTIVITIES

Accounts for the nine production activities included in the SAM derive from an unpublished 30 sector input-output table from Nigeria's Federal Office of Statistics (n.d.). Appendix Table 1 gives the correspondence between SAM sectors and those of the input-output table. The agricultural sector in the input-output table is disaggregated into three sectors (grains, export crops, and other agriculture) using data on crop production and prices from Awoyomi (n.d.) (Appendix Table 2). Two adjustments to the data in Awoyomi (n.d.) are made (Appendix Table 3). First, cocoa production is increased from 937.5 to 1500 million Naira, so as to correspond with the value of exports for 1987 reported in IMF (1994). Second, the difference between the value of production shown in the national accounts and the value of production as calculated from the production data is assigned to "other agriculture" and distributed by region according to the shares of production by region of the crops given in Awoyomi (n.d.).

Value added by activity is assigned to factors of production using the ratios given in Appendix Table 4. For agriculture, the distribution of returns to land according to region is based on production data given in Appendix Table 3.

MARKETING MARGINS

The available I-O table expresses values in factor prices rather than in market prices. In other words, marketing margins and indirect taxes are not included in the value of the commodity purchased by the user. Instead, these items are given as separate expenditures. For use in the model, however, market price valuation is more appropriate.

In converting the values of commodity use to market prices, the value of the marketing services consumed is incorporated into the consumption of commodities. Values of intermediate consumption in market prices are calculated by applying the same percentage marketing margin to all non-services used by the activity. Similarly, an average marketing margin is applied to all non-service final demands. Indirect taxes on commodity inputs into production are not included as part of the value of intermediate consumption of commodities at market prices. Instead, indirect taxes are left as taxes on the value of production.

Indirect taxes on imports are applied to imports of manufactured goods and final consumption is increased by the value of these taxes.

Appendix Table 1 — Activities in the Nigeria SAM and the I-O Table

Activity	I-O Table Sectors
1. Grains	Maize, Rice
2. Export crops	Cocoa, Coffee, Palm Kernels, Palm Oil, Rubber
3. Nontradable food	Other crops, (3) Fishing, (4) Forestry
4. Livestock	(2) Livestock
5. Food processing	(7) Food, (8) Beverages,
6. Meat processing	
7. Other industry	(9) Textiles, (10) Footwear, (11) Wood, (12) Paper, (13) Chemicals, (15) Rubber, Plastics, (16) Steel, (17) Fabricated Metal, (18) Vehicle Assembly, (19) Other Manufacturing, (20) Utilities
8. Private services	(21) Construction, (22) Transport, (23) Communications, (24) Trade, (25) Restaurants, Hotels, (26) Finance, (27) Business Services, (28) Housing, (29) Other Services
9. Public administration	(30) Government Services
10. Petroleum	(5) Crude Petroleum, (6) Other Mining, (14) Refineries

Source: Nigeria 1987 SAM.

Appendix Table 2 — Agricultural Production and Prices in Nigeria, 1987

	Production				Producer Price
	North	Mid-belt	South	Total	
	('000 tons)				Naira/MT
Grains					
Maize	450	680	335	1,465	611
Rice	198	949	665	1,812	2,313
Export crops					
Cocoa	0	0	125	125	7,500
Coffee	0	0	4	4	5,500
Palm kernel	0	0	360	360	850
Palm oil	0	0	730	730	1,200
Rubber	0	0	70	70	1,000
Other crops					
Cassava	14	860	6,396	7,271	910
Cotton	99	21	8	128	4,000
Cowpeas	394	50	8	453	2,382
Groundnuts	467	130	1	597	2,075
Millet	1,825	40	0	1,864	595
Sorghum	1,430	473	10	1,913	615
Soybeans	0	101	0	101	1,500
Yams	78	4,428	3,217	7,724	910

Notes: Prices of coffee, palm oil, cowpeas, and soybeans are from Central Bank of Nigeria (1989). Other price and production data are from Awoyomi (n.d.).

Sources: Awoyomi (n.d.); World Bank (1994); Central Bank of Nigeria (1989).

