THE WEST AFRICAN ECONOMIC AND MONETARY UNION AND THE AFRICAN GROWTH AND OPPORTUNITY ACT: A COMPUTABLE GENERAL EQUILIBRIUM APPROACH

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CHAPTER 1

INTRODUCTION

Problem Statement

The West African Economic and Monetary Union (WAEMU)[1] was created in January 1994 in the aftermath of the "Communauté Financière Africaine" (CFA)[2] devaluation. The decline in the terms of trade and the loss of external competitiveness during the late 1980s in the CFA Franc zone countries changed the member countries' saving position from a positive saving equivalent of 3.1 percent of GDP in 1986 to dissaving of 4.7 percent of GDP by 1989 (see Hadjimichael et al., 1995). The devaluation of the CFA Franc was the result of the internal and external imbalances that led to the economic crisis and the creation of the WAEMU. The union's goals were to create a common market with free movement of goods, services, capital, and labor, as well as the convergence of fiscal policies, harmonization of tax legislation, and a common investment policy.

The economies of the WAEMU countries are small, and highly dependent on the export of a limited number of primary commodities. Agriculture is the dominant activity, employing a large share of the population. The manufacturing sector is relatively small and underdeveloped (see Table 1.1). Most of the WAEMU countries experienced some negative economic growth in the early 1990s, and some before, like Niger and Togo.

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[1] The WAEMU consists of the following countries: Benin, Burkina Faso, Guinea-Bissau, Ivory Coast, Mali, Niger, Senegal, and Togo (see Figure 1.1).

[2] The CFA currency was issued in 13 West African and East African French colonies in 1948. It has been pegged to the French Franc (FF) at a fixed rate of 50 CFA to 1FF until it was devaluated to 100 CFA to 1 FF in January 1994. It was guaranteed by the French Treasury. It was convertible. Since January 1, 2002, the CFA was pegged to the EURO at a fixed rate of 1 EURO to 655.957 CFA.

FIGURE 1.1
SUB-SAHARAN AFRICA MAP

The illustration of the map in this figure is an artistic representation of the countries of sub-Saharan Africa. It is not drawn to scale, nor is it intended to depict political or geographical boundaries.

TABLE 1.1

YEAR 2000 GDP BY ORIGINS (%)

Country	Agriculture Sector	Industry Sector	Services Sector
Benin	33.9	13.9	52.2
Burkina Faso	37.0	20.8	42.2
Guinea-Bissau	54.4	14.5	31.1
Ivory Cost	32.1	29.4	38.5
Mali	46.1	20.9	33.0
Niger	41.6	17.1	41.3
Senegal	17.6	20.4	62.0
Togo	41.8	20.8	37.4
WAEMU average	38.1	19.7	42.2

Source: U.S. Department of Commerce

Benin seemed to have been unaffected. The Ivory Coast, which experienced negative growth since 1987 was the most affected country.

Since the January 1994 CFA franc devaluation, the WAEMU countries have achieved some improved macroeconomic performance as the result of post devaluation economic reform. The average real GDP in the WAEMU grew by 4.9 percent in 1997, 3.5 percent in 1998, 4.3 percent in 1999, 3.1 percent in 2000, and 4.4 percent in 2001 (see Table 1.2).

The export structure of the WAEMU members is heavily oriented toward primary products such as cocoa, coffee, crude oil, peanuts, and phosphates, predominantly sold to developed countries. The low level of intra-regional trade is explained in large part by the limited internal market for the kind of tradable goods in which the countries of the zone have tended to specialize and the poor transportation and communication links between the WAEMU countries. Most sub-Sahara Africa countries and particularly the WAEMU region are relatively less open to trade and face the challenge of relatively low investment shares.

TABLE 1.2
ANNUAL REAL GDP GROWTH IN THE WAEMU
(%)

	1990-1994	1995	1996	1997	1998	1999	2000	2001
Benin	4.4	4.6	5.5	5.7	4.5	5.0	5.8	5.5
Burkina Faso				5.5	5.6	5.8	2.2	6.2
Guinea Bissau				6.6	-2.8	7.6	7.5	7.8
Ivory Coast				5.6	5.8	1.6	-2.3	-0.9
Mali	0.0	6.4	4.0	6.7	5.5	6.7	4.6	-1.2
Niger				3.7	6.7	-0.6	3.0	3.7
Senegal				5.0	5.7	5.1	5.6	5.7
Togo				4.3	-2.2	2.9	-1.9	2.8
Average WAEMU				**4.9**	**3.5**	**4.3**	**3.1**	**4.4**

Source: WAEMU Commission - Central Bank (BCEAO)

To encourage the sub-Sahara Africa region to continue its efforts to open its economies and build free markets and promote private investment, the African Growth and Opportunity Act (AGOA) was enacted by the United States Congress and signed into law by President William Clinton in May 2000, effective January 1, 2001. The goal is to help the sub-Saharan Africa (SSA) countries, hence the WAEMU undertake economic reforms to reverse the declining economic trend. The act stressed the mutual interests of the United States and the SSA countries. Based on the International Trade Commission (ITC) report, the openness of the United States market to the SSA products will not affect the United States economy negatively while it will have positive impacts on the SSA exports, mainly in the manufacturing sectors. Consequently, the AGOA will help build

the WAEMU economy and strengthen its competitiveness and enhance effectiveness of the United States foreign policy.

Objective of the Study

The purpose of this study is to develop a Computable General Model (CGE) model for the WAEMU economy to determine the economic impacts of the new trade and investment policy provided by the AGOA.

Method and Procedure

The WAEMU CGE model follows the CGE model for developing countries built by Dervis, de Melo, and Robinson (1982): a static one-period general equilibrium component and a dynamic multi-period general equilibrium component which updates the static model over time through a set of inter-temporal linkages. The model represents a set of non-linear equations that describe the optimization behavior of the agents (consumers and producers), the market clearing mechanisms, and the budget constraints. The model is based on the aggregation of the 1996 Social Accounting Matrix (SAM) for 6 of the 8 countries that composed the WAEMU economy (Benin, Burkina Faso, Ivory Coast, Mali, Senegal, and Togo)[3]. The model is divided into the following accounts: Activities; Commodities; Factors of production (Labor and Capital); Institutions (Households, Firms and Government); Capital account (accumulation) adjusted for changes in stock; and the rest of the world. The model is aggregated into 18 sectors:

[3] Data on Niger are not available; Guinea-Bissau was admitted into the union on May 18, 1997.

- 4 agriculture sectors:

  food crops;

  cash crops;

  livestock;

  and forestry, hunting and fishery;

- 6 industry sectors:

  mining and petroleum;

  food processing;

  textile, leather, footwear and wearing apparel;

  chemicals and related products;

  basic metal industries;

  and other industries;

- 8 service sectors:

  electricity, gas and water supply;

  construction;

  transportation, storage and communication;

  finance, banking and insurance;

  real estate and service to firms;

  hotel, restaurant and commerce;

  private service;

  and public service.

Each sector is assumed to produce a single composite commodity using labor, capital and intermediate inputs. Under the Leontief production function, intermediate

goods are used in fixed proportions and labor and capital are used according to a nested two-level Cobb-Douglas (CD)/ Constant Elasticity of Substitution (CES) production function.

Households maximize a CD utility function and the firms are maximizing a CD profit function, all subject to a budget constraint. The government uses its revenues to purchase goods and services and finance consumption and investment. Private and public savings add to the exogenous foreign savings to determine the total savings for the WAEMU economy. The total savings, in turn, are set equal to the total private and public investment.

On the import side, the model uses the familiar Armington hypothesis (Armington 1969), which assumes goods are differentiated according to country origin. The functional form the model takes is CES. However, this specification of imports contrasts sharply with the classical theory of international trade, which assumes that domestic goods and imports are perfect substitutes, that is, the domestic price of traded goods is entirely determined by world prices, implying high elasticity of substitution between domestic goods and imports. The result from this specification is that a change in the domestic good price relative to the price of imports will not necessarily produce strong substitution effects. Following the small country assumption, the world prices of imports are fixed and the supply of imports to the WAEMU is perfectly elastic at these prices. In other words, the domestic prices of imports are expressed in terms of their world prices, exchange rate and tariff, which WAEMU cannot affect.

On the export side, the model departs from the small country assumption of a fixed exchange rate and a rigid link between domestic tradable goods prices and import

goods prices. It assumes instead that sectoral exports and goods produced for domestic consumption are imperfect substitutes.

For a general equilibrium solution all excess demands must be zero, which implies aggregate supply (domestic production and imports) equals aggregate demand (households, firms, government, and foreign investment). Following Walras's law, *n-1* sectors excess demand need be zero, where n is the total number of sectors. Also, since the system is homogeneous of degree zero in prices, only relative prices can be determined.

The model uses the aggregate Social Accounting Matrix (SAM) 1996 for the WAEMU countries. The SAM is used to define the CGE model. The dynamic CGE model updates to the year 2000 all exogenous variables entering the static model. Some variables are updated by single time trends, such as factor productivity, consumption shares, world import, and export prices. Other variables are updated by policy choices, that is the policy instruments, such as tariff rates, quotas, government expenditures, and foreign capital. Finally, some variables are updated by behavioral equations like the variables endogenously determined in the model.

After the calibration of the model, simulations are run analyzing the impacts of the new trade and investment policy on the WAEMU economic growth over the 8 years implementation of the AGOA.

The model incorporates a monetary sector to simulate the impact of the policy change in trade and investment policy. The inclusion of the monetary sector in the CGE model determines the average price level. The monetary sector is connected to the real sector through the balance of payments. The base SAM is used to calibrate the model

parameters on the basis of the reference year. The model is solved using the GAUSS program.

The Data

In applications of CGE models to developing countries, the main limitation remains the availability of satisfactory data for calculating the relevant parameters. This study uses the SAM constructed in 1996 for the WAEMU countries by the WAEMU commission to conduct a study involving the application of the Common External Tariff in the union, which entered into force in January 1998, but became operative only on January 1, 2000. Data about the AGOA are obtained from the U.S. Department of Commerce.

Other data sources include the WAEMU commission, The United States Department of State (Bureau of African Affairs), the Statistical Year book from the United Nations, and the International Financial Statistics Year book from the International Monetary Fund.

Outline of the Study

The study is organized into six chapters. Chapter 1 introduces the study. Chapter 2 presents the WAEMU economic performance. Chapter 3 introduces the AGOA and its implications for the WAEMU region. Chapter 4 addresses the model structure by presenting the Input-Output model and the SAM structure for the WAEMU. Chapter 5 conducts policy analysis by calibrating the model and reporting results from simulations.

And finally, Chapter 6 concludes the study, summarizes the results and their policy implications. It also presents the strengths and weaknesses of the study.

CHAPTER 2

THE WAEMU AND ECONOMIC PERFORMANCE

In the 1960s[4], SSA countries growth potential ranked ahead of the East Asian countries. Over the 1965-1990 period, however, real per capita GDP on average did not grow in the SSA, while the per capita GDP grew over 5 percent per year in East Asia and the Pacific.

Many studies have shown that poor economic performance in the SSA countries, hence in the WAEMU countries is associated with high population growth, low schooling, political instability, ethnic divisions, low degree of openness to trade, poor financial intermediary development, poor policy choices, low foreign direct investment, high government deficit, and lack of infrastructure.

GDP Growth in the WAEMU

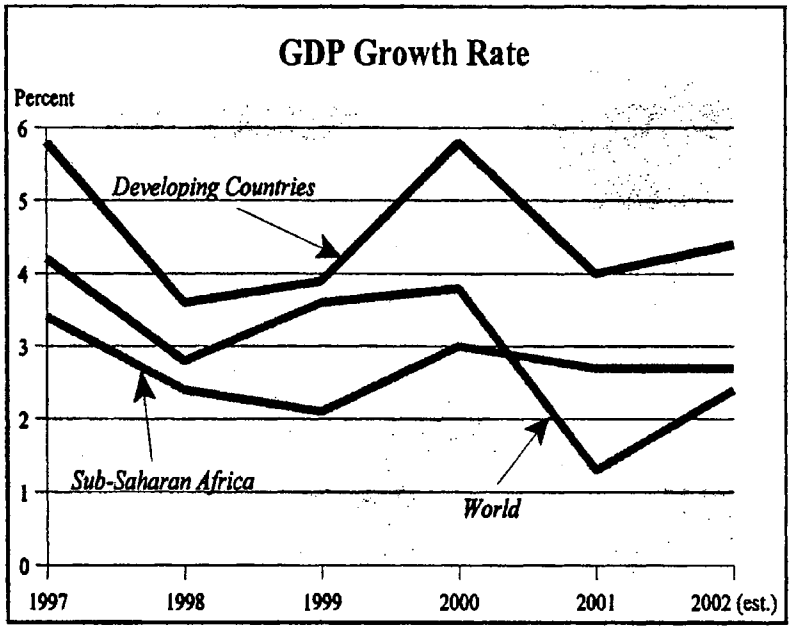
The GDP growth rate in most of the WAEMU improved despite the recent armed conflict in Guinea-Bissau (1998-1999) and political instability in Ivory Coast, poor governance, adverse movements of commodity prices (decline in the terms of trade), and the ravage of the HIV/AIDS pandemic. The average real GDP growth in the WAEMU over the past 5 years is about 3.5 percent per annum.

According to the World Bank and the International Monetary Fund (IMF), SSA experienced 2.7 percent growth in 2001 down from 3.0 percent in 2000, while the developing countries growth fell to 4.0 percent in 2001 from 5.8 percent in 2000 and the

[4] Most African countries particularly the Sub-Sahara African countries gained their independence in the early 1960s.

world growth fell to 1.3 percent in 2001 from 3.8 percent in 2000. The year 2001 marked the first year in the last five years that SSA recorded faster growth than the world as shown in Figure 2.1.

FIGURE 2.1



Source: *IMF and World Bank data*

Macroeconomic policies based on fiscal and monetary policies convergence criteria within the WAEMU (harmonization of the tax legislation, common investment policy and price stability) have promoted a stable financial environment by maintaining a relatively low inflation rate (see table 2.1). Exogenous changes in the WAEMU countries terms of trade resulting in the decline in the primary commodity prices continue to have an impact on GDP growth. Volatile oil prices create both positive and negative economic shocks. A crude oil price hike for example will have a negative effect on the GDP, whereas a decrease in the crude oil price will increase the GDP level.

Population Growth and Economic Growth

Block (2000) modeled population growth as a function of initial income, initial life expectancy at birth, initial total years of schooling, and the ratio of total labor force to total input. The results showed that there is a negative association between population growth and initial life expectancy at birth and the working age share of the population. Hoeffler (2002) used empirical growth models to examine Africa's economic and population growth. The results indicated that on average, SSA countries had higher population growth (2.78 percent) compared to that of the developed countries (0.77 percent) and the developing countries (2.55 percent), and much lower initial total years schooling (1.27) than the average country (3.47). Barro (1997, p.19) observed "On impact, an extra year of male upper-level schooling is therefore estimated to raise the growth rate by a substantial 1.2 percentage points per year." Hence, these differences in economic indicators between the SSA and the developed countries should account for the low economic performance observed in the SSA or the WAEMU countries. The high average population growth rate of 2.81 percent per annum within the WAEMU countries makes it difficult for per capita income to increase despite the improved post devaluation economic performance.

Table 2.1
Population – GDP – Inflation Within WAEMU

	Population (million)				Real GDP Growth(%)			CPI Inflation (an. Av. %)		
Country	1988	1999	2000	Av.%	1988	1999	2000	1988	1999	2000
Benin	5.97	6.10	6.30	2.97	4.5	5.0	5.8	5.8	0.3	3.5
Burkina F.	10.07	11.60	12.60	2.22	5.6	5.8	2.2	5.2	-1.1	0.3
Guinea B.	1.17	1.21	1.25	2.23	-2.8	7.6	7.5	7.6	-2.1	9.1
Ivory Coast	14.30	14.50	14.80	3.8	5.8	1.6	-2.3	5.4	0.8	2.4
Mali	9.79	10.00	10.20	2.2	5.5	6.7	4.6	4.0	-1.2	-0.7
Niger	10.10	10.40	10.70	3.4	6.7	-0.6	3.0	4.5	-2.3	2.9
Senegal	9.30	6.30	9.50	2.8	5.7	5.1	5.6	1.1	0.8	0.7
Togo	4.46	4.60	4.70	2.9	-2.2	2.9	-1.9	1.0	0.0	2.5
WAEMU	65.79	67.71	70.05	2.81	3.5	4.3	3.1	4.3	-0.6	2.6

Source: WAEMU Commission

Ethnic Division and Economic Growth

The results of empirical work by Easterly and Levine (1997) to understand the link between growth and public policies and the reason why countries choose different public policies indicated that high levels of ethnic diversity are strongly linked to low levels of education, insufficient infrastructure, underdeveloped financial systems and a high black market premium. Ethnically polarized societies are more likely to select poor social policies.

African countries have the most ethnically heterogeneous societies in the world and the Asia countries are the most ethnically homogeneous. According to Easterly and Levine, going from completely homogeneous to completely heterogeneous is associated with a fall in growth. All the WAEMU countries are ethnically fragmented[5]. Each WAEMU country accounts for more than forty ethnic groups. Ivory Coast and Mali are

5 The borders of the WAEMU countries were determined through colonization that split up ethnic groups between neighboring countries. This exacerbated a preexisting high level of ethnic and linguistic diversity.

the most fractionalized countries in the union: 68 ethnic groups for Ivory Coast and 78 for Mali. The multiplicity of these ethnic groups and the rapid growing populations have led to increasing conflicts in recent years between some dominant ethnic groups and the minority ones as was the case in Niger between the Husa, the major ethnic group, and the Tuareg, the nomadic group, and also as it was the case in Mali were the Tuareg traditionally have opposed the central government. The association of ethnic division with these measures of social fragmentation and conflict in the WAEMU affects negatively policies that influence economic growth. Also it is more difficult for policymakers to make optimal choices that maximize public goods. Consequently, some groups are discriminated against and sometimes are victims of violence.

Political Freedom and Economic Growth

Many studies have examined the impact of political freedom on economic performance. Early studies by Kormendi and Meguire (1985) and Scully (1988) found a positive link between political freedom and economic growth. Savvides (1995) empirically tested the hypothesis that political freedom impacts positively economic growth across Africa. The results indicated that African countries that have experienced greater political freedom have faster economic growth than the other African countries. Building on Easterly and Levine's work according to which ethnic diversity leads to poor policy choices which in turn impacts economic growth, Bluedorn (2001) empirically examined democracy's positive role in ameliorating the problems associated with ethnic diversity. The results showed that democracy is beneficial for economic growth in ethnically diverse countries. In a cross-section study of countries between the period

1960 and 1990, Rivera- Baltiz (2002) constructed an empirical model to determine the connection between democracy, governance, and growth. According to the author, "democracies allow populations to peacefully and regularly oust inept, inefficient, and corrupt government administrations, while allowing people to keep more efficient, successful regimes, thus tending to make the quality of governance on average higher in the long run. Authoritarian regimes may randomly provide high- quality governance, but if they do not, they can be changed only by force, which may take years or decades longer than under democratic institutions." The results confirm that stronger democratic institutions are closely associated with greater quality of governance and that democracy is a key determinant of economic growth. In the 2003 Index of Economic Freedom reported in the November 12, 2002 *Wall Street Journal*, countries are classified in four categories: "free"; "mostly free"; "mostly unfree"; "repressed." Of the 156 countries ranked in the index, 15 are classified as "free" with Hong Kong in the first place and the United States in the eighth, 56 as "mostly free," 74 as "mostly unfree," and 11 as "repressed." In the article commenting the index, Mary O'Grady wrote: "Economically free countries tend to have higher per capita income than less free countries. For instance, while Hong Kong's GDP per capita in 2000 was $24,218, Iran's was $1649. "Free" countries in 2000 had an average per capita income of $26,855, while "mostly free" countries had slightly less than half that. This demonstrates that while some liberalization brings rewards- "mostly unfree" economies averaged only $3,229 in per capita income- The gains from full liberalization are far more impressive." Hence, if economic freedom leads to prosperity and political freedom leads to economic growth, then, political freedom means economic freedom. In the 2003 rankings, all the WAEMU

countries were classified as "mostly unfree." Out of the 156 countries classified, the WAEMU countries ranked as follows: Mali (75); Ivory Coast (82); Senegal (83); Burkina Faso (95); Benin (106); Niger (117); Togo (130); and Guinea- Bissau (142). The WAEMU country with the highest per capita income is the Ivory Coast with $660 in 2000 down from $727 in 1996. The one with the lowest per capita income is Guinea-Bissau with $173 in 2000. Also, the analysis from the article showed that the decline in the GDP growth rate in some of the WAEMU countries is mainly associated with political instability. The military conflict that took place in Guinea- Bissau from June 1998 to early 1999 disrupted economic activity. The GDP over all dropped by 28 percent in 1998. The economic downturn in Togo is associated with the country's political problems since the introduction of political pluralism in 1991. In Ivory Coast, growth has been negative since 2000 mainly because of the post 1999 coup-d'Etat. Political instability coupled with ethnic division has worsened since 2002 and continued severely to impede economic growth. GDP is estimated to fall by more than 25 percent in 2002.

Financial Development and Economic Growth

Levine (1997), Levine, Loayza, and Beck (2000) conducted a cross-country study to evaluate the impact of the financial system on economic growth. The results indicated that "legal and accounting reforms that strengthen creditor rights, contract enforcement, and accounting practices can boost financial development and accelerate economic growth." Using base- growth equations, Benhabib and Spiegel (2000) examined the role of financial development in growth and investment. The results suggested a positive correlation between financial development and economic growth. Savvides (1995) also

showed that the size of the financial sector contributes significantly to economic growth and concluded that "an increase in the quasiliquid liabilities/GDP ratio by 10 percent raises the annual per capita GDP growth rate by 1.8 percent."

Recent developments in the WAEMU countries are: the establishment of a common accounting system and the legal and regulatory framework for a regional banking system; the establishment by the WAEMU central bank (BCEAO) of a regional stock market (BRVM) that helped to reinforce monetary policy and the financial integration within the union. However, more changes are needed to appreciate the impact of the financial system on WAEMU economic growth.

Trade, Investment, and Economic Growth

Numerous studies have attempted to link trade openness to economic growth. Jones (1998) stated "growth in output and growth in the volume of international trade are closely related."

Empirical works by Grossman and Helpman (1991), Romer (1992), and Barro and Sala-I-Martin (1995), among others, provided arguments that openness to trade affects positively economic growth. Dollar and Kraay (2001) examined through regressions the effect of trade on poor countries. The results from the study indicated that globalization reduces poverty. Using annual data for the period 1970-1995, Athanasios Vamvakidis (1998) conducted an empirical study on the WAEMU countries. The results showed that "openness to international trade, competition in the domestic market, freedom of international capital transactions, and low dependency ratios are positively correlated with investment in the WAEMU region."

Hosoe Nobuhiro (2001) developed a computable general equilibrium (CGE) model for Jordan's trade liberalization. The results were that trade improved Jordan's welfare. Ramos Mabugu (2001) applied a short-run CGE model for Zimbabwe's economy to analyze the effect of tariff reform (dismantlement of foreign exchange) on the trade liberalization. The findings were that tariffs on intermediate goods affected negatively the traded sectors, and contributed to less industrialization.

Addy Samuel (2001) developed a CGE model for Ghana that focused on investment in infrastructure and equipment. The results indicated that foreign direct investment increased welfare. Also Savvides (1995) found that "a 1 percent increase in the average growth rate of the trade sector raises per capita real GDP growth by 0.10 percent."

SSA countries market share of the world trade is marginal, and the WAEMU countries share has declined steadily over time. SSA accounted for less than 1.5 percent of the world trade in 2000, less than 1 percent of the United States merchandises exports and less than 2 percent of the United States merchandises imports. SSA represented in 2000 3.5 percent of the total European Union (EU) exports and 4.3 percent of the total imports. Table 2.2 presents the SSA major trade partners. It indicates that the United States represents one of the most important trade partners of the SSA countries: The United States represented in 1999 and 2000 the second SSA imports partner and the first SSA exports partner.

Table 2.2
SSA Principal Industrial Country Trading Partners
($ Billions and Market Share)

	1999	% Share	2000	% Share
SSA Imports				
France	7.9	10.0	8.7	10.1
United States	5.7	72	5.9	6.8
Germany	5.9	7.4	5.6	6.5
United Kingdom	4.9	6.2	4.8	5.6
Japan	3.8	4.8	3.7	4.3
Italy	2.5	3.2	2.8	3.2
Total EU	30.0	38.1	30.5	35.2
SSA Exports				
United States	14.8	20.2	23.6	27.0
United Kingdom	5.3	7.2	6.3	7.2
France	5.2	7.2	5.5	6.3
Germany	4.6	6.3	5.1	5.9
Italy	4.4	6.0	4.5	5.1
Japan	3.5	4.8	4.4	5.0
Total EU	31.2	42.5	32.6	37.2

Source: Derived from IMF *Directions of Trade Yearbook, 2001*

WAEMU countries exports to the rest of the world remained highly concentrated on a small number of primary products while their imports were dominated by industrial products, as shown in Table 2.3. Consequently, with the deterioration of the terms of trade, all WAEMU countries, with exception of the Ivory Coast, had trade deficits with the rest of the world and the United States (see Table 2.4).

Table 2.3
WAEMU Main Trade Commodities

Country	Main Exports	Main Imports
Benin	Cotton	Food, capital goods, fuel
Burkina Faso	Cotton, gold	Capital goods, petroleum products, food
Guinea-Bissau	Cashew nuts, fish & shrimp	Food, petroleum products
Ivory Coast	Cocoa, coffee, petroleum, timber	Semi-finished products, capital goods, consumer goods, fuel
Mali	Cotton, gold, livestock	Machinery, petroleum
Niger	Uranium, livestock	Food, capital goods, petroleum
Senegal	Fish, phosphates, groundnuts	Food, capital goods, petroleum
Togo	Cotton, phosphates, coffee, cocoa	Food, capital goods, petroleum

Source: United States International Trade Commission

Table 2.4
2000 WAEMU Trade Figures (million dollars)

	ROW			U.S.		
Country	Export	Import	Trade Balance	Export	Import	Trade Balance
Benin	376	548	-172	2.3	26.3	-24
Burkina Faso	220	610	-390	2.5	15.7	-13.2
Guinea-Bissau	80	55.2	24.8	0.042	0.284	-0.24
Ivory Coast	3999	2446	1553	367	92	275
Mali	493	575	-83	9	30	-21
Niger	389	363	26	7	36	-29
Senegal	958.9	1338.1	-379.2	5	60	-75
Togo	335	451	-116	9	11	-2
WAEMU	6850.9	6386.3	464.6	397.34	290.35	106.99

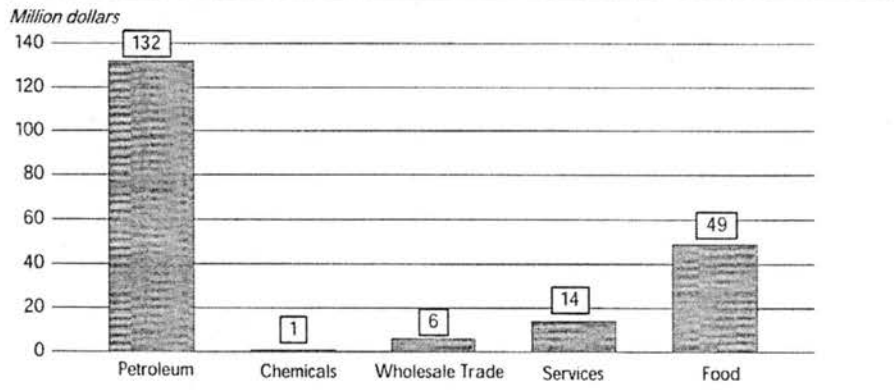
Source: United States International Trade Commission

SSA lagged behind the rest of the world in attracting foreign direct investment. About 3 percent of the world total investment goes to the SSA, and the majority of that is concentrated in the energy and mining sectors.

The United States direct investment in SSA and particularly in WAEMU accounts for less than 1 percent of the world's direct investment in 2000. The United States' investment in the WAEMU countries is mostly in the energy sector and accounts for 132 million dollars in 2001 (see Figure 2.2).

Figure 2.2

U.S. Investment by Sector in WAEMU in 2001



Source: United States Department of Commerce

Experience has shown that investors seek to invest in safe political and economic environments characterized by transparency, open regulatory regimes, and adequate infrastructure. Most WAEMU countries are still rebuilding from years of conflict (Guinea-Bissau) or still dealing with political instability (Ivory Coast). They are also dealing with inadequate transportation, and still have other problems, such as poor economic policies, corruption, weak human capital, dysfunctional legal and judicial institutions, less natural resources and small manufacture base. However, to encourage both domestic and foreign investment many WAEMU countries have established industrial free-trade zones, which provide investors with tax-free and duty-free entry

status. The key investment and privatization sectors for the WAEMU countries are presented in Table 2.5.

Table 2.5
Key Investment and Privatization Sectors

Country	Sector
Benin	Agriculture and forestry; minerals and mining; petroleum and energy-related products
Burkina Faso	Minerals and mining (gold); agriculture (cotton)
Guinea-Bissau	Agriculture (cashnews); petroleum and energy-related products; infrastructure development
Ivory Coast	Petroleum and energy-related products; agriculture and forestry (cotton, timber); agro-industry
Mali	Minerals and mining (gold); telecommunications services; agriculture (cotton, cereal)
Niger	Minerals and mining (gold); services (telecommunication); petroleum and energy-related products
Senegal	Fishing and fish-processing; minerals and mining (gold, copper); infrastructure development
Togo	Minerals and mining (phosphate); agriculture (cotton); infrastructure development

Source: United States International Trade Commission

Based on the preceding development, economic performance in the WAEMU zone has been poor over the past four decades. The annual real GDP growth of 3.5 percent on average has not been sufficient to spur a sustainable economic growth to face the growing population rate. Because education is positively associated with economic growth, the lack of higher education and the weak human capital in the WAEMU do not contribute positively to economic growth. The social fragmentation and conflicts lead to

poor policy choices, poor governance and political instability. The lack of financial development and investment associated with trade deficit as a result of the deterioration of the terms of trade explain the low level of increase in the GDP growth. According to Jones (1998), growth in output and growth in the volume of international trade are closely related. Also, according to Rodrik (1998), the fundamentals for long term economic growth are human resources, physical infrastructure, macroeconomic stability and the rule of law. Governments that undertake investments in these areas will be rewarded with increased rates of economic growth. The absence of these factors in the WAEMU economy explains the poor economic performance.

CHAPTER 3

THE AGOA AND IMPLICATIONS FOR WAEMU

As can be inferred from the discussion in the previous chapter, SSA lags behind in economic development. To integrate SSA into the world economy and to address the issue of the United States economic and trade relations with SSA, the AGOA was enacted into law on May 18, 2000 as Title 1 of the Trade and Development Act of 2000. The amendments to AGOA were signed into law on August 6, 2002 as Sec. 3108 of the Trade Act of 2002. The Act emphasizes the mutual interests of the United States and SSA. It can change the course of trade relations between the United States and the SSA. The AGOA can also encourage substantial new investments and creation of new jobs. The Act lists major areas of the United States assistance by types of policy activities and major participants and beneficiaries.

Historical Background to AGOA

The World Trade Organization (WTO) was established in January 1995 to provide a forum for multilateral trade negotiations and a framework for their implementation and to administer the trade policy review mechanisms and dispute settlement procedures. The dispute settlement procedures detail how a member can initiate a complaint against the trade practices of another member and how the dispute can be processed and resolved. Prior to the WTO, the General Agreement on Tariffs and Trade (GATT) first signed in October 1947 provided a forum where countries can negotiate reductions in their trade barriers. The principles underlying the GATT are that

of national treatment and nondiscrimination. The national treatment principle requires that domestically produced goods and foreign goods are treated the same. The nondiscrimination or Most-Favored-Nation (MFN) principle requires that the products imported from different trading partners be treated on the same basis. Under the MFN, any tariff reduction granted by country A on its imports from country B would unconditionally apply to the imports from any other country. The MFN standard was considered one of the effective means of eliminating discriminatory treatment in international trade between GATT members. By calling for equal treatment for all countries, the MFN remained a very popular means of trade liberalization until international action for multilateral tariff negotiations involving many nations were started.

In addition to the MFN, the developing countries are granted tariff preferences under the Generalized system of Preferences (GSP). The GSP program provides trade benefits to the least developed countries of the world, and particularly expands trade with the SSA, hence the WAEMU. The GSP is designed to encourage beneficiaries to eliminate or reduce significant barriers to trade in goods, services and investment, and to provide adequate and effective means for foreigners to secure, exercise and enforce exclusive intellectual property rights.

The GSP program was offered on a product-by-product basis or service by service basis depending on the granting country's decision and its economic structure. Products can be added or removed. In 1982, 143 developing countries and territories were eligible for GSP duty-free treatment. The United States granted at that time approximately 2800 tariff lines, largely manufactures and semi manufactures. However, certain import

sensitive articles, such as footwear, most textile articles, watches, some electronic products and certain glass and steel products were excluded from GSP duty-free treatment.

AGOA Program

The objective of the law is to expand trade and investment, promote free markets, economic reforms and growth in SSA, and enhance effectiveness of the United States foreign policy.

"The law provides for the United States assistance to SSA countries to achieve the following trade and investment objectives:

1- Strengthening and expanding the private sector in SSA;

2- Encouraging increased trade and investment between the United States and SSA;

3- Reducing barriers to trade;

4- Negotiating free trade areas;

5- Expanding the United States assistance to regional integration efforts in SSA;

6- Establishing a trade and investment partnership between the United States and the SSA;

7- Establishing the United States/ SSA Trade and Economic Cooperation Forum to facilitate regular ministerial-level trade and investment policy discussions; and

8- Promoting the use of technical assistance to strengthen economic reforms and development, including assistance to strengthen relationships between the United States firms and firms in the SSA."

The AGOA extended the existing GSP program (covering 4650 products) for beneficiary countries through September 30, 2008, seven years longer than in the rest of the world. The GSP expanded to AGOA eligible countries more than 1880 tariff line items in addition to the standard GSP list. The AGOA list includes items such as footwear, luggage, handbags, watches, textile, and flatware. As such, the AGOA provides to the WAEMU region a vast opportunity to trade and invest with the United States. AGOA provides for duty-free and quota-free access to the United States market without limits for apparel made in eligible SSA countries from the United States fabric, yarn, and thread. It also provides for substantial growth of duty-free and quota-free apparel imports made from fabric produced in beneficiary countries in SSA. SSA beneficiary countries are also exempted from competitive need limitations, which cap the GSP benefits available to beneficiaries in other regions.

To be eligible to AGOA, SSA countries have to fulfill requirements, such as:

1- establishing a market-based economy and the rule of law;

2- eliminating barriers to the United States trade and investment;

3- implementing economic policies to reduce poverty;

4- protecting internationally recognized worker rights;

5- implementing a system to combat corruption;

6- not engaging in activities that undermine the United States national security or foreign policy interests;

7- not engaging in gross violations of internationally recognized human rights;

8-not providing support for acts of international terrorism; and

9- implementing policies to reduce child labor.

As of January 2003, 38 SSA countries have been eligible for the trade benefits of AGOA. All the WAEMU countries are eligible for AGOA excepted for Burkina Faso and Togo. Burkina Faso did not receive AGOA beneficiary country designation largely because of concerns related to its foreign policy and its participation in the conflict over diamond trade, and Togo because of concerns related to economic reform, political pluralism and rule of law, corruption, poverty reduction, and human rights.

AGOA II

The Trade Act of 2002 signed by President George W. Bush on August 6, 2002, with immediate effect, modifies certain provisions of AGOA. AGOA II was written to amend the operation of AGOA I and to improve SSA countries utilization of the AGOA program. AGOA II clarifies and narrowly expands the trade opportunities for SSA countries under AGOA and encourages more investment in the region. For example, AGOA II doubles the applicable percentage cap for apparel made in Africa from regional yarn from 3 to 7 percent over eight years. It also doubles the annual quantitative limit on apparel articles assembled in the beneficiary countries from regional fabric. The major modifications and clarifications are summarized in Table 3.1.

Table 3.1
AGOA - Before and After

Category	AGOA I	AGOA II
Knit-to Shape	The term "fabric" interpreted by U.S. customs as excluding components that are "knit-to-shape" (i.e., components that take their shape in the knitting process, rather than being cut from a bolt of cloth).	Knit-to-shape apparel qualified for AGOA benefits.
Lesser Developed Countries	Duty-free treatment for apparel articles assembled in less developed countries in Sub-Saharan Africa, regardless of origin of fabric.	LDC apparel eligible for duty-free treatment regardless of origin of fabric and regardless of origin of yarn.
Botswana and Namibia	Not treated as less developed countries because per capita GNP in 1998 exceeded $1,500.	Specially designated as less developed countries.
Hybrid Cutting	Under the U.S. Customs interpretation, cutting of fabric must occur either in U.S. or AGOA countries, but not both.	Hybrid cutting (i.e., cutting that occurs both in U.S. and in AGOA countries) does not render fabric ineligible.
Volume cap on duty-free treatment for apparel made from fabric made in AGOA region or, for lesser developed beneficiary countries from fabric made anywhere.	Applicable percentages increase through October 1, 2007.	Applicable percentages doubled.

Source: United States International Trade Commission

Implications for the WAEMU

Under the expanded GSP, an additional 1835 items were proclaimed duty-free treatment on December 21, 2000. WAEMU agricultural exports, like those of all AGOA eligible countries remain subject to any United States' tariff rate quotas that apply to like

goods from all sources. Goods enter duty-free within the quota, but remain subject to any other quota duties for shipments above the applicable quantitative limit. Apparel articles and textile articles that are determined to be "hand-loomed, handmade or folklore items" are granted duty-free and quota-free treatment under separate AGOA provisions. As a result of these provisions, very few products of the WAEMU countries are not eligible for duty-free treatment. Apparel articles for exports must be assembled in the eligible countries from fabric wholly formed and cut in the United States from yarn originating either in the United States or in eligible countries, subject to an annual cap. However, the status permits lesser developed beneficiary countries (per capita GNP less than $1500) to obtain preferential treatment for apparel assembled in such countries regardless of the source of the fabric for four-year period, that is through September 30, 2004. All WAEMU countries benefit from this preferential treatment.

Under GSP program, 35 percent of the value-added of a product must be produced within a country to receive duty-free treatment in the United States. Under AGOA, countries of the WAEMU and other SSA unions are permitted to accumulate their value-added contributions on GSP imports making it easier for these countries to meet this requirement.

Another implication for the WAEMU countries is the establishment on April 24, 2002 of the Trade and Investment Framework Agreements (TIFA) negotiated between the WAEMU Commission and the United States Trade Representative (USTR). The objective of the council on trade and investment is to "adopt appropriate measures to encourage and facilitate trade in goods and services, and to secure favorable conditions for long-term investment, development, and diversification of trade among their

respective nationals and companies." The council will meet often to identify and work to remove any impediments to trade and investment and to coordinate its efforts in dealing with subjects of common interest.

The implementation of AGOA and AGOAII over the 8 year-period provides SSA beneficiary countries a range of opportunities and assistance as stipulated in the Act:

- Enhanced market access through GSP for developing countries for 4650 product groups and more than 1880 products for developing countries;
- Investment support;
- Support for regional integration;
- Support for American African business relations;
- United States efforts through the IMF, the World Bank to increase private sector investment and trade growth;
- Provide further market access by adding to the GSP list some products that are traditionally excluded due to import sensibility (textiles, clothing and some manufactured products);
- Pursue free trade agreement with strong performing and growth oriented SSA countries.

These measures will improve SSA market access for the United States products and services while at the same time increasing the competitiveness and efficiency of SSA economies. The changes will also help SSA governments to implement political reforms, such as improving transparency and governance, strengthening the rule of law and fighting corruption. Finally, the measures will encourage SSA countries to deregulate their economies and help to promote private sector development.

CHAPTER 4

MODEL STRUCTURE

The purpose of this study is to develop a CGE model to simulate policies that can help the WAEMU countries take advantage of the AGOA program. The CGE model is widely used to simulate alternative policies in both developing and developed countries. It is an analytical tool that has evolved from Input-Output (I-O) and Linear Programming (LP) models. In an LP model, a central authority is often assumed to be the sole maximizing economic agent. It introduces inequality constraints and the ability to deal systematically with these constraints. An I-O model depicts a snapshot summary of the circular flow in an economy. An I-O model ignores changes in prices. In contrast to LP and I-O models, a CGE model emphasizes markets and market clearing prices to which consumers and producers respond. Implicitly, consumers seek to maximize utility subject to their budget constraints, while producers maximize profits subject to available resource and the technology changes. While the LP and I-O models consist of a set of linear equations, the CGE model includes both linear and non-linear equations that describe the optimization behavior of consumers and producers, the market clearing mechanism, and budget constraints. Prices, wages and exchange rates are endogenous.

The CGE model developed in this study uses the Social Accounting Matrix (SAM) framework for the WAEMU economy. The SAM presents in one unified set of accounts a picture of the circular flow of the economy of this region. The columns in the SAM represent the expenditures from sector j to sector i while the rows represent the incomes received by sector i from sector j. The sum of the elements in column j is the

total expenditures by sector j and the sum of the elements in row i is the total income received by sector i. For the system to balance, the sum of the elements in row i must equal the sum of the elements in column j. "The SAM provides a consistent picture of the flow-of-funds accounts of the separate institutions or "actors" in the economy that one may wish to distinguish. The defining characteristic of a SAM is that each row and column reflects a separate account for which expenditures and receipts must balance. The focus is thus on the nominal flow of funds, with the rows representing receipt accounts and the columns expenditure accounts (Dervis et al., 1982, p. 157).

The objective of this chapter is to present the structure of the WAEMU economy. Section 1 presents the I-O table of the WAEMU economy for the base year 1996. Section 2 presents the SAM model. Section 3 specifies the model that reflects the behavioral structure of the model and explicit functional forms for the supply and demand equations. Section 4 presents the calibration of the model. And section 5 presents the model solution that will serve as a base run. This base run serves as a "benchmark" to compare the results of alternative policy scenarios.

Input-Output Table for WAEMU Economy

Tables 4.1 to 4.3 present the eighteen-sector input-output table. These tables depict the circular flow in the WAEMU economy for the base year 1996 and represent the aggregation of the economies of six out of the eight countries of WAEMU for which data are available. Each entry in the tables reflects the flow of goods from the row sector to the column sector. That is, a nominal payment by a column sector to a row sector. Tables 4.1 and 4.2 present the intermediate flows and table 4.3 presents the final demand

flows. The intermediate flows depict the production side and the final demand flows depict the demand side. The production or the total expenditure is the sum of the eighteen inter-industry transactions, the net value added payments to factors of production, the indirect tax and the export tax. The net value added payments is the sum of payments to capital and labor. The net final demand comprises consumption, investment and net exports (exports minus imports minus tariff). Total domestic supply or gross sectoral output is the sum of total intermediate demand and net final demand. GDP is the sum of the value added and tariffs. At equilibrium, total expenditures equal total revenues.

Table 4.1
Input-Output Table for WAEMU (1996)
Interindustry Transactions
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry & Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Food Crops	144.4	13.0	19.2	44.5	0.0	315.3	3.9	0.1	0.0	0.1	0.0	0.0	1.0	0.0	0.0	21.4	1.2	0.6	564.7
Cash Crops	0.8	30.4	0.0	0.0	0.0	236.8	96.5	1.0	0.0	23.7	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.1	390.0
Livestock	13.7	7.1	2.8	1.2	0.0	207.5	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	0.5	0.1	243.0
Forestry, ...& Fishery	0.0	0.0	2.5	1.7	1.0	175.0	2.8	7.2	11.6	87.1	0.0	18.8	0.1	0.0	0.0	9.6	0.5	0.0	317.9
Mining & Petroleum	0.1	3.5	0.0	0.0	13.7	0.5	0.0	9.1	0.0	51.7	256.2	81.0	0.0	0.0	0.0	0.3	0.0	0.0	416.1
Food Processing	9.0	18.0	26.1	17.0	0.0	262.7	4.0	70.8	0.1	1.3	0.0	0.0	1.2	0.0	0.0	66.1	15.5	10.4	502.2
Textile, ... & Apparel	0.0	0.5	0.2	2.6	0.2	3.7	64.1	0.6	0.0	2.0	0.2	20.5	0.9	0.0	0.0	20.6	1.8	7.3	125.2
Chemicals	36.8	67.0	2.2	13.8	30.8	25.1	41.6	115.0	24.2	23.0	15.7	81.7	37.5	0.5	3.2	11.5	21.8	34.1	585.5
Basic Metals	4.6	16.5	0.1	25.1	30.0	47.0	10.2	8.2	151.3	27.3	15.8	156.3	68.8	2.2	1.5	16.7	58.3	56.7	696.6
Other Indus.	1.8	16.7	0.3	4.1	2.6	44.3	7.5	16.2	8.1	195.8	5.6	285.9	42.4	15.1	3.9	37.1	21.3	59.7	768.4
Electricity, Gas	3.3	17.3	2.0	17.5	56.4	58.2	15.4	15.3	14.0	44.3	125.5	72.2	170.1	7.8	4.0	57.4	43.1	102.9	826.7
Construction	0.2	1.8	0.0	1.0	7.2	15.5	1.5	9.3	4.7	7.8	21.5	179.1	27.0	2.8	48.2	35.4	16.1	61.4	440.5
Transportation	4.3	4.8	1.5	43.2	29.5	19.8	19.1	16.4	16.8	11.3	17.0	56.9	78.9	9.8	4.2	349.6	35.1	73.5	791.7
Finance	0.5	0.8	0.0	0.6	3.3	4.8	2.4	1.6	1.1	2.5	4.3	6.8	13.7	297.7	1.8	16.6	1.9	2.7	363.1
Service	0.4	2.2	0.0	3.7	8.9	7.8	2.7	2.0	6.4	5.0	2.9	12.6	16.7	4.4	2.1	52.0	24.0	78.0	231.8
Hotel	253.4	519.5	36.4	129.0	16.5	319.6	206.2	169.5	312.7	100.1	90.5	7.7	18.3	1.7	1.1	9.2	2.7	18.3	2212.2
Private Service	21.7	6.8	0.8	32.2	52.0	28.6	7.7	13.2	11.4	14.5	21.4	68.0	45.8	27.3	3.1	107.7	79.4	55.6	597.2
Public Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Intermediate	495.0	725.9	94.1	337.2	252.1	1772.2	486.8	455.5	562.4	597.5	576.4	1047.5	522.4	369.3	73.1	820.5	323.5	561.4	10072.8

Source: Adapted from WAEMU Commission data

Table 4.2
Input-Output Table for WAEMU (1996)
Value Added
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry & Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Indirect Tax	19.2	9.5	1.7	11.8	12.7	72.2	7.0	4.1	50.5	16.9	224.4	28.7	57.0	28.7	12.9	184.0	20.6	4.2	766.1
Export Tax	0.0	145.0	0.8	0.0	0.0	45.5	0.0	0.0	0.0	15.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	206.5
Wages	87.5	102.0	14.5	57.9	27.1	200.8	54.7	38.0	90.5	65.5	73.7	234.0	324.6	31.3	36.0	344.9	218.5	874.0	2875.5
Capital	1905.9	866.6	531.7	328.2	90.3	442.4	176.1	107.9	89.3	137.3	117.3	229.5	640.4	14.9	751.0	1363.6	332.1	52.9	8177.4
Total Value Added	2012.6	1123.1	548.7	397.9	130.1	760.9	237.8	150.0	230.0	234.9	415.4	492.2	1022.0	74.9	799.9	1892.5	571.2	931.1	12025.5

Source: Adapted from WAEMU Commission data

Table 4.3
Input-Output Table for WAEMU (1996)
Structure of Final Demand
(Billion FCFA)

Sector	Government Consumption	Private Consumption	Fixed Capital	Change in Stocks	Exports	Imports	Tariffs	Net Final Demand	Total Domestic Supply
Food Crops	0.0	1981.6	0.0	44.1	60.3	125.4	17.6	1943.0	2507.7
Cash Crops	0.0	153.9	0.0	105.3	1203.1	2.9	0.4	1459.0	1849.0
Livestock	0.0	387.1	44.2	-79.1	49.8	1.3	0.1	400.6	643.6
Forestry, ...& Fishery	0.0	405.8	11.3	-52.8	136.7	79.4	4.2	417.4	735.3
Mining & Petroleum	0.0	5.8	0.0	52.8	131.8	222.5	1.7	-33.8	382.3
Food Processing	0.0	2124.0	0.0	209.6	532.2	677.9	157.2	2030.7	2532.9
Textile, ... & Apparel	0.0	426.4	0.0	43.3	397.4	202.9	64.8	599.4	724.6
Chemicals	0.0	433.1	1.3	28.8	215.6	558.7	99.8	20.3	605.8
Basic Metals	0.0	252.2	850.5	-102.8	152.3	845.0	211.7	95.5	792.1
Other Indus.	0.0	257.0	8.2	30.2	382.4	490.0	123.7	64.1	832.5
Electricity, Gas	0.0	238.9	0.0	17.5	233.3	250.6	74.5	164.6	991.3
Construction	0.0	24.2	1061.7	0.4	15.6	3.1	0.0	1098.8	1539.3
Transportation	0.0	700.1	0.0	0.1	194.7	142.0	0.0	752.9	1544.6
Finance	0.0	70.5	0.0	-0.1	33.7	22.3	0.0	81.8	444.9
Service	0.0	637.9	0.0	-0.3	27.0	23.3	0.0	641.3	873.1
Hotel	0.0	410.1	0.0	0.4	215.3	125.1	0.0	500.7	2712.9
Private Service	0.0	557.6	42.8	-2.7	341.2	641.3	0.0	297.6	894.8
Public Service	1490.8	2.0	0.0	0.0	0.0	0.0	0.0	1492.8	1492.8
Total Intermediate	1490.8	9068.2	2020.0	294.7	4322.4	4413.7	755.7	12026.7	22099.0

Source: Adapted from WAEMU Commission data

Social Accounting Matrix for WAEMU Economy

The SAM is primarily constructed to check the consistency of the data and ensure that the accounting identities are satisfied. Table 4.4 shows the structure of the SAM for WAEMU. It consists of the following accounts: activities, commodities, factors of production (labor and capital), institutions (households, firms, government), capital account (investment), change in stocks, and rest of the world. The activities accounts correspond to the producing sectors in the input-output table. The commodities accounts or the domestic market for all products combine domestic supply and imports (including tariff) minus exports. Factors of production accounts comprise labor and capital. Total value added at factor cost (excluding indirect tax and export tax) is divided between labor and capital. Wages and rentals are transferred from producers to households. Households, firms and government represent the institutions accounts. Households receive factor income, which they divide between consumption and savings. Households also pay taxes to the government. Government receives direct and indirect taxes, spends on consumption, saves, and makes transfers to households and firms. The capital accounts or investment collect all savings, domestic and foreign, and spend them on investment goods. Total investment is a function of the distribution of income among households, firms and government. The change in stocks account indicates the change in inventories. The rest of the world account connects the domestic economy to the world's through the exchange rate. Foreign exchange receipts from exports are distributed to households, producers and government.

Table 4.4
Structure of the Social Accounting Matrix for WAEMU, 1996

	Expenditures										
			Factors		Institutions						
Receipts	Activities	Commodities	Labor	Capital	Households	Firms	Government	Capital Account	Change in Stocks	Rest of the World	Total Receipts
Activities		Domestic commodity supply								Exports	Total Costs
Commodities	Intermediate inputs				Private Consumption		Government consumption	Investment	Change in inventories		Total absorption
Factors											
Labor	Wages										Labor income
Capital	Rentals										Capital income
Institutions											
Households			Labor Income	Capital Income			Transfer to households			Capital inflow	Household income
Firms				Transfer between firms			Transfer to firms				Total firms expenditures
Government	Indirect taxes	Tariffs		Allocation of capital income to government	Direct taxes from households	Direct taxes from firms				Transfer from ROW to government	Total govt. expenditure
Capital Accounts					Private saving	Retained earning	Government saving			ROW saving	Investment
Change in Stocks								Capital accumulation			Capital accumulation
Rest of the World		Imports			Transfer from households to ROW		Government debt services				ROW revenue
Total	Total Costs	Total absorption	Labor income	Capital income	Household income	Total firms expenditures	Total govt. expenditure	Investment	Change in inventories	ROW revenue	

Source: Adapted from WAEMU Commission data

Table 4.5
Social Accounting Matrix for WAEMU (billion FCFA)

	Expenditures										
			Factors		Institutions						
Receipts	Activities	Com-modities	Labor	Capital	House-holds	Firms	Gov.	Capital Account	Change in Stocks	Rest of the World	Total Receipts
Activities		17776.9								4322.1	22099.0
Commodities	10072.8				9068.3		1490.8	2020.0	294.5		22946.4
Factors											
Labor	2875.6										2875.6
Capital	8177.7										8177.7
Institutions											
Households			2875.6	6620.1			418.2			220.4	10134.3
Firms				1504.7			-12.0				1492.8
Government	972.4	755.9		52.9	205.0	361.1				251.1	2606.5
Capital Accounts					548.9	1123.7	218.3			423.5	2314.5
Change in Stocks								294.5			294.5
Rest of the World		4413.7			312.2		491.2				5217.1
Total	22099.0	22946.4	2875.6	8177.7	10134.3	1492.8	2606.5	2314.5	294.5	5217.1	

Source: Adapted from WAEMU Commission data

Model Specification

Production and Supply

The model assumes that (1) each sector in the WAEMU economy produces only one output using labor, capital and intermediate inputs; (2) intermediate inputs are required in fixed proportions to output in each sector; and (3) there are constant returns to scale in production. The production function for a given sector is modeled according to a two-level production function of both value added and intermediate input. At level one, the intermediate input is modeled as a Leontief function of composite intermediates. At level two, the value added is modeled as a Cobb-Douglas function of capital and labor to allow for substitution among these primary factors.

The functional form of the sectoral production function can be written as:

$$X_i = \Omega_i L_i^{\alpha_i} K_i^{(1-\alpha_i)} \qquad \text{i} = 1.....\text{n} \tag{4.1}$$

Where

X_i is the sectoral output;

Ω_i is the sectoral shift parameter;

L_i is the aggregate sectoral labor;

K_i is the aggregate sectoral capital; and

α_i is the output elasticity with respect to labor.

The capital stock is sector specific and fixed in the base year so that sectoral production depends on labor. For the WAEMU economy, the sectoral labor input is

assumed to be an aggregation of labor of different skill categories. The labor market clears when the sectoral supply of labor equals the sectoral demand for labor. That is:

$$L_i^D = L_i^S \qquad \text{i} = 1.....\text{n} \tag{4.2}$$

This implies that labor is immobile between sectors so that wages can differ among sectors.

In each sector of the WAEMU economy, firms are maximizing profits subject to the technological constraints. Based on the small country assumption, the firms take the commodity prices as given. Equation (4.3) gives the aggregate sectoral profit function:

$$\Pi_i = PN_i X_i - W_i L_i \qquad \text{i} = 1.....\text{n} \tag{4.3}$$

Where

W_i is the wage of labor;

PN_i is the net after tax price received by producers for good i after paying for intermediate inputs and indirect taxes.

$$PN_i = PD_i(1 - tau_i) - \sum_{j=1}^{n} P_j a_{ij} \qquad \text{i} = 1.....\text{n} \tag{4.4}$$

Where

PD_i is the domestic price of sector i;

tau_i is the indirect tax rate;

P_j is the composite price of sector j;

a_{ij} is the input-output coefficient representing the amount of output from sector *i* required to produce one unit of output in sector j.

Equation (4.5) defines the labor demand equation for sector i, which assumes that labor is employed up to the point where the value of the marginal product equals the wage rate in each sector.

$$PN_i \frac{\partial X_i}{\partial L_i} = W_i \qquad \text{i} = 1.....\text{n} \tag{4.5}$$

Income Generation and Production Demand

Households, firms and government are the main recipients of the flow of income. Households and government demand consumer goods and the firms demand intermediate goods and capital goods.

The household sector can be characterized as a representative consumer whose objective is to maximize utility subject to income. Household total income is given by the sum of the wages across sectors. Households do not pay income tax in the WAEMU economy. They save a fraction of their income, and spend the rest on goods and services. Equation (4.6) describes the total income from labor which is assumed to equal household income.

$$Y_W = \sum_{i=1}^{n} W_i L_i \tag{4.6}$$

Firms are assumed to maximize profit subject to resource constraints and production technology. Firms collect their revenues from diverse sources mainly capital on which they pay direct taxes to government. Firms use the disposable income for investment and savings. The firms' income equation can be written as:

$$Y_k = \sum_{i=1}^{n} PN_i X_i - \sum_{i=1}^{n} W_i L_i \tag{4.7}$$

Government does not own capital. It collects revenues from tariffs, indirect taxes, and foreign borrowing that are used to purchase goods and services, and to finance investment. Equation 4.8 determines government revenues

$$Y_g = \sum_{i=1}^{n} tau_i P_i X_i + \sum_{i=1}^{n} tm_i M_i + ER * \overline{F} \tag{4.8}$$

Where

tm_i is the tariff rate;

M_i are imports;

$\overline{F}$ is the exogenous foreign capital inflow; and

ER represents the exchange rate expressed as CFA's/$.

The total income for the WAEMU economy equals the total national product at market prices, that is

$$Y_w + Y_k + Y_g = \sum_{j=1}^{n} P_j X_j - \sum_{j=1}^{n} \sum_{i=1}^{n} P_i a_{ij} X_j \tag{4.9}$$

Where

a_{ij} represents the composite intermediate demand of sector i per unit of domestic output in sector j.

The gross domestic product equals the total income minus the capital inflow.

$$\text{GDP} = Y_w + Y_k + Y_g - ER * \overline{F} \tag{4.10}$$

Each institution decides on the proportion of income to save and the proportion to consume.

The household savings equation can be written as

$$S_w = s_w Y_w \tag{4.11}$$

The firm savings equation is

$$S_k = s_k Y_k \tag{4.12}$$

And the government savings equation is

$$S_g = s_g Y_g \tag{4.13}$$

Where

s_w represents the households savings rate;

s_k represents the firms savings rate; and

s_g represents the government savings rate.

The total saving for the WAEMU economy is given by

$$TS = s_w Y_w + s_k Y_k + s_g Y_g \tag{4.14}$$

The amount of income to be spent on consumer goods is the difference between total income and total saving. The marginal propensity to consume for each institution is

$(1\text{-}s_w)$ for households, $(1\text{-}s_k)$ for firms, and $(1\text{-}s_g)$ for government. Hence, the total consumption equation can be written as

$$TC = (1\text{-}s_w)Y_w + (1\text{-}s_k)Y_k + (1\text{-}s_g)Y_g \tag{4.15}$$

Where

$(1\text{-}S_w)Y_w$ is household consumption;

$(1\text{-}S_k)Y_k$ is firms consumption; and

$(1\text{-}S_g)Y_g$ is government consumption.

The sectoral consumption at constant prices equation can be written as

$$C_i = fc_i\left(\frac{TC}{P_i}\right) \qquad i = 1.....n \tag{4.16}$$

Where

fc_i is the sectoral consumption shares which are assumed to be fixed.

Total savings are assumed to determine the level of total investment. Since investment depends on savings, an increase in its availability will lead to an increase in demand for investment goods from the capital goods producing sector. An excess investment will come from foreign sources. The foreign investment is referred to as the saving investment gap. It is the amount needed to cover the deficit in the current account. The saving investment balance is the difference between total saving and total investment.

Assuming that all savings are spent on investment goods, the sectoral share of investment equation can be written as follows:

$$\overline{H}_i = U_i \frac{\Delta K_i}{TS} \qquad i = 1.....n \qquad (4.17)$$

And ΔK_i the real sectoral investment can be derived as

$$\Delta K_i = \overline{H}_i \frac{TS}{U_i} \qquad i = 1.....n \qquad (4.18)$$

U_i is the price of capital of type i given by

$$U_i = \sum_{j=1}^{n} S_{ji} P_j \qquad i = 1.....n \qquad (4.19)$$

Where

S_{ij} are the shares in the capital consumption matrix. The capital composition coefficient, S_{ij} is a matrix of n by n elements. Each coefficient in the matrix is the ratio of the investment demand by sector i from sector j to the total investment by sector of destination (Zij/Zj). Each column in the matrix sums to one.

The sectoral investment demand by origin at constant prices is

$$Z_i = \sum_{j=1}^{n} S_{ij} \Delta K_j \qquad i = 1.....n \qquad (4.20)$$

Alternatively,

$$Z_i = \sum_{j=1}^{n} S_{ij} \overline{H}_i \frac{TS}{U_i} \qquad i = 1.....n \qquad (4.21)$$

For a dynamic investment model, equation (4.22) defines the sectoral share of investment for the next period

$$H_{i,t+1} = SP_{it} + \mu SP_{it}\left(\frac{R_{it} - AR_t}{AR_t}\right) \tag{4.22}$$

Where

μ, the mobility of investable funds parameter, indicates the responsiveness of capital market to static market signals. If μ is zero, there is no intersectoral mobility of investment funds. When μ is too large, sectoral profit rates oscillate. This study assumes a perfect intersectoral mobility of investment funds and assigns a value of one to the parameter.

SP_{it} the sectoral shares in the aggregate profit correspond to the ratio of profit in sector i (Rk_{it}) to the total profit (Rk_t) in time period t, that is

$$SP_{it} = \frac{Rk_{it}}{Rk_t} \qquad i = 1.....n \text{ and } t = 1.....12 \tag{4.23}$$

With

$$Rk_{it} = (1 - \alpha_i) PN_{it} X_{it} \qquad i = 1.....n \text{ and } t = 1.....12 \tag{4.24}$$

and

$$Rk_t = \sum_{t=1}^{T} Rk_{it} \qquad t = 1.....12 \tag{4.25}$$

R_{it} denotes the profit rate and consists of the returns to capital when the capital stock is valued in current prices plus capital gains, that is

$$R_{it} = \left(\frac{Rk_{it}}{U_i \cdot K_i}\right) + \left(\frac{U_i - U_{i,t-1}}{U_{i,t-1}}\right) \qquad i = 1.....n \text{ and } t = 1.....12 \tag{4.26}$$

AR_t represents the average nominal profit rate

$$AR_t = \sum_{i=1}^{n} SP_{it} R_{it} \qquad t = 1.....12 \tag{4.27}$$

Equation (4.28) defines the capital stock for sector *i* for the following period

$$K_{i,t+1} = K_{oi} + \Delta K_{it} \qquad i = 1....n \text{ and } t = 1....12 \tag{4.28}$$

Where

K_{oi} is the initial sectoral capital stock in sector i.

ΔK_{it} is the change in capital stock for sector i at time t

Foreign Trade

On the import side, the model adopts the Armington (1969) assumption of product differentiation, that is, goods produced for domestic consumption and imports are imperfect substitutes. The composite good Q_i is an aggregate function of imports M_i and domestically produced goods D_i using a CES function. In each sector consumers select a combination of M and D that minimizes total expenditure based on the relative price of imports to domestic production and the level of Q_i.

The composite good function is given by

$$Q_i = \overline{B}_i \left[\delta_i M_i^{-\rho_i} + (1-\delta_i) D_i^{-\rho_i} \right]^{\frac{-1}{\rho_i}} \tag{4.29}$$

or

$$Q_i = \overline{B}_i \left[\delta_i M_i^{\frac{(\sigma_i - 1)}{\sigma_i}} + (1-\delta_i) D_i^{\frac{(\sigma_i - 1)}{\sigma_i}} \right]^{\frac{\sigma_i}{\sigma_i - 1}} \qquad i = 1.....n \tag{4.30}$$

Where

$\sigma_i = \frac{1}{1+\rho_i}$ is the trade substitution elasticity;

$\overline{B}_i$, δ_i, ρ_i are parameters;

M_i and D_i are imports and domestic production of goods classified under sector i, respectively.

The import price equation can be written as

$$PM_i = P\overline{W}_i(1+tm_i)ER \quad i = 1.....n \tag{4.31}$$

Where

$P\overline{W}_i$ is the world prices of imports in dollars, which the WAEMU cannot affect, based on the small country assumption;

tm_i is the tariff rate.

Under the assumption of cost minimization the value of the composite commodity prices P_i is given by the CES cost function.

$$P_i = \frac{1}{\overline{B}_i}\left[\delta_i^{\sigma_i} PM_i^{(1-\sigma_i)} + (1-\delta_i)^{\sigma_i} PD_i^{(1-\sigma_i)}\right]^{\frac{1}{1-\sigma_i}} \qquad i = 1.....n \tag{4.32}$$

Where

PM_i and PD_i are import and domestic prices for sector i, respectively.

The balance of payments constraint is given by

$$\overline{F} = \sum_{i=1}^{n} P\overline{W}_i M_i - \sum_{i=1}^{n} PWE_i E_i \tag{4.33}$$

where

PWEi is the export price for sector i.

On the export side, the model departs from the small country assumption of fixed terms of trade and introduces product differentiation and differences between the price of imports and domestic product goods. WAEMU exporters face a downward sloping demand curve for their products. The exports demand equation can be specified as

$$E_i = \overline{E}_o \left(\frac{\Pi_i}{PWE_i} \right)^{\eta_i} \qquad i = 1.... n \qquad (4.34)$$

Where

E_o is a constant term;

Π_i is the aggregate world price expressed in \$;

PWE_i is the dollar price of the WAEMU exports;

η_i is the price elasticity of export demand.

The export prices equation can be written as

$$PWE_i = \frac{PD_i}{(1+te_i)ER} \qquad i = 1...n \qquad (4.35)$$

Where

te_i is the export subsidy rate.

Monetary Sector

The WAEMU economy can be divided into two sectors: the real sector described by the excess demand functions for commodities, and the monetary sector described by the excess demand function for money.

The commodity sector is assumed to depend only on relative prices. In fact, according to neoclassical monetary theory, a change in the quantity of money leads to an equiproportionate change in the equilibrium price level and leaves the interest rate unchanged. This is referred to as "homogeneity postulate" (no money illusion), where the demand functions are homogeneous of degree zero in the price level (indetermination in the price level) (See Patinkin, Don, p.174).

The monetary sector is assumed to depend on the commodity variables and the absolute price level. Hence, a change in the quantity of money will create a real-money balance effect in the commodity markets.

Following Keynesian model, the real demand for money depends on, or is a function of real GDP and the (nominal) interest rate (r).

$$\frac{M_d}{P_a} = L(\text{real GDP}, r) \tag{4.36}$$

where

P_a is the average price level.

The real amount of money demanded is directly related to real GDP and inversely related to the interest rate.

The demand for money equation can be rewritten as

$$\frac{M_d}{P_a} = \text{mm} * \text{real GDP}^{\beta} * r^{\varepsilon} \qquad (4.37)$$

Where mm is the real money balance multiplier;

β is the elasticity of real money balances to real GDP. The value of β equals one solves the model.

ε is the interest rate elasticity. Based on the results of many studies using the rates on U.S. Treasury Bills or Government Bonds over different time periods to estimate the interest elasticity of money balances, Boorman (1980)[1] concluded that the estimates of the interest elasticity of the demand for money are between –0.07 and –0.2 for the short – term interest rate. This implies that a 10 percent increase in the interest rate reduces the real amount of money demanded by 2 percent. However, the Baumol- Tobin model implies that the interest elasticity of money demand is one-half. That is, a 10 percent increase in the interest rate should lead to a 5 percent decrease in the demand for real balances. All these studies demonstrate that the interest rate is an important determinant of the demand for money. The study assumes that the interest rate elasticity is –0.2.

Also, according to the Keynesian model, the money supply depends on the monetary base, the reserve-deposit ratio, and the currency-deposit ratio, adjusted for capital inflow.

The monetary base (H), or, high-powered money is the total amount of CFA Franc held by the public as currency (C), and the banks as reserves (R) in the WAEMU

(H=C+R). The reserve-deposit ratio (rr) is the fraction of deposits that banks hold in reserve, and the currency-deposit ratio (cr) determines how much money the public hold in the form of currency and how much to hold in the form of demand deposits. Equation (4.38) presents the money supply function.

$$M_s = mmH - ER * \overline{F} \tag{4.38}$$

And the money multiplier is given by

$$mm = \frac{1+cr}{rr+cr} \tag{4.39}$$

The money supply can be also defined as the sum of the previous money supply, the change in domestic credit, and the change in international reserves.

Following Dornbusch and Fisher (1994 p.614), domestic credit is the banks claims on the public sector and on the private sector.

$$dDC = dH - dNFA \tag{4.40}$$

where

dNFA denotes the change in net foreign assets, that is the balance of payments;

dH the change in high-powered money; and

dDC the change in the domestic credit.

Equation (4.41) expresses the money supply as

$$M_s = M_o + dDC - ER \cdot \overline{F} \tag{4.41}$$

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[1] See John T. Boorman, "The Evidence on the Demand for Money: Theoretical Formulations and Empirical Results," *in Current Issues in Monetary Theory and Policy,* 2nd ed., eds. Thomas M. Havrilesky and John T. Boorman (Arlington Heights, Ill.: AHM Publishing Corporation, 1980), pp. 315-60.

Where

M_o represents the previous money supply.

In equilibrium, the demand for money equals the supply for money.

$$M_d = M_s \tag{4.42}$$

The domestic inflation rate is defined as the percentage change in the general price index (CPI). The CPI is the cost of a given basket of goods and services relative to the cost of the same basket in some base year. The domestic inflation rate is given by:

$$\inf_t = 100\left(\frac{CPI_t - CPI_{t-1}}{CPI_{t-1}}\right) \qquad t = 1....12 \tag{4.43}$$

And

$$CPI_t = \sum_{i=1}^{n} fc_{it} P_{it} \qquad t = 1.....12 \tag{4.44}$$

Real GDP is defined as

$$\text{Real GDP} = \frac{GDP}{CPI} \tag{4.45}$$

The real interest rate can be then defined as the nominal interest rate denoted nomint adjusted for inflation. In equation form this is given by

$$r = \text{nomint} - 100\left(\frac{CPI_t - CPI_{t-1}}{CPI_{t-1}}\right) \tag{4.46}$$

The nominal interest rate in effect in the WAEMU in 1996 was 6.5 percent, or

$$\text{nomint} = 6.5 \tag{4.47}$$

The model can assume a fixed exchange rate. In this case, the exchange rate is an exogenously fixed variable and the monetary base is an endogenous variable that consists at least in part of foreign exchange.

Supply-Demand Equilibrium (Model Closure)

For a general equilibrium solution, all excess demands must be zero. That is, supply must equal demand. These excess demand equations are written as functions of the endogenous variables. Hence, the demand functions for domestically produced commodities can be written as follows

$$X_i = d_i V_i + d_i C_i + d_i Z_i + E_i \tag{4.48}$$

Where

V_i denotes the intermediate demand;

d_i, the domestic use ratio, is given by $d_i = \frac{1}{f_i(M_i / D_i, 1)}$, where f_i is the CES function trade aggregation function;

C_i the consumption demand;

Z_i the investment demand; and

E_i are exports.

The demand functions can be written as functions of sectoral domestic prices and the exchange rate.

$$X_i = f(PD_i, ER) \qquad i = 1.....n \tag{4.49}$$

The supply functions also can be similarly expressed as

$$X_i = f(PD_i, ER) \qquad i = 1.....n \qquad (4.50)$$

Equation (4.51) expresses the sectoral excess demand as

$$EX_i = X_i^D - X_i^S = 0 \qquad i = 1.....n \qquad (4.51)$$

The system is homogeneous of degree zero in the price level: the doubling, for example, of all prices leaves the demand functions unchanged although the nominal terms double.

From Walras' law, with n goods in the economy corresponding to n markets excess- demand equations, only n-1 of these equations are independent. That is, n-1 sectors' excess-demand equations determine n-1 relative prices. For any set of prices that satisfy n-1 markets' excess-demands must also satisfy the nth.

The price normalization rule required to determine the average price level is given by

$$\sum P_i \Omega_i = P_a \qquad (4.52)$$

This average price level is determined by equilibrium in the monetary sector.

From the supply side, the excess demand for labor equations are given by

$$L_i^D = L_i^S \qquad \text{i} = 1.....\text{n} \tag{4.53}$$

From the demand side, the closure rule implies that total saving equals investment

$$TS = \sum_{i=1}^{n} Z_i \tag{4.54}$$

The excess-demand for the balance of payments equilibrium gives

$$\sum_{i=1}^{n} PWM_i - \sum_{i=1}^{n} PWEE_i - \overline{F} = 0 \tag{4.55}$$

If foreign capital inflow is assumed fixed at $\overline{F}$, the exchange rate is endogenous and variable. If the exchange rate is assumed to be fixed, foreign capital inflow is endogenous.

Calibration

Calibration consists of fitting the CGE model to the WAEMU economy data for the base year 1996. The first step is to select the elasticity values and the use of observed data to compute values of function parameters. The second step is to calculate the values of these parameters. The parameters are estimated by setting all prices in the model to unity. Since the prices and the values of all endogenous variables are known, the equations can be solved to determine the unknown parameters. The model is then solved

once the solution values of the parameters are substituted into their corresponding equations.

Production and Supply Parameters

The objective of the firms is to maximize profit subject to the production function (equation 4.1)

$$\prod_i = PN_iX_i - w_iL_i - Rk_iK_i \qquad i = 1.....n \qquad (4.56)$$

Setting the Lagrangian function and solving the first-order condition with respect to labor

$$MP_{L_i} = PN_i \frac{\partial X_i}{\partial L_i} \qquad i = 1.....n \qquad (4.57)$$

$$MP_{L_i}L_i = \frac{w_iL_i}{PN_i} = \alpha_iX_i \qquad i = 1.....n \qquad (4.58)$$

$$\alpha_i = \frac{w_iL_i}{PN_iX_i} \qquad i = 1.....n \qquad (4.59)$$

and

$$\Omega_i = \frac{X_i}{L_i^{\alpha_i}K_i^{(1-\alpha_i)}} \qquad i = 1.....n \qquad (4.60)$$

Foreign Trade Parameters

Assuming that consumers minimize the cost of acquiring the composite goods subject to the CES function Q_i, the marginal rate of substitution is a function of the ratio of the price of the domestically produced commodity to the price of the imported commodity, and of the elasticity of substitution. Letting PD_i denote the price of the domestic goods, and *PMi* the price of the imported goods, the first- order condition for cost minimization gives

$$m_i = \frac{M_i}{D_i} = \left(\frac{PD_i}{PM_i}\right)^{\sigma_i}\left(\frac{\delta_i}{1-\delta_i}\right)^{\sigma_i} \tag{4.61}$$

where

$$\sigma_i = \frac{1}{1+\rho_i}$$

From equation (4.34)

$$\overline{B}_i = \frac{Q_i}{\left[\delta_i M_i^{\frac{(\sigma_i-1)}{\sigma_i}} + (1-\delta_i) D_i^{\frac{(\sigma_i-1)}{\sigma_i}}\right]^{\frac{\sigma_i}{\sigma_i-1}}} \qquad i = 1.....n \tag{4.62}$$

$\overline{B}_i$ and δi are calibrated parameters, whereas σ_i needs to be determined before the calibration. The magnitude of σ_i determines the responsiveness of the import demand ratio (M_i/D_i) to changes in the relative prices of imported goods $\frac{PD_i}{PM_i}$.

Similarly, from equation (4.34), the price elasticity of exports η_i needs to be estimated.

Given the non availability data in the WAEMU economy required to conduct econometric analysis of structural change in the ratios $\frac{PD_i}{PM_i}$, the study derives the elasticities estimated from previous studies (see Khan (1975), Stern et al. (1976), and Abdelkhalek (1994)).

These were estimated using available data for Morocco from 1962 to 1992. Morocco is a small economy and has the same economic characteristics as those of the WAEMU.

From equation (4.62),

$$\delta_i = \frac{\left(\frac{PM_i}{PD_i}\right)\left(\frac{M_i}{D_i}\right)^{\frac{1}{\sigma_i}}}{1+\left(\frac{PM_i}{PD_i}\right)\left(\frac{M_i}{D_i}\right)^{\frac{1}{\sigma_i}}} \qquad i = 1.....n \qquad (4.63)$$

Table 4.6 summarizes the complete set up of the model equations and variables used in the model.

Table 4.6
Model Equations and Variables

Equations	Number of Equations	
Production and Supply		
$X_i = \Omega_i L_i^{\alpha_i} K_i^{(1-\alpha_i)}$	18	(4.1)
$L_i^D = L_i^S$	18	(4.2)
$PN_i = PD_i(1 - tau_i) - \sum_{j=1}^{n} P_j a_{ij}$	18	(4.4)
$PN_i \frac{\partial X_i}{\partial L_i} = W_i$	18	(4.5)
Income Generation and Production Demand		
$Y_W = \sum_{i=1}^{n} W_i L_i$	1	(4.6)
$Y_k = \sum_{i=1}^{n} PN_i X_i - \sum_{i=1}^{n} W_i L_i$	1	(4.7)
$Y_g = \sum_{i=1}^{n} tau_i P_i X_i + \sum_{i=1}^{n} tm_i M_i + ER * \overline{F}$	1	(4.8)
$\text{GDP} = Y_w + Y_k + Y_g - ER * \overline{F}$	1	(4.10)
$TS = s_w Y_w + s_k Y_k + s_g Y_g$	1	(4.14)
$TC = (1\text{-}s_w) Y_w + (1\text{-}s_k) Y_k + (1\text{-}s_g) Y_g$	1	(4.15)
$C_i = fc_i \left(\frac{TC}{P_i} \right)$	18	(4.16)
Dynamic Investment		
$\Delta K_i = \overline{H}_i \frac{TS}{U_i}$	18	(4.18)
$U_i = \sum_{i=1}^{n} S_{ij} P_j$	18	(4.19)
$Z_i = \sum_{j=1}^{n} S_{ij} \overline{H}_i \frac{TS}{U_i}$	18	(4.21)
$\text{H}_{i,t+1} = \text{SP}_{it} + \mu \text{SP}_{it} \left(\frac{\text{R}_{it} - \text{AR}_t}{\text{AR}_t} \right)$	18	(4.22)

Table 4.6 (Continued)
Model Equations and Variables

Equations	Number of Equations	
$SP_{it} = \frac{Rk_{it}}{Rk_t}$	18	(4.23)
$Rk_{it} = (1-\alpha_i) PN_{it} X_{ti}$	18	(4.24)
$Rk_t = \sum_{t=1}^{T} Rk_{it}$	1	(4.25)
$R_{it} = \left(\frac{Rk_{it}}{U_i \cdot K_i}\right) + \left(\frac{U_i - U_{i,t-1}}{U_{i,t-1}}\right)$	18	(4.26)
$AR_t = \sum_{i=1}^{n} SP_{it} R_{it}$	1	(4.27)
$K_{i,t+1} = K_{oi} + \Delta K_{it}$	18	(4.28)
Foreign Trade		
$Q_i = \overline{B}_i \left[\delta_i M_i^{\frac{(\sigma_i - 1)}{\sigma_i}} + (1-\delta_i) D_i^{\frac{(\sigma_i - 1)}{\sigma_i}} \right]^{\frac{\sigma_i}{\sigma_i - 1}}$	18	(4.30)
$\mathrm{PM_i} = \mathrm{P\overline{W}_i}(1 + \mathrm{tm_i})\mathrm{ER}$	18	(4.31)
$P_i = \frac{1}{\overline{B}_i} \left[\delta_i^{\sigma_i} PM_i^{(1-\sigma_i)} + (1-\delta_i)^{\sigma_i} PD_i^{(1-\sigma_i)} \right]^{\frac{1}{1-\sigma_i}}$	18	(4.32)
$\overline{F} = \sum_{i=1}^{n} P\overline{W}_i M_i - \sum_{i=1}^{n} PWE_i E_i$	1	(4.33)
$E_i = \overline{E}_o \left(\frac{\Pi_i}{PWE_i} \right)^{\eta_i}$	18	(4.34)
$PWE_i = \frac{PD_i}{(1+te_i)ER}$	18	(4.35)
Monetary Sector		
$\frac{M_d}{P_a} = mm * \mathrm{real\,GDP}^{\beta} * r^{\varepsilon}$	1	(4.37)
$M_s = mmH - ER \cdot \overline{F}$	1	(4.38)
$mm = \frac{1+cr}{rr+cr}$	1	(4.39)

Table 4.6 (Continued)
Model Equations and Variables

Equations	Number of Equations	
$\inf_t = 100\left(\frac{CPI - CPI_{t-1}}{CPI_{t-1}}\right)$	1	(4.43)
$CPI_t = \sum_{i=1}^{n} fc_{it} P_{it}$	1	(4.44)
Real GDP $= \frac{GDP}{CPI}$	1	(4.45)
r = nomint -100$\left(\frac{CPI_t - CPI_{t-1}}{CPI_{t-1}}\right)$	1	(4.46)
nomint = 6.5	1	(4.47)
Supply-Demand Equilibrium (model closure)		
$X_i = d_i V_i + d_i C_i + d_i Z_i + E_i$	18	(4.48)
$\sum P_i \Omega_i = P_a$	1	(4.52)
Total	360	

Endogenous Variables		Number
X_i	Domestic production by sector	18
PN_i	Net or value-added prices	18
L_i	Aggregate labor by sector	18
W_i	Sectoral wages	18
Y_w	Labor income	1
Y_k	Capital income	1
Y_g	Government income	1
TS	Total saving	1
TC	Total consumption	1
C_i	Total sectoral consumption	18
U_i	Price of capital of type i	18
Z_i	Investment by sector of origin	18
PD_i	Domestic prices	18
PM_i	Import prices	18
PWE_i	Export prices	18
P_i	Composite commodity prices	18

Table 4.6 (Continued)
Model Equations and Variables

Endogenous Variables		Number
M_i	Imports	18
E_i	Exports	18
$\overline{F}$	Foreign capital inflow (Fixed exchange rate regime)	1
ER	Exchange rate (Flexible exchange rate regime)	1
CPI	General price index	1
expinf	Expected inflation	1
r	Interest rate	1
nomint	Nominal interest rate	1
GDP	Gross domestic product	1
real GDP	Real gross domestic product	1
Md	Money demand	1
Pa	Average price level	1
Ms	Money supply	1
H	Monetary base (fixed exchange rate)	1
dK_i	Real investment by sector of destination	18
Rki	Sectoral profit	18
Rk	Total profit	1
ri	Nominal sectoral profit rates	18
Spi	Sectoral share in aggregate profits	18
AR	Average profit rate	1
*Hplus*1	Sectoral share of investment for the following period	18
*Kplus*1	Sectoral capital stock for the following period	18
Total		360

Exogenous Variables		Number
tau_i	Indirect tax rates	18
tm_i	Tariff rates	18
te_i	Export subsidy rates	18
$\overline{PW_i}$	Import world $ price indices	18
$\overline{F}$	Foreign capital inflow (Flexible exchange rate regime)	1
ER	Exchange rate (Fixed exchange rate regime)	1
H	Monetary base (Flexible exchange rate regime)	1
Π_i	Export world $ price indices	18
Total		92

Model Solution

The last step in the process of the model specification is to solve for the equilibrium prices and the base year 1996 data. This model verification uses the GAUSS to check for data entry errors in parameters and in equations as well as generating the base year equilibrium data set. Once the model is solved for the year 1996 for which data are available, it is updated to the new base year 2000 needed to simulate the policy options. Table 4.7 presents the model solution for the year 2000. The model solution replicates the base run conditions and shows the validity of the CGE model.

Table 4.7
Comparison of the Base CGE Solution with the SAM Value (Billions CFA Francs)

SECTORAL OUTPUT Sector	Value from SAM	Base CGE Solution
Food crops	2656.80	2656.80
Cash crops	1949.87	1949.87
Livestock	682.21	682.21
Forestry, hunting and fishery	791.53	791.53
Mining and petroleum	425.48	425.48
Food processing	2763.71	2763.71
Textile, leather, footwear and wearing apparel	783.39	783.39
Chemicals and related products	680.04	680.04
Basic metal industries	903.69	903.69
Other industries	934.36	934.36
Electricity, gas and communication	1129.80	1129.80
Construction	1710.86	1710.86
Transportation, storage and communication	1690.04	1690.04
Finance, banking and insurance	537.04	537.04
Real estate and service to firms	924.83	924.83
Hotel, restaurant and commerce	2947.63	2947.63
Private service	986.45	986.45
Public service	1704.28	1704.28
TOTAL	24201.79	24201.79

Table 4.7 (Continued)
Comparison of the Base CGE Solution with the SAM Value (Billions CFA Francs)

SECTORAL EXPORTS Sector	Value from SAM	Base CGE Solution
Food crops	54.64	54.64
Cash crops	1211.73	1211.73
Livestock	39.06	39.06
Forestry, hunting and fishery	123.13	123.13
Mining and petroleum	158.47	158.47
Food processing	486.09	486.09
Textile, leather, footwear and wearing apparel	402.57	402.57
Chemicals and related products	234.86	234.86
Basic metal industries	185.37	185.37
Other industries	443.74	443.74
Electricity, gas and communication	274.88	274.88
Construction	15.91	15.91
Transportation, storage and communication	183.39	183.39
Finance, banking and insurance	39.45	39.45
Real estate and service to firms	23.63	23.63
Hotel, restaurant and commerce	204.94	204.94
Private service	349.77	349.77
Public service	0	0
TOTAL	4431.63	4431.63

Table 4.7 (Continued)
Comparison of the Base CGE Solution with the SAM Value (Billions CFA Francs)

SECTORAL IMPORTS Sector	Value from SAM	Base CGE Solution
Food crops	136.79	136.79
Cash crops	3.19	3.19
Livestock	1.47	1.47
Forestry, hunting and fishery	81.84	81.84
Mining and petroleum	249.15	249.15
Food processing	778.68	778.68
Textile, leather, footwear and wearing apparel	235.47	235.47
Chemicals and related products	641.04	641.04
Basic metal industries	959.64	959.64
Other industries	565.84	565.84
Electricity, gas and communication	296.21	296.21
Construction	3.46	3.46
Transportation, storage and communication	155.88	155.88
Finance, banking and insurance	30.42	30.42
Real estate and service to firms	24.47	24.47
Hotel, restaurant and commerce	141.61	141.61
Private service	765.81	765.81
Public service	0	0
TOTAL	4468.87	4468.87

Table 4.7 (Continued)
Comparison of the Base CGE Solution with the SAM Value (Billions CFA Francs)

SECTORAL CONSUMPTION Sector	Value from SAM	Base CGE Solution
Food crops	2247.33	2247.33
Cash crops	199.44	199.44
Livestock	425.85	425.85
Forestry, hunting and fishery	466.92	466.92
Mining and petroleum	7.35	7.35
Food processing	2500.19	2500.19
Textile, leather, footwear and wearing apparel	510.22	510.22
Chemicals and related products	530.93	530.93
Basic metal industries	320.82	320.82
Other industries	327.75	327.75
Electricity, gas and communication	300.63	300.63
Construction	29.02	29.02
Transportation, storage and communication	817.64	817.64
Finance, banking and insurance	88.53	88.53
Real estate and service to firms	726.94	726.94
Hotel, restaurant and commerce	480.63	480.63
Private service	672.63	672.63
Public service	1720.94	1720.94
TOTAL	12373.76	12373.76

Table 4.7 (Continued)
Comparison of the Base CGE Solution with the SAM Value (Billions CFA Francs)

SECTORAL INVESTMENT Sector	Value from SAM	Base CGE Solution
Food crops	539.66	539.664
Cash crops	173.51	173.51
Livestock	158.4	158.4
Forestry, hunting and fishery	95.33	95.33
Mining and petroleum	20.04	20.04
Food processing	123.28	123.28
Textile, leather, footwear and wearing apparel	48.86	48.86
Chemicals and related products	24.87	24.87
Basic metal industries	15.53	15.53
Other industries	27.8	27.8
Electricity, gas and communication	27.03	27.03
Construction	69.29	69.29
Transportation, storage and communication	186.97	186.97
Finance, banking and insurance	3.34	3.34
Real estate and service to firms	210.53	210.53
Hotel, restaurant and commerce	379.29	379.29
Private service	90.71	90.71
Public service	16.76	16.76
TOTAL	2211.2	2211.2

OTHER VARIABLES	Value from SAM	Base CGE Solution
Household income	3244.14	3244.14
Firm income	8917.86	8917.86
Government income	2566.51	2566.51
Total savings	2148.29	2148.29
Total consumption	12580.22	12580.22
Average price	1.05	1.05
Interest rate	6.61	6.61
Money demand	4698.81	4698.81
Real GDP	14238.34	14238.34

CHAPTER 5

SIMULATION AND RESULTS

The solution of the CGE model for the year 2000 is the solution for the WAEMU economy under the GSP trade policies. The model is then run from 2001 to 2008 to obtain a "base solution" which can be used to compare simulations of the WAEMU economy assuming AGOA program implementation for the same period. Results of the simulations are then compared with the base solution to measure the effects of various policy options.

As developed in Chapter 2, the WAEMU economy faces many economic issues related to poverty, political instability, the low rate of the economic growth, trade liberalization, foreign exchange shortage due to the decline in the terms of trade, and the lack of economic reform, among others. The primary objective of the AGOA program is to encourage trade and investment in the WAEMU countries and assist them in restructuring their economies. The purpose of this chapter is to simulate policies in the context of the AGOA program and evaluate their economic impacts.

The first section presents policy options and compares the results of the simulations to a base solution, which assumes no change in current policy. Section two analyzes the policy mix consisting of a combination of the policy options.

Policy Options and Results

Four policies are simulated in the context of the AGOA program: three foreign market-led policies and one domestic policy. The first three policies are (1) free trade,

(2) foreign direct investment and foreign capital inflow, (3) devaluation of the CFA Franc. The last policy is economic reform within the WAEMU countries.

The models for the base solution and the policy options are run using the same rates of growth for labor and the monetary base. The study assumes that the labor growth rate is the same as the average annual growth rate of 3.5 percent in the WAEMU economy over the past five years. Also, the study assumes an average annual growth rate of 5.9 percent in the monetary base, which is the rate calculated over the period 1995-2000.

Free Trade Policy

The main objective of the AGOA program is to support the SSA countries by liberating trade and promoting exports. Under AGOA provisions, the WAEMU countries are granted free trade through elimination of both tariffs and quotas. To evaluate the impact of free trade on the WAEMU economic growth, the study simulates the elimination of both all tariffs and quantitative restrictions. In general, quotas and tariffs result in higher world price of imports. Hence, with the elimination of quantitative restrictions on some export items from the WAEMU countries to the United States, the import prices are expected to fall. The simulation takes into account a 10 percent reduction in the rest of the world price of the WAEMU imports as a consequence of the free trade policy enacted by the United States. Under this change in trade policy, the WAEMU economy is supposed to capture some rents that accrue under quotas. The simulation of the growth of the WAEMU economy is conducted from 2001 to the year 2008 when the implementation of the AGOA program ends.

Table 5.1 compares the sectoral effects of eliminating trade barriers and selected quotas in 2008 with the base solution.

Table 5.1
Sectoral Effects of Eliminating Tariffs and Selected Quotas in 2008

Sector	Change (%) in base solution 2001 to 2008			Change (%) with policy 2001 to 2008		
	Output	Exports	Imports	Output	Exports	Imports
Agriculture						
Food crops	16.29	-6.75	18.93	17.95	-6.6	18.66
Cash crops	12.45	8.03	18.18	13.91	9.31	16.48
Livestock	17.26	-17.51	23.81	19.01	-15.12	23.12
Forestry	18.21	-4.45	17.96	18.5	-5.49	18.59
Industry						
Mining and petroleum	14.64	19.68	18	19.22	38.73	17.74
Food processing	19.75	0.41	23.78	16.7	-3.13	22.64
Textile	18.25	8.52	26.97	17.57	8.51	26.7
Chemicals	16.37	5.65	23.03	21.66	19.23	25.65
Basic metal industries	20.08	-0.86	25.15	21.33	5.3	22.99
Other industries	16.34	12.26	23.9	21.41	21.61	25.09
Service						
Electricity	19.13	9.36	25.2	18.23	5.03	23.35
Construction	24.35	0.12	24.56	24.62	-2	23.27
Transportation	21.02	0.6	23.8	22.02	0.07	23.33
Finance	24.21	8.57	30.6	23.98	7.95	29.61
Real estate and service to firms	16.12	-10.11	14.51	18.05	-10.24	14.53
Hotel	17.94	2.74	20.8	19.22	2.7	20.46
Private service	20.69	10.63	28.42	21.55	10.93	28.45
Public service	30.95	0	0	32.21	0	0
Total	17.77	6.24	22.01	18.53	7.19	22.13

The effect of free trade is to increase total output by 18.53 percent in 2008, while in the absence of this policy total production increases by 17.77 percent. The agriculture sectors grow by 17.34 percent compared to a 16.05 percent increase for the base solution. Under the policy change, exports in food crops, livestock, and forestry, hunting and

fishery decrease. These decreases are due to the fact that those commodities have small trade flows and are primarily for domestic consumption. The export- oriented sector (cash crops) is affected most by the free trade policy due to the fact that the major exports of the WAEMU are cocoa, coffee, cotton and cashews[1]. Total production from the industrial sectors rises by 19.65 percent compared to a 17.57 percent increase for the base solution. The service sectors increase by 22.48 percent in comparison with a 21.8 percent increase for the base run simulation. The increase in total sectoral exports and imports occurs at an increasing rate with a higher increasing rate in imports than exports. The smaller incremental increases in exports are due to the decline in the terms of trade. Commodities, such as textile, leather, footwear and wearing apparel, and food processing are examples of sectors with a fall in the terms of trade where the free trade policy has no positive effects. Similarly, the service sectors have small increases in exports due to decrease in the terms of trade and the lack of international competition. The real estate and service to firms sector is the most affected due to an absence of trade flows in the sector.

Table 5.2 compares the macroeconomic impact of the free trade policy to the base year solution for 2008. The impact of free trade is to increase total consumption of goods by 24.16 percent in 2008 compared to a 23.99 percent increase for the base solution, total savings by 23.08 percent compared to a 22.92 percent increase for the base solution. On the income side, household income increases by 23.34 percent while it increases by 22.43 for the base solution. Government revenue increases by 52.82 percent compared to a 45.61 percent increase for the base solution, while the increase in the firm income is less

1 Ivory Coast ranks first in the world in exporting cocoa and ranks third in exporting coffee.

than the increase for the base solution; 17.03 percent for the free trade policy and 17.29 percent for the base solution. By the year 2008, real investment increases by 23.43 percent compared to a 22.78 percent increase for the base solution. The increase in real GDP is 19.35 percent compared to a 19.31 percent increase for the base solution. The average price level rises by 216.21 percent compared to a 226.57 percent for the base solution. The lower increase in the average price of commodities under the free trade policy may explain the rise in the real GDP. The lower increase in the average price creates a real-balance effect in the production sectors which increases the real GDP because the effect of a decrease in the price level is to increase the real demand for money and consequently increase the total production[2]. The effect of the increase in exports is to increase government revenue from export taxes.