Appendix Table 3 — Value of Production by Region in Nigeria, 1987

	North		Midbelt		South		National	
	value	share	value	share	value	share	value	share
	(mn Naira)	(percent)	(mn Naira)	(percent)	(mn Naira)	(percent)	(mn Naira)	(percent)
Grains								
Maize	275	3.6	416	3.6	205	1.1	895	2.4
Rice	457	6.1	2196	18.9	1,539	8.4	4,191	11.2
Subtotal grains	732	9.7	2611	22.5	1,744	9.5	5,087	13.6
Export crops								
Cocoa	0	0.0	0	0.0	1,500	8.2	1,500	4.0
Coffee	0	0.0	0	0.0	22	0.1	22	0.1
Palm kernel	0	0.0	0	0.0	306	1.7	306	0.8
Palm oil	0	0.0	0	0.0	876	4.8	876	2.3
Rubber	0	0.0	0	0.0	70	0.4	70	0.2
Subtotal export crops	0	0.0	0	0.0	2,774	15.1	2,774	7.4
Other crops								
Cassava	13	0.2	783	6.7	5,820	31.8	6,617	17.6
Cotton	395	5.2	85	0.7	33	0.2	513	1.4
Cowpea	940	12.4	120	1.0	19	0.1	1,078	2.9
Groundnut	968	12.8	270	2.3	2	0.0	1,240	3.3
Millet	1,086	14.4	24	0.2	0	0.0	1,109	3.0
Sorghum	879	11.6	291	2.5	6	0.0	1,177	3.1
Soybeans	0	0.0	151	1.3	1	0.0	151	0.4
Yam	71	0.9	4,030	34.7	2,928	16.0	7,029	18.7
Subtotal other crops	4,352	57.6	5,752	49.5	8,809	48.1	18,913	50.4
Subtotal all crops	5,084	67.3	8,363	71.9	13,327	72.7	26,774	71.4
Other crops (n.i.e.)	2,468	32.7	3,262	28.1	4,996	27.3	10,726	28.6
Total	7,552	100.0	11,626	100.0	18,323	100.0	37,500	100.0

Note: The cocoa figure is equal to the value of exports for 1987, reported in IMF (1994).

Sources: Awoyomi (n.d.); IMF (1994); World Bank (1994); Central Bank of Nigeria (1989).

Appendix Table 4 — Factor Shares by Activity, Nigeria 1987 SAM

	Grain	Export Crops	Nontraded Food Crops	Livestock	Food Processing	Other Industry	Private Services	Public Services	Petroleum
Rural labor	0.60	0.50	0.47	0.20	0.20	0.15	0.25	—	—
Informal urban labor	0.10	—	0.08	—	0.40	0.25	0.42	—	—
Formal urban labor	—	—	—	—	—	0.20	0.03	1.00	0.10
Land — North	0.04	0.00	0.10	0.55	—	—	—	—	—
Land — Middle	0.15	0.00	0.14	0.15	—	—	—	—	—
Land — South	0.10	0.50	0.21	0.10	—	—	—	—	—
Informal capital	—	—	—	—	0.35	0.30	0.25	—	—
Formal capital	—	—	—	—	0.05	0.10	0.05	—	0.90
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Nigeria 1987 SAM.

HOUSEHOLD INCOMES

Household incomes are calculated by dividing returns to factors across households. Shares of factor income to households (Appendix Table 5) were adjusted so as to result in an income distribution approximating the expenditure distribution given in World Bank (1993) (Appendix Table 6).

Adjustments were made to the following factor shares:

1. Rural and urban labor shares in production of food, other industry, and private services.
2. Land and labor shares in agriculture.
3. Shares of agricultural capital paid to poor and non-poor households.
4. Shares of income from non-agricultural capital paid to households.

In addition, transfers from firms to the urban non-poor are set to 15,000 million Naira.

HOUSEHOLD EXPENDITURES

The level of expenditures per household is derived from the above household income estimates and assumed household savings rates equal to 8.0 percent of income for poor households, 16.0 percent for rural non-poor households, and 18.4 percent for urban non-poor households. The distribution of expenditures by commodity is derived from expenditure share data from the 1985/86 household survey by the Federal Office of Statistics (Appendix Table 7).[13] A RAS procedure was used to estimate expenditures of households by commodity for the 1987 SAM. Budget shares for each of the households are given in Appendix Table 8.

GOVERNMENT ACCOUNTS

Government revenues are derived from Tables 3.1 and 3.11, World Bank (1994). Total revenues are equal to 27.5 billion (including state and local revenues). Net indirect taxes on production are taken from the national accounts (2.435 billion less 0.352 billion in subsidies).[14] Import duties (equal to 1.135 billion Naira in IMF [1992]) are ascribed to imports of industrial goods.[15] Taxes on petroleum, equal to 20.5 billion Naira, are treated as indirect taxes on the petroleum sector in the SAM, although technically much of this total was due to royalties and other forms of taxation. Independent revenues, direct taxes, and other revenues from Table 3.1, World Bank (1994), are recorded as direct taxes and transfers paid by firms to the government. The difference between total revenues and federally collected

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[13] See World Bank (1993) for a description of the survey.

[14] These indirect taxes are those paid by firms on the purchases of their intermediate inputs. In the SAM, these are left as indirect taxes on production of the sector.