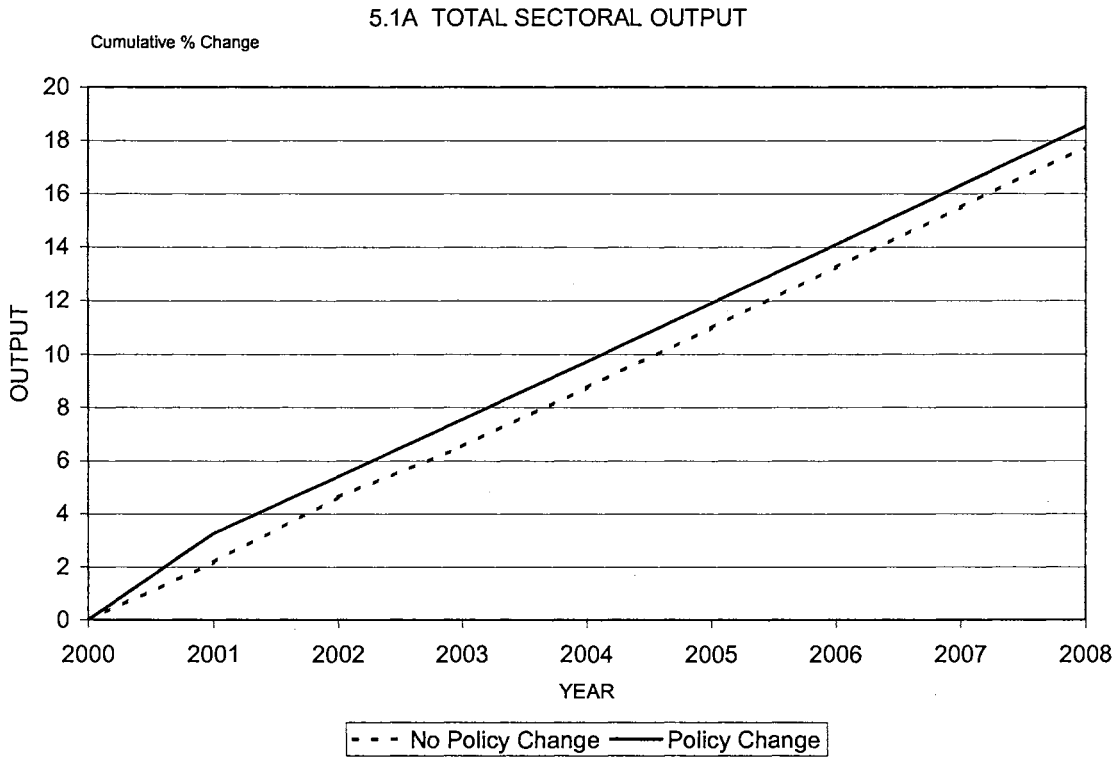
[2] The simulation over the 8 year-period does not provide ample time for the WAEMU economy to converge to a steady state and make the money neutral in a regime of fixed exchange rates.

Table 5.2
Macroeconomic Impact of Free Trade and No Free Trade Policies in 2008

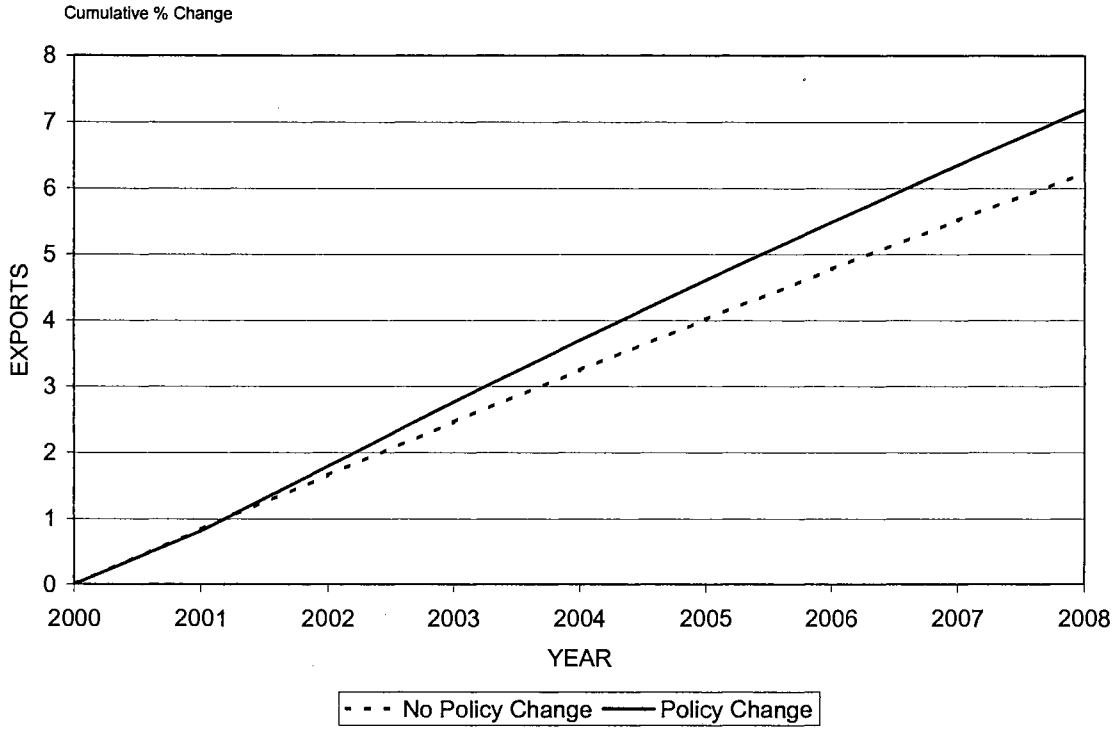
Variable	No policy change (%)	Change in policy (%)
Output	17.77	18.53
Exports	6.24	7.19
Imports	22.01	22.13
Household income	22.43	23.34
Firm income	17.29	17.03
Government income	45.61	52.82
Total saving	22.92	23.08
Total consumption	23.99	24.16
Average price	226.57	216.21
Real GDP	19.31	19.35
Real investment	22.78	23.43

Figure 5.1 compares the economic impact of eliminating all trade barriers with the base solution for the period 2001 to 2008. The vertical axis in the figure represents the cumulative percentage change in each variable.

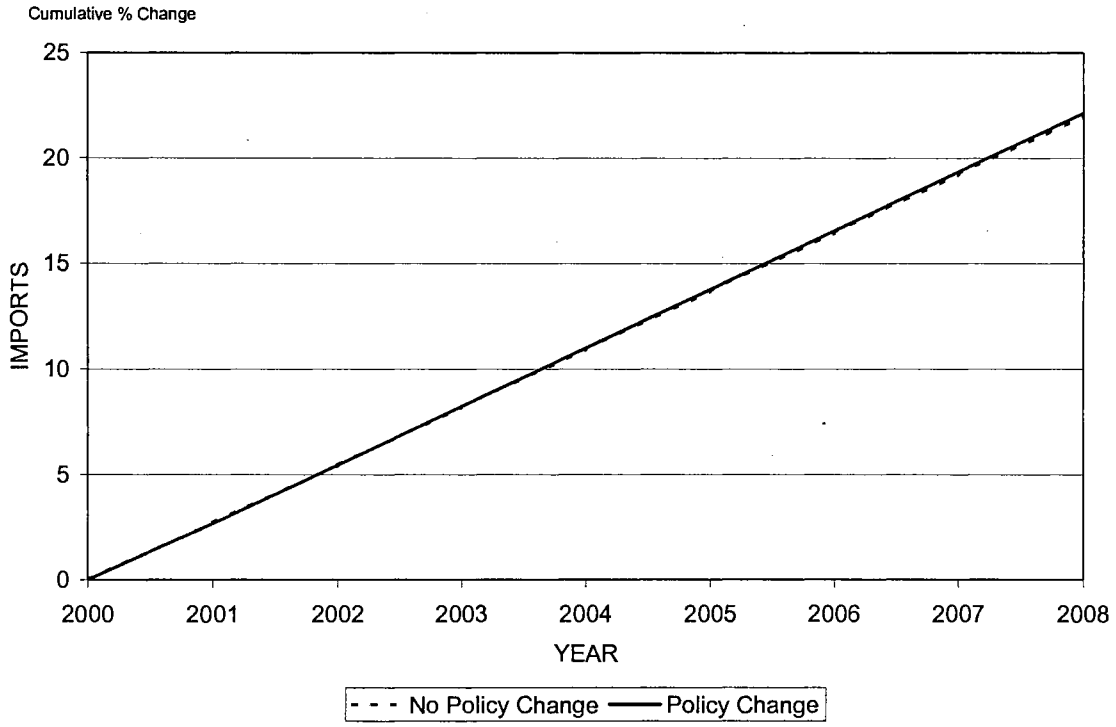
Figure 5.1
Dynamic Effects of Tariff and Selected Quotas Elimination



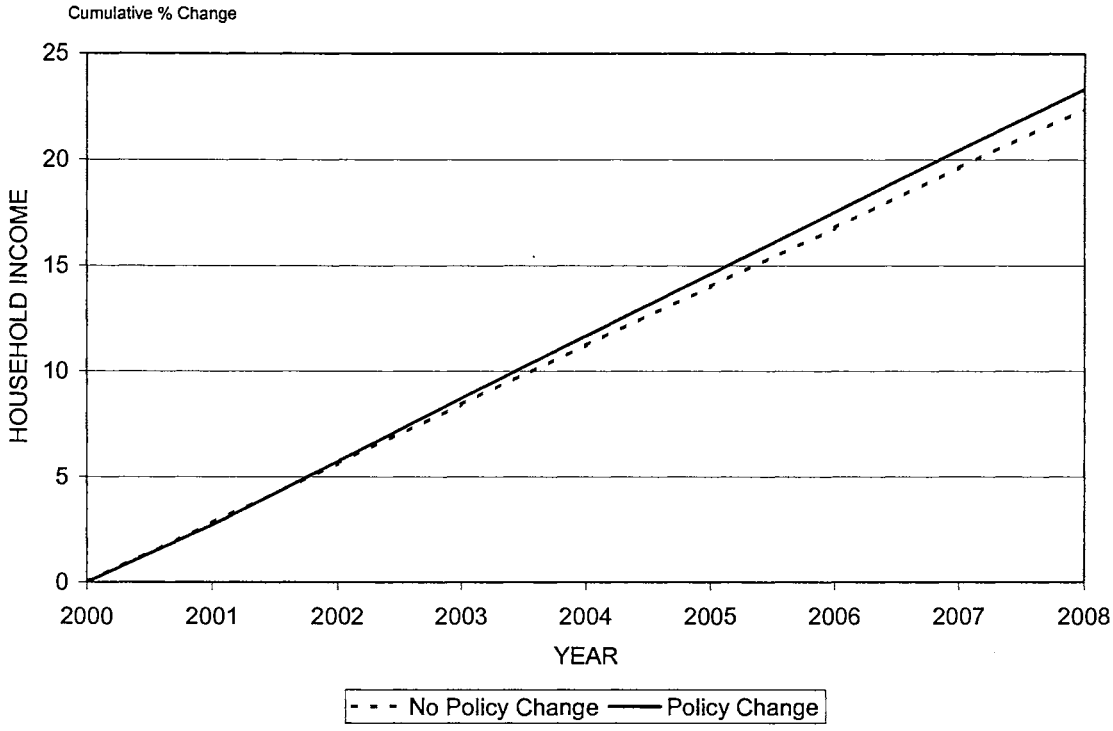
5.1B EXPORTS



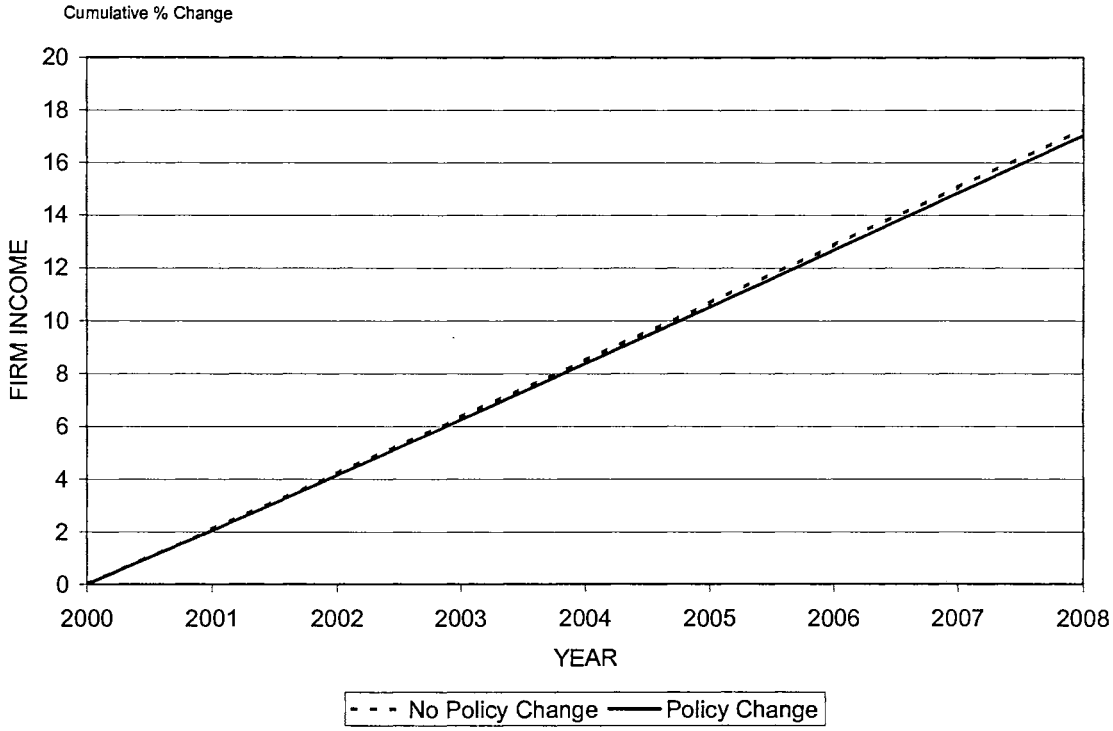
5.1C IMPORTS



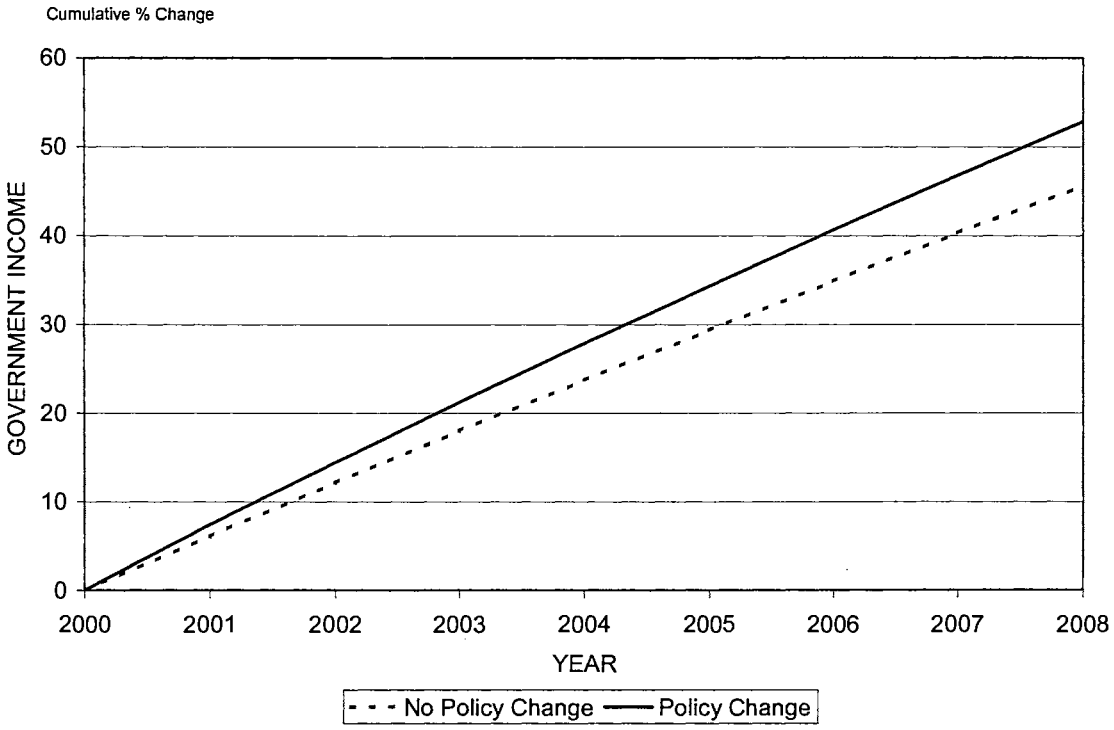
5.1D HOUSEHOLD INCOME



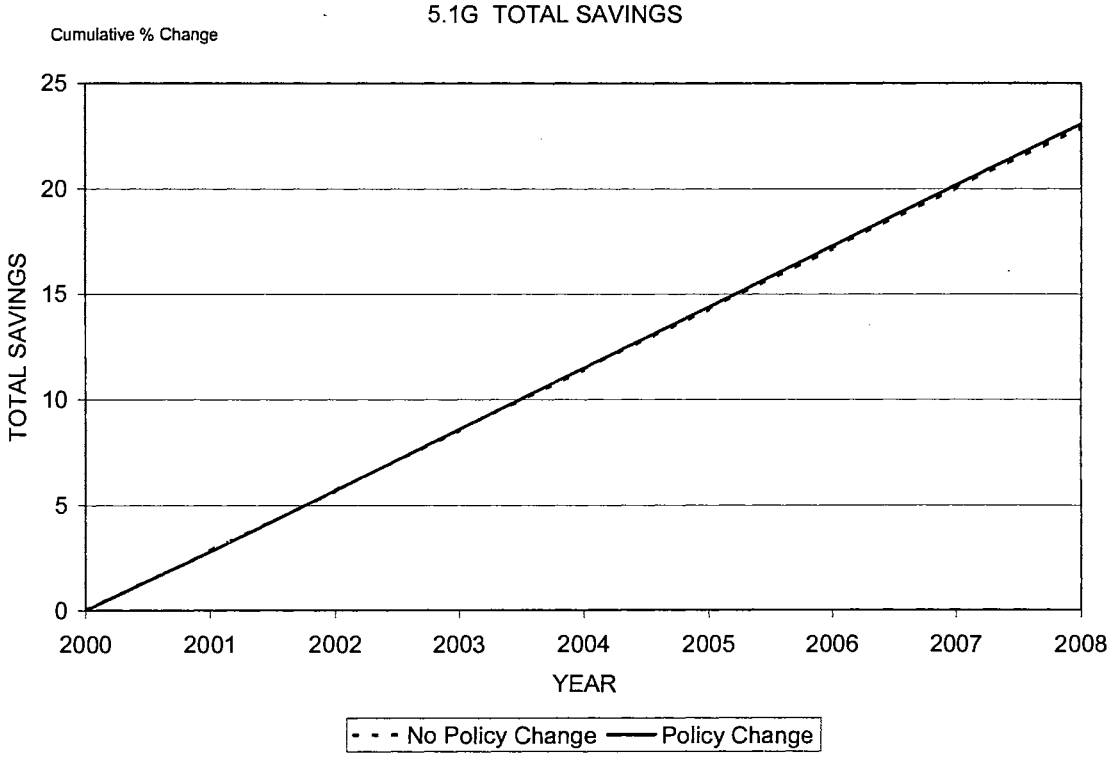
5.1E FIRM INCOME



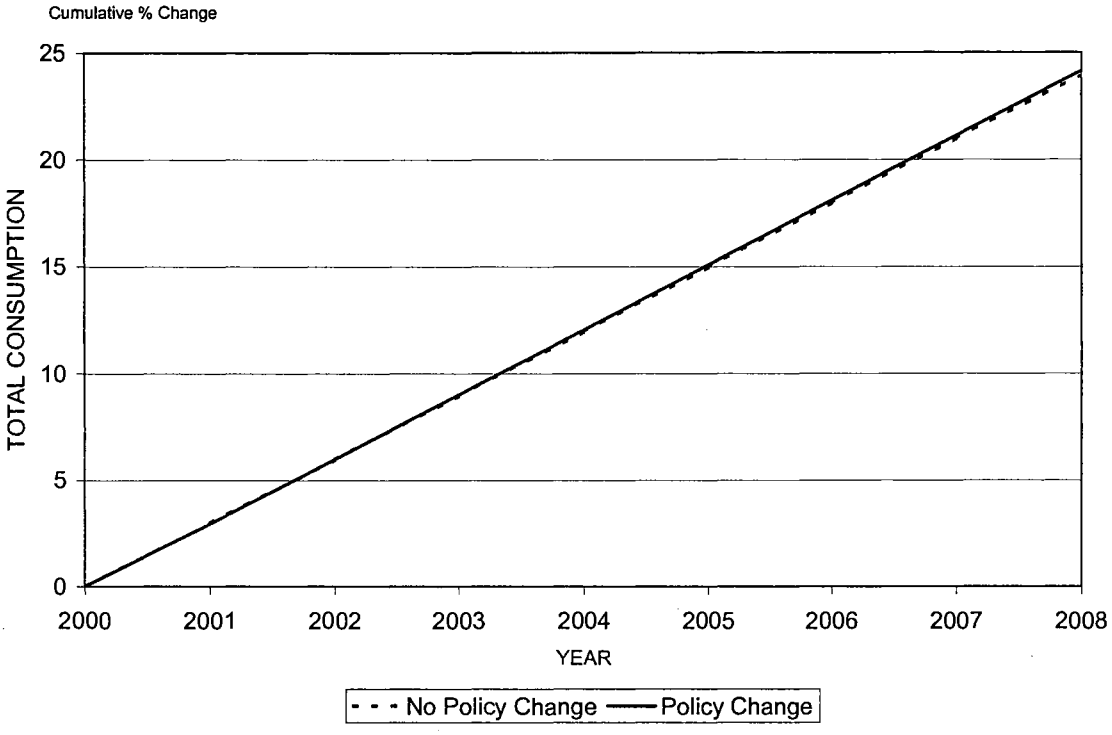
5.1F GOVERNMENT INCOME



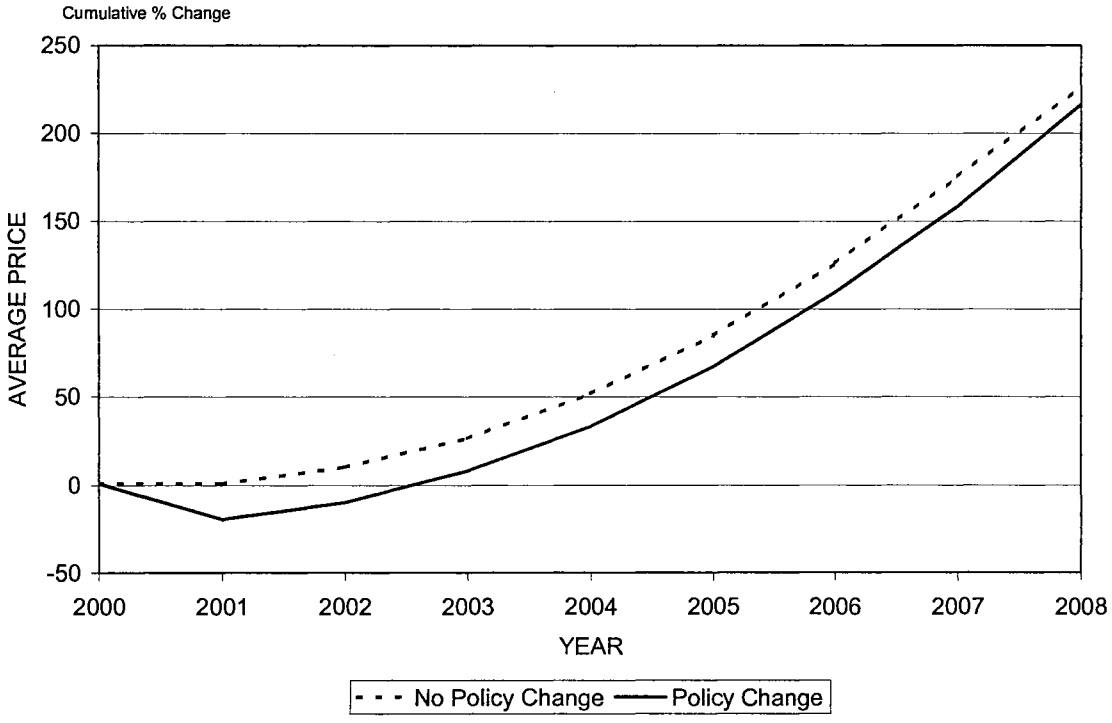
5.1G TOTAL SAVINGS



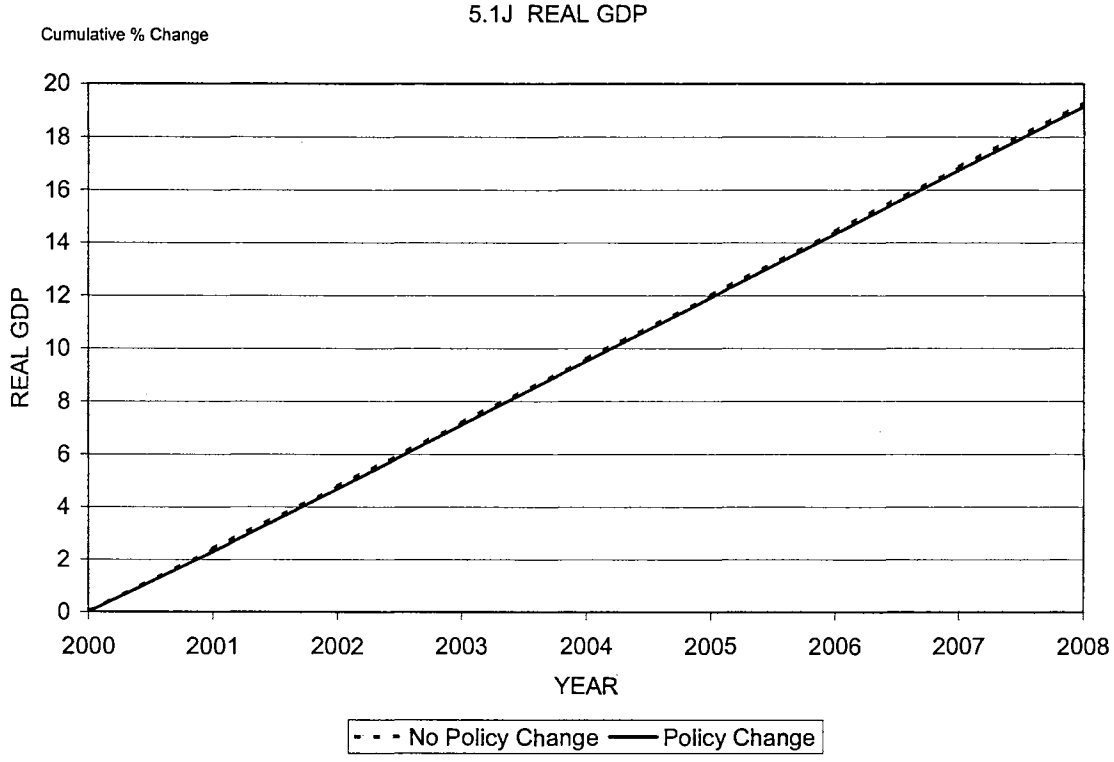
5.1H TOTAL CONSUMPTION



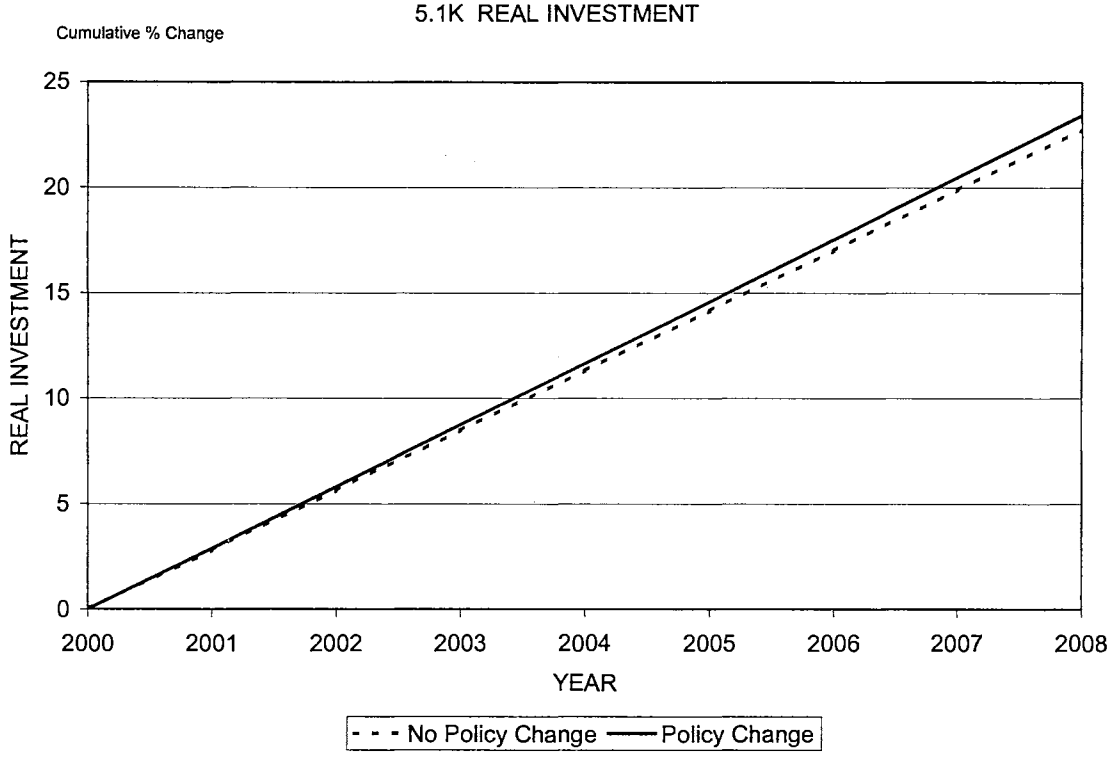
5.1I AVERAGE PRICE



5.1J REAL GDP



5.1K REAL INVESTMENT



Under the GSP program, the most highly taxed commodities are footwear, textile, apparel, leather, flatware, washes, and glass. The AGOA provisions provide the WAEMU countries duty-free and quota-free on exports of these articles. A policy of free trade under AGOA is supposed to increase WAEMU countries exports to the United States for these commodities. The sectoral effects of eliminating all tariff barriers is the increase in the total output of the textile, leather, footwear and wearing apparel sector by 17.57 percent in the year 2008. With no change in policy (status quo), the average percentage increase in total output in the same sector is 18.25 percent. The decrease in this sectoral output and the increase in the balance of trade deficit suggest that either the WAENU countries could not take advantage of the statute because of the lack of investment in the sector or the 10 percent reduction in the import prices simulated in the model is not important.

The above results show that the free trade policy improves total output and the trade deficit compared to the policy of status quo. Institutions' revenues also improve significantly. The incremental increases in total saving, total consumption and real investment show that the free trade policy impacts positively the WAEMU economy. The decrease in real GDP is due to the higher increase in the price level. In general, the economic gain for the WAEMU under the free trade policy exceeds the gain from no free trade policy.

Foreign Direct Investment and Foreign Capital Inflows Policy

SSA countries suffer from lack of foreign direct investment. Only about 3 percent of the world's total investment flows goes to the SSA countries, and most of this is

concentrated in the extractive industries. The United States was the leading supplier of foreign direct investment to Africa during the period 1994-1998. However, at year-end 2000, the United States direct investment to Africa had declined. SSA accounts for less than one percent of the United States direct investment in the world.

The AGOA program offers opportunities to African governments and the private sector to increase investment and foreign capital inflows. The United States direct investment in the WAEMU countries for 2001 totaled 202 million dollars and represented direct investment in 5 production sectors: mining and petroleum; food processing; textile, leather, footwear and wearing apparel; chemicals and related products; and private service.

The lack of foreign direct investment associated with the deterioration in the terms of trade (declines in export prices and/or increase in import prices) causes a shortage of foreign exchange. To deal with the excess demand for foreign exchange, the WAEMU countries can let the exchange rate float. This can be simulated by treating the exchange rate endogenously in the model and making net foreign capital inflow exogenous. The study simulates a 25 percent increase in foreign capital inflow per year. The results are then compared with the base solution.

The macroeconomic impact expected from the increase in the direct foreign investment is to raise output, consumption, savings, and income. The increase in output increases imports due to an increase in consumption leading to increased spending on imports. Also with the increase in output, the real demand for money increases, and hence the interest rate increases. Because of the increase in output and the fall in the exchange rate, net exports fall.

Under the flexible exchange rate and with the 25 percent per annum increase in the capital inflow, sectoral output in 2008 rises by 17.91 percent compared to a 17.31 percent increase for the base solution as presented in Table 5.3. However, the policy implementation has a negative effect on some export- oriented commodities sectors such as cash crops, mining and petroleum, other industries, and textile, leather, footwear, and wearing apparel. The reason for the decrease in output compared to the base solution may be the lack of international competitiveness and the decline in the terms of trade in those sectors as import prices increase more than the increase in the export prices, which discourages the production of those commodities. For example, because of the harsh international competitiveness in the textile, leather, footwear, and wearing apparel sector, WAEMU producers of the commodities related to that sector switch to the production of other commodities such as food crops. Exports in all sectors (except for mining and petroleum sector) decrease while imports in all sectors increase.

Table 5.3
Sectoral Effects of 25% Increase in Capital in 2008

Sector	Change (%) in base solution 2001 to 2008			Change (%) with policy 2001 to 2008		
	Output	Exports	Imports	Output	Exports	Imports
Agriculture						
Food crops	13.96	17.64	0.41	18.85	-45.91	70.76
Cash crops	13.64	14.06	10.23	13.48	-4.85	40.68
Livestock	14.69	16.25	12.41	20.21	-65.88	48.32
Forestry	17.5	19.43	-14.85	19.95	-41.91	100.59
Industry						
Mining and petroleum	16.84	28.61	17.31	14.84	12.92	19.11
Food processing	19.93	23.1	12.23	20.98	-35.17	48.44
Textile	19.42	20.79	9.68	19.14	-14.47	69.18
Chemicals	16.87	25.13	15.21	17.22	-29.52	39.68
Basic metal industries	19.54	26.16	17.81	21.11	-42.22	39.35
Other industries	17.54	23.26	16.76	16.72	-7.1	39.89
Service						
Electricity	20.15	19.18	7.64	19.79	-7.37	71.3
Construction	20.21	41.55	0.98	26.71	-57.97	97.11
Transportation	19.85	30	-1.48	22.71	-47.33	102.31
Finance	23.81	35.29	3.44	24.51	-38.7	121.01
Real estate and service to firms	14.16	25.73	-6.96	18.51	-59.48	82.89
Hotel	17.45	25.14	-5.8	19.68	-41.58	107.6
Private service	20.75	23.25	15.73	21.72	-12.54	58.18
Public service	30.05	0	0	31.5	0	0
Total	17.31	19.4	12.28	17.91	-20.03	43.32

The increase in the output due to the increase in investment increases the real money balance and the interest rate by 32.82 percent compared to a 20.23 percent increase for the base solution. The resulting appreciation of the CFA Franc or the decrease in the exchange rate leads to a trade balance deficit due to a higher decrease in exports and a higher increase in imports. The exchange rate decreases by 23.02 percent whereas it increases by 9.83 percent in the base solution. Exports decrease by 20.03 percent in comparison with a 19.4 percent increase for the base solution. Imports

increase by 43.32 percent with the policy implementation, while the increase is 12.28 percent in the base run simulation.

The economic impact of the increase in capital flow as presented in Table 5.4 has an expansionary effect on the WAEMU economy. However, net exports fall, offsetting part of the increase in the real investment, hence real GDP. Household income increases by 51.33 percent compared to a 5.24 percent increase for the base solution. Government income increases by 79.2 percent, while the increase in the base solution is 16.57 percent. The huge increase in the government revenue comes from the increase in tariff as imports rise sharply[3]. As a consequence, firm income rises only by 14.77 percent compared to a 17.54 percent for the base solution. Total consumption increases by 37.15 percent compared to a 14.94 percent increase for the base solution. Total saving increases by 34.93 percent, while the increase in the base run is 14.88 percent. With the rise in the total saving, real investment increases by 36.29 percent compared to a 15.04 percent increase for the base solution. Real GDP rises by 42.07 percent in comparison with a 5.07 percent increase for the base solution. With a decrease in the incremental average price a positive real- balance effect is generated due to an increase in real money balance, which leads to an increase in real GDP[4].

[3] With the harmonization of tax legislation within the WAEMU and the application of the WAEMU Customs Union based on the value-added tax system, increase in tariff due to increase in imports is translated into an increase in government revenue.

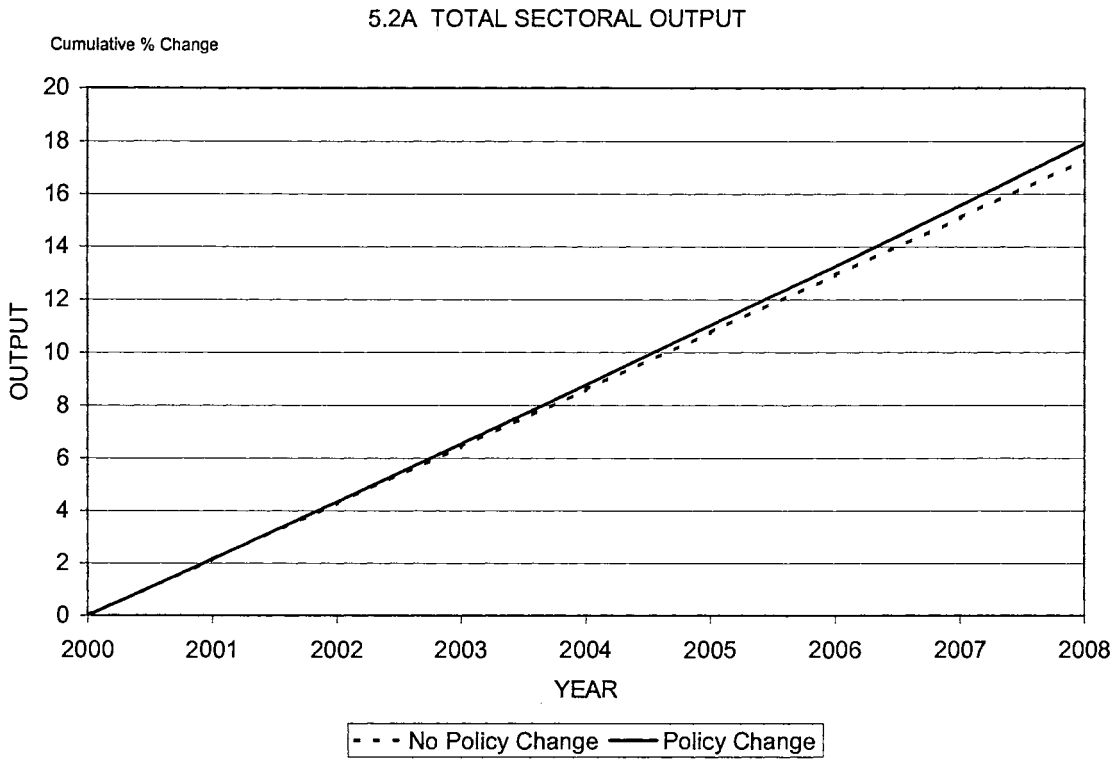
[4] The real- balance effect may be attributed to a distribution effect. This may explain the higher increase in household income, government revenue, total consumption and total saving.

Table 5.4
Macroeconomic Impact of 25 percent Increase in Foreign Capital Inflow in 2008

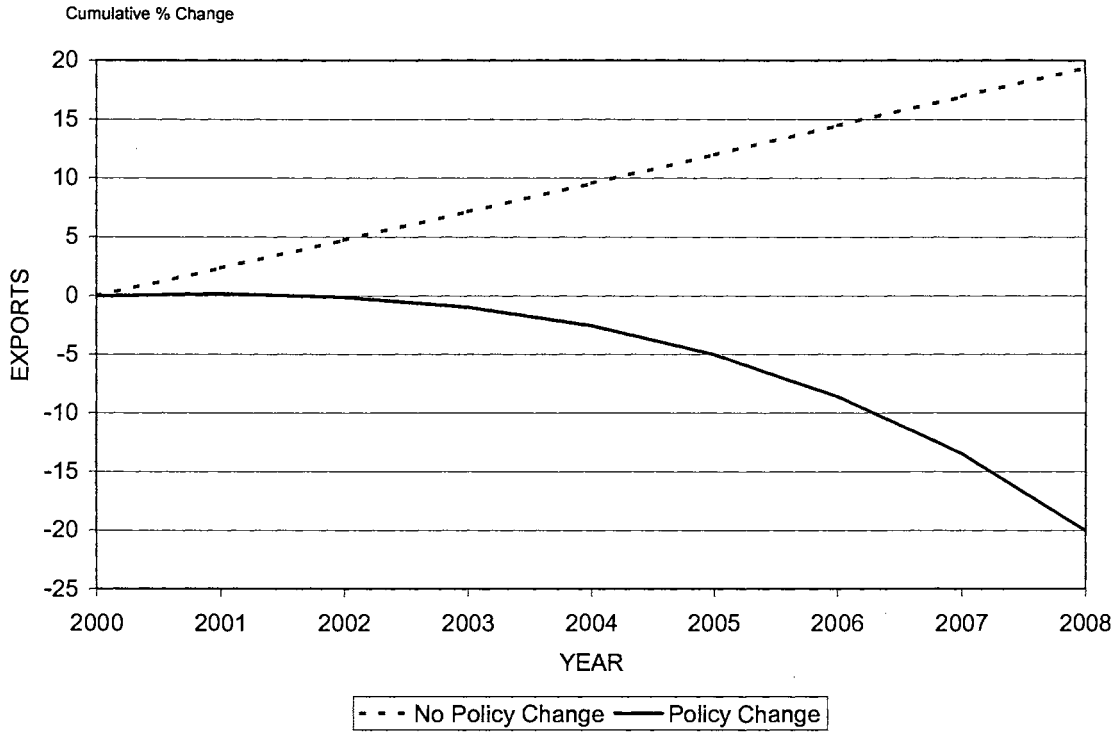
Variable	No policy change (%)	Change in policy (%)
Output	17.31	17.91
Exports	19.4	-20.03
Imports	12.28	43.32
Household income	5.24	51.33
Firm income	17.57	14.77
Government income	16.57	79.2
Total saving	14.88	34.93
Total consumption	14.94	37.15
Average price	237	184.72
Real GDP	5.07	42.07
Real investment	15.04	36.29
Exchange rate	9.83	-23.02

Figure 5.2 presents the macroeconomic results of these effects. The vertical axis in the figure represents the cumulative percentage change in each variable resulting from the 25 percent increase in capital inflow.

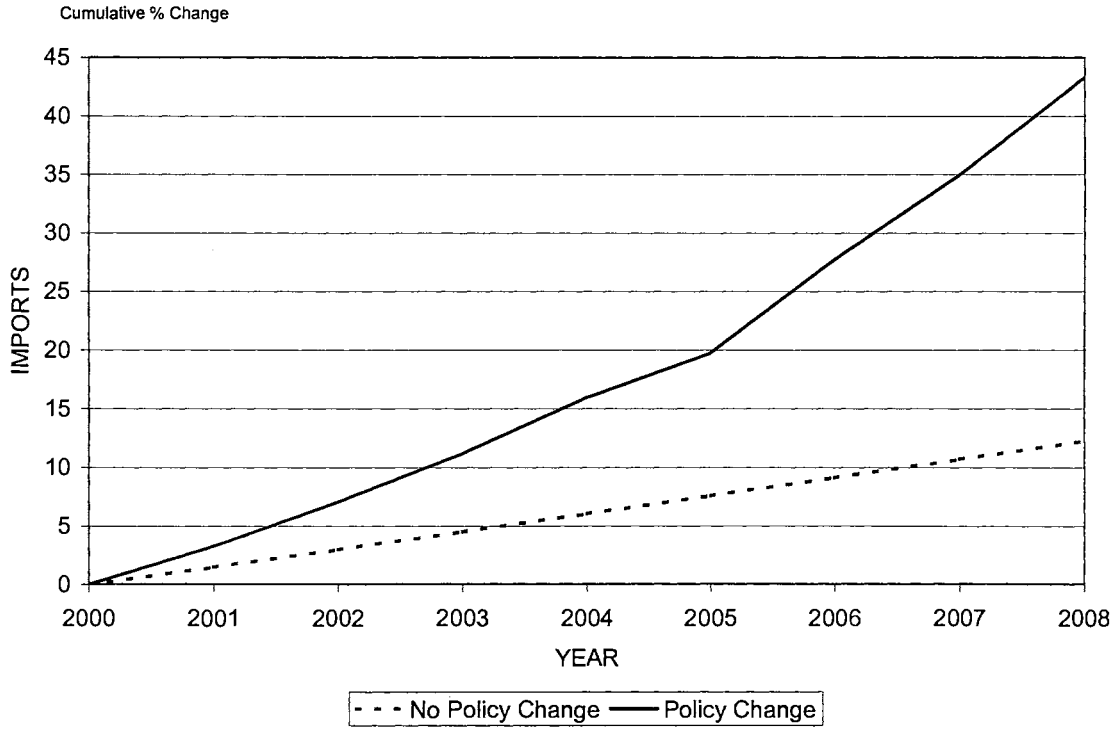
Figure 5.2
Dynamic Effects of Foreign Direct Investment and Foreign Capital Inflow



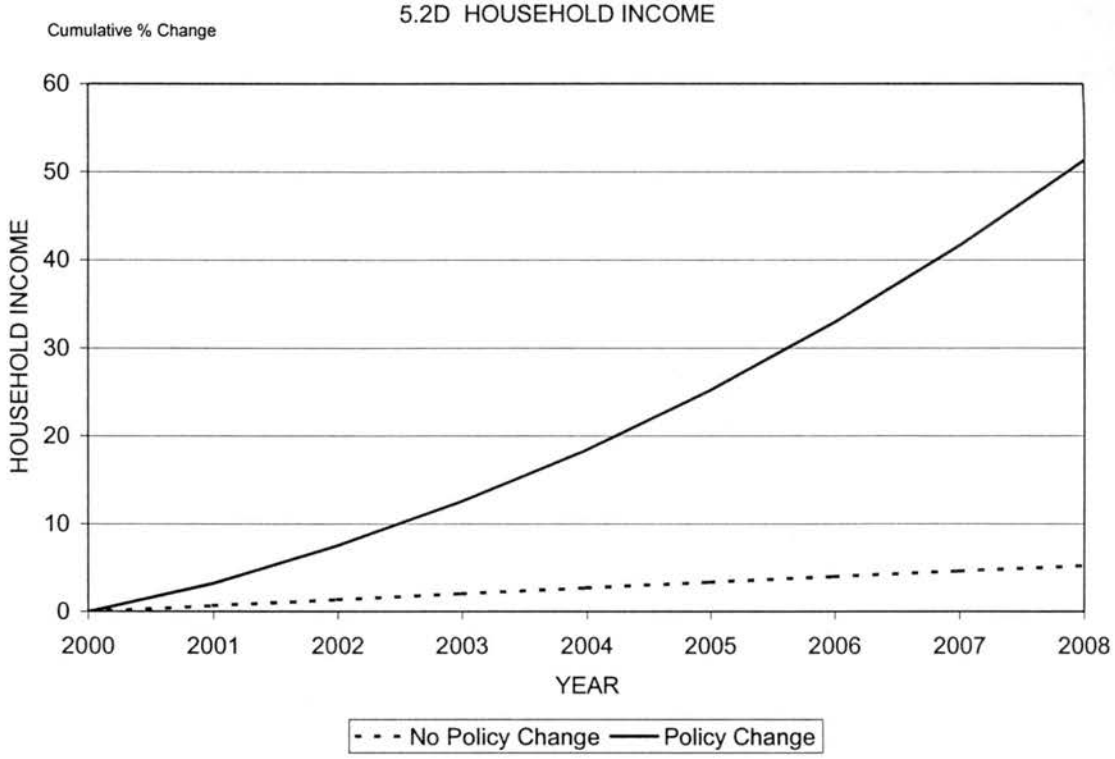
5.2B EXPORTS



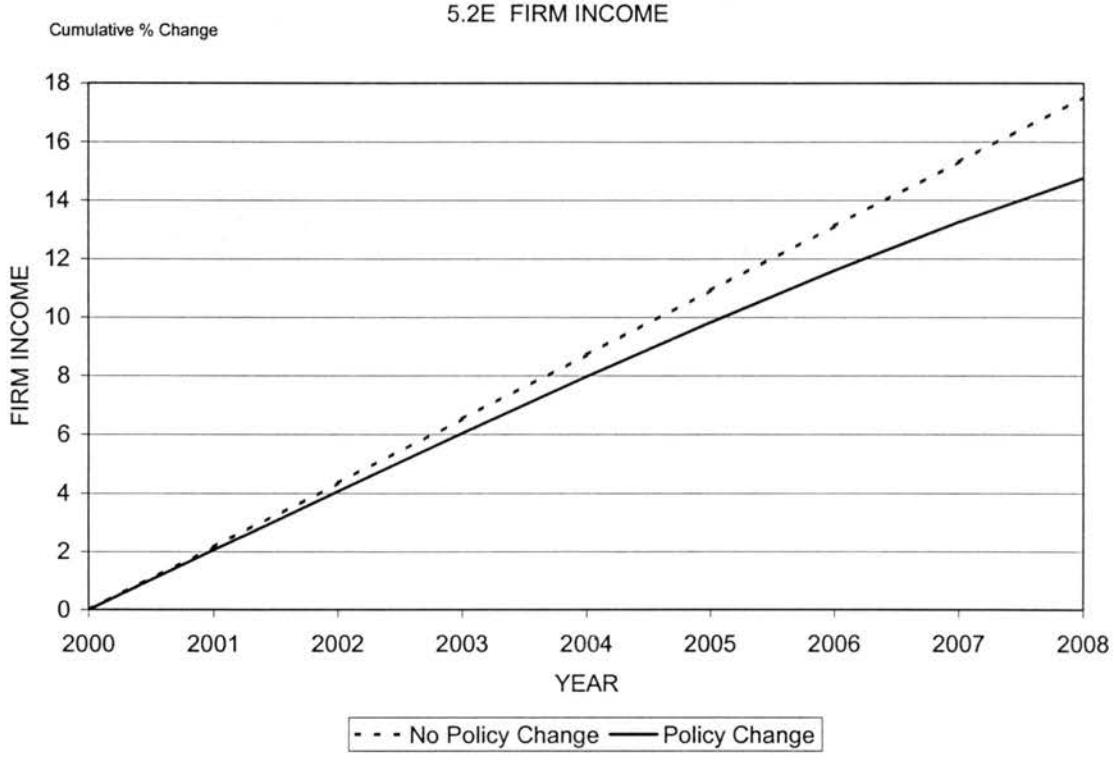
5.2C IMPORTS



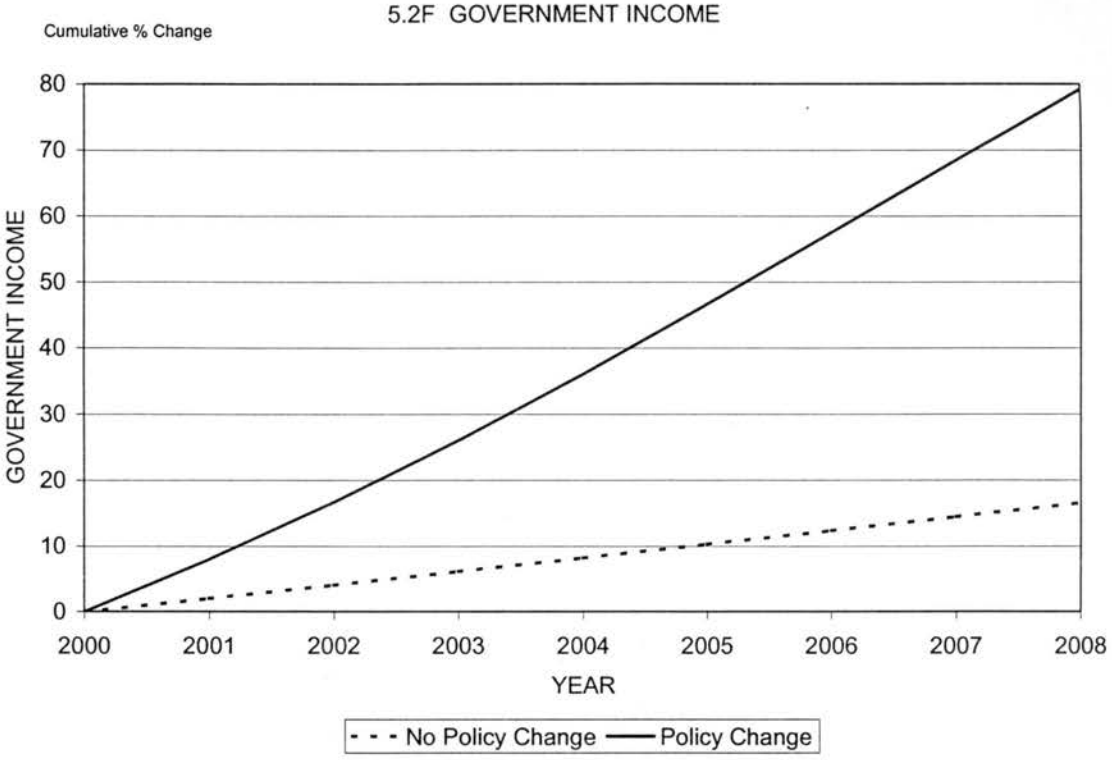
5.2D HOUSEHOLD INCOME



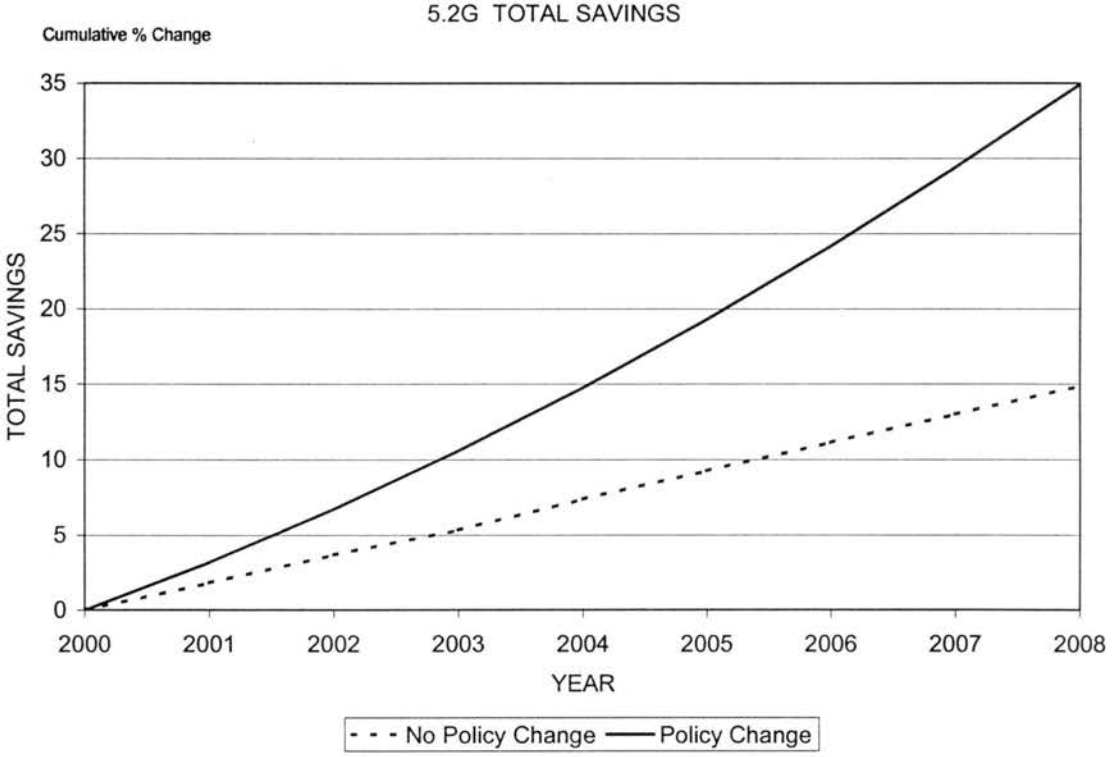
5.2E FIRM INCOME



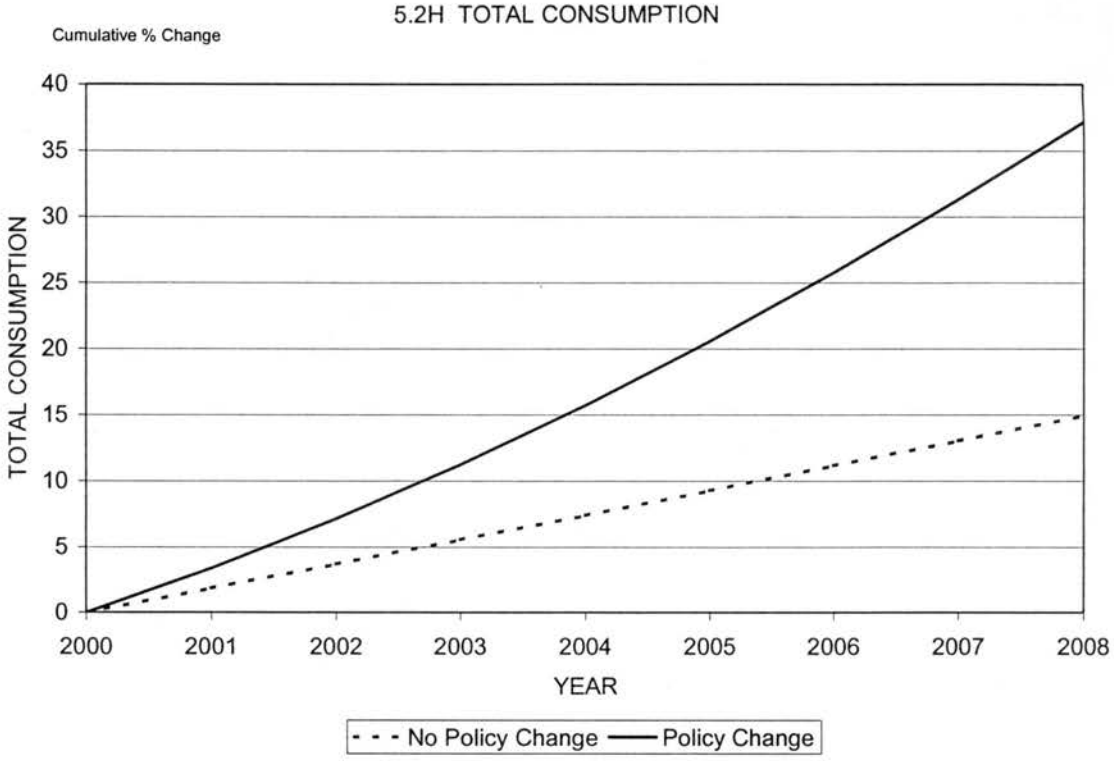
5.2F GOVERNMENT INCOME



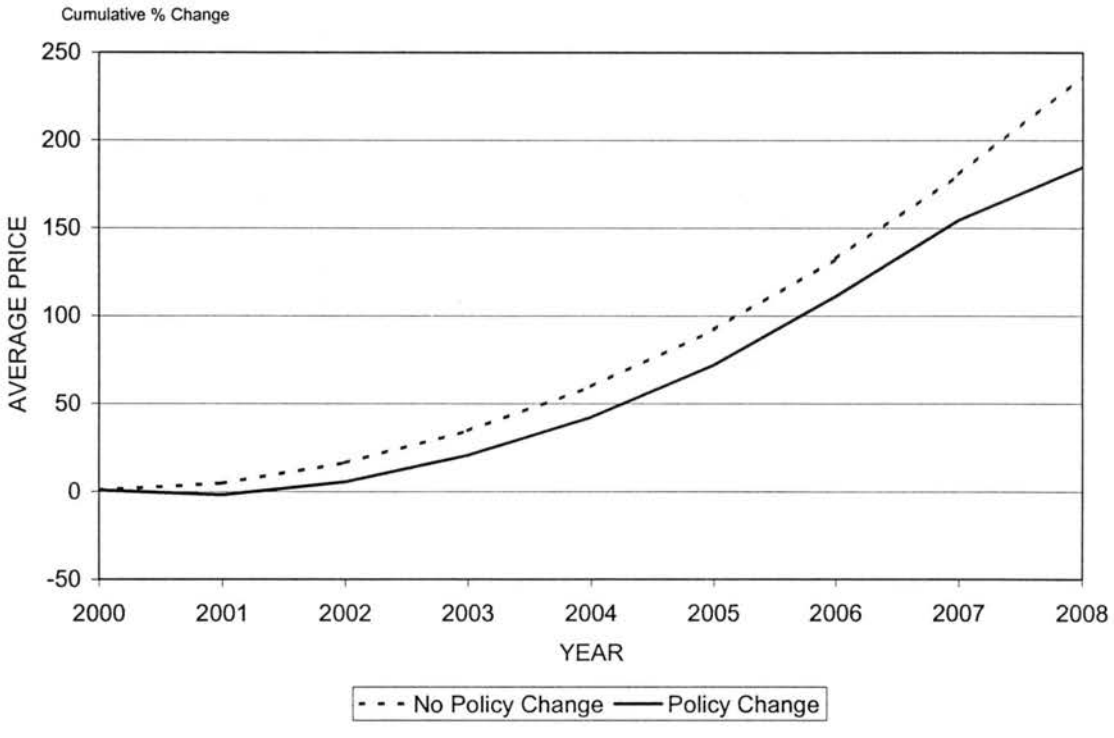
5.2G TOTAL SAVINGS



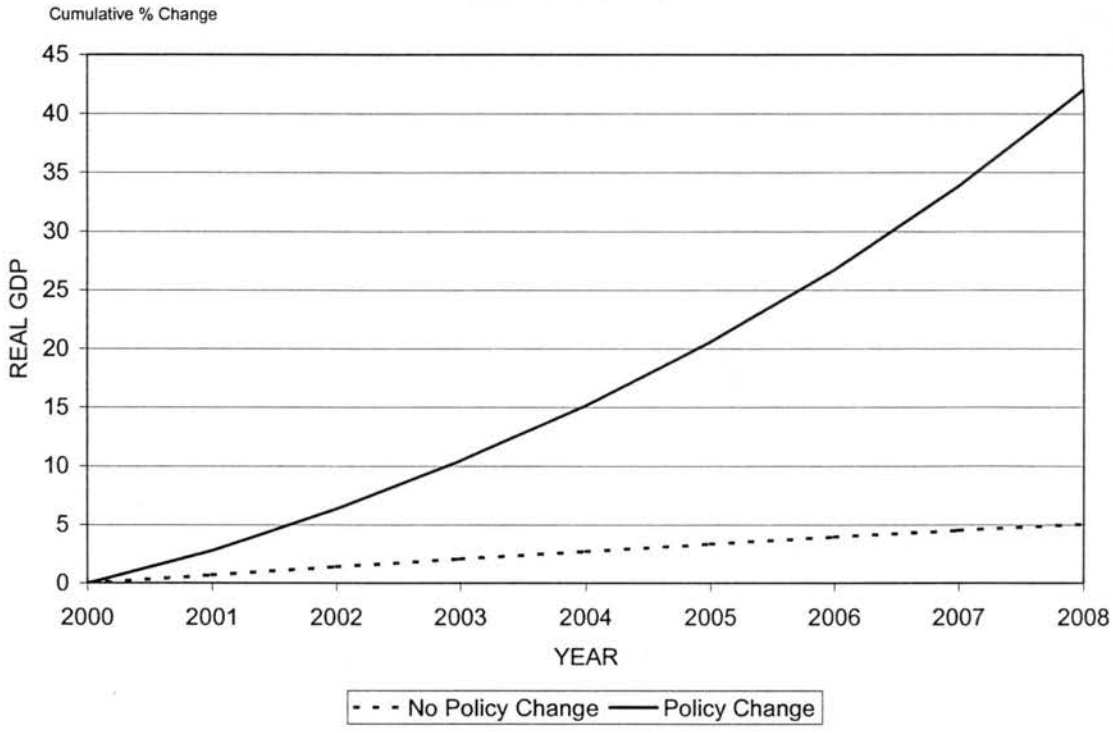
5.2H TOTAL CONSUMPTION



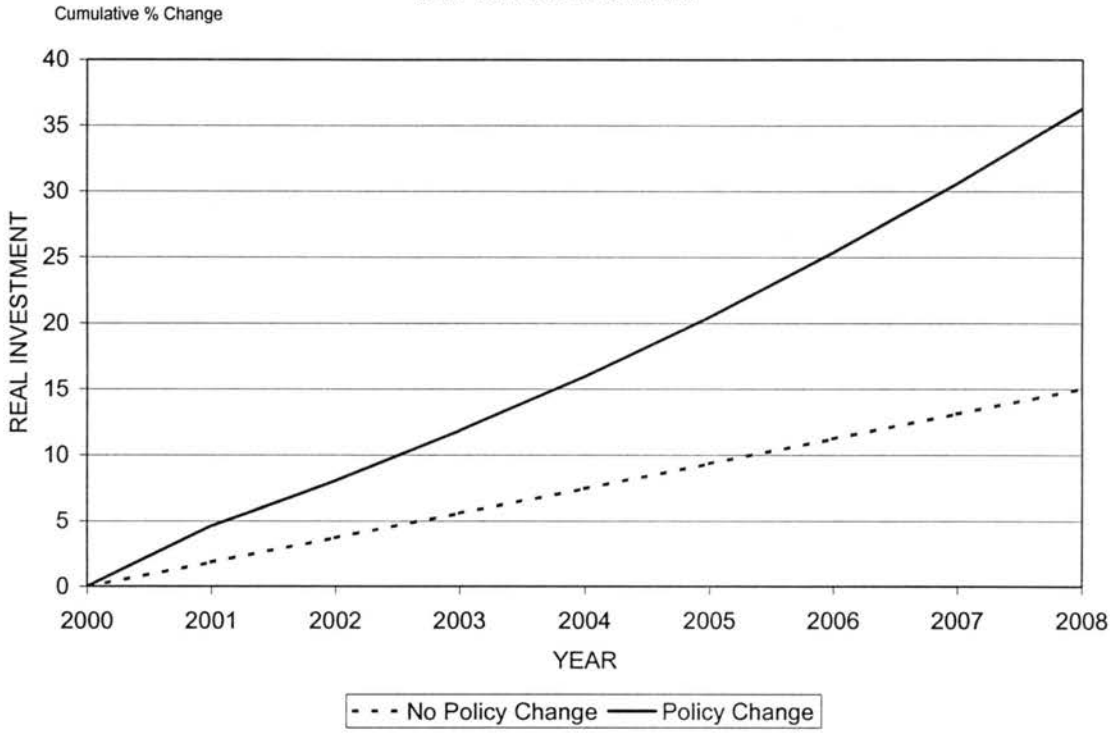
5.2I AVERAGE PRICE

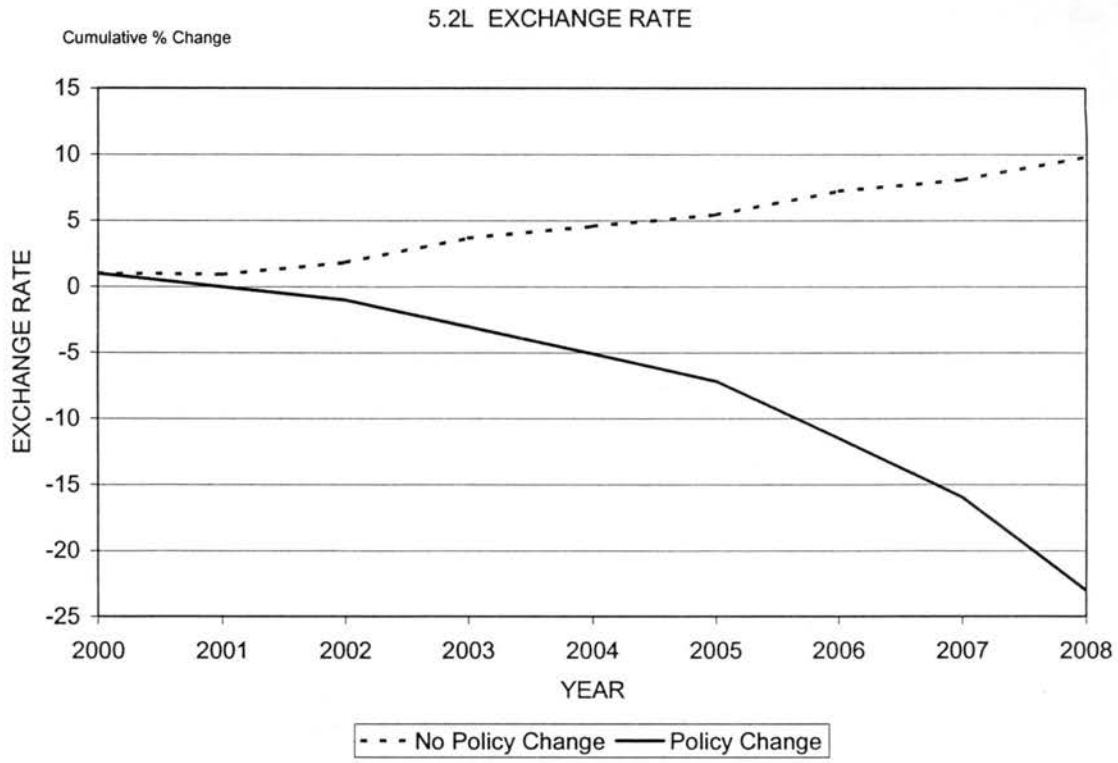


5.2J REAL GDP



5.2K REAL INVESTMENT





The implementation of the increase in the foreign capital inflow policy impacts positively the WAEMU economy. Total output increases more than the case of no policy change. Household income, government income, total saving, total consumption and real investment improve substantially with the implementation of the policy change. As a consequence, real GDP increase sharply. However, the appreciation of the CFA franc worsens the balance of trade deficit.

It is important to point out that besides the lack of foreign direct investment in the WAEMU, there is little sectoral investment diversification. For example, out of 202 million dollars invested in the WAEMU economy in 2001 by the United States, only five sectors received these funds and 132 million dollars or 65 percent of the total investment went to the mining and petroleum sector. Also, besides the investment diversification

and higher investment rates, political and economic reforms to create stable environment are necessary for achieving sustainable long- run reduction in poverty in the WAEMU.

Devaluation Policy

The WAEMU was created in the aftermath of the January 1994 devaluation of the FCFA to help the members coordinate their fiscal and monetary policy. Economic performance has improved in the union during the 1990s. However, except for Ivory Coast, all the WAEMU countries face a balance-of-payments deficit resulting in the decline of their terms of trade. Devaluation is the major policy instrument for dealing with payments deficits. It results in an increase in the domestic currency price of foreign exchange. Devaluation also increases the relative price of imported goods and reduces the relative price of exports from the devaluing country. This causes an increase in the exports, hence an increase in income. An increase in income results in an increase in imports. "A devaluation induced by a shortfall of foreign exchange will tend to raise the relative price of close import substitutes and exportables and lower the price of essentially nontraded commodities or commodities that behave as import complements. The resulting reallocation of resources will lead to an expansion in the production of exports and import substitutes and a contraction in the production of nontradables and import complements" (Dervis, pp. 295 and 296).

To boost the exports in the WAEMU countries the study simulates a 5 percent devaluation of the CFA Franc by changing exogenously the exchange rate from 1.0 to 1.05 in the model. The results from the simulation are compared with the base solution.

The effect of the devaluation as presented in Table 5.5 is to increase total output in all sectors of production except for the construction, finance and public sectors. The effect of the devaluation on those three nontradable goods is negative. Overall, total output increases by 18.77 percent in 2008 compared to a 17.77 percent increase for the base solution.

The devaluation affects positively the exports and imports of tradable goods sectors (crash crops in the agriculture sectors, all the industry sectors, and the electricity in the service sectors) and negatively the exports and imports of nontradable goods sectors (food crops, livestock, and forestry, hunting and fishery sectors, and the rest of the service sectors). With the devaluation the relative price of imports of those commodities increases and the relative price of exports decreases. As a consequence, exports and imports of those tradable goods increase. In total, exports and imports increase by 7.04 percent and 22.1 percent in comparison with a 6.24 percent increase in exports and a 22.01 percent increase in imports for the base solution. As expected, the devaluation improves the trade balance deficit due to the increase in the price level, which leads to an expansion in exports leaving imports almost unchanged .

Table 5.5
Sectoral Effects of the Devaluation in 2008

Sector	Change (%) in base solution 2001 to 2008			Change (%) with policy 2001 to 2008		
	Output	Exports	Imports	Output	Exports	Imports
Agriculture						
Food crops	16.29	-6.75	18.93	17.25	-7.67	18.29
Cash crops	12.45	8.03	18.18	14.25	8.99	18.33
Livestock	17.26	-17.51	23.81	18.1	-19.62	23.07
Forestry	18.21	-4.45	17.96	19.54	-4.64	17.18
Industry						
Mining and petroleum	14.64	19.68	18	16.53	23.52	18.24
Food processing	19.75	0.41	23.78	21.37	1.08	24.12
Textile	18.25	8.52	26.97	20.12	9.48	27.37
Chemicals	16.37	5.65	23.03	17.67	7.26	23.22
Basic metal industries	20.08	-0.86	25.15	20.88	15.67	25.27
Other industries	16.34	12.26	23.9	17.66	14.31	23.73
Service						
Electricity	19.13	9.36	25.2	20.55	12.19	26.05
Construction	24.35	0.12	24.56	23.96	-1.97	22.57
Transportation	21.02	0.6	23.8	21.78	0.22	23.34
Finance	24.21	8.57	30.6	24.16	8.73	30.37
Real estate and service to firms	16.12	-10.11	14.51	17.23	-10.91	13.65
Hotel	17.94	2.74	20.8	19.16	1.5	19.92
Private service	20.69	10.63	28.42	21.82	11.28	28.59
Public service	30.95	0	0	30.69	0	0
Total	17.77	6.24	22.01	18.77	7.04	22.1

Other effects of the devaluation are presented in Table 5.6. Government revenue, household income, and firm income increase more compared to the increase in the base solution. Also total consumption and total saving increase substantially in comparison with the base solution. The devaluation more than doubles the demand for money and the interest rate in 2008. With no devaluation, the demand for money increases by 9.37 percent and the interest rate by 0.96 percent. The higher increase in the price level generated by the devaluation causes a negative real- balance effect for real GDP and

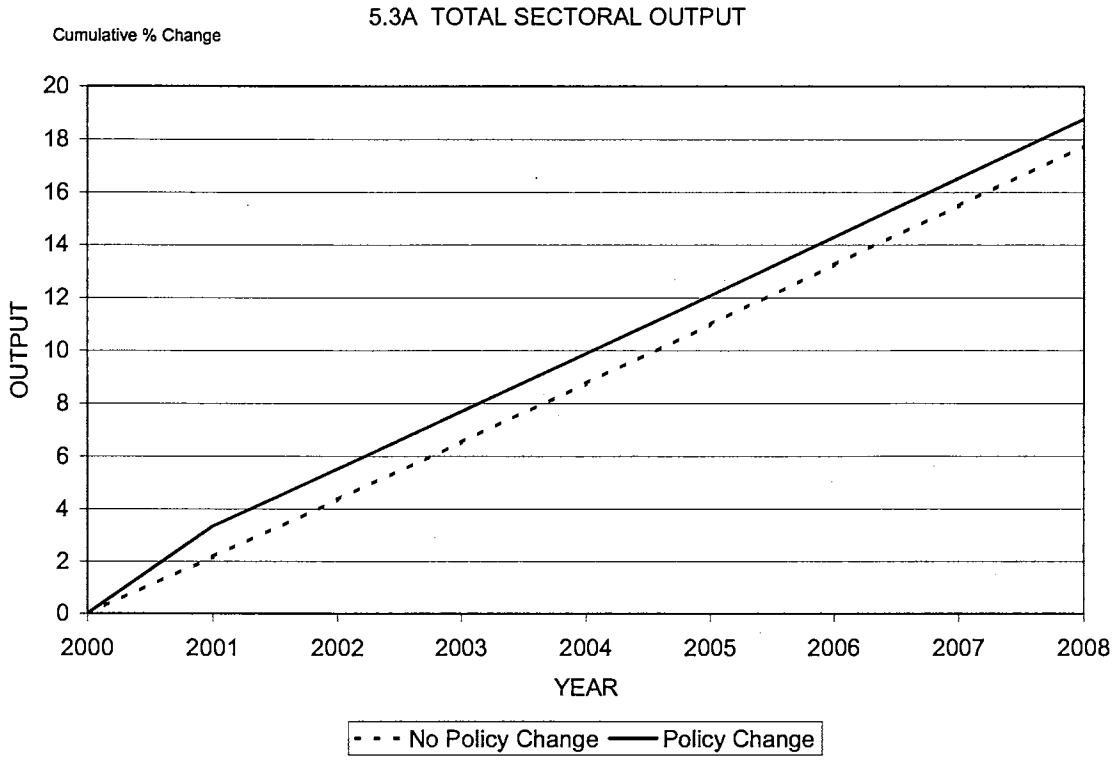
firms and an offsetting positive one for the government. Government revenue increases by 50.46 percent compared to a 45.61 percent for the base solution while firm income increases by 16.96 percent in comparison with 17.29 percent in the base run simulation.

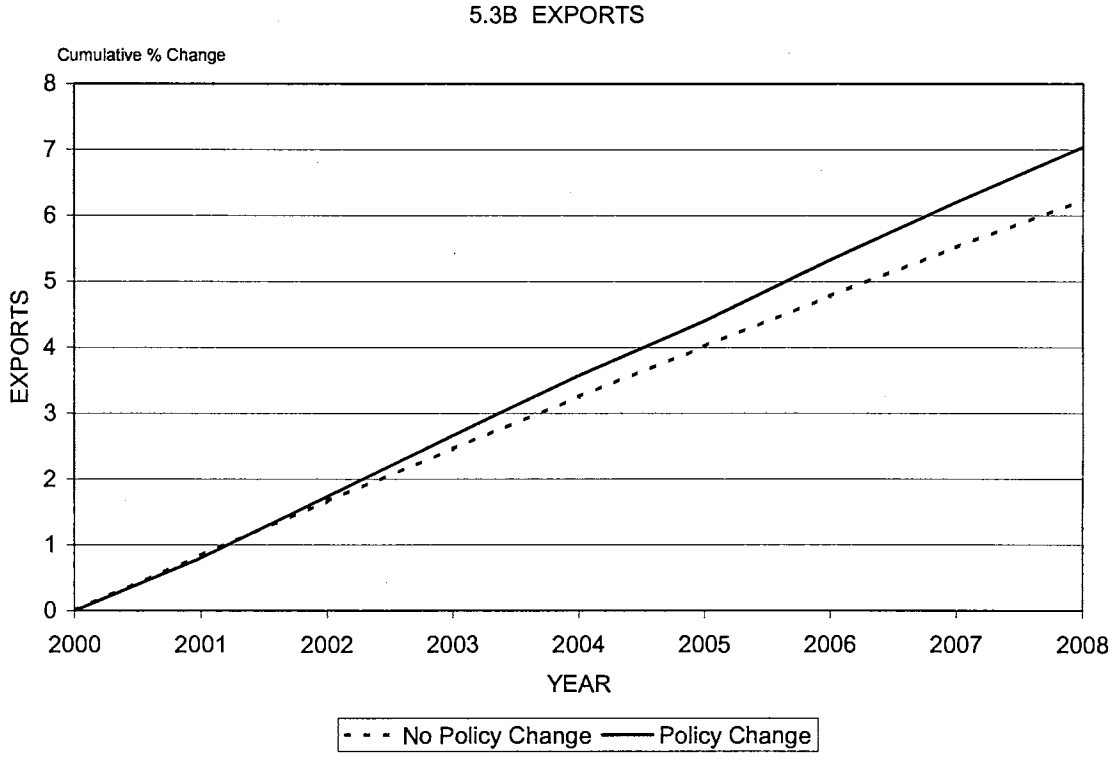
Table 5.6
Macroeconomic Impact of 5 percent Devaluation in 2008

Variable	No policy change (%)	Change in policy (%)
Output	17.77	18.77
Exports	6.24	7.04
Imports	22.01	22.1
Household income	22.43	22.84
Firm income	17.29	16.96
Government income	45.61	50.46
Total saving	22.92	23.05
Total consumption	23.99	24.21
Average price	226.57	239.69
Real GDP	19.31	19.61
Real investment	22.78	22.84

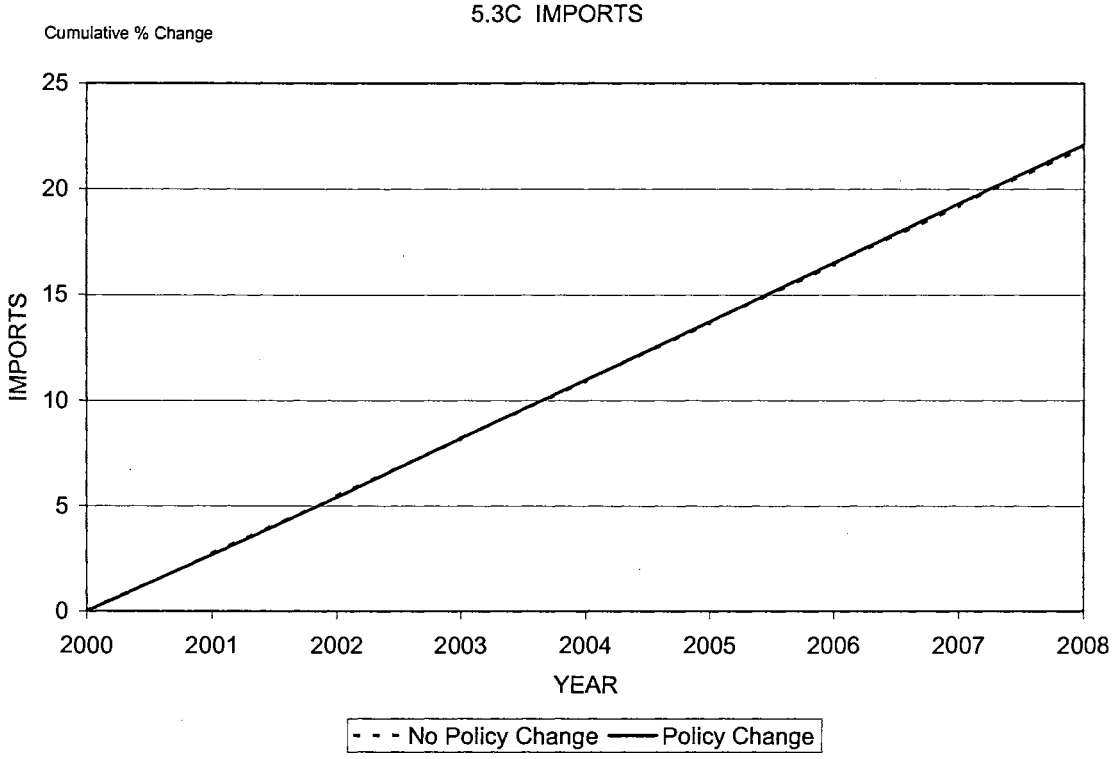
Figure 5.3 summarizes this economic impact. The vertical axis gives the cumulative percentage change in the variables resulting from the devaluation policy.