[15] These latter two figures accord well with the figure for total customs and excise duties of 3.5 billion Naira in Table 3.1, World Bank (1994).

Appendix Table 5 — Factor Income Shares by Household, Nigeria 1987 SAM

	Rural Labor	Informal Urban Labor	Formal Urban Labor	Land North	Land Middle	Land South	Informal Capital	Formal Capital
Urban poor	—	0.35	—	0.05	0.05	0.05	0.03	—
Urban non-poor	—	0.65	1.00	0.10	0.10	0.10	0.39	—
Rural North poor	0.23	—	—	0.20	—	—	0.04	—
Rural Middle poor	0.07	—	—	—	0.15	—	0.01	—
Rural South poor	0.19	—	—	—	—	0.20	0.03	—
Rural non-poor	0.51	—	—	0.65	0.70	0.65	0.50	—
Firms	—	—	—	—	—	—	—	1.00
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Nigeria 1987 SAM.

Appendix Table 6 — Per Capita Expenditures by Household Group, 1985/86 and the Nigeria 1987 SAM

	1985/86 Population	1985/86 Expenditures/Capita	1985/86	1987 Expenditures/Capita	1987
	(millions)	(Naira/year)	Ratio	(Naira/year)	Ratio
Urban					
Poor	10.21	240	1.00	664	1.00
Non-poor	21.95	768	3.19	1472	2.22
Rural poor	27.81	211	0.88	571	0.86
North	13.01	208	0.87	539	0.81
Middle	3.89	197	0.82	637	0.96
South	10.91	215	0.89	584	0.88
Rural non-poor	28.40	687	2.86	909	1.37
Nigeria total	60.57	641	2.67	914	1.38
Total poor	10.21	240	1.00	596	0.90
Total non-poor	50.36	722	3.00	1154	1.74

Source: Government of Nigeria (1986); Nigeria 1987 SAM.

Appendix Table 7 — Household Budget Shares, 1985/86

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	Total Nigeria
Grain	11.9	18.9	13.8	14.5	8.4	17.7	17.1
Export crops	2.6	2.2	1.3	3.2	2.7	1.7	2.0
Nontraded food	50.6	32.1	48.4	45.6	50.3	28.8	33.9
Livestock	13.9	11.4	9.1	9.1	14.4	9.4	10.7
Food products	3.4	3.1	4.7	3.3	2.3	3.3	3.2
Other industry	6.6	11.3	9.4	11.8	11.4	14.6	12.4
Private services	8.0	18.0	10.2	11.0	9.1	22.1	18.2
Public services	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum products	2.9	3.0	3.1	1.5	1.4	2.3	2.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Calculated from Government of Nigeria (1986).

Appendix Table 8 — Household Budget Shares, Nigeria 1987 SAM

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	Total Nigeria
Grain	4.9	8.1	5.6	6.0	3.4	7.4	7.0
Export crops	1.6	1.4	0.8	1.9	1.6	1.0	1.3
Nontraded food	57.1	37.9	53.8	52.2	55.6	33.1	41.2
Livestock	11.7	10.0	7.5	7.7	11.8	8.0	9.4
Food products	5.1	4.8	7.0	5.0	3.3	5.0	5.0
Other industry	8.0	14.4	11.3	14.6	13.6	18.1	14.7
Private services	7.4	17.6	9.4	10.4	8.4	21.0	16.2
Public services	0.6	0.4	0.5	0.7	0.6	0.3	0.4
Petroleum products	3.6	5.3	4.1	1.5	1.9	6.0	4.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Nigeria 1987 SAM.

revenues (27.5 - 26.6 = 0.9 billion Naira) is included as transfers from firms to state and local governments.

Total government expenditure (including federal, state, and local governments) was estimated as 36.1 billion Naira in 1987 (Table 3.11, World Bank 1994). The total was subdivided into recurrent expenditures on goods and services (7.395 billion Naira, National Accounts I-O Table), foreign interest paid (a transfer to the ROW equal to 8.4 billion Naira), capital expenditures of the federal government less the overall deficit (5.4 - 8.6 = 3.2 billion Naira), and transfers to firms (consisting of exchange rate guarantees and the residual between total revenues and other expenditures). The government accounts are summarized in Appendix Table 9.

REST OF WORLD ACCOUNTS

The difference between exports (30,013 million Naira) less imports (16,457 million Naira) and interest paid by the government (8,400 billion Naira) is shown as a capital outflow paid to the ROW of 5,156 billion Naira. This figure represents the combined net capital outflow of private households and enterprises (including interest payments by enterprises). Total foreign savings is the sum of the above figure and the interest paid by the government (-5,156 + -8,400 = -13,556 billion Naira).