Figure 5.3
Dynamic Effects of Devaluation

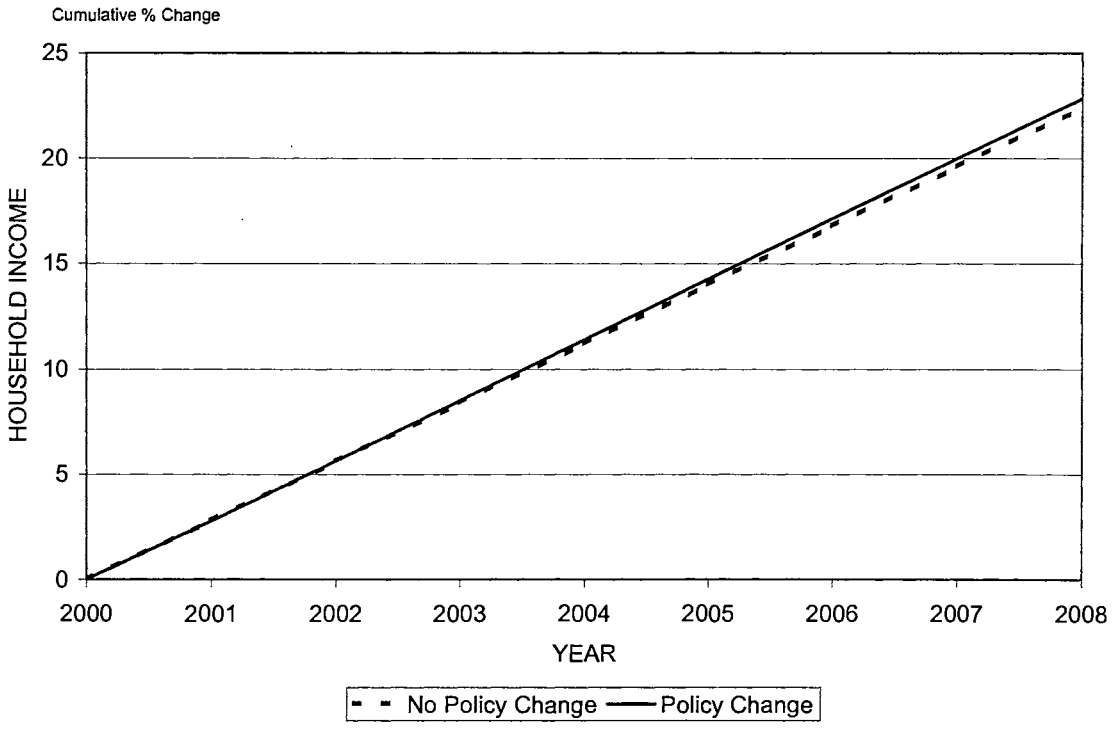




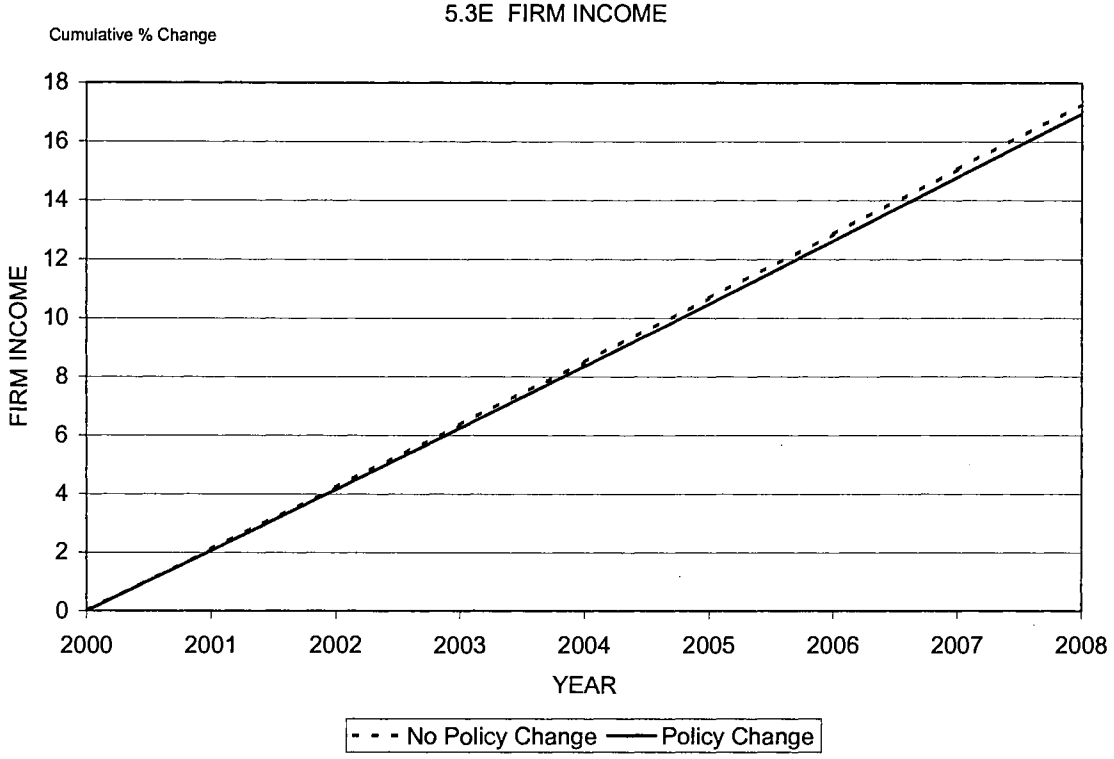
5.3C IMPORTS



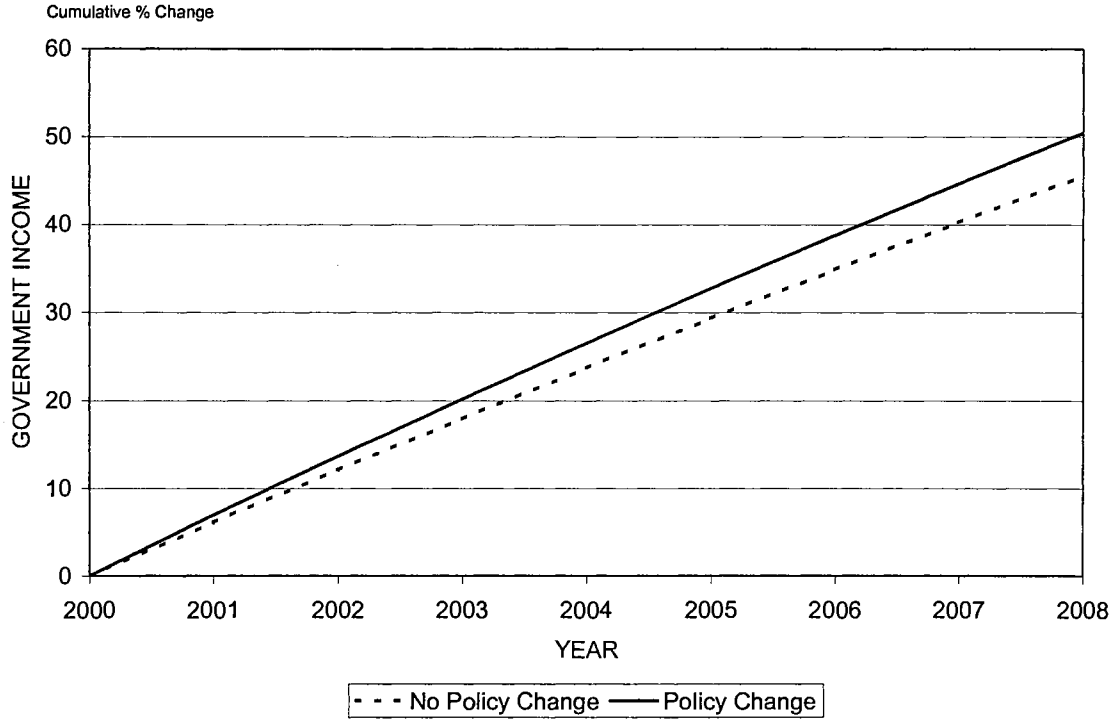
5.3D HOUSEHOLD INCOME



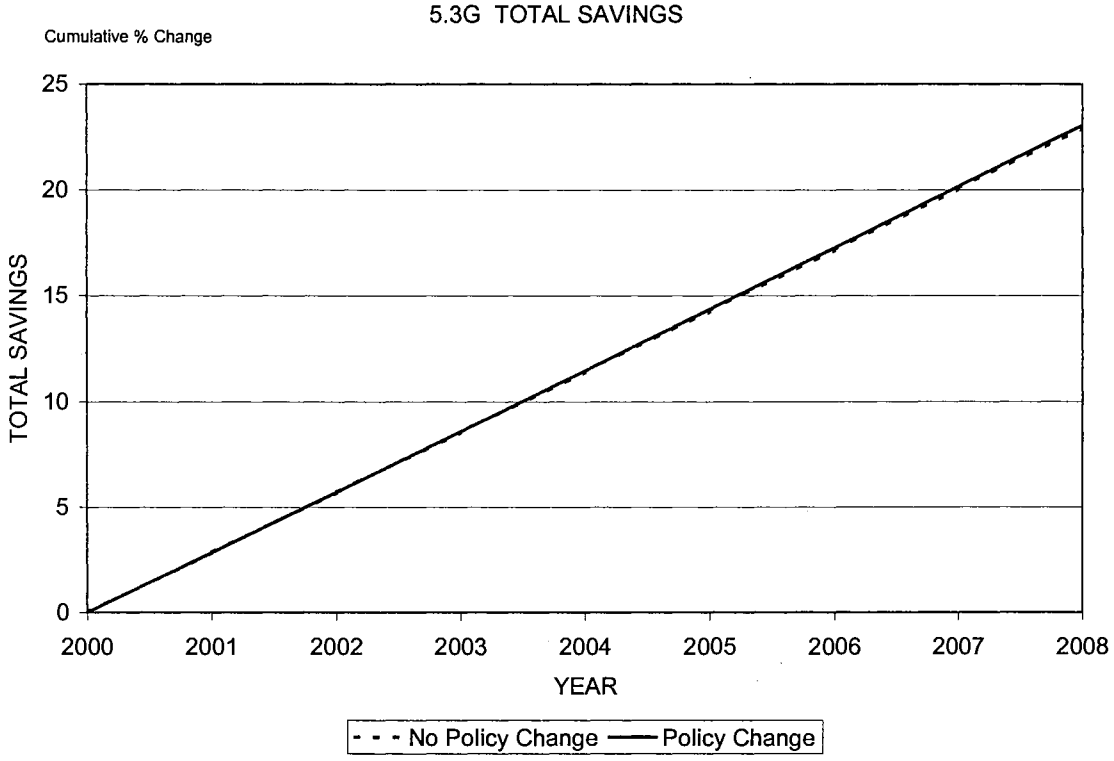
5.3E FIRM INCOME



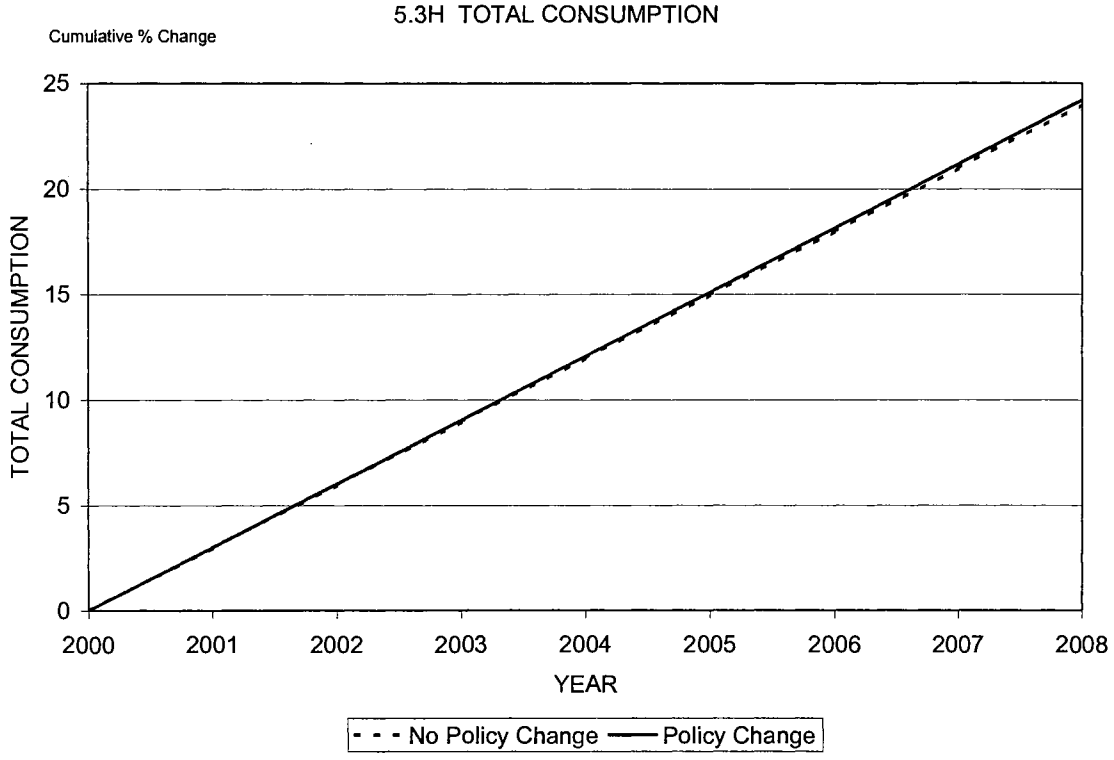
5.3F GOVERNMENT INCOME



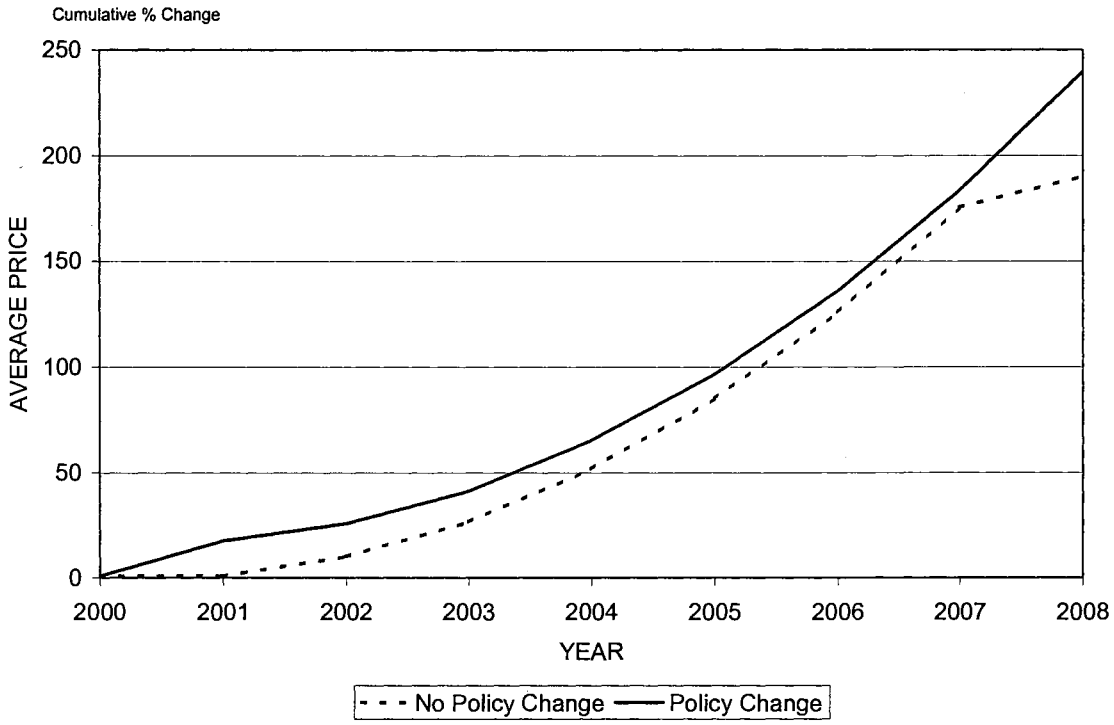
5.3G TOTAL SAVINGS



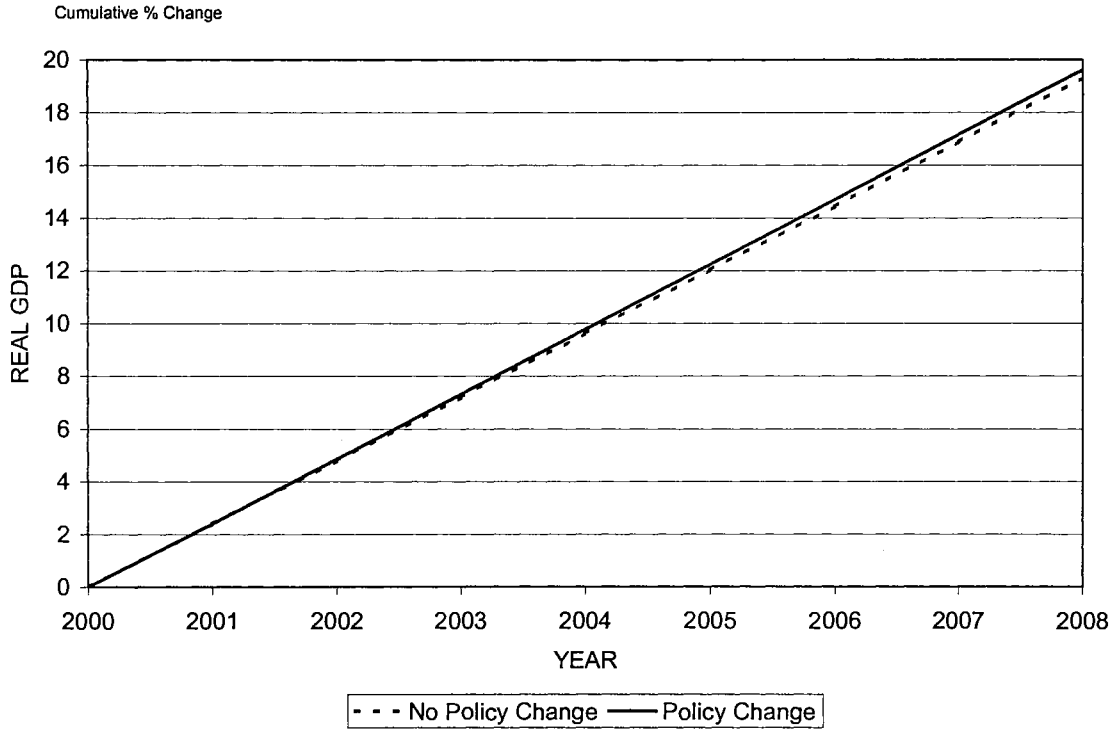
5.3H TOTAL CONSUMPTION

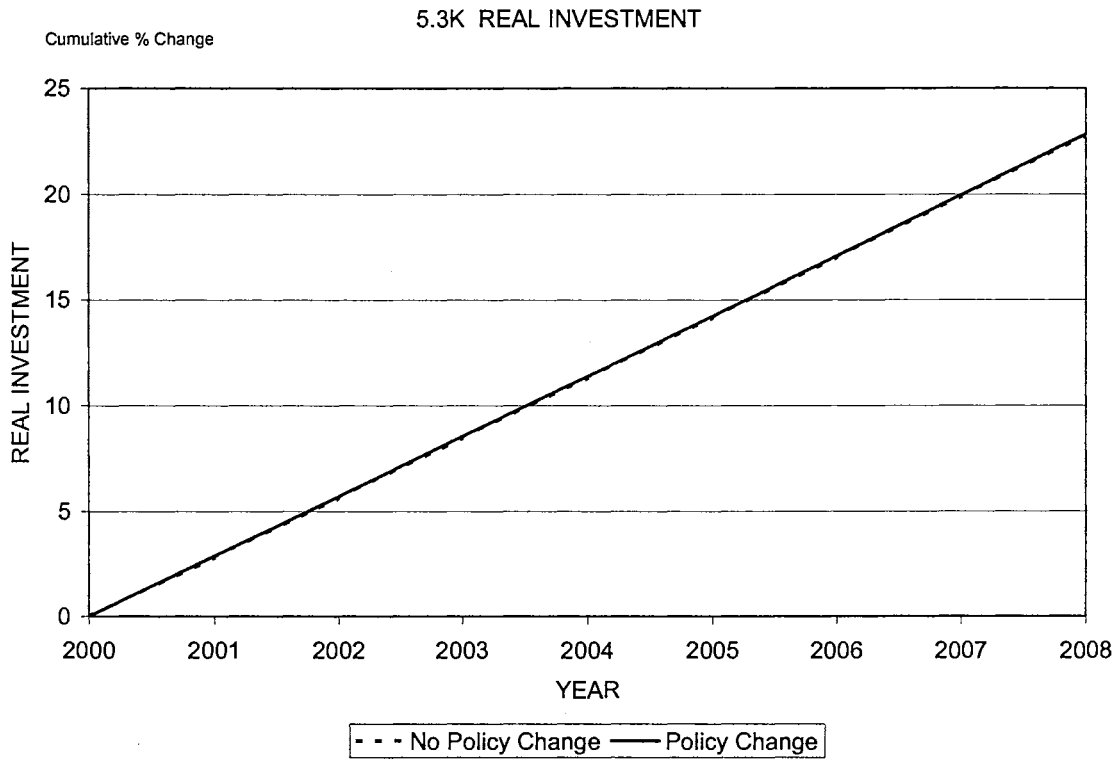


5.3I AVERAGE PRICE



5.3J REAL GDP





Economic Reform Policy

In addition to the three foreign market-led policies the study developed one domestic policy aimed at improving economic performance. Economic performance in the WAEMU is weak because of the lack of sustaining market- led reform that can create the conditions for growth. Also the absence of political reform including measures to combat corruption and strengthen the rule of law has adversely affected economic growth.

Economic reform means good governance and good policy choices that enhance the ability of the WAEMU countries to improve economic performance and maximize profits from AGOA. Policy choices are basically the use of fiscal and monetary policies to achieve certain economic goals. To increase output and consumption, for example,

government can undertake an expansionary fiscal policy by increasing government spending or cutting taxes. Similarly, the same objectives can be achieved through expansionary monetary policy by increasing the nominal money supply or decreasing nominal interest rate. The monetary aspect is already taken into account in the model by assuming an annual 5.9 percent increase in the monetary base. In a context of poor economic performance in the WAEMU and lack of domestic and foreign investments, government spending is already problematic. Hence, an expansionary fiscal policy through tax cuts appears most indicated as an economic reform policy to achieve economic goals.

The study simulates a 10 percent decrease in the indirect tax rate and measures its impacts on the WAEMU economy. The results are displayed in Table 5.7. It is expected that the indirect tax rate cut impacts positively on total output and in particular the trade balance. The sectoral effect of this policy is to increase total output in all sectors except for the textile, leather, footwear, and wearing apparel sector. Under the GATT, the most highly taxed commodity imports were from the textile, leather, footwear, and wearing apparel sector. A reduction in indirect taxes on domestic and imported commodities from this sector has a negative impact on the production and exports of these commodities despite the special treatments received under AGOA (see AGOA II). Under the tax cut policy, exports of the nontraded goods decrease more than in the base solution. For the traded goods, the impact is positive for most of the sectors.

Table 5.7
Sectoral Effects of 10 percent Decrease in Indirect Tax Rate in 2008

Sector	Change (%) in base solution 2001 to 2008			Change (%) with policy 2001 to 2008		
	Output	Exports	Imports	Output	Exports	Imports
Agriculture						
Food crops	16.29	-6.75	18.93	18.15	-6.81	21.02
Cash crops	12.45	8.03	18.18	13.65	7.92	18.63
Livestock	17.26	-17.51	23.81	19.12	-18.05	23.33
Forestry	18.21	-4.45	17.96	19.75	-4.91	17.29
Industry						
Mining and petroleum	14.64	19.68	18	15.74	17.63	18.63
Food processing	19.75	0.41	23.78	21.32	0.58	23.84
Textile	18.25	8.52	26.97	17.53	8.16	26.81
Chemicals	16.37	5.65	23.03	17.41	5.22	22.94
Basic metal industries	20.08	-0.86	25.15	21.32	0.97	25.43
Other industries	16.34	12.26	23.9	17.16	11.96	23.84
Service						
Electricity	19.13	9.36	25.2	21.33	13.64	26.7
Construction	24.35	0.12	24.56	25.41	-0.12	24.35
Transportation	21.02	0.6	23.8	22.31	0.35	23.55
Finance	24.21	8.57	30.6	24.66	8.51	30.62
Real estate and service to firms	16.12	-10.11	14.51	17.99	-10.11	14.45
Hotel	17.94	2.74	20.8	19.47	2.05	20.04
Private service	20.69	10.63	28.42	21.76	10.24	28.25
Public service	30.95	0	0	31.13	0	0
Total	17.77	6.24	22.01	18.95	6.34	22.09

The macroeconomic impact results presented in Table 5.8 show that total output increases by 18.95 percent in 2008, while exports and imports increase by 6.34 percent and 22.09 percent. With no tax cut, the increase in output is 17.77 percent and the increase in exports and imports are 6.24 percent and 22.01 percent, respectively. The result is an increase in the trade balance deficit. The tax cut reduces the household revenue, total saving, and total consumption. It increases government and firm incomes. The economic impact of the implementation of this policy shows little changes in the target variables compared to the base solution. The higher increase in the price level has

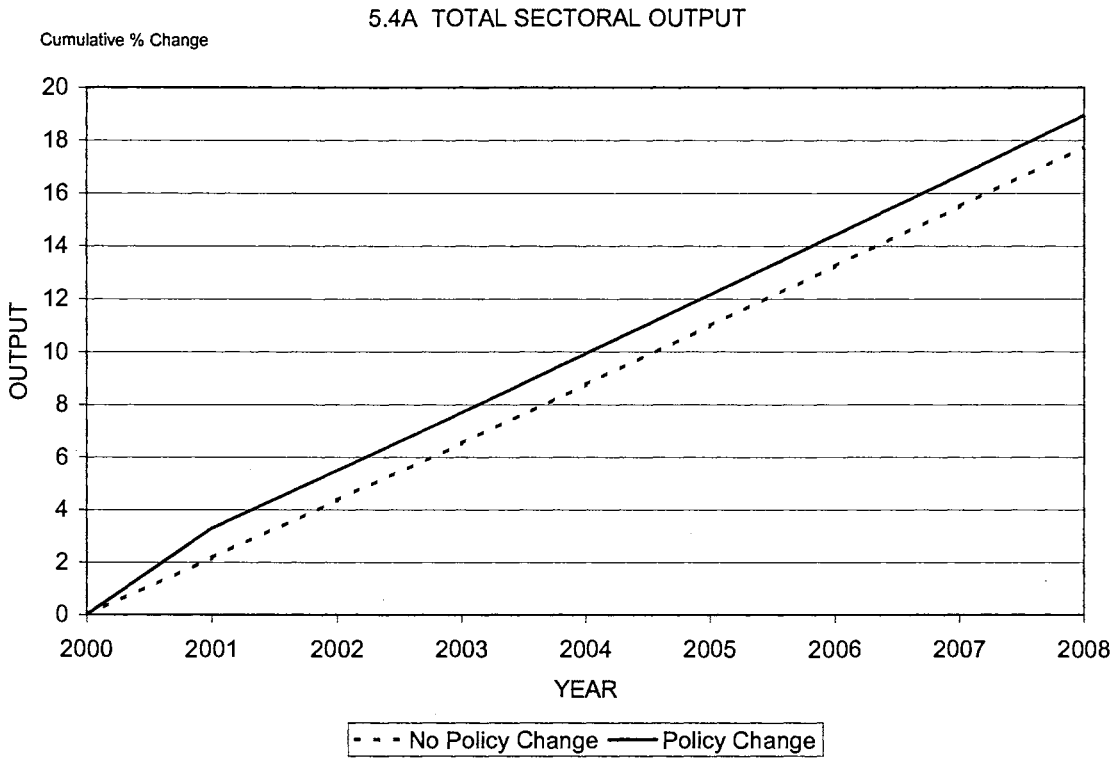
a negative real- balance effect, which leaves real GDP unchanged and slight changes in the real investment compared to the base solution.

Figure 5.4. The vertical axis in the figure represents the cumulative percentage change in each variable resulting from implementing the tax cut policy.

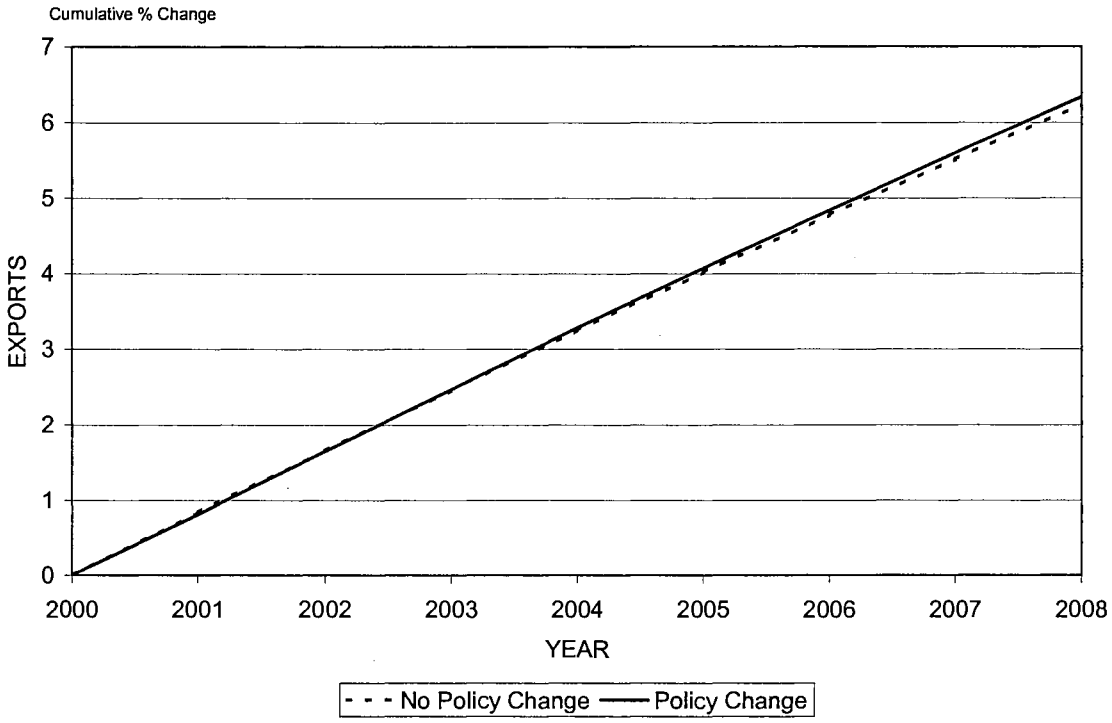
Table 5.8
Macroeconomic Impact of Indirect Tax Cut and No Tax Cut in 2008

Variable	No policy change (%)	Change in policy (%)
Output	17.77	18.95
Exports	6.24	6.34
Imports	22.01	22.09
Household income	22.43	22.06
Firm income	17.29	17.31
Government income	45.61	46.11
Total saving	22.92	22.91
Total consumption	23.99	23.94
Average price	226.57	229.84
Real GDP	19.31	19.31
Real investment	22.78	22.95

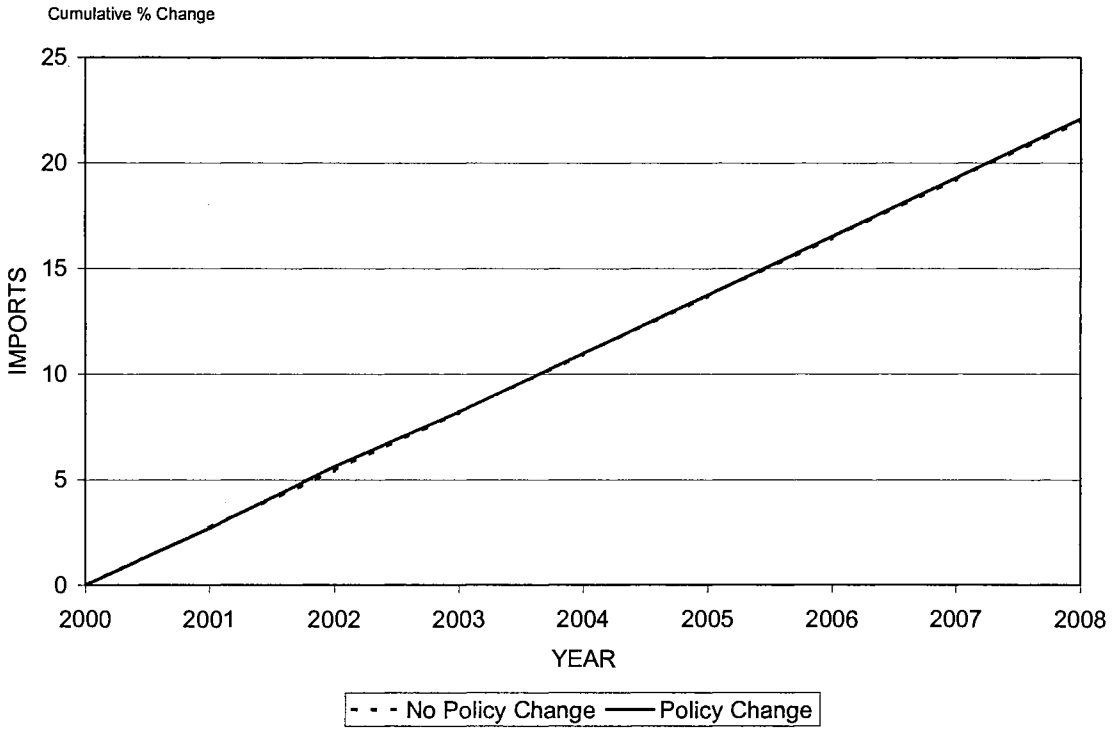
Figure 5.4
Dynamic Effects of Tax Cut



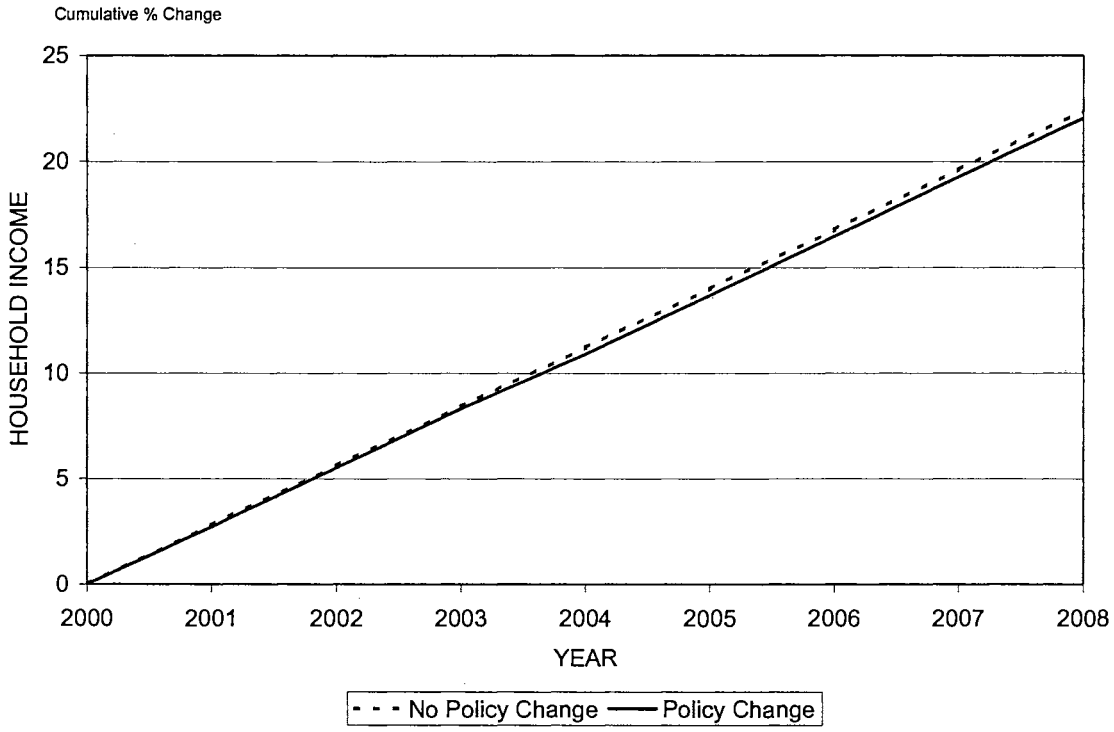
5.4B EXPORTS



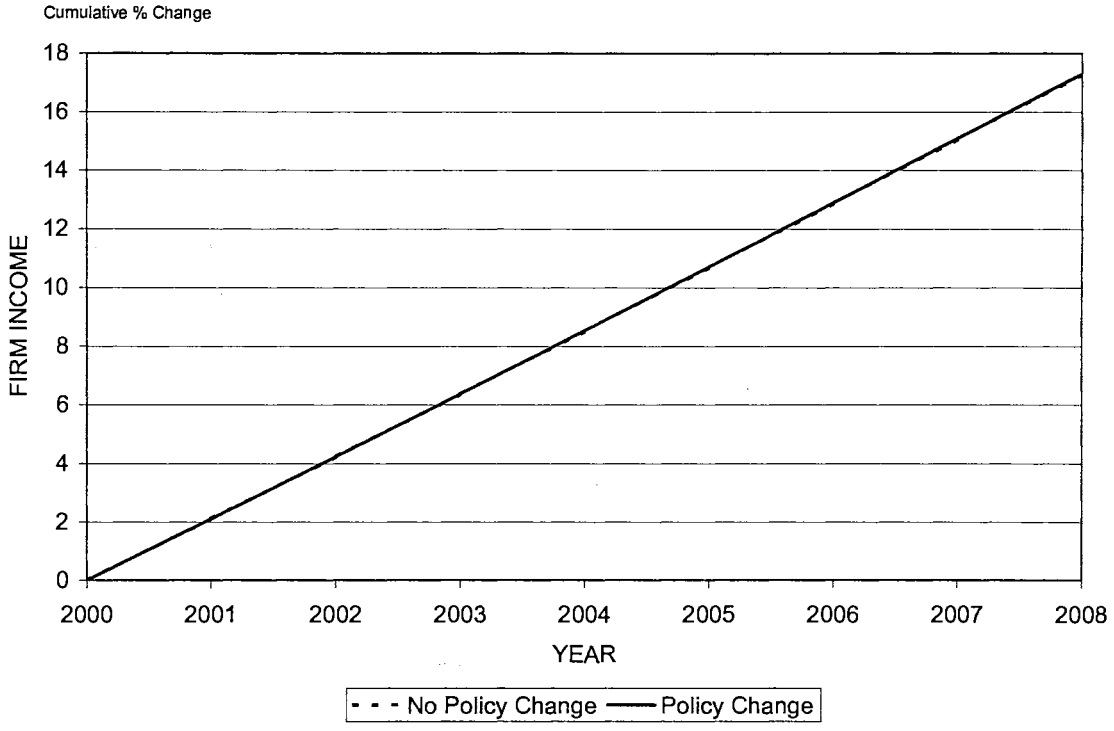
5.4C IMPORTS



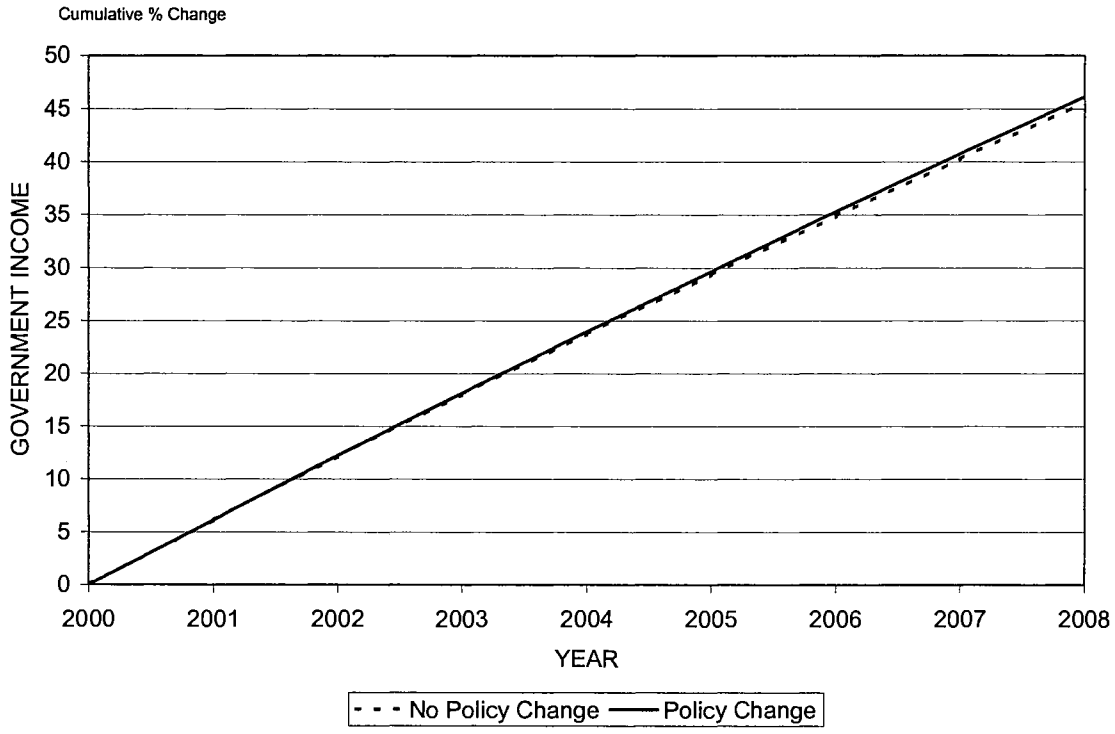
5.4D HOUSEHOLD INCOME



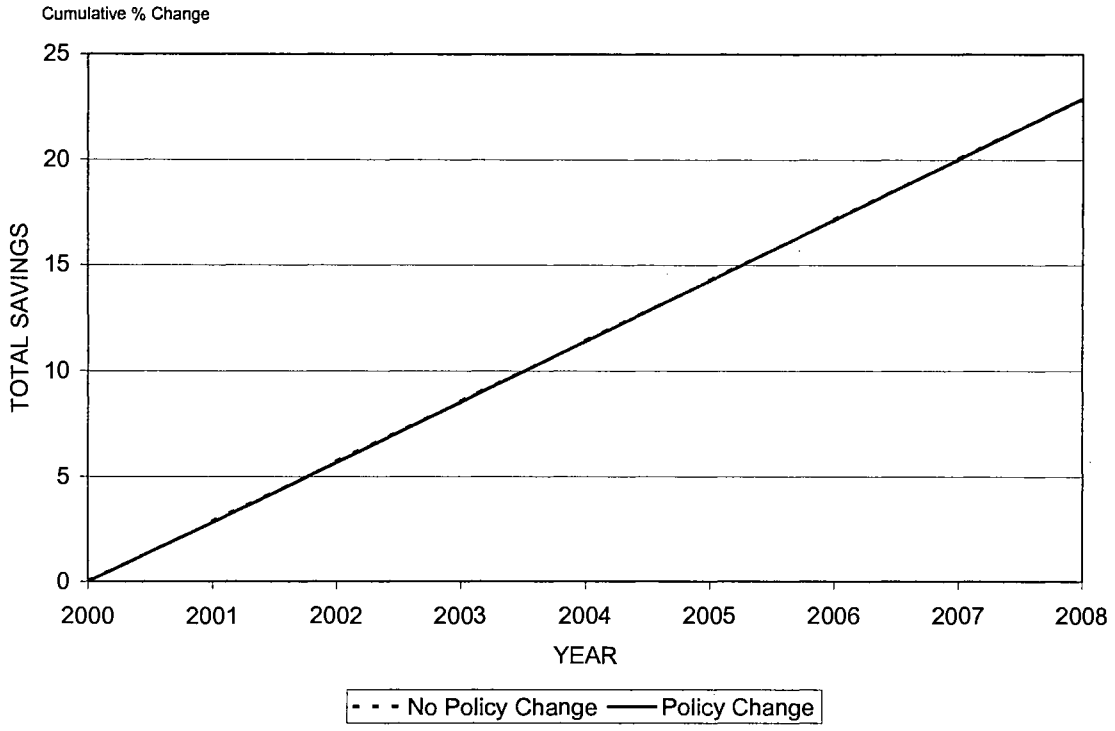
5.4E FIRM INCOME



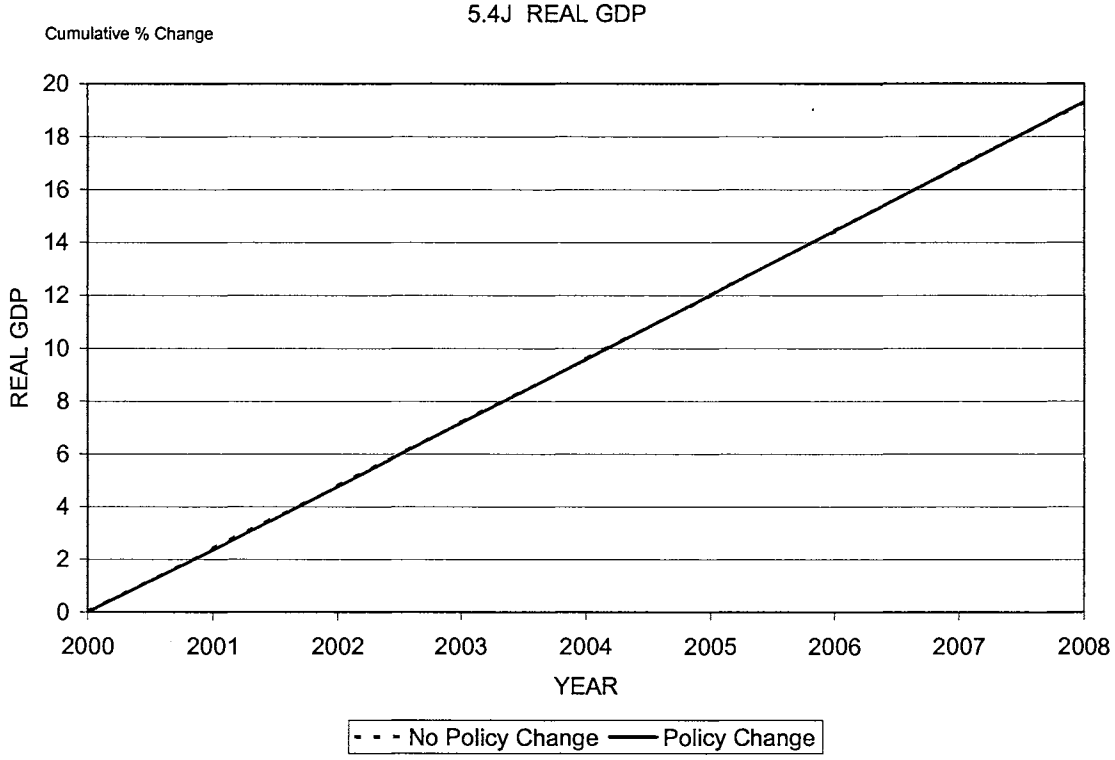
5.4F GOVERNMENT INCOME



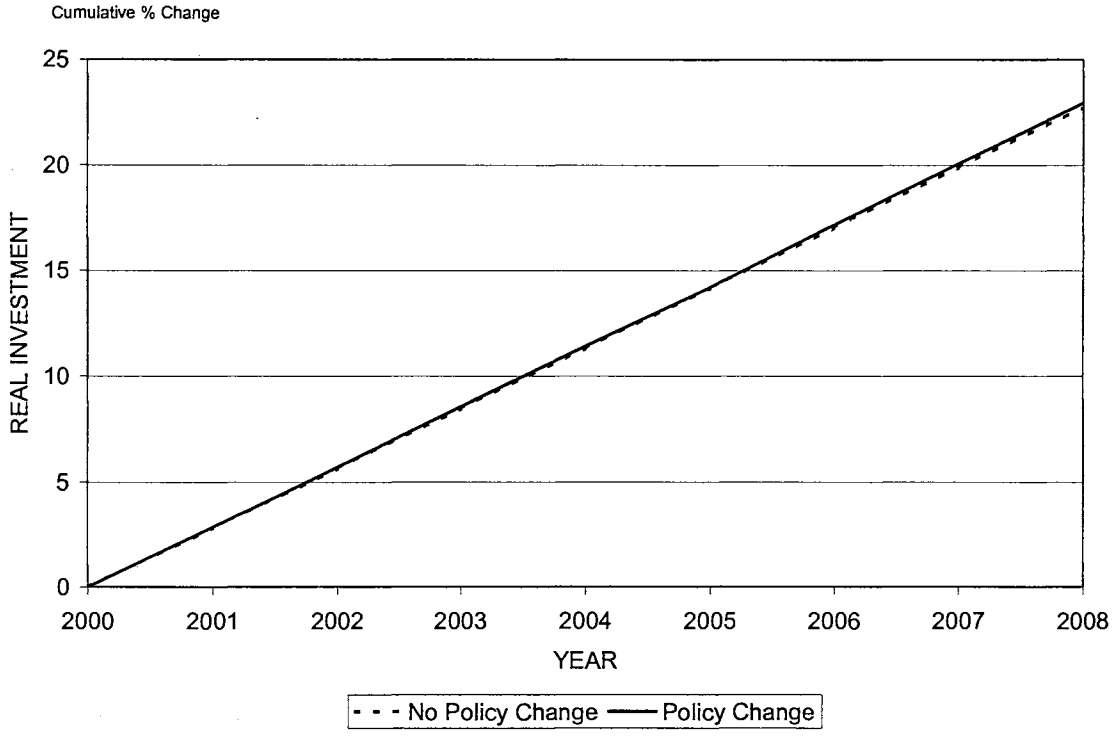
5.4G TOTAL SAVINGS



5.4J REAL GDP



5.4K REAL INVESTMENT



Policy Mix

The primary purpose of this section is to: (1) evaluate the economic impacts of simulating simultaneously all four policies with both the fixed exchange rate regime and the flexible exchange rate system, and compare the results to the situation of no policy change; (2) compare the state of the WAEMU economy under the two exchange rate regimes.

Policy Mix Under Fixed Exchange Rate

The sectoral effect of simultaneous simulation of all policies with a fixed exchange rate is presented in Table 5.9. This policy increases sectoral output more than in the base solution. Moreover, the increase in the tradable goods sectors is greater than the increase in the nontradable goods sectors. Export- oriented goods increase substantially compared to the base solution, while exports in the nontradable goods decrease in comparison with the base solution. Agriculture sectors except for cash crops and service sectors such as transportation and real estate and service to firms are the most affected due to the decline in the terms of trade. All this indicates that the policy mix under the fixed exchange rate regime has a positive impact on the WAEMU economy. Free trade combined with devaluation policy, for example, boosts exports and increases sectoral output. Total output increases by 18.29 percent in 2008 compared to a 17.77 percent increase for the base solution. The agriculture sectors increase by 16.8 percent compared to a 16.05 percent increase for the base run simulation. The increase in the industry sectors is 20.27 percent in comparison with a17.57 percent increase for the base solution and the increase in the service sectors is 22.24 percent compared to a 21.8

percent increase for the base solution. Imports increase by 21.96 percent, while exports rise by 8.21 percent. The increase in the base solution is 22.01 percent in imports and 6.24 percent in exports. The resulting trade deficit is 13.75 percent, lower than the 15.77 percent for the base solution.

Table 5.9
Sectoral Effects of Policy Mix with Fixed Exchange Rate

Sector	Change (%) in base solution			Change (%) with policy		
	Output	Exports	Imports	Output	Exports	Imports
Agriculture						
Food crops	16.29	-6.75	18.93	16.79	-7.93	17.97
Cash crops	12.45	8.03	18.18	14.42	10.14	16.81
Livestock	17.26	-17.51	23.81	17.7	-17.92	22.87
Forestry	18.21	-4.45	17.96	18.3	-5.64	18.13
Industry						
Mining and petroleum	14.64	19.68	18	20.62	45.04	18.84
Food processing	19.75	0.41	23.78	17	-2.42	23.28
Textile	18.25	8.52	26.97	18.16	9.6	27.39
Chemicals	16.37	5.65	23.03	22.08	21.25	26.02
Basic metal industries	20.08	-0.86	25.15	21.54	7.4	26.29
Other industries	16.34	12.26	23.9	22.24	25.41	25.21
Service						
Electricity	19.13	9.36	25.2	19.87	11.4	25.31
Construction	24.35	0.12	24.56	23.11	-4.34	21.16
Transportation	21.02	0.6	23.8	21.51	-0.4	23.08
Finance	24.21	8.57	30.6	24.15	8.94	30.5
Real estate and service to firms	16.12	-10.11	14.51	17.06	-11.62	13.39
Hotel	17.94	2.74	20.8	19.11	2.14	20.26
Private service	20.69	10.63	28.42	21.59	11.58	28.9
Public service	30.95	0	0	31.55	0	0
Total	17.77	6.24	22.01	18.29	8.21	21.96

Table 5.10 presents the macroeconomic effects of the policy mix under the fixed exchange rate regime. Household income increases by 24.42 percent compared to 22.43 percent increase in the base solution. The increase in government income is 63.85

percent in comparison with a 45.61 percent for the base run simulation, while firm income increases less than the increase in the base solution; 16.82 percent and 17.29 percent. The increase in the real GDP is not considerable in comparison with the increase in the base solution. The higher increase in the average price due to the devaluation policy and the increase in the monetary base may decrease the real investment and offset part of the increase in the real GDP. Real investment increases by 23.69 percent, while the increase in the base solution is 22.78 percent.

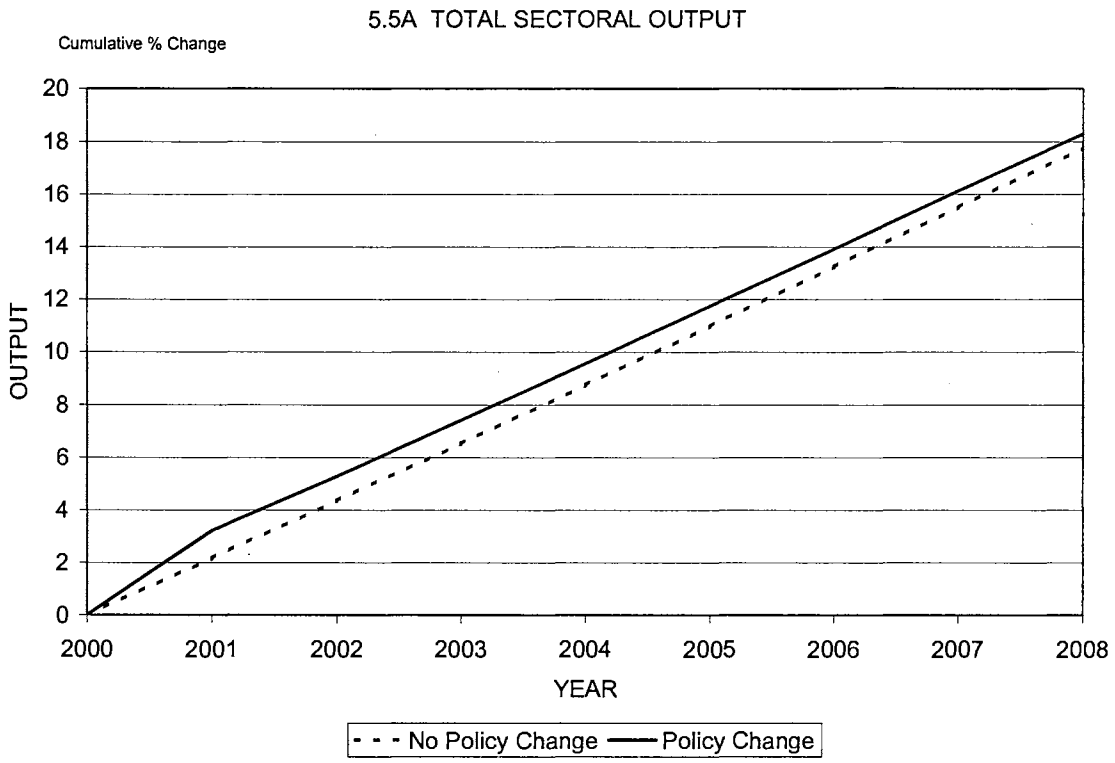
The results of the policy mix under the fixed exchange rate regime are overall positive: high increase in government revenue and household income as well as an increase in the money demand. These results compared to that of no policy mix indicate that the economic impacts are considerably greater than in the case of no policy change. The policy mix increases sectoral productions, improves the trade balance deficit, and raises institutions revenues, money demand, and real GDP.

Table 5.10
Macroeconomic Impact of Policy Mix with Fixed Exchange Rate in 2008

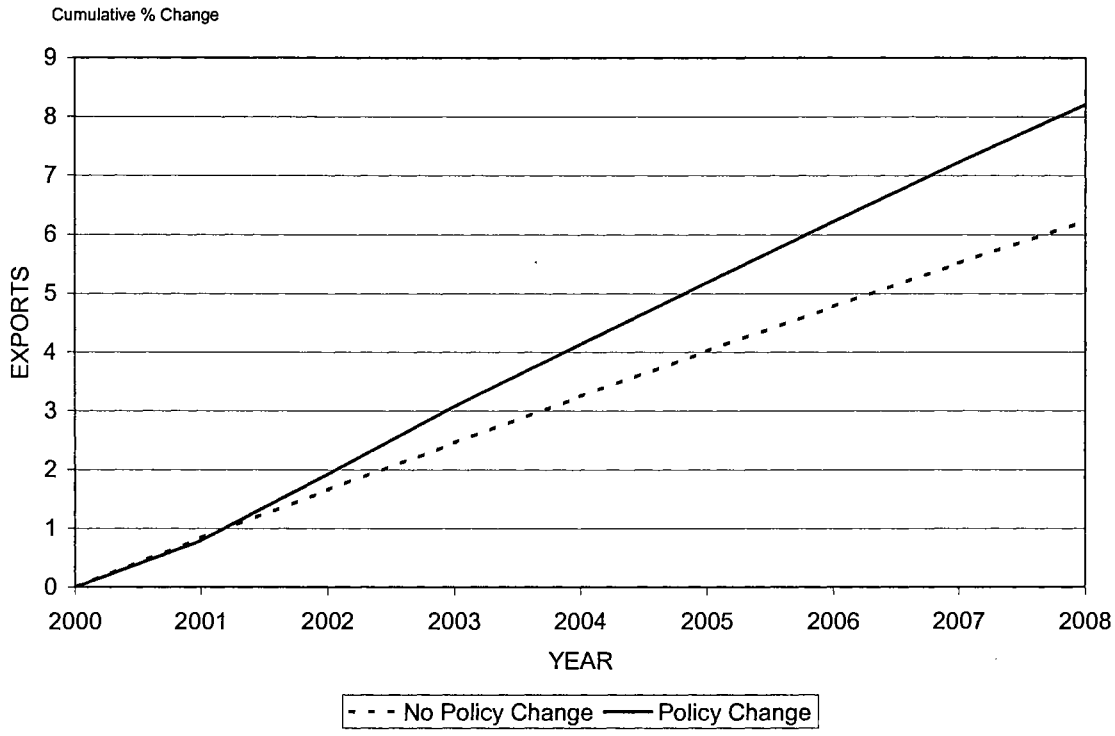
Variable	No policy change (%)	Change in policy (%)
Output	17.77	18.29
Exports	6.24	8.21
Imports	22.01	21.96
Household income	22.43	24.42
Firm income	17.29	16.82
Government income	45.61	63.85
Total saving	22.92	23.51
Total consumption	23.99	24.7
Average price	226.57	209.16
Real GDP	19.31	19.69
Real investment	22.78	23.69

Figure 5.5 compares the economic impact of the simultaneous simulation of all policies under the fixed exchange rate regime to the base solution. The vertical axis gives the cumulative percentage change in the variables resulting from the policy mix under fixed exchange rate.

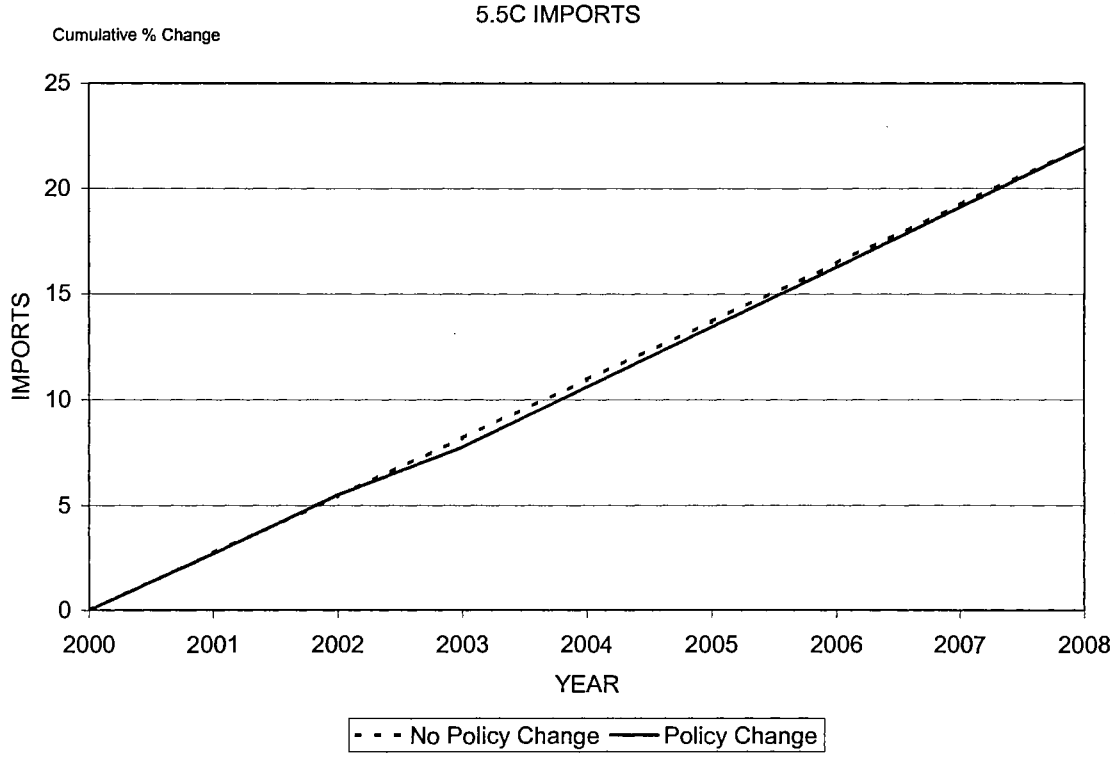
Figure 5.5
Dynamic Effects of Policy Mix Under Fixed Exchange Rate



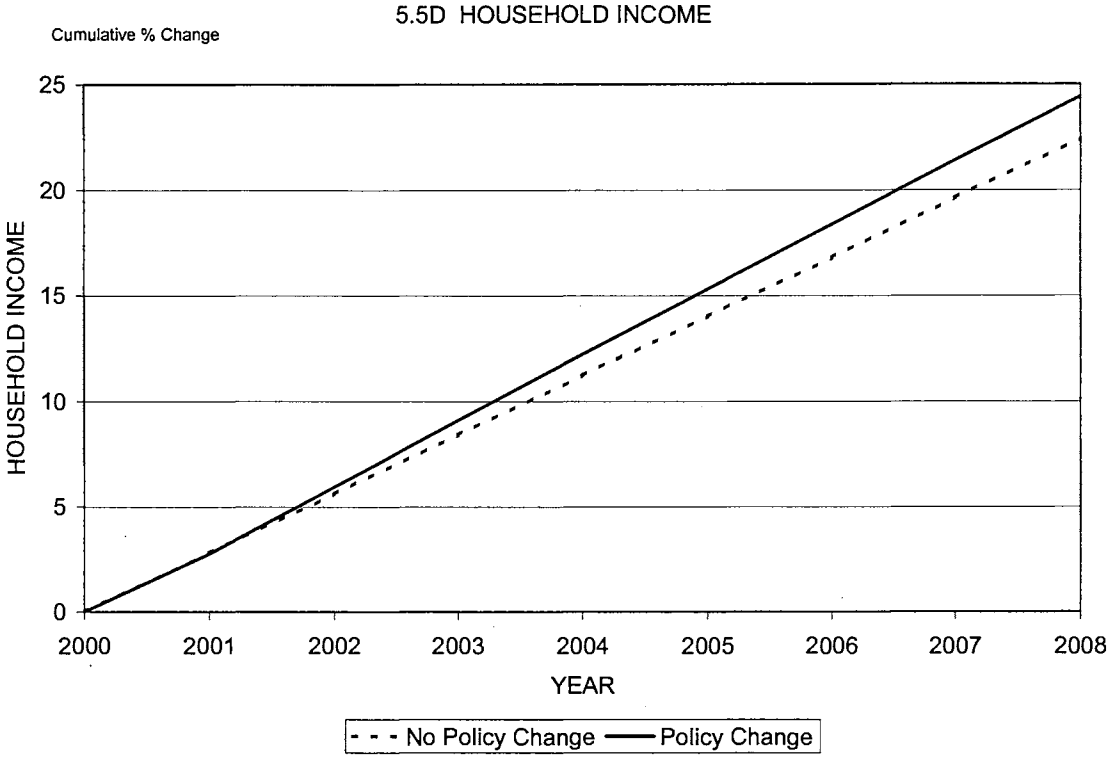
5.5B EXPORTS



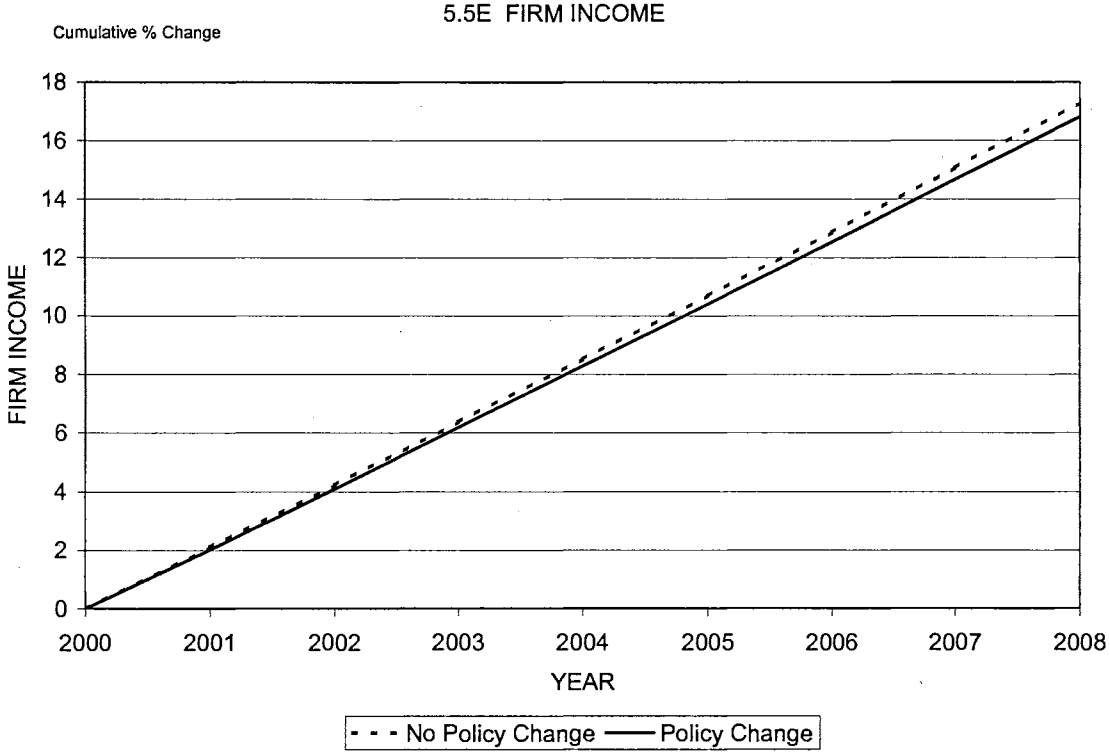
5.5C IMPORTS



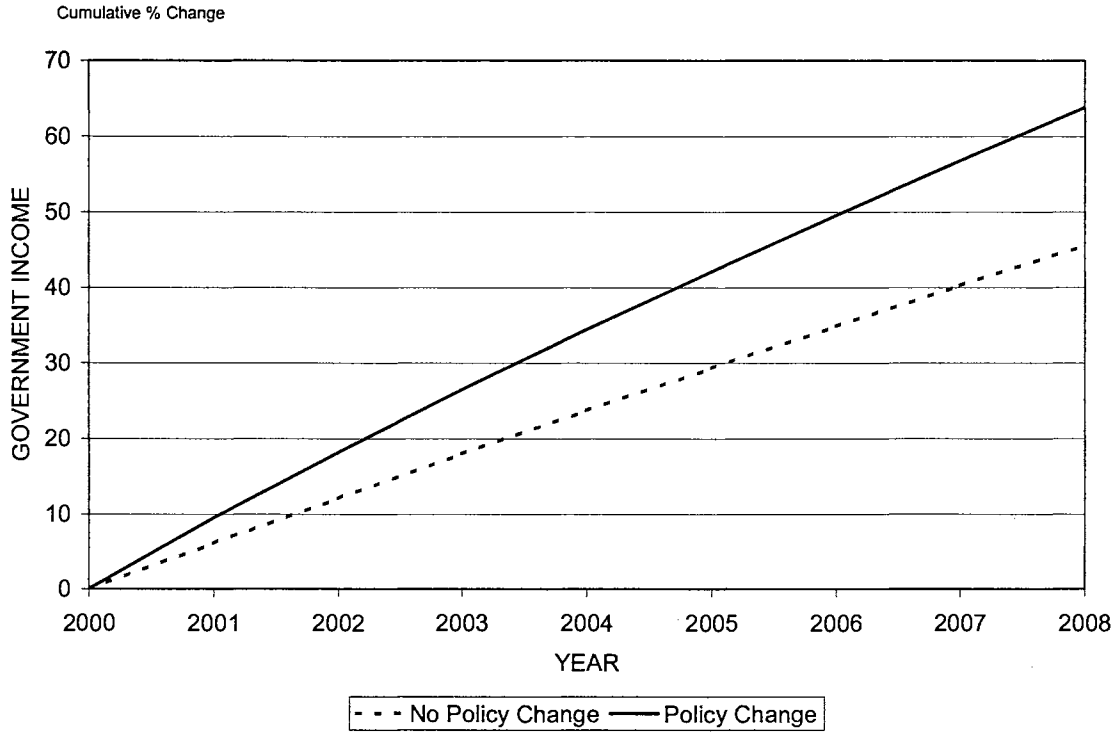
5.5D HOUSEHOLD INCOME



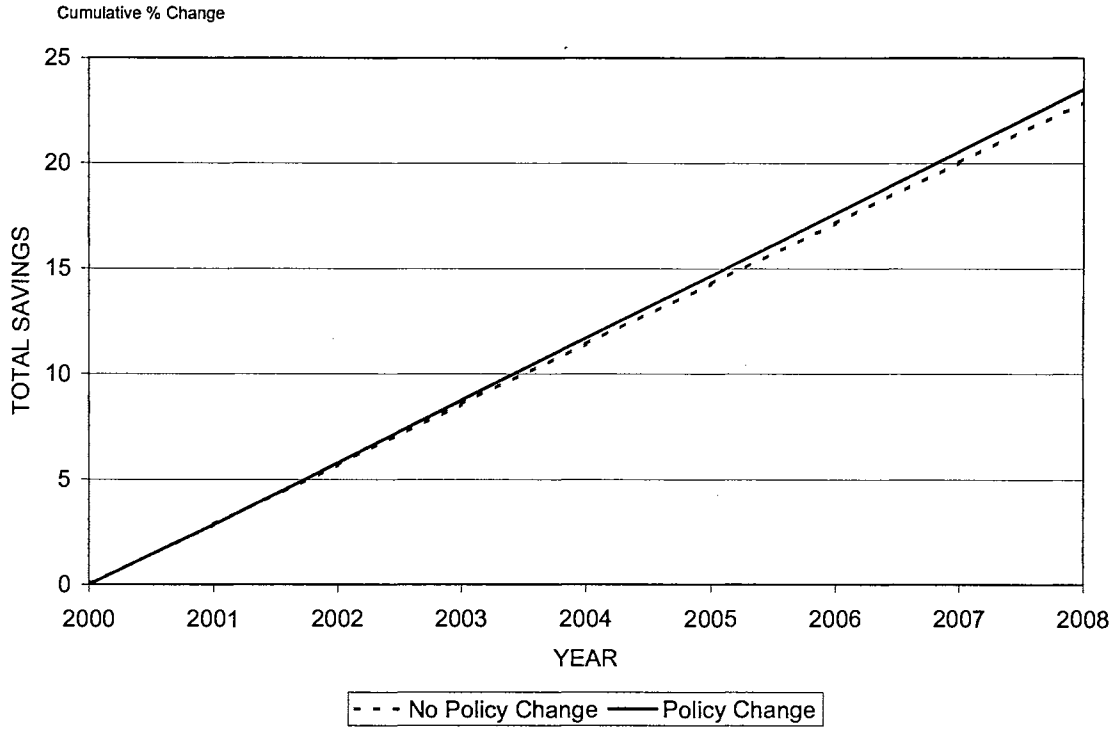
5.5E FIRM INCOME



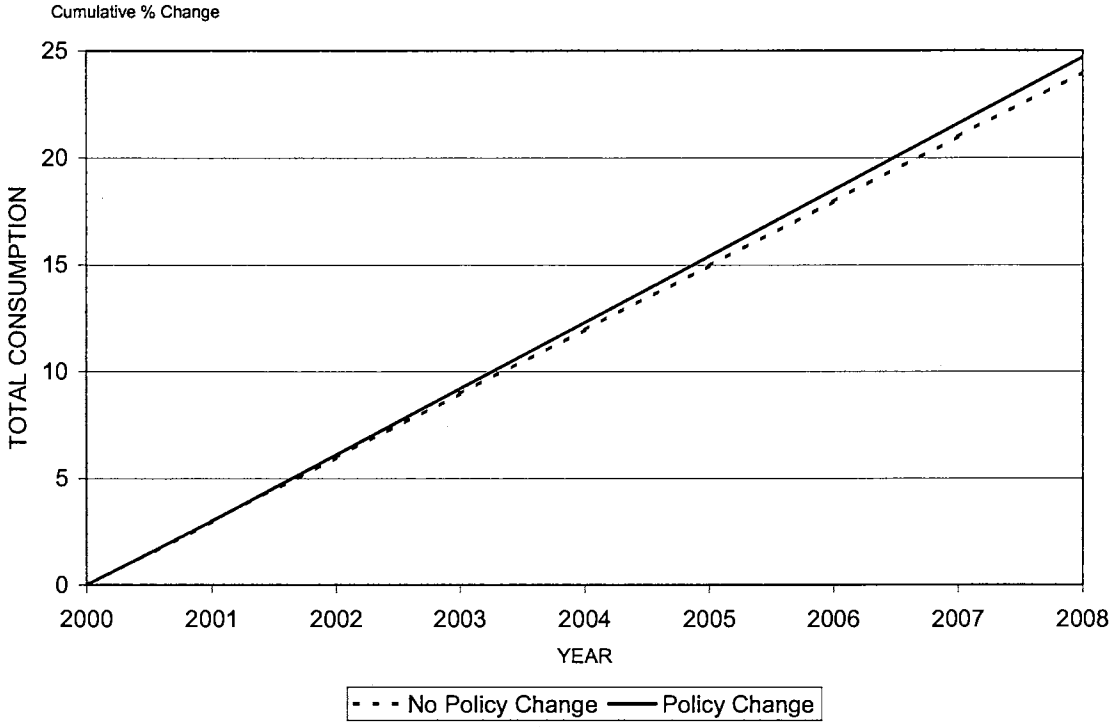
5.5F GOVERNMENT INCOME



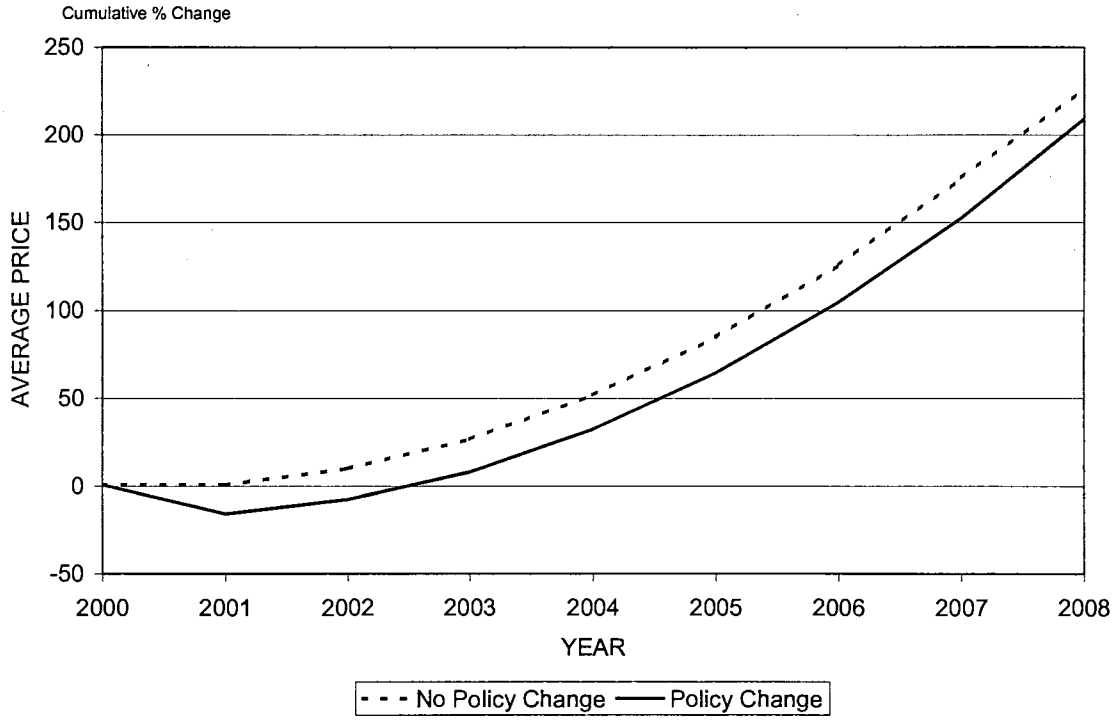
5.5G TOTAL SAVINGS



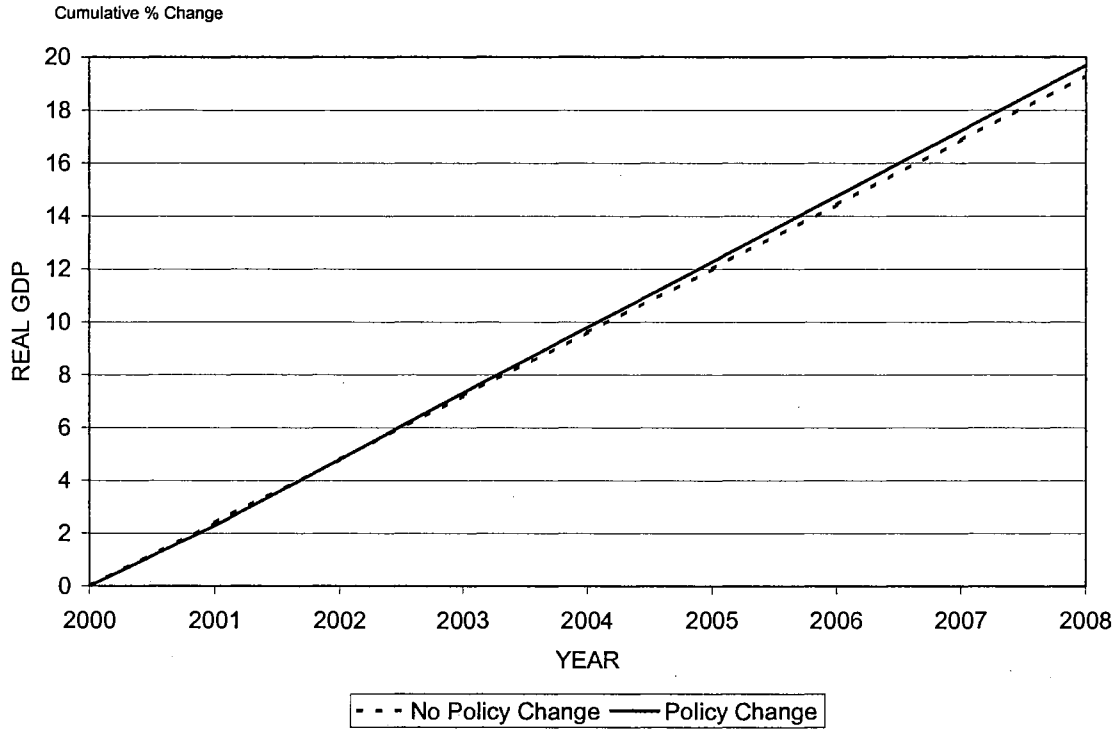
5.5H TOTAL CONSUMPTION



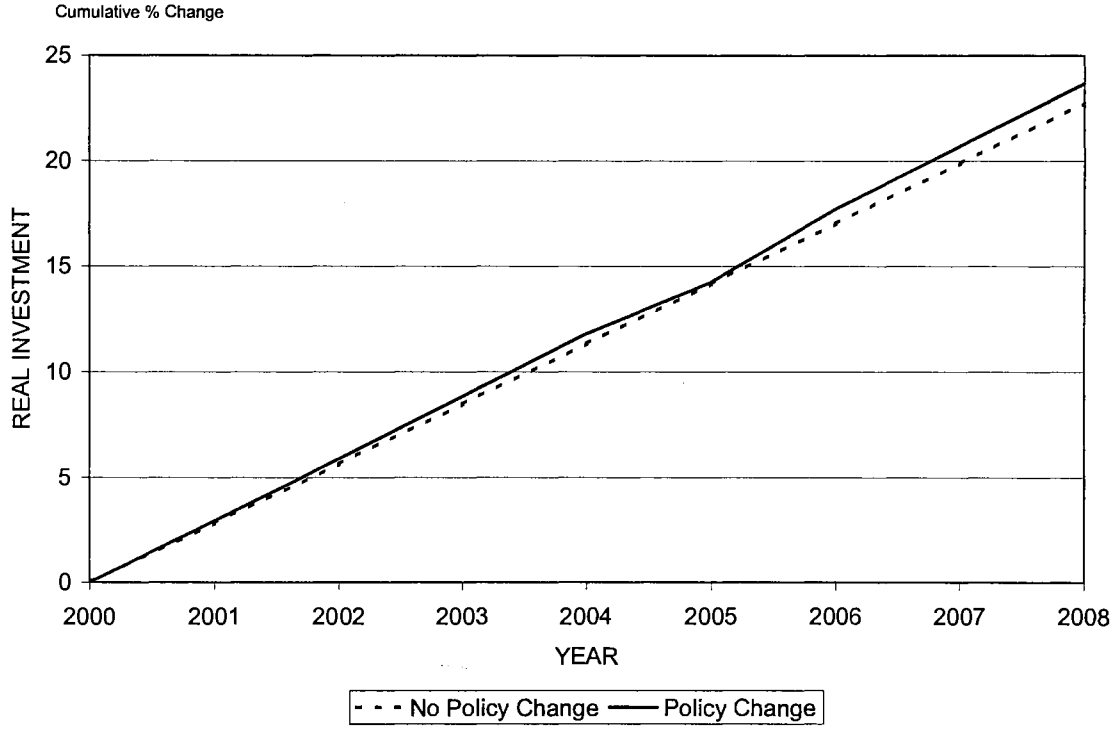
5.5I AVERAGE PRICE



5.5J REAL GDP



5.5K REAL INVESTMENT



Policy Mix with Flexible Exchange Rate

The sectoral effect of the policy mix under a flexible exchange rate regime is presented in Table 5.11. Total output increases by 18.68 percent in 2008. Exports increase by 15.72 percent and imports increase by 43.5 percent. The changes in the base solution are 17.31 percent increase in output, 19.4 percent in exports, and 12.28 percent in imports. However, outputs from food processing, electricity, and textile, leather, footwear, and wearing apparel sectors decrease compared to the base solution, because of the deterioration of the terms of trade (increase in domestic prices or decrease in import prices). The decrease of 21.39 percent in the exchange rate, hence the appreciation of the CFA Franc may explain the fall in the net exports and the small differential increase in output over the base solution. In other words, with the appreciation of the CFA Franc the WAEMU economy loses international competitiveness.

Table 5.11
Sectoral Effects of Policy Mix with Flexible Exchange Rate

Sector	Change (%) in base solution 2001 to 2008			Change (%) with policy 2001 to 2008		
	Output	Exports	Imports	Output	Exports	Imports
Agriculture						
Food crops	13.96	17.64	0.41	18.09	-44.82	66.95
Cash crops	13.64	14.06	10.23	13.82	-2.04	37.78
Livestock	14.69	16.25	12.41	19.44	-63.86	47.13
Forestry	17.5	19.43	-14.85	18.5	-38.52	76.63
Industry						
Mining and petroleum	16.84	28.61	17.31	18.83	31.16	19.54
Food processing	19.93	23.1	12.23	16.6	-23.2	48.21
Textile	19.42	20.79	9.68	17.33	-7.6	67.69
Chemicals	16.87	25.13	15.21	21.4	-12.19	43.23
Basic metal industries	19.54	26.16	17.81	21.45	-30.55	41.42
Other industries	17.54	23.26	16.76	21.12	6.12	39.65
Service						
Electricity	20.15	19.18	7.64	19.24	-3.47	61.1
Construction	20.21	41.55	0.98	25.52	-58.01	88.46
Transportation	19.85	30	-1.48	22.29	-45	97.36
Finance	23.81	35.29	3.44	24.42	-34.83	117.53
Real estate and service to firms	14.16	25.73	-6.96	18.11	-58.27	77.27
Hotel	17.45	25.14	-5.8	19.55	-37.77	104.39
Private service	20.75	23.25	15.73	21.53	-9.87	57.17
Public service	30.05	0	0	32.54	0	0
Total	17.31	19.4	12.28	18.68	-15.72	43.5

The domestic economic impact, however, is substantial as presented in Table 5.12. Total savings and total consumption increase by 35.59 percent and 37.97 percent, while the increases in the base solution are 14.88 percent and 14.94 percent respectively. Government income doubles compared to a 16.57 percent rise for the base solution. Household income increases by 51.42 percent in comparison with a 5.25 percent increase for the base solution. The increase in the firm income on the over hand is less than the increase in the base run simulation: 14.36 percent and 17.54 percent. The increase in the

monetary base, hence the stock of money causes the interest rate to fall by 50.47 percent compared to a 0.96 percent decrease for the base solution. The decrease in the interest rate consequently increases real investment by 38.15 percent compared to a 15.04 percent increase for the base solution. As a result, the GDP rises by 39.53 percent, while the increase in the base solution is only 5.07 percent.

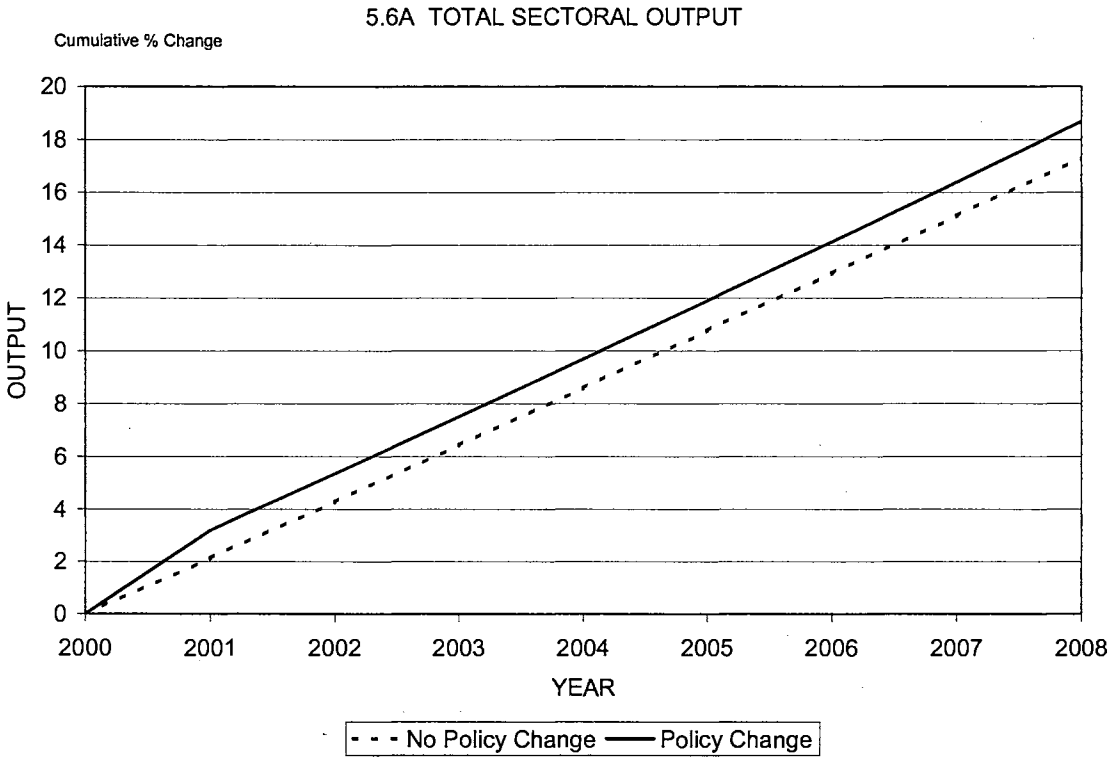
The results of the economic impact of the policy mix under the floating exchange rate are impressive as compared to the situation of no policy under flexible exchange rate. Except for the trade balance, most of the variables present positive impacts. This can be explained by the high increase in capital inflow.

Table 5.12
Macroeconomic Impact of Policy Mix with Flexible Exchange Rate in 2008

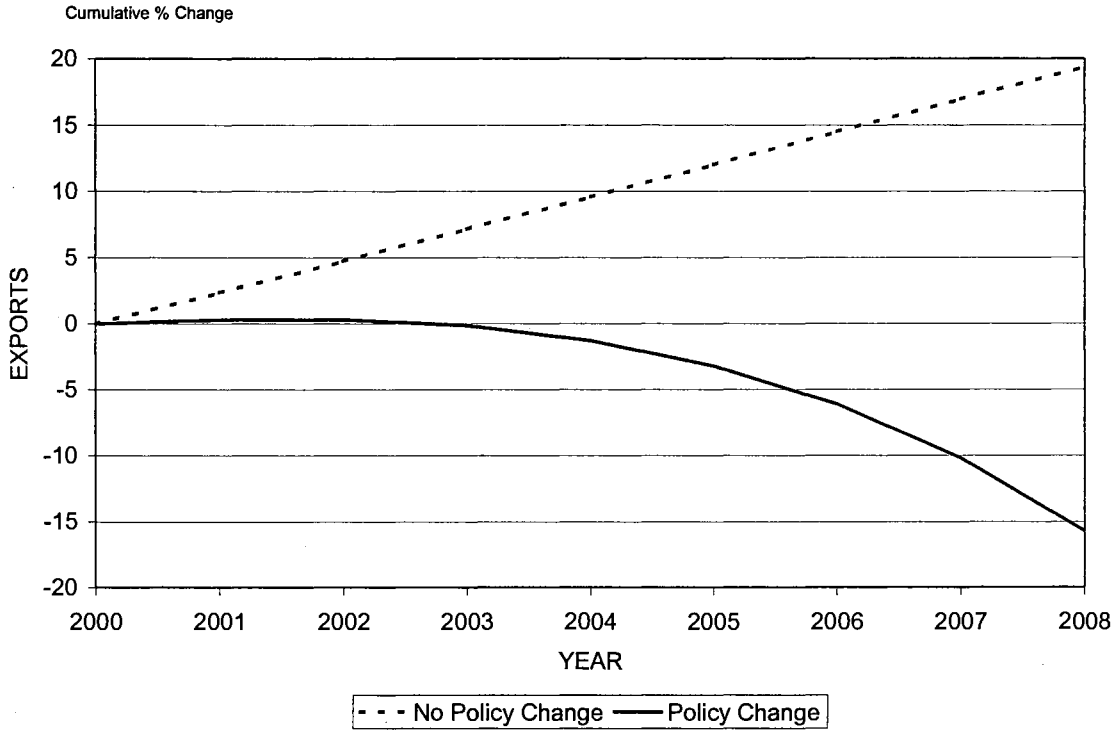
Variable	No policy change (%)	Change in policy (%)
Output	17.31	18.68
Exports	19.4	-15.72
Imports	12.28	43.5
Household income	5.24	51.42
Firm income	17.57	14.36
Government income	16.57	100.52
Total saving	14.88	35.59
Total consumption	14.94	37.97
Average price	237	192.26
Real GDP	5.07	39.53
Real investment	15.04	38.15
Exchange rate	9.83	-21.39

Figure 5.6 compares the economic impact of the simultaneous simulation of all policies under the flexible exchange rate regime to the base solution. The vertical axis gives the cumulative percentage change in the variables from this policy mix.

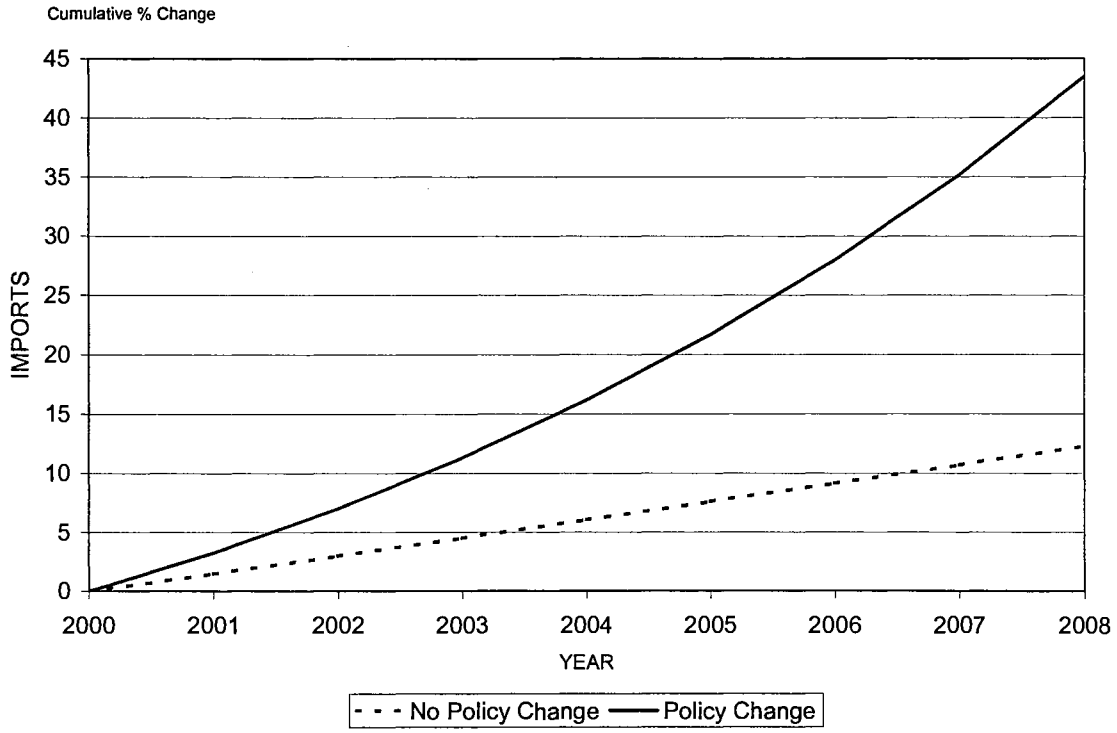
Figure 5.6
Dynamic effects of Policy Mix Under Flexible Exchange Rate