Appendix Table 9 — Government Accounts, Nigeria 1987 SAM

	bn Naira
Government expenditures	
Current expenditures on goods and services	7.4
Foreign interest paid	8.4
Capital expenditures (federal government)	5.4
Subsidies to firms	0.3
Tansfers to firms	14.6
Total	36.1
Government revenues	
Indirect taxes on production	2.4
Import duties	1.1
Taxes on petroleum	20.5
Other taxes on firms (federal)	2.6
Taxes on firms (state and local)	0.9
Total	27.5
Deficit	8.6

Sources: Nigeria 1987 SAM and World Bank (1994).

APPENDIX 2: EQUATIONS AND VARIABLES OF THE NIGERIA MODEL

Prices:

(1) $PM_i = \overline{PWM_i} \cdot (1 + TM_i) \cdot ER \cdot (1 + PREM)$

(2) $PE_i = PWE_i \cdot ER \cdot [(1 - \overline{SMUG_i})/(1 + TE_i) + \overline{SMUG_i} \cdot (1 + PREM)]$

(3) $PPT_i \cdot XPT_i = PPD_i \cdot XPD_i + \frac{PE_i}{(1 + margx_i)} \cdot E_i$

(4) $PVA_j = PPT_j (1 - tprod_j) - \sum_i PC_i a_{ij}$

(5) $PC_i \cdot XT_i = PPD_i (1 + margd_i + dtax_i) \cdot XPD_i + PM_i \cdot (1 + margm_i + itax_i) \cdot M_i$

(6) $PK_j = \sum_i PC_i \cdot imat_{ij}$

(7) $PPTACT_j = \sum_i PPT_i \cdot outmat_{ij}$

(8) $PINDEX = \sum_i \theta_i \cdot PC_i$

Production:

(9) $XPTACT_j = CES(L_{1j}, L_{2j}, L_{3j}, K_j)$

(10) $XPT_i = \sum_j XPTACT_j \cdot outmat_{ij}$

Trade:

(11) $XPT_i = AT_i(\gamma_i E_i^{\varphi_i} + (1 - \gamma_i) XPD_i^{\varphi_i})^{1/\varphi_i}$, for i = non-oil export goods

(12) $XT_i = E_i + XPD_i$, for i = petroleum products

(13) $\frac{E_i}{XPD_i} = \left[\frac{PE_i^*}{PPD_i} \cdot \frac{(1 - \gamma_i)}{\gamma_i}\right]^{\phi_i}$, $PE_i^* = \frac{PE_i}{1 + margx_i}$, $\phi_i = \frac{1}{\varphi_i - 1}$, for i = non-oil export goods

(14) $XT_i = AC_i(\delta_i M_i^{-\rho_i} + (1 - \delta_i) XPD_i^{-\rho_i})^{-\frac{1}{\rho_i}}$, for i = competitive import goods

(15) $XT_i = M_i(1 + MARGM_i + MSALRATE_i)$, for i = non-competitive imports

(16) $\frac{M_i}{XPD_i} = \left[\frac{PPD_i^*}{PM_i^*} \cdot \frac{\delta_i}{1 - \delta_i}\right]^{\sigma_i}$, $\sigma_i = \frac{1}{1 + \rho_i}$, for i = competitive import goods

$PPD_i^* = PPD_i(1 + margd_i + dtax_i)$, and $PM_i^* = PM_i(1 + margm_i + itax_i)$

Appendix 2: Equations and Variables of the Nigeria Model (continued)

(17) $XT_i = XPD_i$, *for i = non-imported goods*

(18) $XPT_i = XPD_i$, *for i = non-exported goods*

Factor markets:

(19) $W_{lc,j}/r_j = \frac{a_{lc,j}}{1 - \sum_{lc} a_{lc,j}} \cdot K_j^{1+\rho_j} / L_{lc,j}^{1+\rho_j}$

(20a) $LS_{uf} = LSO_{uf}$, *uf = urban formal*

(20b) $LS_{ui} + LS_{rur} = LSO_{ui} + LSO_{rur}$, *ui = urban informal, rur = rural*

(20c) $w_{ui}/w_{rur} = wO_{ui}/wO_{rur}$

(21) $\sum_j L_{lc,j} = LS_{lc}$

Household incomes, saving:

(22) $r_j = (1 - \sum_{lc} a_{lc,j}) \cdot AD_j^{-\rho} \cdot K_j^{-\rho-1} \cdot PVA_j \cdot Q_j^{1+\rho}$

(23) $LCSAL_{lc} = \sum_j wdist_{lc,j} \cdot W_j \cdot L_{lc,j}$

(24) $RETK_{kc} = \sum_j (PVA_j \cdot XPTACT_j - ACTSAL_j) \cdot shrkc_{kc,j}$

(25) $ACTSAL_j = \sum_{lc} (WA_{lc}) \cdot wdist_{j,lc} \cdot L_{j,lc}$

(26) $SMUGREV = \sum_i PWE_i \cdot ER \cdot PREM \cdot E_i \cdot \overline{SMUG}_i$

(27) $RENT = \overline{PWM}_i \cdot \sum_i ER \cdot ((1 + PREM) \cdot (1 + TM_{im}) - (1 + \overline{TMR}_i) \cdot \overline{M}_i - SMUGREV$

(28) $Y_h = \sum_{lc} (shr_{lc,h} \cdot LCSAL_{lc}) + \sum_{kc} (shr_{kc,h} \cdot RETK_{kc}) + (rentshr_h \cdot RENT) + (divshr_h \cdot DIVIDEND)$

(29) $SAVHH_h = sO_h \cdot (\frac{PINDEX}{PINDEX0}) + mps_h \cdot Y_h$

(30) $YD_h = Y_h - SAVHH_h - \overline{TDIR}_h \cdot Y_h$

Intermediate Demand:

(31) $INT_i = \sum_j a_{ij} XPTACT_j$

Appendix 2: Equations and Variables of the Nigeria Model (continued)

(32) $INT_7 = \sum_j a_{ij} XPTACT_j + (MARGXIT + MARGMIT + MARGDIT)/PC_7$

(33) $MARGXIT = \sum_i PE_i \cdot margx_i/(1 + margx_i) \cdot E_i$

(34) $MARGMIT = \sum_i PM_i \cdot margm_i \cdot M_i$

(35) $MARGDIT = \sum_i PPD_i \cdot margd_i \cdot XPD_i$

Household Consumption:

(36) $PC_i \cdot CD_{ih} = cles_{ih} \cdot YD_h$

(37) $CD_i = \sum_h CDHH_{i,h}$

Government:

(38) $GD_i = \beta_i^G \cdot \overline{GDTOT}$

(39) $GR = TARIFF + DUTY + PRODTX + DSALETX + ISALETX + DIRTX$

(40) $TARIFF = \sum_i \overline{TMR_i} \cdot \overline{PWM_i} \cdot M_i \cdot ER$

(41) $DUTY = \sum_i (\overline{TE_i}/(1 + \overline{TE_i})) \cdot PWE_i \cdot ER \cdot E_i \cdot (1 - \overline{SMUG_i})$

(42) $PRODTX = \sum_j tprod_j \cdot PPTACT_j \cdot XPTACT_j$

(43) $DSALETX = \sum_i dtax_i \cdot PPD_i \cdot XPD_i$

(44) $MSALETX = \sum_i itax_i \cdot PM_i \cdot M_i$

(45) $DIRTX = \sum_h tdir_h \cdot Y_h + tdir_{firms} \cdot Y_{firms}$

(46) $GOVSAV = GR - \sum_i PC_i \cdot GD_i$

Investment:

(47) $ID_i = \sum_j imat_{ij} \cdot DK_j$

Appendix 2: Equations and Variables of the Nigeria Model (continued)

(48) $PK_j \cdot DK_j = KIO_j \cdot (SAVINGS - RURHHSAV - TOTDSTK - VGOVIVT + RKIO_j \cdot RURHHSAV)$

(49) $TOTDSTK = \sum_i PC_i \cdot DSTK_i$

(50) $SAVINGS = TOTHHSAV + GOVSAV + ENTFSAV + \overline{FSAV} \cdot ER$

(51) $TOTHHSAV = \sum_h SAVHH_h$

(52) $Y_{firms} = \sum_{kc} shr_{kc,firms} \cdot RETK_{kc}$

(53) $ENTFSAV_{firms} = sO_{firms} \cdot (\frac{PINDEX}{PINDEX0}) + mps_{firms} \cdot Y_{firms}$

(54) $DIVIDEND = Y_{firms} \cdot (1 - tdir_{firms}) - ENTFSAV$

(55) $DEPRECIA = \sum_j DEPR_j \cdot PK_j \cdot K_j$

(56) $DKTOT = \sum_j DK_j$

National Income:

(57) $YGDP = \sum_j PVA_j \cdot XPTACT_j + PRODTX + TARIFF + DUTY + DSALETX + ISALETX - DEPRECIA$

Model Closure:

(58) $\sum_i PWM_i \cdot M_i = \sum_i PWE_i \cdot E_i + \overline{FSAV}$

(59) $XT_i = INT_i + CD_i + GD_i + ID_i + GID_i + DST_i$

Dynamic Equations:

(60) $LSO_{lc,t+1} = LSO_{lc,t} \cdot (1 + lsgr_lc)$

(61) $\bar{K}_{l,t+1} = \bar{K}_{l,t} \cdot (1 - depr_l) + DK_l$

Appendix 2: Equations and Variables of the Nigeria Model (continued)

Endogenous Variables

ACTSAL	Wage bill by activity j
CD	Total consumer demand of good i
CDHH	Consumer demand for good i by household h
DEPRECIA	Total value of depreciation
DIRTX	Direct tax
DIVIDEND	Dividends from formal enterprises
DK	Real investment by activity
DKTOT	Total real investment
DSALETX	Sales tax on domestic goods
DUTY	Export duties
E	Exports
ENTFSAV	Formal enterprise savings
GD	Government consumption of good i
GOVSAV	Government savings
GR	Government revenue
ID	Private investment demand for good i
INT	Intermediate use of good i
L	Labor use (demand) in activity j
LCSAL	Total wage bill for labor of type lc
LS	Labor supply
M	Imports
MARGDIT	Total marketing margin on domestic goods
MARGMIT	Total marketing margin on imports
MARGXIT	Total marketing margin on exports
MSALETX	Sales tax on imported goods
PC	User price of good i
PE	Domestic price of exported goods
PINDEX	National consumer price index
PK	Price of capital goods in activity j
PM	Domestic price of imported goods
PPD	Price of domestically produced goods
PPT	Price of output of good i
PPTACT	Price output of activity j
PRODTX	Revenue from producer taxes
PVA	Price of value added of activity j
R	Return on capital by activity
RENT	Rent from import quotas
RETK	Total returns to capital of type kc
SAVHH	Savings by household h
SAVINGS	Total value of savings
SMUGREV	Income from smuggling of exports
TARIFF	Tariff revenue
TOTDSTK	Total change in stocks
TOTHHSAV	Total household savings
WA	Average wage rate
XPD	Domestic sales of production of commodity i
XPT	Domestic output of commodity i
XPTACT	Output of activity j
XT	Supply of commodity i
Y	Household income
YFIRMS	Formal enterprise income
YGDP	Definition of GDP

Appendix 2: Equations and Variables of the Nigeria Model (continued)

Exogenous Variables

E ("Petroleum")	Exports of petroleum
ER	Exchange rate (Naira/dollar)
FSAV	Foreign savings
DSTK	Change in stocks of commodity i
GDTOT	Total government consumption
K	Capital stock in activity j
PREM	Premium on foreign exchange for imports
PWM	World import price in dollars
PWE	World export price in dollars
SMUG	Share of commodity i exports smuggled
TE	Export tariff rate
TMR	Import tariff rate

Activities (9): grain, export crops, nontraded crops, livestock, food processing, other industry, private services, public services, petroleum

Commodities (10): output from each of the nine domestic activities, non-competitive imports

Labor types: rural, informal urban, formal urban

Capital and land types: land — North, land — Middle belt, land — South, informal capital, formal capital

Households: urban poor, urban nonpoor, rural poor — North, rural poor — Middle belt, rural poor — South, rural non-poor

Institutions: firms, government, rest of world

Appendix Table 10 — Trade Levels and Parameters, Nigeria 1987

	Production	Imports	Exports	Elasticity of Substitution
	(millions Naira)			
1. Grains	5,087	300	0	2.0
2. Export crops	2,774	0	1,588	0.4
3. Nontradable food	32,436	354	1,186	0.4
4. Livestock	6,217	16	182	2.0
5. Food processing	5,596	590	1,019	0.9
6. Other industry	15,627	2,988	387	0.9
7. Private services	42,056	70,645	1,653	0.4
8. Public administration	5,314	672	331	0.4
9. Petroleum	30,661	565	23,667	2.0
10. Non-competitive imports	0	3,906	0	—
Total	145,768	16,457	30,013	—

Source: Nigeria CGE Model.

Appendix Table 11 — Simulations with Alternative Labor Market Closure

	Simulation 1a	Simulation 3a	Simulation 5a
	(percentage change)[a]		
Real GDP	-1.2	-5.9	-0.9
Consumption / GDP	-0.5	-1.9	-0.1
Investment / GDP	-0.7	-4.1	0.5
Government consumption / GDP	0.0	0.0	-1.3
Government revenue / GDP	-9.2	2.2	0.0
Exports / GDP[b]	-0.5	-0.7	0.0
Imports / GDP[b]	-0.5	-0.7	0.0
Foreign savings / GDP[b]	0.0	0.0	0.0
Rents / GDP	10.0	0.0	0.0
Relative prices			
Real exchange rate	-65.8	46.0	-0.1
Exchange rate premium (level, percent)	300.0	0.0	0.0
Real wage payments			
Rural labor	-9.3	-1.5	0.0
Urban informal labor	-17.1	-10.7	0.3
Urban formal labor	-26.4	1.1	-1.8
Real incomes			
Urban poor	-14.3	-7.9	0.2
Urban non-poor	10.1	-3.7	-0.3
Rural north poor	-8.0	-1.0	0.0
Rural middle poor	-5.2	-1.2	-0.1
Rural south poor	-7.5	0.8	0.0
Rural non-poor	-9.6	-1.6	0.1
All Nigeria	-1.3	-2.7	-0.1