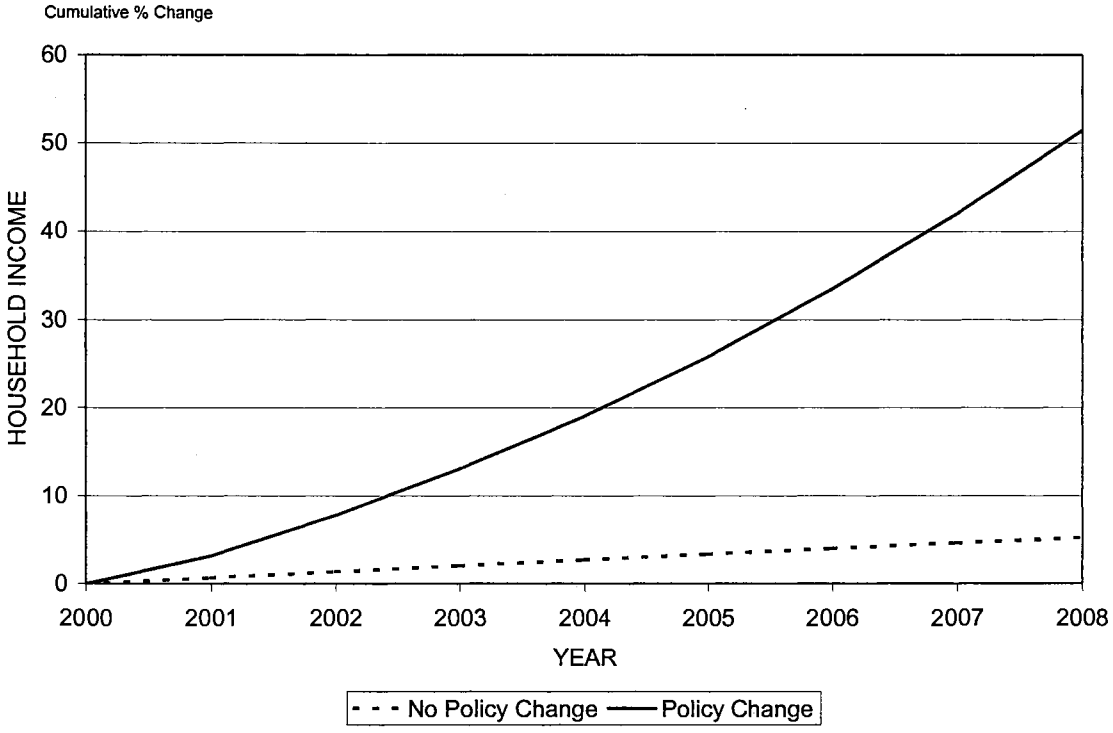
5.6B EXPORTS



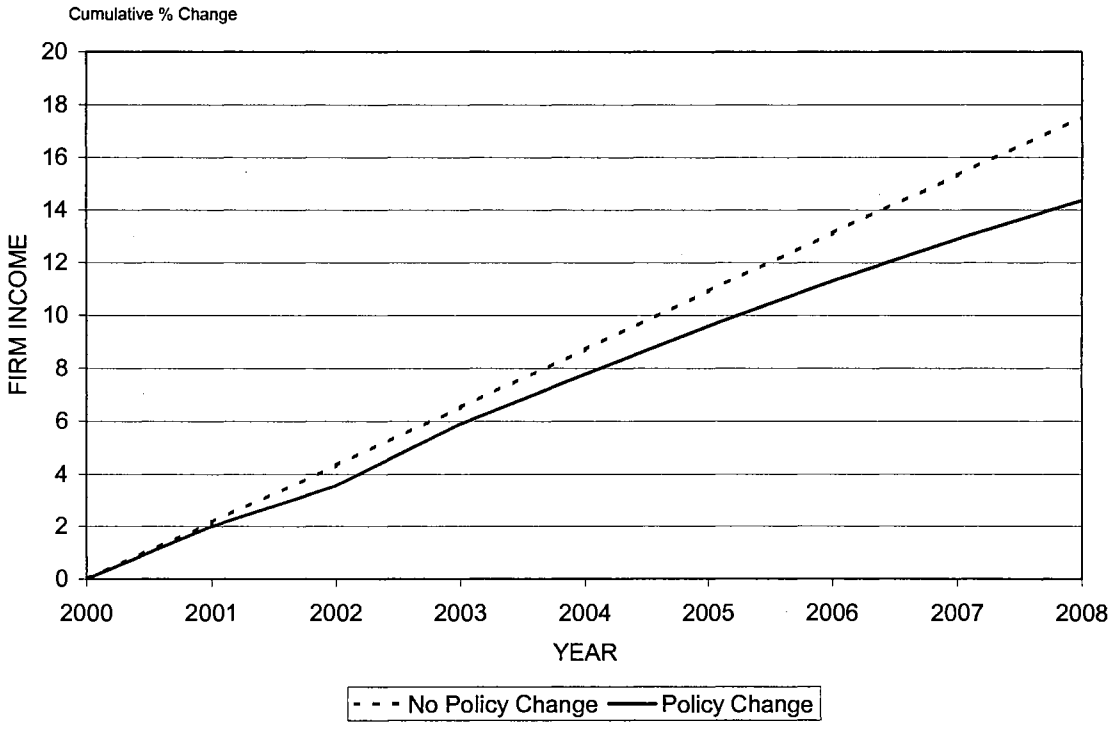
5.6C IMPORTS



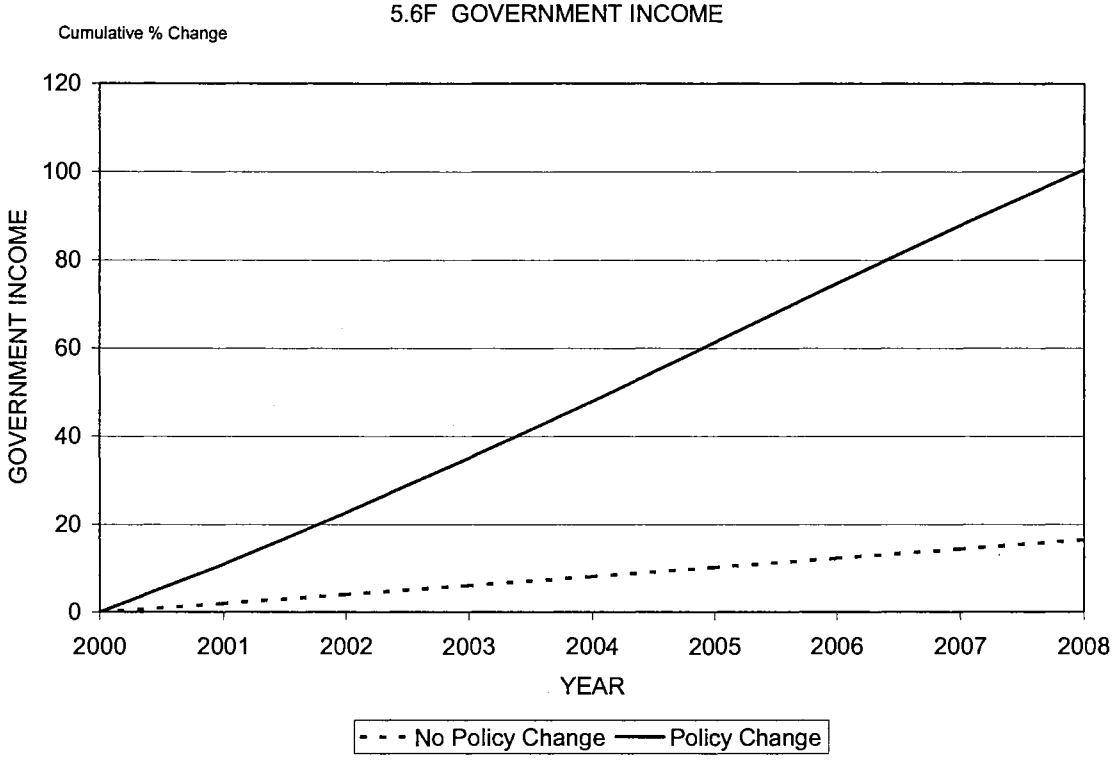
5.6D HOUSEHOLD INCOME



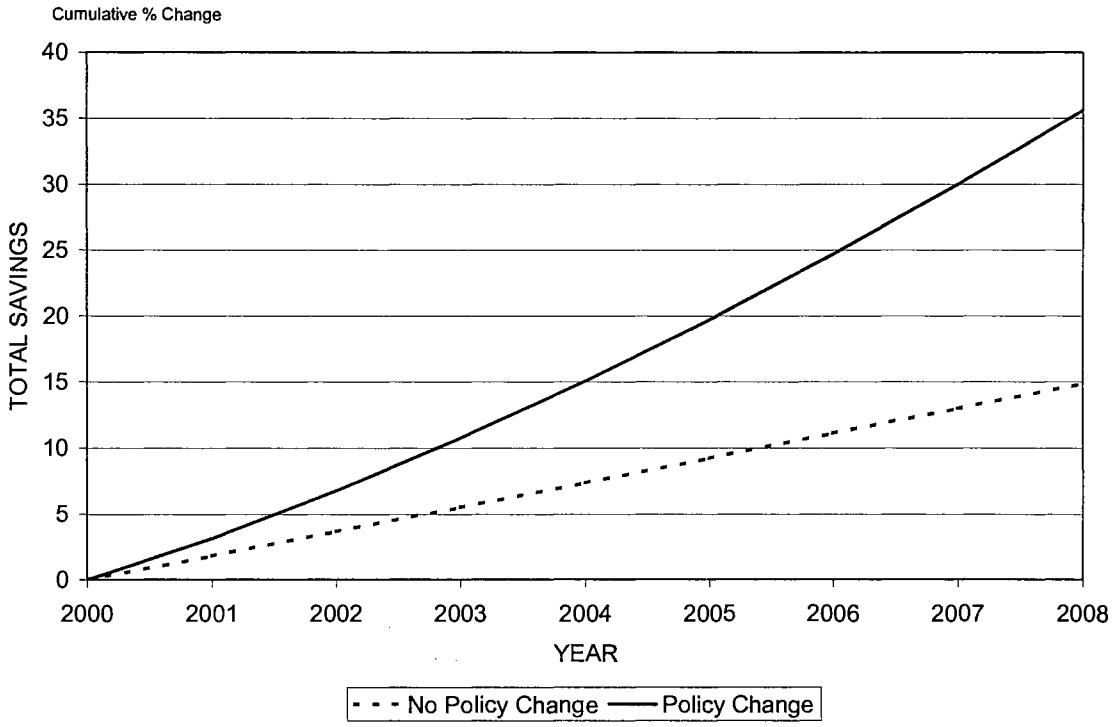
5.6E FIRM INCOME



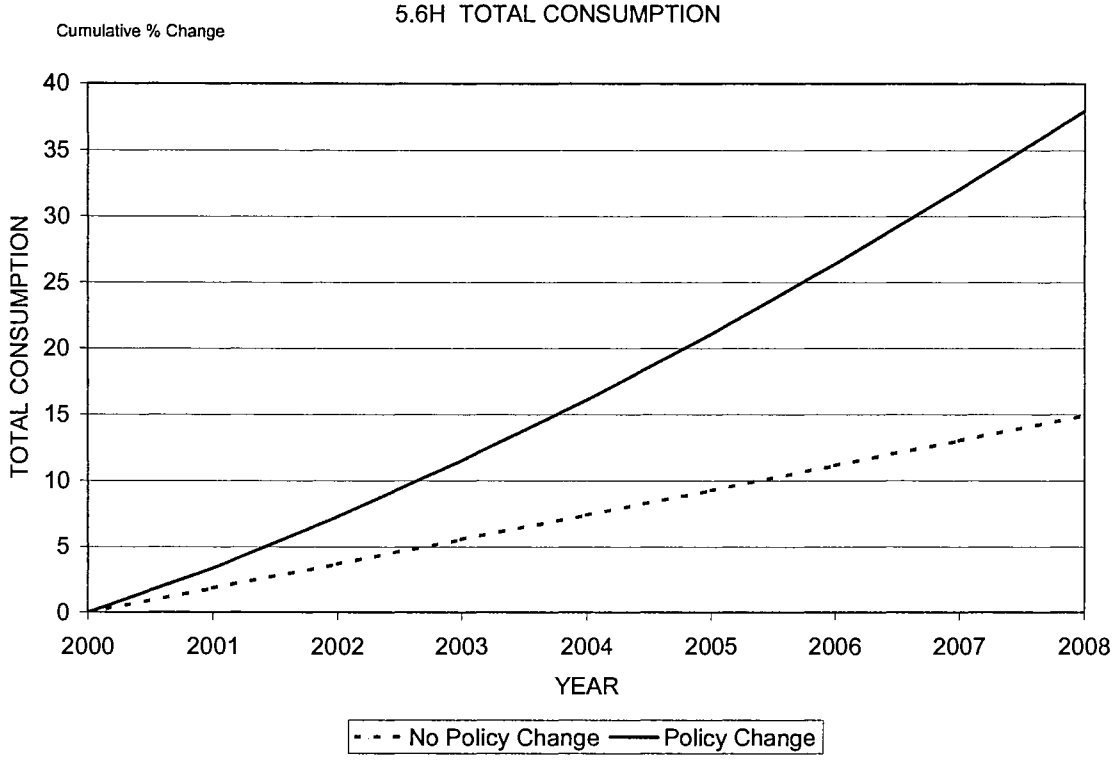
5.6F GOVERNMENT INCOME



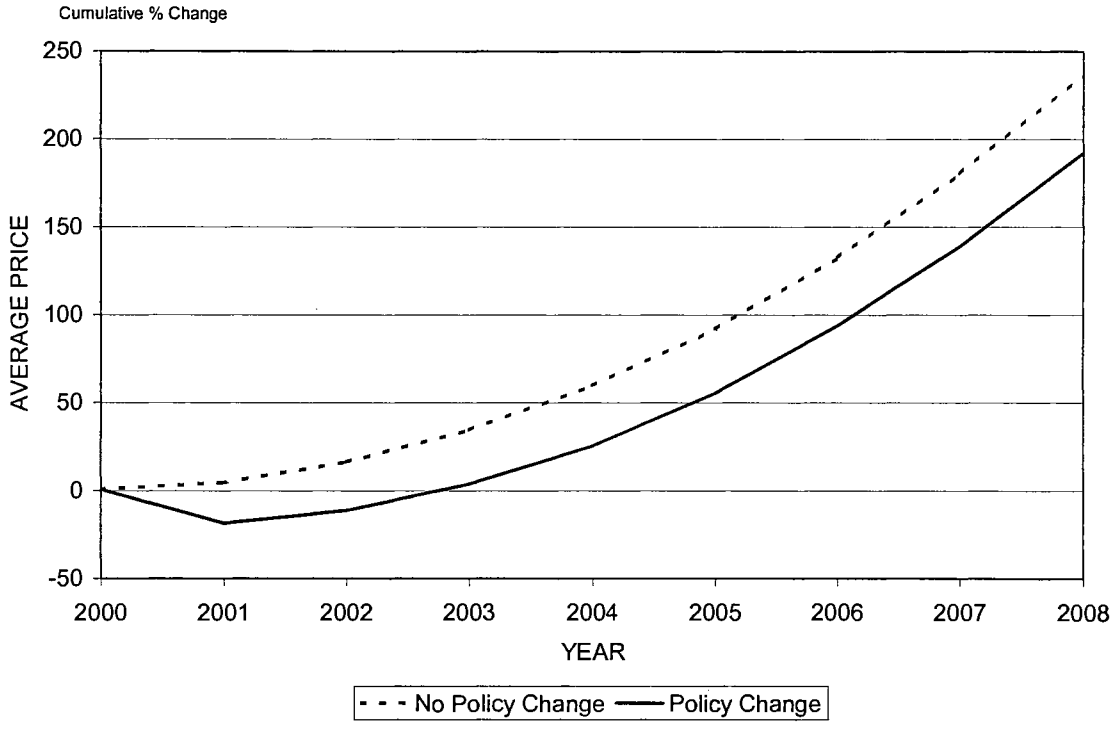
5.6G TOTAL SAVINGS



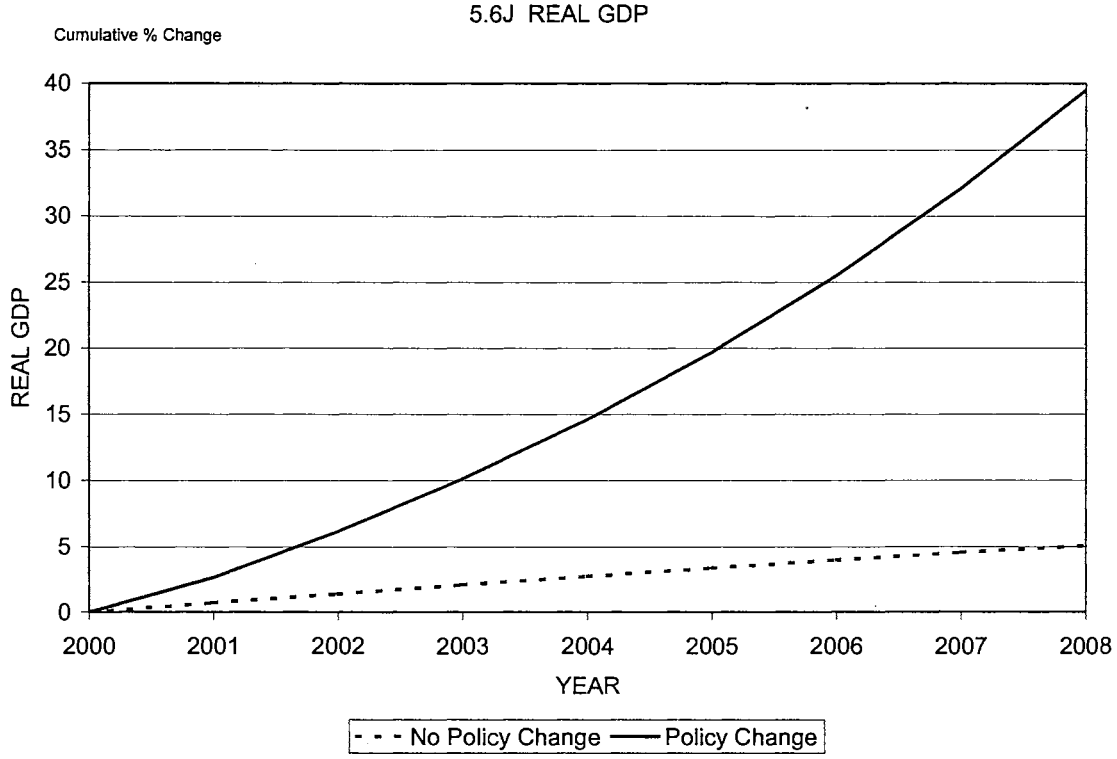
5.6H TOTAL CONSUMPTION



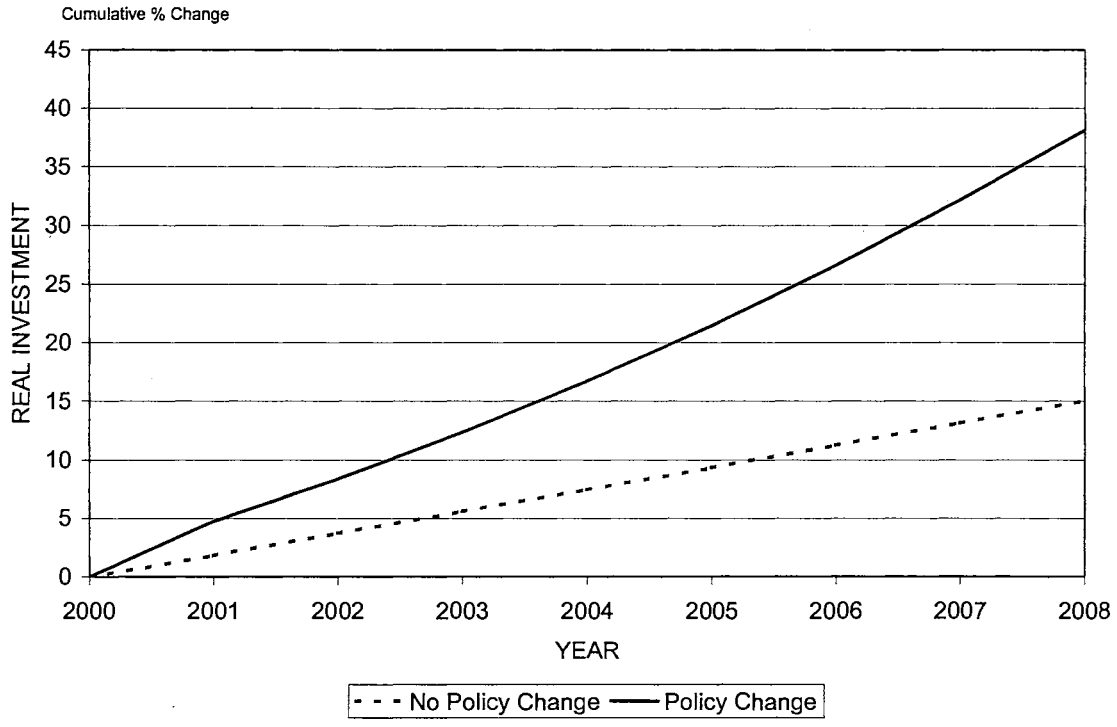
5.6I AVERAGE PRICE

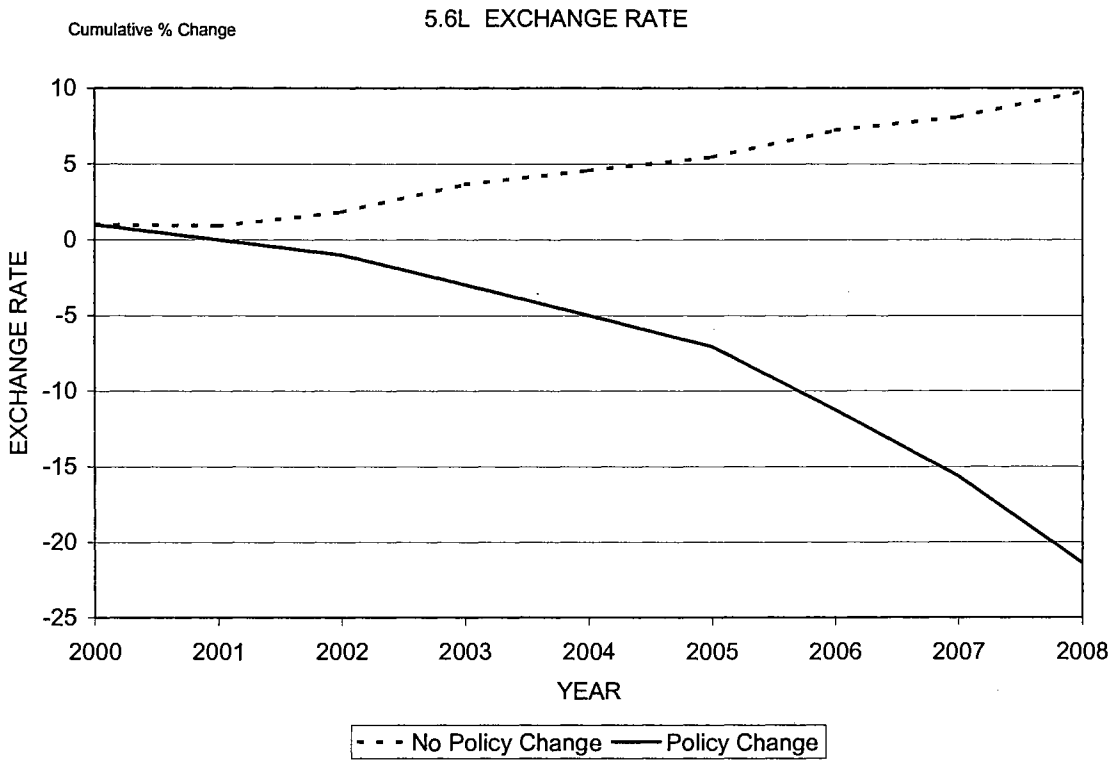


5.6J REAL GDP



5.6K REAL INVESTMENT





Fixed Exchange Rate Regime Versus Flexible Exchange Rate Regime

The fixed exchange rate system and the flexible exchange rate system have different stabilizing effects on the economy and the adoption of either regime depends on the economic variables targeted by the policymakers.

The results from the comparison of the fixed exchange rate with the flexible exchange rate under the policy mix presented in Table 5.13 are mixed. Total output increases slightly higher under the flexible exchange rate than under the fixed exchange rate. The increase in the imports is also higher under the flexible exchange rate. The exports, however, decrease by 15.72 percent under the flexible exchange rate compared to an 8.21 percent increase under the fixed exchange rate. The reason is the 21.39 percent fall in the exchange rate under the flexible exchange rate that leads to the

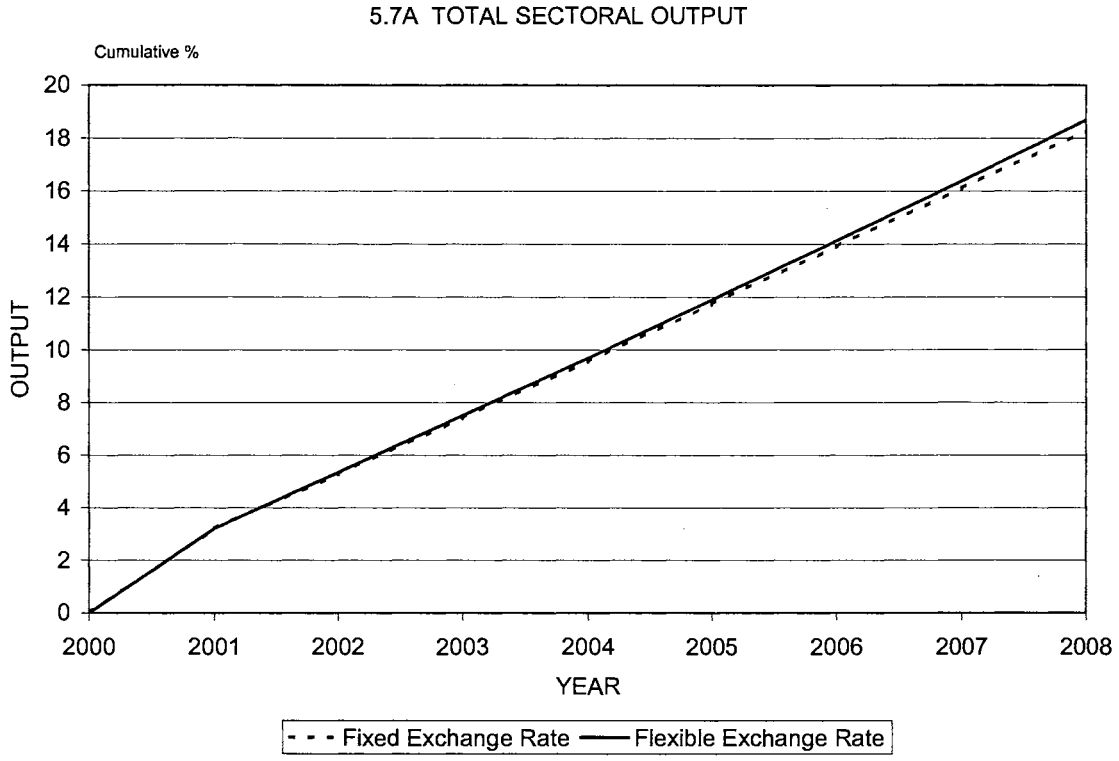
appreciation of the CFA Franc. Total saving and total consumption increase by 35.59 percent and 37.97 percent under the flexible exchange rate compared to 23.51 percent and 24.7 percent increase respectively under the fixed exchange rate. Government income and household income also increase higher under the flexible exchange rate.

Figure 5.7 compares the macroeconomic results under the two exchange rate regimes.

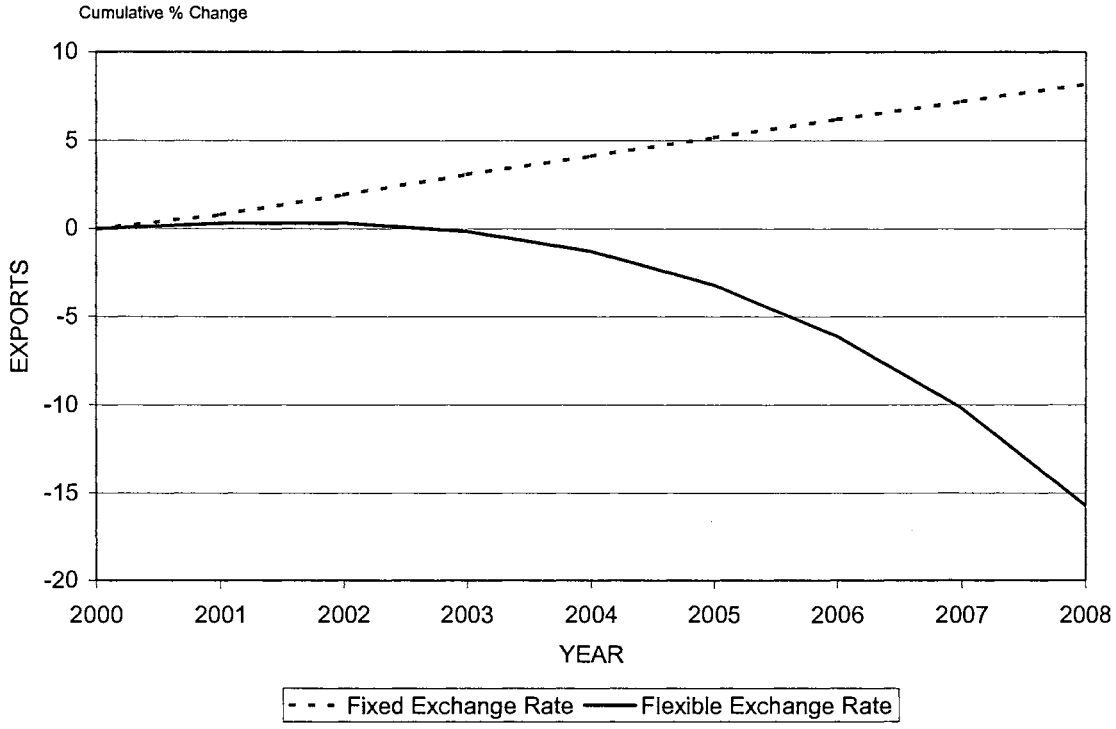
Table 5.13
Macroeconomic Impact of Fixed Exchange Rate Versus Flexible Exchange Rate in 2008

Variable	Fixed exchange rate (%)	Flexible exchange rate (%)
Output	18.29	18.69
Exports	8.21	-15.72
Imports	21.96	43.5
Household income	24.42	51.42
Firm income	16.82	14.36
Government revenue	63.85	100.52
Total savings	23.51	35.59
Total consumption	24.7	37.97
Real GDP	19.69	39.53
Interest rate	1.51	-50.47
Average price	209.16	192.26
Real investment	23.69	38.15
Exchange rate	1	-21.39

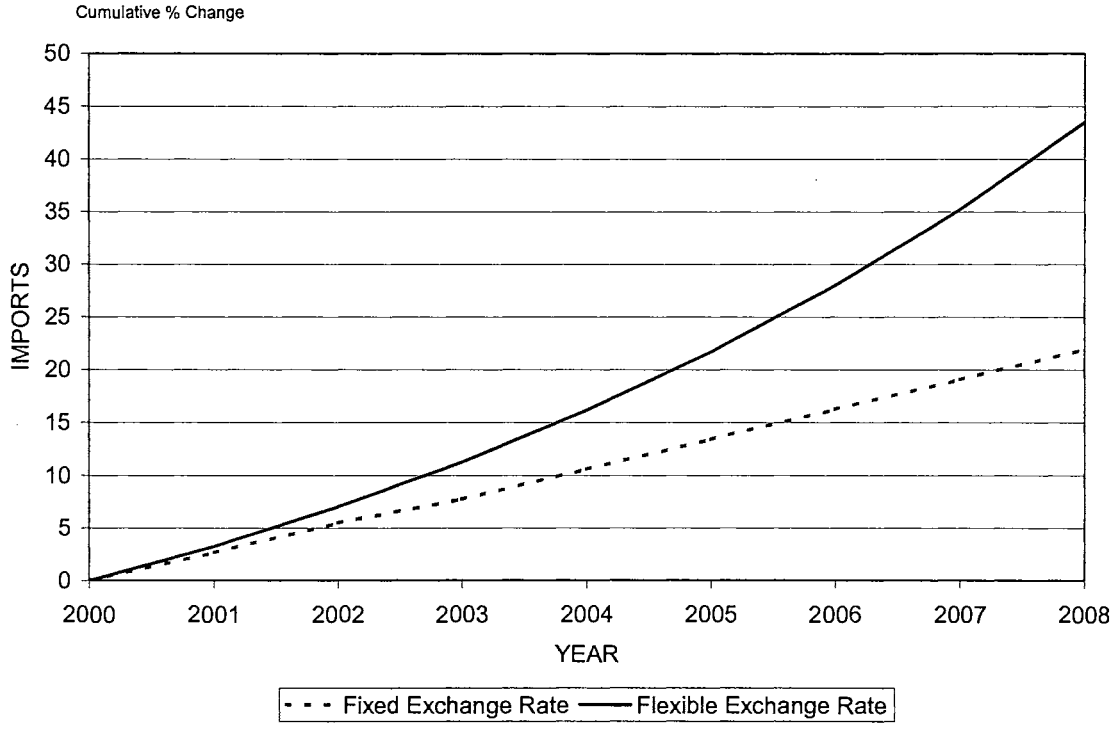
Figure 5.7
Dynamic Effects of Policy Mix Under Fixed Exchange Rate Regime Versus Flexible Exchange Rate Regime



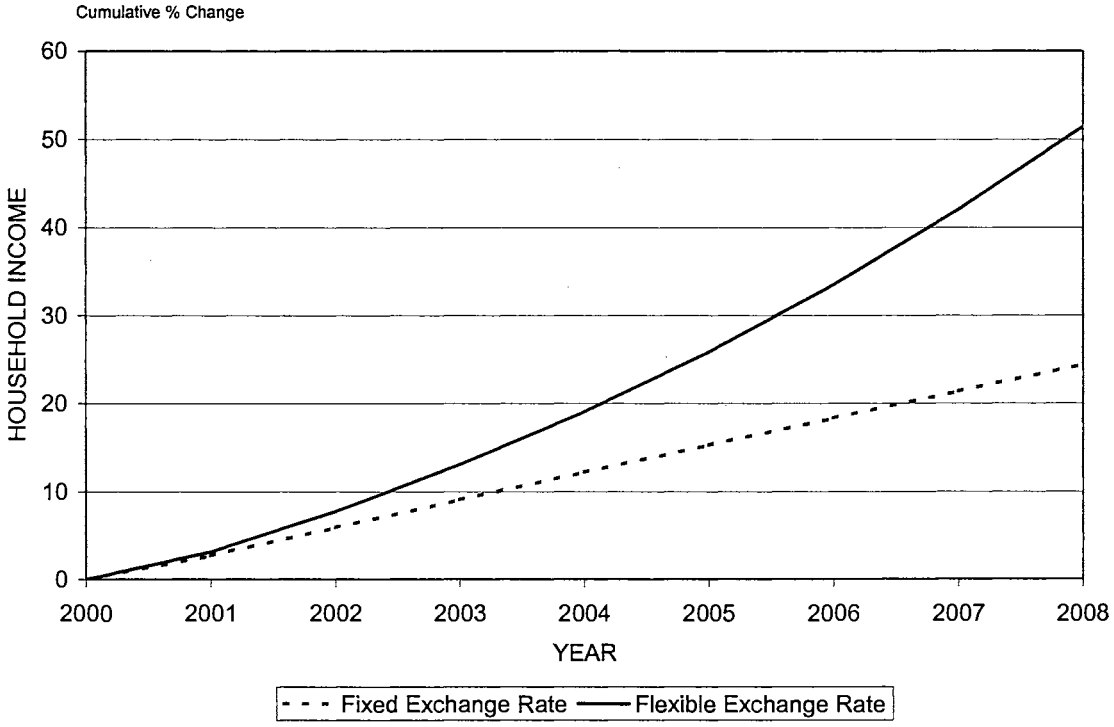
5.7B EXPORTS



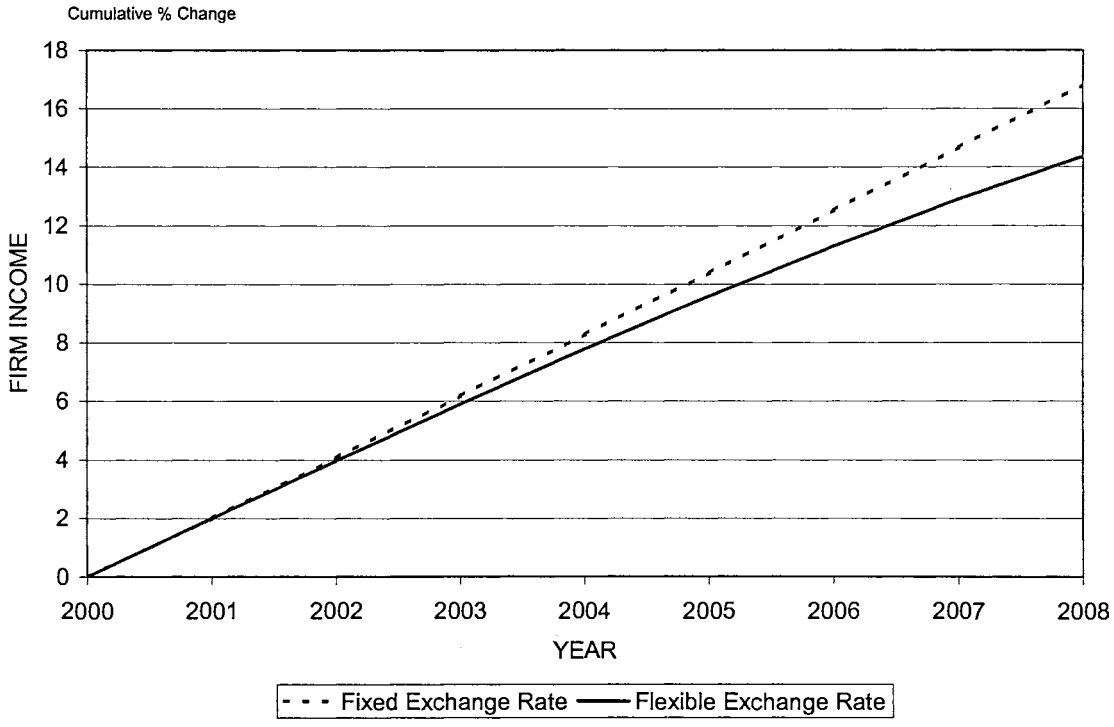
5.7C IMPORTS



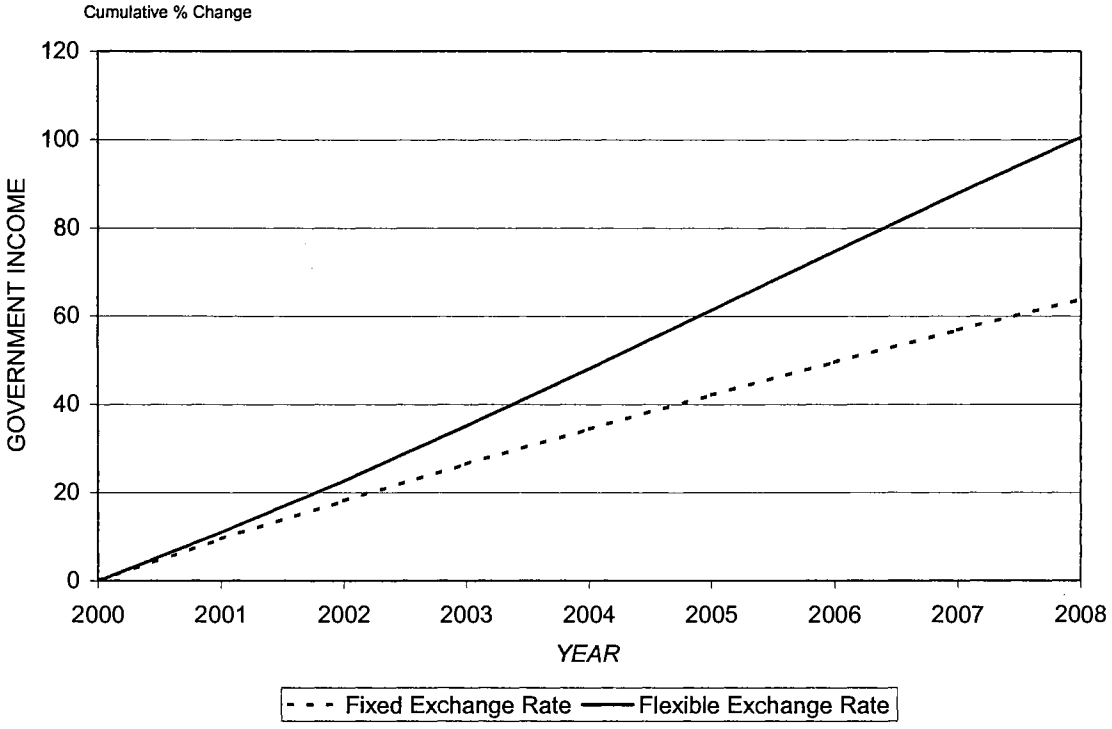
5.7D HOUSEHOLD INCOME



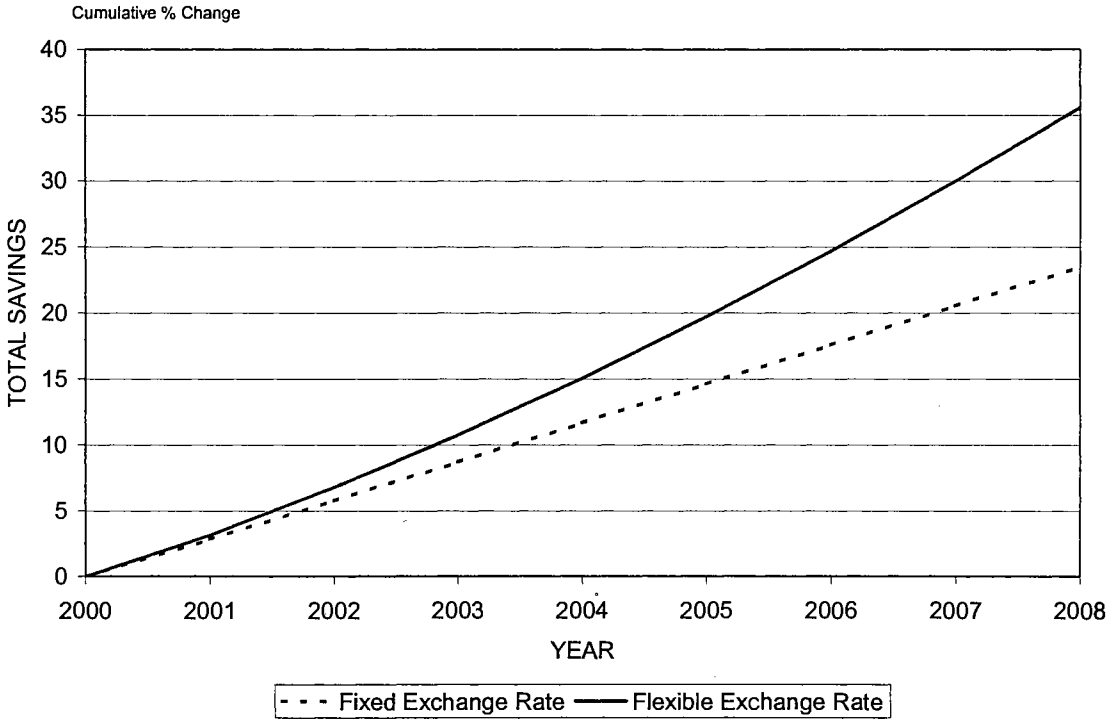
5.7E FIRM INCOME



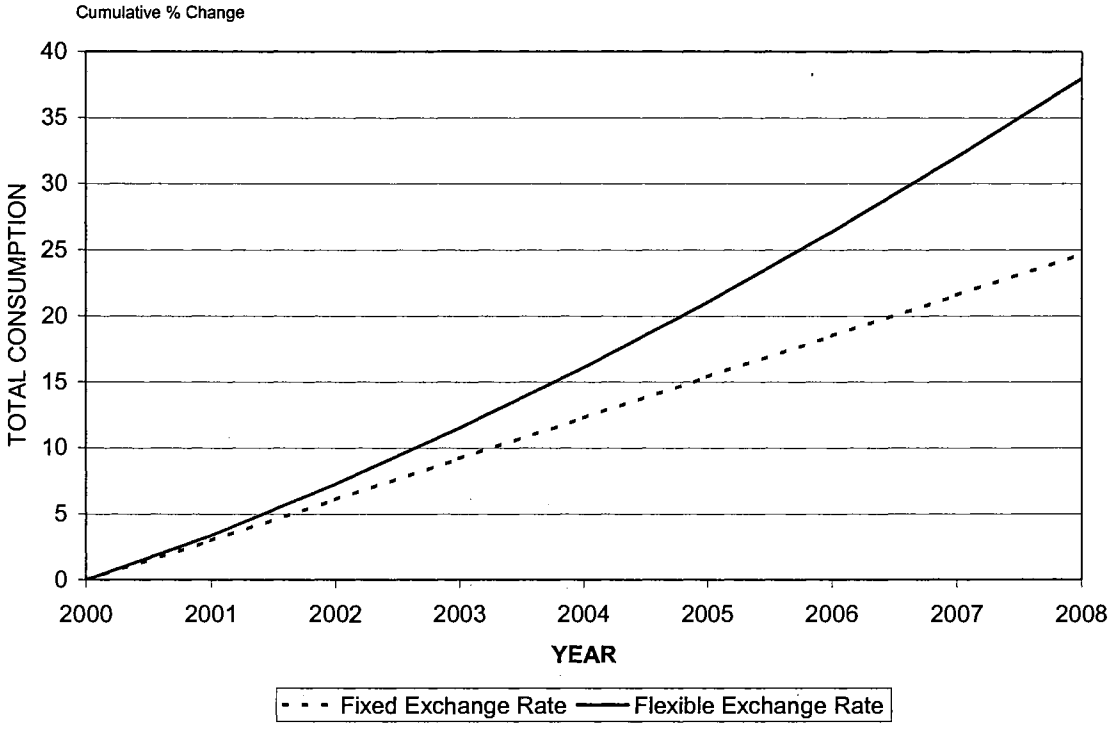
5.7F GOVERNMENT INCOME



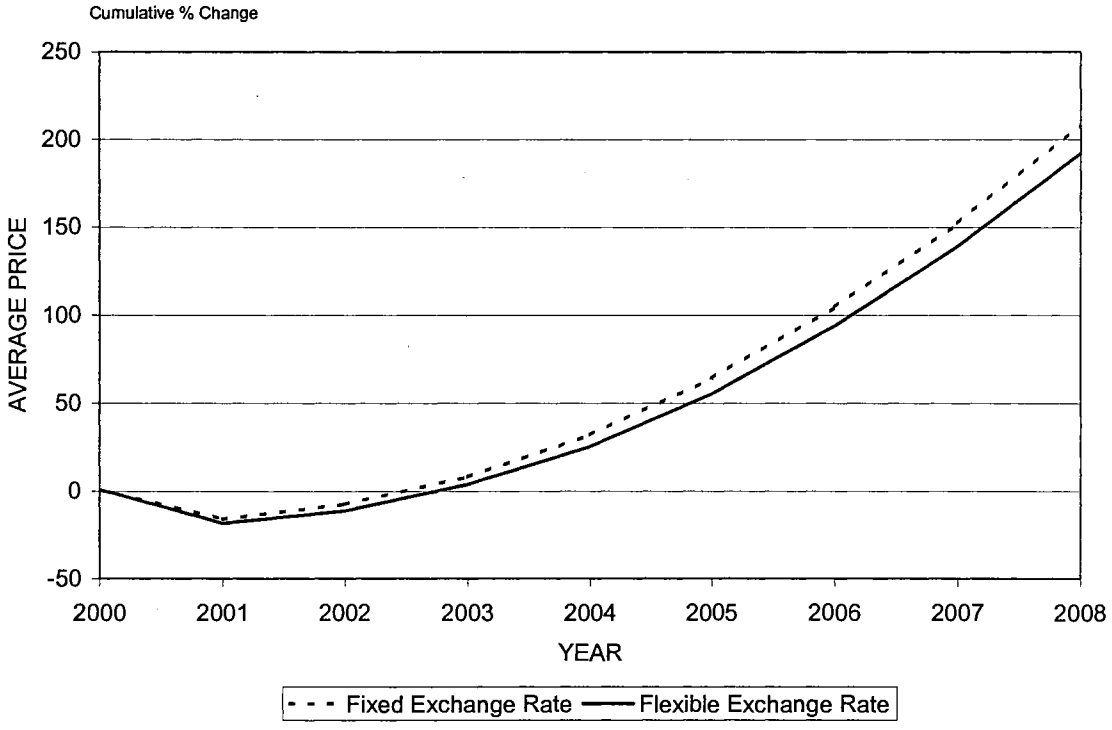
5.7G TOTAL SAVINGS



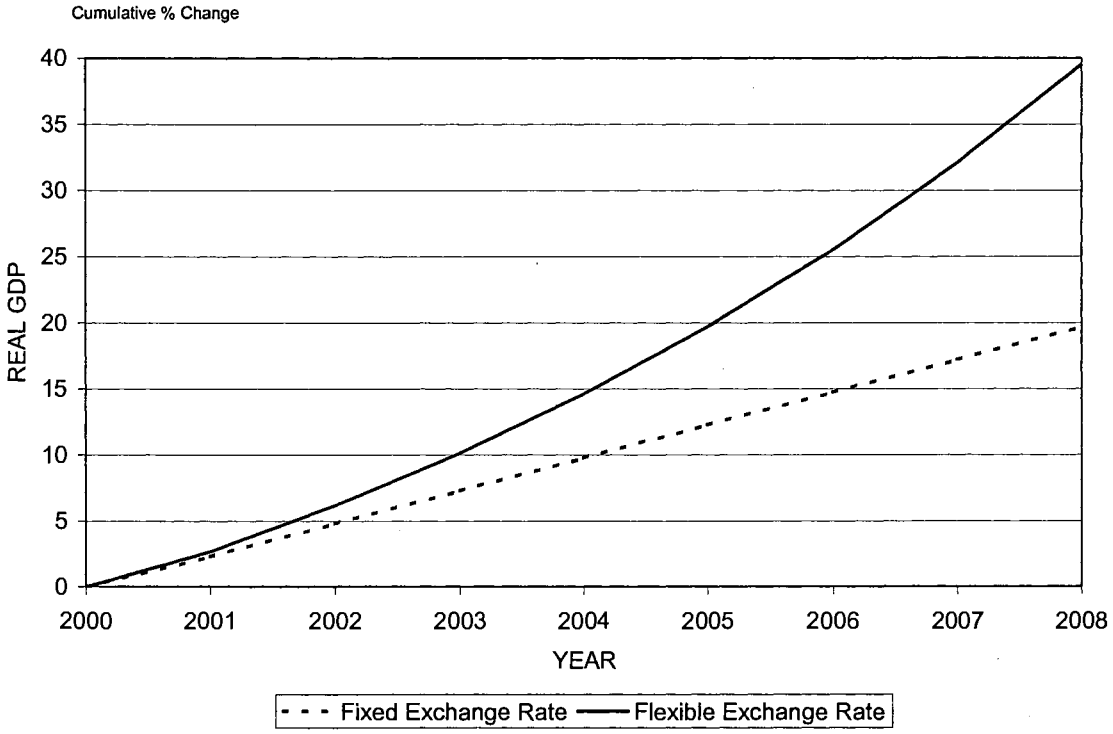
5.7H TOTAL CONSUMPTION



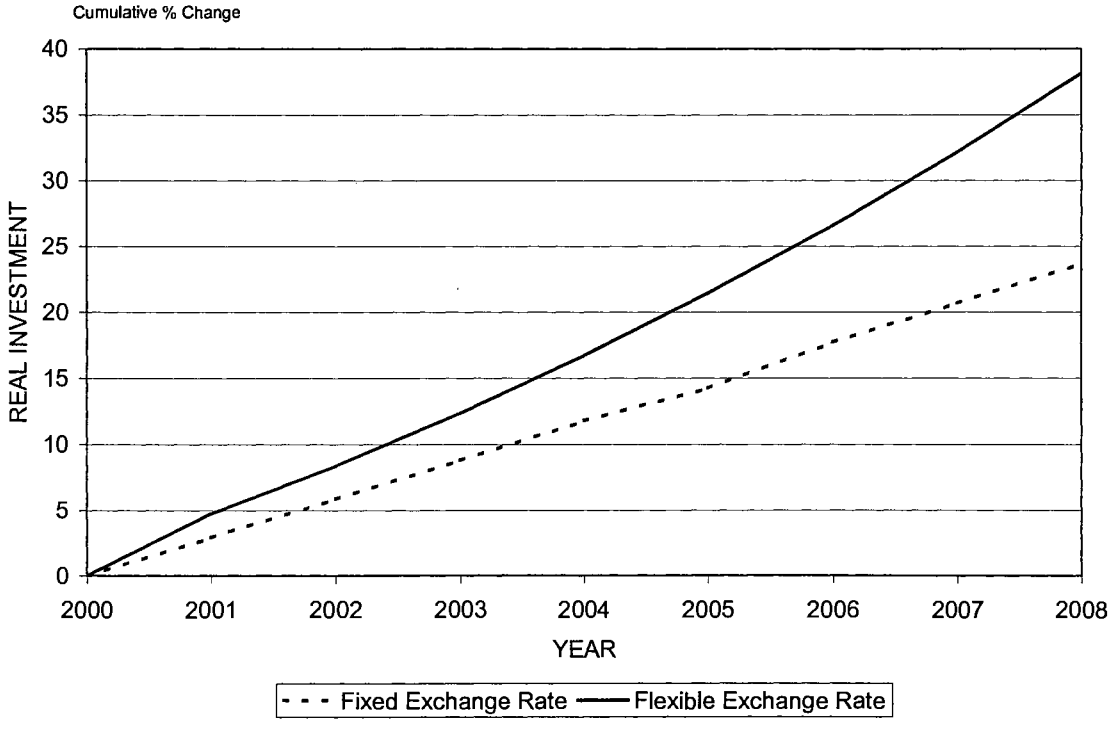
5.7I AVERAGE PRICE

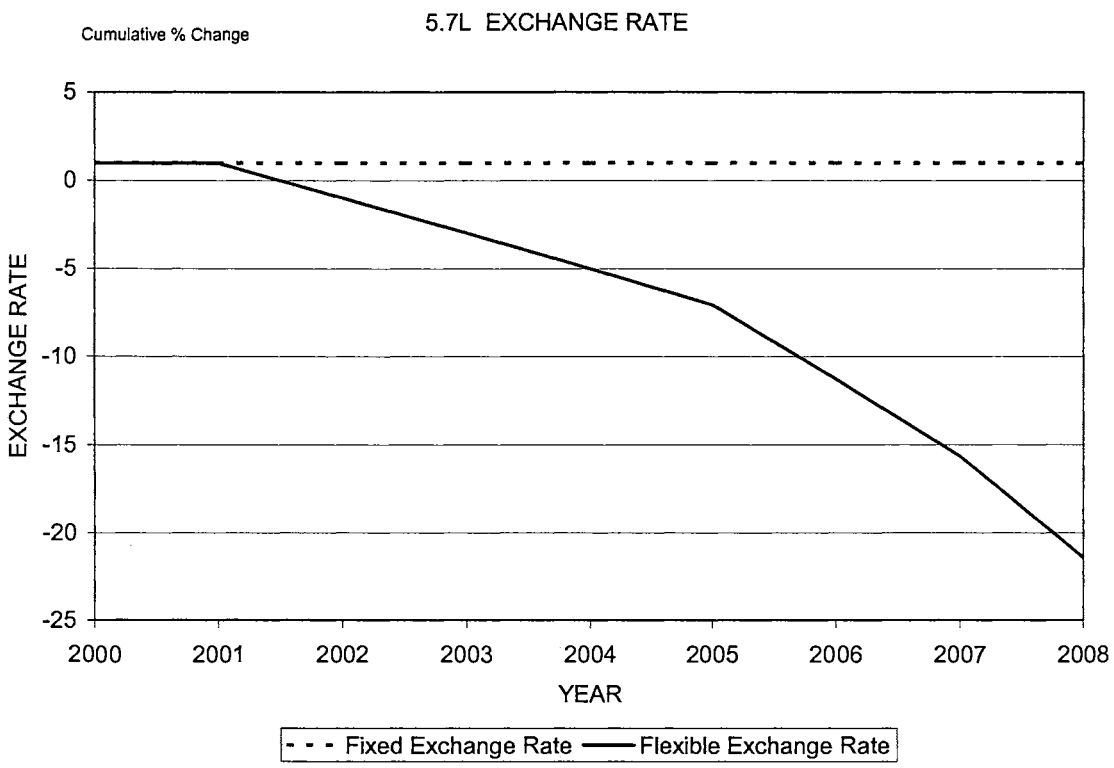


5.7J REAL GDP



5.7K REAL INVESTMENT




5.7L EXCHANGE RATE
Cumulative % Change
5
0
-5
-10
-15
-20
-25
EXCHANGE RATE
2000
2001
2002
2003
2004
2005
2006
2007
2008
YEAR
Fixed Exchange Rate
Flexible Exchange Rate

CHAPTER 6

CONCLUSIONS

Summary

The WAEMU was created in January 1994 to harmonize economic policies: investment; tax legislation; free movement of goods, services, capital, and labor; and fiscal and sectoral policies. Economic performance is poor in the WAEMU countries, like other SSA countries. Results from several theoretical studies have shown that economic growth in the WAEMU countries is low due to high population growth, low schooling, political instability, ethnic divisions, low degree of openness to trade, poor financial intermediary development, poor policy choices, low foreign direct investment, high government deficit, and lack of infrastructure. To encourage the WAEMU countries to improve the performance of their economy, the United States implemented the AGOA. This law provides to the WAEMU countries free- trade and free- market access, investment, and economic reform assistance.