Notes: All simulations with fixed labor supply in urban formal, urban informal, and rural labor markets; simulation 1a — reversal of exchange rate reforms, smuggling equals 20 percent of tree crop exports; simulation 3a — 20 percent decline in world oil price; simulation 5a — 20 percent reduction in government recurrent expenditures. [a] Percentage change from base simulation.
[b] Exports and imports valued at base simulation (1987) exchange rate.

Source: Model simulations.

Appendix Table 12 — Income Decomposition: Simulation 1a — Reversal of Exchange Rate Reforms

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	All Nigeria
	(percentage change in real household income)						
Rural labor	0.000	0.000	-7.385	-6.245	-6.814	-4.001	-2.558
Informal urban labor	-14.173	-4.782	0.000	0.000	0.000	0.000	-3.097
Formal urban labor	0.000	-5.269	0.000	0.000	0.000	0.000	-2.203
Land — North	-0.121	-0.045	-0.467	0.000	0.000	-0.377	-0.187
Land — Middle	-0.015	-0.006	0.000	-0.126	0.000	-0.052	-0.024
Land — South	-0.435	-0.161	0.000	0.000	-1.847	-1.354	-0.673
Informal capital	-0.743	-1.774	-0.914	-0.775	-0.844	-2.969	-1.915
Dividends	0.000	-5.544	0.000	0.000	0.000	0.000	-2.317
Rents	0.000	27.997	0.000	0.000	0.000	0.000	11.703
Transfers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	-15.486	10.416	-8.766	-7.147	-9.504	-8.752	-1.272
Consumer price effect	1.189	-0.336	0.770	1.991	1.987	-0.851	0.000
Total	-14.298	10.080	-7.996	-5.155	-7.517	-9.604	-1.272

Note: Reversal of exchange rate reforms; smuggling equals 20 percent of tree crop exports; fixed labor supply in urban formal, urban informal, and rural labor markets.

Source: Model simulations.

Appendix Table 13 — Income Decomposition: Simulation 5

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	All Nigeria
	(percentage change in real household income)						
Rural labor	0.000	0.000	-8.029	-6.789	-7.407	-4.350	-2.781
Informal urban labor	-6.798	-2.294	0.000	0.000	0.000	0.000	-1.486
Formal urban labor	0.000	-3.051	0.000	0.000	0.000	0.000	-1.275
Land — North	-0.129	-0.048	-0.498	0.000	0.000	-0.402	-0.200
Land — Middle	-0.054	-0.020	0.000	-0.439	0.000	-0.180	-0.083
Land — South	0.064	0.024	0.000	0.000	0.271	0.199	0.099
Informal capital	-1.212	-2.895	-1.491	-1.265	-1.377	-4.844	-3.125
Dividends	0.000	-3.187	0.000	0.000	0.000	0.000	-1.332
Rents	0.000	16.443	0.000	0.000	0.000	0.000	6.874
Transfers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	-8.129	4.971	-10.018	-8.493	-8.513	-9.577	-3.310
Consumer price effect	1.948	-0.211	1.120	0.976	1.438	-0.993	0.000
Total	-6.181	4.760	-8.898	-7.517	-7.075	-10.570	-3.310

Note: 20 percent decline in world oil price; elastic labor supply in urban informal sector. Simulation 4 with no depreciation of official real exchange rate.

Source: Model simulations.

Appendix Table 14 — Income Decomposition: Simulation 6

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	All Nigeria
	(percentage change in real household income)						
Rural labor	0.000	0.000	-1.200	-1.014	-1.107	-0.650	-0.416
Informal urban labor	-8.898	-3.002	0.000	0.000	0.000	0.000	-1.945
Formal urban labor	0.000	0.219	0.000	0.000	0.000	0.000	0.091
Land — North	0.039	0.014	0.151	0.000	0.000	0.122	0.061
Land — Middle	0.013	0.005	0.000	0.104	0.000	0.043	0.020
Land — South	0.464	0.172	0.000	0.000	1.973	1.446	0.719
Informal capital	-0.523	-1.250	-0.644	-0.546	-0.594	-2.091	-1.349
Dividends	0.000	0.249	0.000	0.000	0.000	0.000	0.104
Rents	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transfers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	-8.905	-3.594	-1.692	-1.457	0.272	-1.131	-2.715
Consumer price effect	0.965	-0.085	0.719	0.278	0.485	-0.501	0.000
Total	-7.940	-3.678	-0.974	-1.179	0.757	-1.631	-2.715

Note: 20 percent decline in world oil price; fixed labor supply.

Source: Model simulations.

Appendix Table 15 — Income Decomposition: Simulation 8

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	All Nigeria
	(percentage change in real household income)						
Rural labor	0.000	0.000	0.006	0.005	0.006	0.003	0.002
Informal urban labor	0.225	0.076	0.000	0.000	0.000	0.000	0.049
Formal urban labor	0.000	-0.364	0.000	0.000	0.000	0.000	-0.152
Land — North	-0.005	-0.002	-0.020	0.000	0.000	-0.016	-0.008
Land — Middle	-0.004	-0.002	0.000	-0.035	0.000	-0.015	-0.007
Land — South	-0.006	-0.002	0.000	0.000	-0.025	-0.018	-0.009
Informal capital	0.017	0.040	0.021	0.017	0.019	0.067	0.043
Dividends	0.000	-0.011	0.000	0.000	0.000	0.000	-0.005
Rents	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transfers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	0.227	-0.264	0.007	-0.013	0.000	0.022	-0.086
Consumer price effect	-0.047	0.005	-0.043	-0.074	-0.042	0.036	0.000
Total	0.179	-0.260	-0.036	-0.087	-0.042	0.057	-0.086

Note: 20 percent reduction in government recurrent expenditures; fixed labor supply in urban informal sector.

Source: Model simulations.

Appendix Table 16 — Income Decomposition: Simulation 10

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	All Nigeria
	(percentage change in real household income)						
Rural labor	0.000	0.000	-7.968	-6.737	-7.351	-4.317	-2.760
Informal urban labor	-6.688	-2.257	0.000	0.000	0.000	0.000	-1.462
Formal urban labor	0.000	-3.434	0.000	0.000	0.000	0.000	-1.435
Land — North	-0.134	-0.050	-0.517	0.000	0.000	-0.417	-0.207
Land — Middle	-0.058	-0.021	0.000	-0.473	0.000	-0.194	-0.089
Land — South	0.060	0.022	0.000	0.000	0.257	0.188	0.094
Informal capital	-1.190	-2.844	-1.465	-1.243	-1.352	-4.758	-3.069
Dividends	0.000	-3.185	0.000	0.000	0.000	0.000	-1.331
Rents	0.000	16.388	0.000	0.000	0.000	0.000	6.850
Transfers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	-8.009	4.621	-9.949	-8.453	-8.447	-9.497	-3.410
Consumer price effect	1.912	-0.204	1.085	0.900	1.394	-0.965	0.000
Total	-6.097	4.417	-8.864	-7.552	-7.053	-10.462	-3.410

Note: 20 percent decline in world oil prices; 20 percent reduction in government recurrent expenditures; elastic labor supply in urban informal sector; no depreciation of official exchange rate.

Source: Model simulations.

Appendix Table 17 — Income Decomposition: Simulation 11

	Urban Poor	Urban Non-poor	Rural North Poor	Rural Middle Poor	Rural South Poor	Rural Non-poor	All Nigeria
	(percentage change in real household income)						
Rural labor	0.000	0.000	0.767	0.649	0.708	0.416	0.266
Informal urban labor	-2.353	-0.794	0.000	0.000	0.000	0.000	-0.514
Formal urban labor	0.000	-7.821	0.000	0.000	0.000	0.000	-3.269
Land — North	0.025	0.009	0.098	0.000	0.000	0.079	0.039
Land — Middle	-0.019	-0.007	0.000	-0.155	0.000	-0.064	-0.029
Land — South	0.459	0.170	0.000	0.000	1.949	1.429	0.710
Informal capital	-0.129	-0.308	-0.158	-0.134	-0.146	-0.515	-0.332
Dividends	0.000	0.349	0.000	0.000	0.000	0.000	0.146
Rents	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transfers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	-2.016	-8.401	0.707	0.359	2.511	1.345	-2.984
Consumer price effect	0.729	0.014	0.473	-0.438	-0.124	-0.271	0.000
Total	-1.287	-8.387	1.180	-0.079	2.387	1.074	-2.984

Note: 20 percent decline in world oil prices; 20 percent reduction in government recurrent expenditures; fixed labor supply in the urban informal sector.

Source: Model simulations.

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