The purpose of this study was to develop a CGE model to determine the economic impacts of the AGOA program. In doing so, the study simulates four policies: (1) elimination of all tariffs and selected quotas; (2) increase in the foreign capital inflow; (3) devaluation of the CFA franc; and (4) economic reform through indirect tax cut. As expected, the economic impacts in implementing these policies are considerably greater than in the situation of absence of these policies. As a result, productions in the agricultural sectors increase on average by 17.5 percent in 2008 compared to 15.5 percent average increase in the base solution. The industry sectors increase on average by 19.2

percent compared to 17.6 percent average increase in the base run simulation. The average increase in the service sectors was 27.7 percent in comparison with 21.3 percent average increase in the base solution. The results for the policy mix under the fixed exchange rate and the flexible exchange rate were mixed. Mostly, the advantage went to the flexible exchange rate in terms of domestic economic policies. The sectoral effects are to increase the aggregate production by 18.5 percent on average in 2008 compared to 17.5 percent increase in the base solution, and reduce substantially the trade balance deficit. The economic impacts of the policies simulation are substantial: incomes to institutions, total saving and total consumption increased by a significant percentage; real GDP, money demand and real investment also increase remarkably under both the fixed exchange rate regime and the flexible exchange rate regime compared to the base solution for the two regimes.

Policy Implications

One characteristic of the WAEMU economy is the relative smallness and underdevelopment of the industrial sector. The development of this sector is essential for sustainable growth in the WAEMU economy. The results from the different policies simulated indicate that the industry sectors can grow by 1.6 percent on average over the base solution in 2008. Investment in those sectors is weak. In 2001, the United States investment in the industry sectors totals $188 million, most of it went to the mining and petroleum sector ($132 million).

To promote investment in the industry sectors- led growth, the WAEMU countries have to offer a most competitive and "investor- friendly" environments. As stressed in the AGOA program, the WAEMU countries have to create political and

economic stability, open and transparent regulatory regimes, and adequate infrastructure. Beside the political reform, the role of the private sector is crucial to market- led reform. The private sector can actively develop and seize the opportunities offered by AGOA in terms of trade and investment by seeking and working closely with the United States private sector through, for example, joint- venture.

Strengths and Weaknesses of the Study

One of the biggest advantages of the CGE approach is the explicit consideration of the interactions between different sectors that make up the economy so that the modeler gets total results of different policies and sees what is happening to the different sectors. In this regard, CGE models generate more complete results than does partial equilibrium analysis, which treats income and factor prices exogenously and ignores changes in these variables in a dynamic model.

Another important advantage is the model can be used to analyze the impacts on the WAEMU economy growth of many other economic policies, such as environmental regulation, the economic impacts of AIDS on the WAEMU economy, and identifying growth areas, as well as exogenous shock to the WAEMU economy.

Despite these advantages, the CGE model presents some weaknesses. The first one is the level of aggregation used in the model. For example, the agriculture sectors can be divided into more than four sectors. Specifically, the forestry, hunting and fishery sector can be disaggregated into two or three sectors. This is also true for the textile, leather, footwear and wearing apparel sector, and most importantly, the public service sector. For the latter sector, the study has no specific data on education, health, social services, administration and defense. This caveat puts some limitations on the study.

The second limitation of the study is the estimation of the parameters. CGE models are not estimated econometrically. So, the values assigned to the models' parameters are either simply guessed by the modelers, taken from previous studies, or calculated from one year of data.

Finally, the dynamic runs of the model are simply a sequence of static equilibria linked together by inter- temporal equations. Any economic decision is based solely on the current period available information so that predicting long run outcomes may be difficult.

Concluding Remarks

The certainty about this study is it offers a clear indication of the benefits the WAEMU countries can draw from the AGOA program should they take actions based on the results obtained from the different policies simulations.

The WAEMU Commission and the countries members can use these results to revamp their market-oriented fiscal and monetary policies.

The AGOA requires that designated beneficiary countries meet specific political and economics eligibility criteria. Consequently, Burkina Faso and Togo are not eligible for AGOA in the WAEMU. It will be advised that, for the best economic interests of the WAEMU, the United States designates these two countries as AGOA beneficiaries.

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APPENDIXES

APPENDIX A

INPUT-OUTPUT TABLES FOR WAEMU COUNTRIES

Table 4.1
Input-Output Table for BENIN (1996)
Interindustry Transactions
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry ...& Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Food Crops	19.6	4.0	1.4	1.3	0.0	52.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	80.7
Cash Crops	0.4	0.1	0.0	0.0	0.0	0.2	45.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.1
Livestock	0.0	0.0	0.0	0.0	0.0	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	9.4
Forestry, ...& Fishery	0.0	0.0	0.0	0.0	0.0	17.5	0.0	0.1	0.0	1.8	0.0	1.8	0.0	0.0	0.0	0.6	0.0	0.0	21.8
Mining & Petroleum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	6.3	0.0	0.0	0.0	0.0	0.0	0.0	9.8
Food Processing	0.0	0.0	0.4	0.4	0.0	26.1	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	0.0	34.4
Textile, ... & Apparel	0.0	0.0	0.1	0.1	0.0	0.0	6.8	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	2.2	0.0	1.0	10.4
Chemicals	11.9	2.4	0.9	0.8	0.6	0.9	1.3	0.8	0.3	0.4	0.1	6.0	3.9	0.1	0.0	0.9	0.1	0.6	32.0
Basic Metals	0.4	0.1	0.0	0.0	0.9	1.6	1.5	0.1	3.5	2.3	0.6	12.0	11.1	0.0	0.0	0.2	10.7	1.0	46.0
Other Indus.	0.2	0.0	0.0	0.0	0.0	0.6	0.5	0.1	0.1	28.2	0.0	48.1	1.4	1.1	0.1	1.5	0.3	2.9	85.1
Electricity, Gas	0.9	0.2	0.2	0.1	3.7	5.1	2.0	1.1	0.8	5.1	12.3	4.5	21.2	1.0	0.0	3.2	1.9	8.1	71.4
Construction	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	20.9	0.5	0.2	3.4	0.6	0.1	2.1	28.2
Transportation	0.1	0.0	0.0	0.0	0.7	0.4	0.2	0.0	0.3	0.4	0.1	1.9	7.6	0.6	0.0	56.0	0.5	5.1	73.9
Finance	0.1	0.0	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.4	0.1	0.3	1.6	19.8	0.2	1.7	0.1	0.1	24.8
Service	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.1	0.1	0.0	1.1	2.1	0.2	0.0	1.3	0.6	1.6	7.5
Hotel	44.7	8.4	10.7	15.0	0.5	54.3	80.8	18.2	19.9	17.5	12.7	0.5	0.4	0.2	0.0	0.5	0.1	1.9	286.3
Private Service	0.2	0.1	0.0	0.0	1.9	1.7	0.5	0.4	0.2	1.5	0.4	6.2	6.9	1.7	0.0	10.9	5.3	4.4	42.0
Public Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Intermediate	78.6	15.3	13.7	17.7	8.6	170.1	139.3	24.5	25.2	61.5	26.3	109.6	56.8	24.9	3.7	85.8	19.7	28.5	909.8

Source: Adapted from WAEMU Commission data

Table 4.2
Input-Output Table for BENIN (1996)
Value Added
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry & Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Indirect Tax	0.1	0.0	0.0	0.0	1.5	2.2	0.2	0.1	0.1	1.3	-1.9	3.1	4.7	0.0	0.1	10.0	0.8	0.0	22.3
Export Tax	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Wages	2.5	0.5	0.4	0.3	1.7	5.7	2.8	0.8	0.6	4.7	2.9	9.6	27.1	0.4	0.4	29.0	7.3	81.6	178.3
Capital	245.2	50.3	67.3	58.8	1.6	44.2	13.8	3.6	3.6	9.9	7.2	36.0	51.0	0.9	85.2	173.2	10.1	0.0	861.9
Total Value Added	247.8	50.8	67.9	59.1	4.8	52.1	16.8	4.5	4.3	15.9	8.2	48.7	82.8	1.3	85.7	212.2	18.2	81.6	1062.7

Source: Adapted from WAEMU Commission data

Table 4.3
Input-Output Table for BENIN (1996)
Structure of Final Demand
(Billion FCFA)

Sector	Government Consumption	Private Consumption	Fixed Stocks	Change in Work	Exports	Imports	Tariffs	Net Final Demand	Total Domestic Supply
Food Crops	0.0	232.7	0.0	-0.2	14.9	1.5	0.3	245.6	326.3
Cash Crops	0.0	20.2	0.0	-6.1	6.1	0.1	0.0	20.1	66.2
Livestock	0.0	69.2	4.5	-3.0	1.7	0.0	0.0	72.4	81.8
Forestry, & Fishery	0.0	57.8	0.0	-0.4	0.7	2.5	0.4	55.2	77.0
Mining & Petroleum	0.0	1.0	0.0	-1.6	5.8	1.5	0.1	3.6	13.4
Food Processing	0.0	218.9	0.0	7.1	54.3	78.3	14.3	187.7	222.1
Textile, & Apparel	0.0	57.0	0.0	26.7	53.2	74.0	17.1	145.8	156.2
Chemicals	0.0	30.5	0.0	3.3	27.0	52.5	11.0	-2.7	29.3
Basic Metals	0.0	6.7	62.1	-14.8	4.8	62.4	12.9	-16.5	29.6
Other Indus.	0.0	19.3	0.0	-3.0	6.0	26.3	4.2	-8.2	76.9
Electricity, Gas	0.0	9.5	0.0	-2.2	2.3	39.7	6.9	-37.0	34.4
Construction	0.0	5.0	124.9	0.0	0.0	0.0	0.0	129.9	158.1
Transportation	0.0	47.9	0.0	0.0	23.2	5.5	0.0	65.6	139.5
Finance	0.0	1.3	0.0	0.0	0.3	0.0	0.0	1.6	26.4
Service	0.0	81.8	0.0	0.0	0.0	0.0	0.0	81.8	89.3
Hotel	0.0	11.6	0.0	0.0	0.0	0.0	0.0	11.6	297.9
Private Service	0.0	8.4	5.3	0.0	0.0	17.7	0.0	-4.0	38.0
Public Service	108.3	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Intermediate	108.3	880.8	196.8	6.0	300.0	362.0	67.2	1062.7	1972.5

Source: Adapted from WAEMU Commission data

Table 4.1
Input-Output Table for BURKINA FASO (1996)
Interindustry Transactions
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry ...& Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Food Crops	12.8	0.1	1.3	0.0	0.0	43.4	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	0.2	0.6	70.0
Cash Crops	0.0	0.3	0.0	0.0	0.0	2.6	10.	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7
Livestock	4.8	4.0	0.0	0.0	0.0	49.6	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.1	62.3
Forestry, ...& Fishery	0.0	0.0	2.5	0.0	0.0	4.5	2.8	0.0	11.1	6.7	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	30.4
Mining & Petroleum	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0	0.0	7.2
Food Processing	0.0	0.0	1.0	0.0	0.0	25.9	3.6	10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.3	8.9	0.7	76.2
Textile, ... & Apparel	0.0	0.0	0.0	0.1	0.1	0.1	12.0	0.4	0.0	1.3	0.0	20.3	0.6	0.0	0.0	0.6	0.2	1.7	37.4
Chemicals	2.3	7.8	0.0	0.0	0.2	0.2	1.0	2.4	1.9	1.7	1.7	4.5	0.9	0.0	0.0	1.0	4.2	2.7	32.5
Basic Metals	1.4	0.8	0.0	2.0	0.4	0.1	0.6	0.5	14.3	2.0	0.8	16.5	4.8	0.1	0.9	0.8	5.8	7.0	58.8
Other Indus.	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.8	4.0	0.0	11.5	0.4	2.8	0.3	1.2	4.5	1.2	27.3
Electricity, Gas	0.2	0.3	0.0	0.0	1.1	0.4	1.0	0.3	1.7	0.3	11.0	15.4	18.7	1.2	0.1	7.6	11.8	8.8	79.9
Construction	0.0	0.0	0.0	0.0	2.5	0.0	0.1	0.1	1.0	0.4	0.2	40.9	9.2	0.9	6.6	6.2	6.4	11.0	85.5
Transportation	0.0	0.0	0.0	0.0	0.2	1.7	14.4	2.0	3.6	1.3	2.6	20.4	9.3	0.3	0.3	25.2	3.6	5.3	90.2
Finance	0.1	0.1	0.0	0.0	0.2	0.1	0.7	0.3	0.1	0.1	1.0	2.3	2.6	0.2	0.1	1.3	0.3	1.7	11.2
Service	0.4	1.0	0.0	0.0	0.0	0.1	0.4	0.2	0.4	0.3	0.9	2.1	2.4	0.1	0.1	3.0	1.5	1.8	14.7
Hotel	0.0	0.0	0.0	0.0	0.1	0.2	0.8	0.3	0.8	0.3	0.5	1.6	3.6	0.2	0.3	1.5	0.2	3.0	13.4
Private Service	0.0	0.0	0.0	0.0	0.4	1.1	1.4	0.2	0.6	0.2	0.2	8.2	2.9	0.5	0.2	1.8	4.0	4.2	25.9
Public Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Intermediate	23.1	14.4	4.8	2.1	5.2	130.3	54.1	18.4	36.3	18.6	18.9	150.8	55.4	6.3	8.9	88.6	51.6	49.8	736.6

Source: Adapted from WAEMU Commission data

Table 4.2
Input-Output Table for BURKINA FASO (1996)
Value Added
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry ...& Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Indirect Tax	0.3	0.2	0 3	0.0	0.0	9.2	-0.3	0.6	0.8	0.2	-0.4	3.8	2.2	5.0	2.3	9.4	0.2	1.4	35.2
Export Tax	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Wages	3.2	1.8	3.1	1.6	3.3	21.7	8.2	3.0	6.7	2.3	5.0	12.9	30.6	8.3	8.1	31.5	59.1	79.3	289.7
Capital	194.2	45.3	146.0	78.0	5.2	52.2	24.2	4.2	9.9	5.2	11.4	38.5	62.5	4.2	11.9	111.2	3.0	2.0	809.1
Total Value Added	197.7	47.3	150.0	79.6	8.5	83.1	32.1	7.8	17.4	7.7	16.0	55.2	95.3	17.5	22.3	152.1	62.3	82.7	1134.6

Source: Adapted from WAEMU Commission data

Table 4.3
Input-Output Table for BURKINA FASO (1996)
Structure of Final Demand
(Billion FCFA)

Sector	Government Consumption	Private Consumption	Fixed Stocks	Change in Work	Exports	Imports	Tariffs	Net Final Demand	Total Domestic Supply
Food Crops	0.0	118.5	0.0	39.5	7.9	14.0	2.1	149.8	219.8
Cash Crops	0.0	6.0	0.0	-15.9	58.0	0.3	0.0	47.8	61.5
Livestock	0.0	142.0	7.7	-77.1	19.3	0.0	0.0	91.9	154.2
Forestry, ...& Fishery	0.0	65.5	0.0	-13.9	0.0	0.3	0.2	51.1	81.5
Mining & Petroleum	0.0	0.0	0.0	7.4	0.1	1.1	0.1	6.3	13.5
Food Processing	0.0	155.5	0.0	47.2	4.0	59.5	10.0	137.2	213.4
Textile, ... & Apparel	0.0	36.6	0.0	22.4	10.1	15.3	5.2	48.6	86.0
Chemicals	0.0	27.9	0.0	27.4	1.9	56.1	7.5	-6.4	26.1
Basic Metals	0.0	8.4	146.1	-74.9	11.5	80.1	16.0	-5.0	53.8
Other Indus.	0.0	19.0	0.0	49.9	3.6	61.2	12.2	-0.9	26.4
Electricity, Gas	0.0	12.0	0.0	7.9	2.0	44.3	22.5	-18.5	61.4
Construction	0.0	0.0	120.6	0.0	0.0	0.0	0.0	120.6	206.1
Transportation	0.0	66.7	0.0	0.0	5.2	11.3	0.0	60.6	150.8
Finance	0.0	12.8	0.0	0.0	0.0	0.0	0.0	12.8	24.0
Service	0.0	16.5	0.0	0.0	0.0	0.0	0.0	16.5	31.2
Hotel	0.0	223.6	0.0	0.0	20.3	16.8	0.0	227.1	240.5
Private Service	0.0	53.5	36.3	0.0	14.6	16.4	0.0	88.0	113.9
Public Service	132.5	0.0	0.0	0.0	0.0	0.0	0.0	132.5	132.5
Total Intermediate	132.5	965.4	310.7	19.9	158.5	376.7	75.8	1134.5	1871.1

Source: Adapted from WAEMU Commission data

Table 4.1
Input-Output Table for IVORY COAST (1996)
Interindustry Transactions
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry ...& Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Food Crops	38.2	0.0	1.3	0.0	0.0	136.8	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	177.5
Cash Crops	0.4	16.8	0.0	0.0	0.0	160.5	16.3	0.2	0.0	23.7	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	218.3
Livestock	0.2	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Forestry, ...& Fishery	0.0	0.0	0.0	0.0	0.0	47.6	0.0	0.2	0.0	64.4	0.0	0.3	0.0	0.0	0.0	0.0	0.2	0.0	112.7
Mining & Petroleum	0.0	3.5	0.0	0.0	11.3	0.0	0.0	2.6	0.0	2.4	245.6	44.5	0.0	0.0	0.0	0.0	0.0	0.0	309.9
Food Processing	7.3	18.0	0.2	0.1	0.0	103.9	0.3	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	6.5	4.0	150.8
Textile, ... & Apparel	0.0	0.5	0.0	0.2	0.0	3.2	26.1	0.2	0.0	0.5	0.2	0.2	0.1	0.0	0.0	17.1	0.3	2.5	51.1
Chemicals	3.5	40.1	0.1	0.0	2.0	16.1	23.0	57.9	6.9	10.7	2.9	26.5	0.3	0.0	1.8	3.1	6.2	11.4	212.5
Basic Metals	1.5	15.0	0.1	19.9	6.6	36.6	4.6	4.3	67.4	18.6	5.8	71.8	32.7	1.5	0.5	13.5	6.6	36.5	343.5
Other Indus.	0.4	5.5	0.0	2.7	0.7	38.0	3.2	10.0	3.6	104.0	1.4	96.7	18.4	4.5	1.7	30.1	10.6	25.1	356.6
Electricity, Gas	0.3	16.2	0.0	8.9	7.3	41.8	7.5	4.9	5.7	27.6	26.2	32.4	72.5	3.4	2.7	28.2	15.1	51.4	352.1
Construction	0.1	1.8	0.0	0.8	3.9	4.0	0.2	0.4	0.6	0.5	3.3	77.2	2.0	1.4	19.3	5.1	2.5	16.5	139.6
Transportation	0.8	3.8	0.0	18.5	2.7	8.7	1.6	1.2	2.5	4.1	1.6	11.3	38.1	4.7	1.4	211.7	13.6	31.6	357.9
Finance	0.2	0.7	0.0	0.3	0.2	3.8	0.6	0.4	0.5	1.6	1.8	1.4	3.0	201.9	0.7	9.5	0.9	0.5	228.0
Service	0.0	1.2	0.0	3.4	3.3	5.6	0.3	0.4	1.9	2.2	0.4	1.4	3.4	2.2	0.4	28.7	9.6	36.4	100.8
Hotel	101.6	494.6	0.7	14.0	5.5	212.9	76.9	95.6	180.2	42.9	30.1	1.6	1.1	0.8	0.1	6.1	2.2	1.5	1268.4
Private Service	21.4	6.7	0.7	24.4	31.4	21.4	3.2	5.6	8.1	9.0	6.8	36.1	25.1	16.9	1.9	87.9	49.9	34.4	390.9
Public Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Intermediate	175.9	624.4	3.1	93.2	74.9	841.7	163.8	192.4	277.4	312.3	326.1	401.4	196.7	237.3	30.5	443.1	125.5	251.9	4771.6

Source: Adapted from WAEMU Commission data

Table 4.2
Input-Output Table for IVORY COAST (1996)
Value Added
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry ...& Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Indirect Tax	15.0	8.1	0.0	8.1	9.9	53.9	2.7	2.0	43.7	12.9	227.4	8.6	23.6	22.0	6.8	99.3	11.8	0.0	555.8
Export Tax	0.0	145.0	0.0	0.0	0.0	45.5	0.0	0.0	0.0	15.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	205.7
Wages	6.4	85.5	0.0	17.0	8.6	98.7	30.0	20.2	43.1	32.1	31.7	75.9	160.8	10.3	11.4	131.6	105.5	419.9	1288.7
Capital	940.9	535.0	2.7	36.6	17.6	211.2	124.5	43.6	16.5	80.7	13.6	99.5	305.6	7.6	345.3	556.6	202.1	6.5	3546.0
Total Value Added	962.3	773.6	2.7	61.7	36.1	409.3	157.2	65.8	103.3	140.9	272.7	184.0	490.0	39.9	363.5	787.5	319.4	426.4	5596.2

Source: Adapted from WAEMU Commission data

Table 4.3
Input-Output Table for IVORY COAST (1996)
Structure of Final Demand
(Billion FCFA)

Sector	Government Consumption	Private Consumption	Fixed Stocks	Change in Work	Exports	Imports	Tariffs	Net Final Demand	Total Domestic Supply
Food Crops	0.0	1007.7	0.0	1.6	2.8	45.5	5.7	960.9	1138.4
Cash Crops	0.0	95.6	0.0	144.8	940.6	1.2	0.3	1179.5	1397.8
Livestock	0.0	6.0	0.0	0.0	0.0	0.9	0.1	5.0	6.0
Forestry, ...& Fishery	0.0	60.8	11.3	0.1	31.9	59.2	2.6	42.3	155.0
Mining & Petroleum	0.0	0.0	0.0	10.3	7.3	215.8	0.7	-198.9	111.0
Food Processing	0.0	952.5	0.0	44.8	339.9	192.6	44.3	1100.3	1251.1
Textile, ... & Apparel	0.0	183.7	0.0	-0.1	143.9	41.3	16.2	270.0	321.1
Chemicals	0.0	225.0	0.0	0.1	119.2	248.6	50.0	45.7	258.2
Basic Metals	0.0	172.2	274.2	-2.0	88.6	395.7	100.1	37.2	380.7
Other Indus.	0.0	59.7	0.0	17.5	298.9	218.8	61.0	96.3	452.9
Electricity, Gas	0.0	108.8	0.0	-1.4	217.2	65.9	12.3	246.4	598.5
Construction	0.0	2.3	429.6	0.4	15.6	2.3	0.0	445.6	585.2
Transportation	0.0	342.3	0.0	0.1	79.1	92.5	0.0	329.0	686.9
Finance	0.0	42.3	0.0	-0.1	15.1	8.0	0.0	49.3	277.3
Service	0.0	271.9	0.0	-0.3	27.0	5.4	0.0	293.2	394.0
Hotel	0.0	5.1	0.0	0.4	55.8	98.9	0.0	-37.6	13230.8
Private Service	0.0	142.1	0.0	-2.7	131.1	216.5	0.0	54.0	444.9
Public Service	678.4	0.0	0.0	0.0	0.0	0.0	0.0	678.4	678.4
Total Intermediate	678.4	3678.0	715.1	213.5	2514.0	1909.1	293.3	5390.8	10162.4

Source: Adapted from WAEMU Commission data

Table 4.1
Input-Output Table for MALI (1996)
Interindustry Transactions
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry ...& Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Food Crops	8.6	0.0	0.0	0.0	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0	20.1
Cash Crops	0.0	2.2	0.0	0.0	0.0	0.7	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	8.6
Livestock	0.0	0.0	0.0	0.0	0.0	22.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	25.6
Forestry, ...& Fishery	0.0	0.0	0.0	0.0	1.0	1.2	0.0	0.3	0.0	0.1	0.0	13.9	0.0	0.0	0.0	2.1	0.0	0.0	18.6
Mining & Petroleum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	2.1
Food Processing	0.0	0.0	6.0	0.0	0.0	2.5	0.1	3.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	15.3	0.0	0.0	28.2
Textile, ... & Apparel	0.0	0.0	0.0	1.3	0.0	0.4	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1
Chemicals	0.9	12.4	0.2	0.5	1.8	0.4	0.3	1.8	1.3	0.8	2.6	29.0	18.8	0.2	0.8	2.0	1.6	11.8	87.2
Basic Metals	0.5	0.4	0.0	1.1	1.9	0.2	0.5	0.6	2.4	0.3	1.7	6.9	5.4	0.1	0.1	1.4	1.0	7.8	32.3
Other Indus.	0.8	11.2	0.2	0.5	1.6	0.4	0.3	1.7	1.2	0.7	2.4	26.1	16.9	0.2	0.7	1.8	1.5	10.7	78.9
Electricity, Gas	0.0	0.0	0.0	0.0	0.7	0.6	0.5	0.8	0.2	0.4	1.2	7.6	10.5	0.6	0.7	11.9	3.6	21.1	60.4
Construction	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.2	32.3	1.1	0.0	0.2	0.3	0.0	12.2	46.5
Transportation	2.5	0.7	1.2	1.2	1.0	0.8	0.2	2.4	3.8	1.0	0.6	5.8	6.2	0.5	1.3	5.9	0.9	15.1	51.1
Finance	0.0	0.0	0.0	0.0	0.6	0.2	0.3	0.3	0.2	0.1	0.7	2.1	3.3	12.6	0.1	1.8	0.0	0.0	22.3
Service	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.0	0.6	3.6	3.3	0.3	1.4	3.3	2.4	25.9	41.4
Hotel	15.7	4.4	7.4	7.6	3.5	4.3	1.9	14.3	23.7	6.1	0.2	3.1	12.1	0.3	0.6	0.8	0.0	10.3	116.3
Private Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Public Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Intermediate	29.0	31.3	15.0	12.2	12.2	39.2	13.9	25.6	33.0	10.9	10.2	132.2	77.6	14.8	5.9	56.8	11.0	114.9	645.7

Source: Adapted from WAEMU Commission data

Table 4.2
Input-Output Table for MALI (1996)
Value Added
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry ...& Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Indirect Tax	0.0	0.4	0.5	0.0	0.0	1.5	0.7	0.1	0.5	0.4	1.4	5.0	6.2	0.2	2.9	1.5	2.1	2.8	26.1
Export Tax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wages	32.1	4.5	3.0	13.3	2.8	21.5	6.1	0.3	2.5	2.2	6.8	60.1	34.0	4.6	13.2	4.6	9.7	48.4	269.7
Capital	216.6	110.8	135.1	75.0	25.7	22.5	1.4	1.8	13.5	11.8	10.7	6.2	18.4	0.5	24.6	194.2	18.1	44.4	931.5
Total Value Added	248.7	115.7	138.6	88.3	28.5	45.5	8.2	2.2	16.5	14.4	18.9	71.3	58.6	5.3	40.7	200.3	29.9	95.6	1227.3

Source: Adapted from WAEMU Commission data

Table 4.3
Input-Output Table for MALI (1996)
Structure of Final Demand
(Billion FCFA)

Sector	Government Consumption	Private Consumption	Fixed Stocks	Change in Work	Exports	Imports	Tariffs	Net Final Demand	Total Domestic Supply
Food Crops	0.0	258.3	0.0	-1.3	6.7	4.9	1.2	257.6	277.7
Cash Crops	0.0	14.9	0.0	-1.0	124.5	0.0	0.0	138.4	147.0
Livestock	0.0	79.3	17.9	2.0	28.8	0.0	0.0	128.0	153.6
Forestry, ...& Fishery	0.0	80.0	0.0	-1.1	3.4	0.2	0.0	82.1	100.7
Mining & Petroleum	0.0	0.0	0.0	-0.1	39.8	0.8	0.1	38.8	40.9
Food Processing	0.0	127.8	0.0	5.8	0.0	59.6	17.8	56.2	84.4
Textile, ... & Apparel	0.0	40.5	0.0	1.0	1.2	18.8	7.9	16.0	22.1
Chemicals	0.0	20.9	1.1	-1.9	0.0	72.1	7.7	-59.7	27.5
Basic Metals	0.0	17.9	155.6	-2.9	0.0	130.0	23.5	17.1	49.4
Other Indus.	0.0	18.8	1.0	-1.6	0.0	61.0	10.8	-53.6	25.3
Electricity, Gas	0.0	31.9	0.0	14.7	0.0	51.2	26.6	-31.2	29.2
Construction	0.0	16.9	140.8	0.0	0.0	0.8	0.0	156.9	203.4
Transportation	0.0	78.7	0.0	0.0	22.8	16.4	0.0	85.1	136.2
Finance	0.0	10.2	0.0	0.0	0.0	12.2	0.0	-2.0	20.3
Service	0.0	5.1	0.0	0.0	0.0	0.0	0.0	5.1	46.5
Hotel	0.0	127.5	0.0	0.0	13.4	0.0	0.0	140.9	257.2
Private Service	0.0	91.0	0.0	0.0	10.9	61.0	0.0	40.9	40.9
Public Service	210.6	0.0	0.0	0.0	0.0	0.0	0.0	210.6	210.6
Total Intermediate	210.6	1019.7	316.4	13.5	251.5	489.1	95.6	1227.3	1873.0

Source: Adapted from WAEMU Commission data

Table 4.1
Input-Output Table for SENEGAL (1996)
Interindustry Transactions
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry ...& Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Food Crops	13.8	0.0	11.2	0.0	0.0	33.6	0.0	0.1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	3.2	0.0	0.0	62.9
Cash Crops	0.0	11.0	0.0	0.0	0.0	72.8	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.8
Livestock	8.7	3.1	2.7	0.0	0.0	112.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.5	0.0	129.1
Forestry, ...& Fishery	0.0	0.0	0.0	1.7	0.0	32.1	0.0	0.2	0.5	1.6	0.0	0.0	0.1	0.0	0.0	0.7	0.3	0.0	37.2
Mining & Petroleum	0.0	0.0	0.0	0.0	0.0	0.1	0.0	5.2	0.0	0.2	10.6	2.6	0.0	0.0	0.0	0.0	0.0	0.0	18.7
Food Processing	1.7	0.0	17.5	5.7	0.0	86.0	0.0	15.7	0.1	0.0	0.0	0.0	1.2	0.0	0.0	16.1	0.1	5.7	149.8
Textile, ... & Apparel	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	2.4
Chemicals	6.0	2.2	0.0	1.9	5.0	7.2	12.4	49.3	9.2	9.2	7.8	14.9	5.7	0.0	0.6	4.1	9.0	5.9	150.4
Basic Metals	0.6	0.2	0.0	1.8	3.3	8.2	0.8	2.6	36.2	3.4	4.2	48.3	3.2	0.5	0.0	0.8	3.0	2.9	120.0
Other Indus.	0.1	0.0	0.0	0.3	0.1	4.7	1.1	3.4	1.2	33.4	0.8	93.6	0.7	1.3	0.3	1.4	1.4	6.9	150.7
Electricity, Gas	1.7	0.6	1.8	8.1	8.0	9.9	3.0	7.2	2.6	10.2	41.1	12.2	36.5	0.9	0.5	6.1	8.1	7.9	166.4
Construction	0.0	0.0	0.0	0.1	0.3	11.3	1.1	8.6	3.0	6.7	17.8	6.4	13.6	0.0	11.0	23.0	6.7	16.4	126.0
Transportation	0.8	0.3	0.3	23.2	5.6	8.1	2.4	10.7	3.5	4.3	11.4	17.3	6.5	2.4	1.2	32.5	14.4	6.1	151.0
Finance	0.0	0.0	0.0	0.1	0.1	0.6	0.2	0.5	0.1	0.1	0.2	0.7	0.2	10.0	0.0	1.6	0.1	0.0	14.5
Service	0.0	0.0	0.0	0.2	0.4	1.9	1.6	1.2	2.4	2.3	0.8	4.3	1.9	1.1	0.2	15.2	6.9	8.5	48.9
Hotel	85.1	11.1	16.0	64.9	4.3	45.5	15.7	32.0	47.5	32.0	27.9	0.9	1.0	0.1	0.1	0.3	0.1	0.9	385.4
Private Service	0.0	0.0	0.1	7.7	2.2	4.3	2.3	6.7	1.9	3.6	13.1	17.3	7.8	7.1	1.0	6.0	13.6	10.4	105.1
Public Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Intermediate	118.5	28.5	49.6	115.7	29.3	439.0	48.6	143.4	108.2	107.1	135.7	218.5	79.4	23.4	14.9	112.4	65.5	71.6	1909.3

Source: Adapted from WAEMU Commission data

Table 4.2
Input-Output Table for SENEGAL (1996)
Value Added
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry ...& Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Indirect Tax	0.0	0.0	0.3	3.2	0.1	3.4	0.6	0.7	4.2	1.4	-2.9	6.6	16.5	1.4	0.4	31.5	2.9	0.0	70.3
Export Tax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wages	1.2	0.7	1.3	19.8	5.4	39.7	6.9	12.9	33.9	13.2	18.5	57.3	50.3	7.5	2.4	105.1	33.0	191.4	600.5
Capital	153.0	91.7	155.6	58.0	8.8	88.0	11.9	51.5	44.7	26.7	56.6	45.8	186.6	1.3	238.6	269.1	95.8	0.0	1583.6
Total Value Added	154.2	92.4	157.2	81.0	14.3	131.1	19.4	65.1	82.8	41.3	72.2	109.7	253.4	10.2	241.4	405.7	131.7	191.4	2254.4

Source: Adapted from WAEMU Commission data

Table 4.3
Input-Output Table for SENEGAL (1996)
Structure of Final Demand
(Billion FCFA)

Sector	Government Consumption	Private Consumption	Fixed Stocks	Change in Work	Exports	Imports	Tariffs	Net Final Demand	Total Domestic Supply
Food Crops	0.0	244.2	0.0	0.7	22.8	50.2	7.8	209.7	272.6
Cash Crops	0.0	11.4	0.0	-0.1	20.2	1.1	0.1	30.3	121.1
Livestock	0.0	69.1	106.6	-1.7	0.0	0.2	0.0	173.8	302.9
Forestry, ...& Fishery	0.0	118.1	0.0	-59.0	100.4	0.1	0.0	159.4	196.6
Mining & Petroleum	0.0	0.4	0.0	0.3	26.1	1.5	0.4	24.9	43.6
Food Processing	0.0	522.8	0.0	102.0	106.3	247.9	62.8	420.4	570.2
Textile, ... & Apparel	0.0	43.1	0.0	-7.9	63.1	22.0	10.8	65.5	67.9
Chemicals	0.0	107.6	0.2	-2.7	67.2	94.1	19.8	58.2	208.6
Basic Metals	0.0	43.0	163.2	9.2	44.4	124.3	45.9	89.6	209.6
Other Indus.	0.0	82.4	7.2	-31.2	54.4	86.1	28.9	-2.2	148.5
Electricity, Gas	0.0	52.7	0.0	0.7	11.8	22.0	1.8	41.4	207.8
Construction	0.0	0.0	202.1	0.0	0.0	0.0	0.0	202.1	328.1
Transportation	0.0	125.0	0.0	0.0	60.4	3.5	0.0	181.9	332.9
Finance	0.0	2.9	0.0	0.0	18.3	2.1	0.0	19.1	33.6
Service	0.0	225.4	0.0	0.0	0.0	17.9	0.0	207.5	256.4
Hotel	0.0	16.2	0.0	0.0	125.8	9.4	0.0	132.6	418.0
Private Service	0.0	240.9	0.0	0.0	139.6	288.5	0.0	92.0	197.1
Public Service	263.1	0.0	0.0	0.0	0.0	0.0	0.0	263.1	263.1
Total Intermediate	263.1	1905.2	383.3	-8.3	860.8	970.9	178.3	2254.4	4163.7

Source: Adapted from WAEMU Commission data

Table 4.1
Input-Output Table for TOGO (1996)
Interindustry Transactions
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry ...& Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Food Crops	51.4	8.9	4.0	43.2	0.0	43.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	153.5
Cash Crops	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
Livestock	0.0	0.0	0.1	1.2	0.0	13.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	15.6
Forestry, ...& Fishery	0.0	0.0	0.0	0.0	0.0	72.1	0.0	6.4	0.0	12.5	0.0	2.8	0.0	0.0	0.0	3.4	0.0	0.0	97.2
Mining & Petroleum	0.0	0.0	0.0	0.0	2.4	0.4	0.0	1.1	0.0	45.5	0.0	18.7	0.0	0.0	0.0	0.3	0.0	0.0	68.4
Food Processing	0.0	0.0	1.0	10.8	0.0	18.3	0.0	29.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	62.8
Textile, ... & Apparel	0.0	0.0	0.1	0.9	0.1	0.0	13.8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.7	0.0	2.1	17.8
Chemicals	12.2	2.1	1.0	10.6	21.2	0.3	3.6	2.8	4.6	0.2	0.6	0.8	7.9	0.2	0.0	0.4	0.7	1.7	70.9
Basic Metals	0.2	0.0	0.0	0.3	16.9	0.3	2.2	0.1	27.5	0.7	3.3	0.8	11.6	0.0	0.0	0.0	31.2	1.5	96.6
Other Indus.	0.3	0.0	0.1	0.6	0.2	0.3	2.2	0.9	1.2	25.5	0.4	9.9	4.6	5.2	0.8	1.1	3.0	12.9	69.2
Electricity, Gas	0.2	0.0	0.0	0.4	35.6	0.4	1.4	1.0	3.0	0.7	33.7	0.1	10.7	0.7	0.0	0.4	2.6	5.6	96.5
Construction	0.0	0.0	0.0	0.1	0.5	0.0	0.1	0.1	0.1	0.0	0.0	1.4	0.6	0.3	7.7	0.2	0.4	3.2	14.7
Transportation	0.1	0.0	0.0	0.3	19.3	0.1	0.3	0.1	3.1	0.2	0.7	0.2	11.2	1.3	0.0	18.3	2.1	10.3	67.6
Finance	0.1	0.0	0.0	0.2	2.1	0.0	0.4	0.1	0.2	0.2	0.5	0.0	3.0	53.2	0.7	0.7	0.5	0.4	62.3
Service	0.0	0.0	0.0	0.1	4.9	0.0	0.2	0.1	1.4	0.1	0.2	0.1	3.6	0.5	0.0	0.5	3.0	3.8	18.5
Hotel	6.3	1.0	1.6	27.5	2.6	2.4	30.1	9.1	40.6	1.3	18.9	0.0	0.1	0.1	0.0	0.0	0.1	0.7	142.4
Private Service	0.1	0.0	0.0	0.1	16.1	0.1	0.3	0.3	0.6	0.2	0.9	0.2	3.1	1.1	0.0	1.1	6.6	2.5	33.3
Public Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Intermediate	70.9	12.0	7.9	96.3	121.9	151.9	67.1	51.2	82.3	87.1	59.2	35.0	56.5	62.6	9.2	33.8	50.2	44.7	1099.8

Source: Adapted from WAEMU Commission data

Table 4.2
Input-Output Table for TOGO (1996)
Value Added
(Billion FCFA)

Sector	Food Crops	Cash Crops	Live-stock	Forestry & Fishery	Mining	Food Proc.	Textile	Chemical	Basic Metal	Other Ind.	Electric, Gas	Const.	Trans.	Finance	Service	Hotel	Private Service	Public Service	Total
Indirect Tax	3.8	0.8	0.6	0.5	1.2	2.0	3.1	0.6	1.2	0.7	0.8	1.6	3.8	0.1	0.4	32.3	2.8	0.0	56.3
Export Tax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wages	42.1	9.0	6.7	5.9	5.3	13.5	0.7	0.8	3.7	11.0	8.8	18.2	21.8	0.2	0.5	43.1	3.9	53.4	248.7
Capital	156.0	33.5	25.0	21.8	31.4	24.3	0.3	3.2	1.1	3.0	17.8	3.5	16.3	0.4	45.4	59.3	3.0	0.0	445.6
Total Value Added	201.9	43.3	32.3	28.2	37.9	39.8	4.1	4.6	6.0	14.7	27.4	23.3	41.9	0.7	46.3	134.7	9.7	53.4	750.6

Source: Adapted from WAEMU Commission data

Table 4.3
Input-Output Table for TOGO (1996)
Structure of Final Demand
(Billion FCFA)

Sector	Government Consumption	Private Consumption	Fixed Stocks	Change in Work	Exports	Imports	Tariffs	Net Final Demand	Total Domestic Supply
Food Crops	0.0	120.2	0.0	3.8	5.2	9.3	0.5	119.4	272.9
Cash Crops	0.0	5.8	0.0	-16.4	53.7	0.2	0.0	42.9	55.4
Livestock	0.0	20.6	3.5	0.7	0.0	0.2	0.0	24.6	40.2
Forestry, ...& Fishery	0.0	23.6	0.0	21.5	0.3	17.1	1.0	27.3	124.5
Mining & Petroleum	0.0	4.4	0.0	36.5	52.7	1.8	0.3	91.5	159.9
Food Processing	0.0	146.5	0.0	2.7	27.7	40.0	8.0	128.9	191.7
Textile, ... & Apparel	0.0	65.5	0.0	1.2	25.9	31.5	7.6	53.5	71.3
Chemicals	0.0	21.2	0.0	2.6	0.3	35.3	3.8	-15.0	55.9
Basic Metals	0.0	4.0	49.3	1.0	3.0	52.5	13.3	-8.5	88.1
Other Indus.	0.0	57.8	0.0	-1.4	19.5	36.6	6.6	32.7	101.9
Electricity, Gas	0.0	24.0	0.0	-2.2	0.0	27.5	4.4	-10.1	86.4
Construction	0.0	0.0	43.7	0.0	0.0	0.0	0.0	43.7	58.4
Transportation	0.0	39.5	0.0	0.0	4.0	12.8	0.0	30.7	98.3
Finance	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	63.3
Service	0.0	37.2	0.0	0.0	0.0	0.0	0.0	37.2	55.7
Hotel	0.0	26.1	0.0	0.0	0.0	0.0	0.0	26.1	168.5
Private Service	0.0	21.7	1.2	0.0	45.0	41.2	0.0	26.7	60.0
Public Service	97.9	0.0	0.0	0.0	0.0	0.0	0.0	97.9	97.9
Total Intermediate	97.9	619.1	97.7	50.0	237.3	305.9	45.5	750.6	1850.4

Source: Adapted from WAEMU Commission data

APPENDIX B

SAM FOR WAEMU COUNTRIES

Appendix B

Table 4.5
Social Accounting Matrix for BENIN (billion FCFA)

	Expenditures										
			Factors		Institutions						
Receipts	Activities	Com-modities	Labor	Capital	House-holds	Firms	Gov.	Capital Account	Change in Stocks	Rest of the World	Total Receipts
Activities		1672.5								300.0	1972.5
Commodities	909.8				880.6		108.3	196.8	6.0		2101.7
Factors											
Labor	178.3										178.3
Capital	861.9										861.8
Institutions											
Households			178.3	693.3			28.8			37.7	937.9
Firms				168.6			-22.9				145.6
	22.5	67.3		0.0	13.1	62.5				0.0	165.5
Government											
Capital					44.0	83.1	11.0			64.5	202.8
Accounts											
Change in								6.0			6.0
Stocks											
Rest of the		362.0			0.0		40.3				402.2
World											
Total	1972.5	2101.7	178.3	861.8	937.9	145.6	165.5	202.8	6.0	402.2	

Source: Adapted from WAEMU Commission data

Table 4.5
Social Accounting Matrix for BURKINA FASO (billion FCFA)

	Expenditures										
			Factors		Institutions						
Receipts	Activities	Com-modities	Labor	Capital	House-holds	Firms	Gov.	Capital Account	Change in Stocks	Rest of the World	Total Receipts
Activities		1712.6								158.5	1871.1
Commodities	736.6				965.4		132.5	310.7	19.8		2165.0
Factors											
Labor	289.7										289.1
Capital	809.1										809.1
Institutions											
Households			289.7	630.3			58.2			72.0	1050.2
Firms				176.8			-11.0				165.8
	35.7	75.8		2.0	20.3	21.6				39.9	195.4
Government											
Capital					48.3	144.2	15.7			122.4	330.5
Accounts											
Change in								19.8			19.8
Stocks											
Rest of the		376.7			16.2		0.0				392.8
World											
Total	1871.1	2165.0	289.7	809.1	1050.2	165.8	195.4	330.5	19.8	392.8	

Source: Adapted from WAEMU Commission data

Table 4.5
Social Accounting Matrix for IVORY COAST (billion FCFA)

	Expenditures										
			Factors		Institutions						
Receipts	Activities	Com-modities	Labor	Capital	House-holds	Firms	Gov.	Capital Account	Change in Stocks	Rest of the World	Total Receipts
Activities		7853.8								2514.0	10367.8
Commodities	4771.6				3678.0		678.4	715.1	213.5		10056.6
Factors											
Labor	1288.7										1288.7
Capital	3546.0										3546.1
Institutions											
Households			1288.7	2719.1			260.7			0.0	4268.6
Firms				820.5			-171.3				649.3
	761.5	293.4		6.5	87.1	198.5				0.0	1347.1
Government											
Capital					246.8	450.8	128.4			102.6	928.6
Accounts											
Change in								213.5			213.5
Stocks											
Rest of the		1909.1			256.7		450.9				2616.6
World											
Total	10367.8	10056.6	1288.7	3546.1	4268.6	649.3	1347.1	928.6	213.5	2616.6	

Source: Adapted from WAEMU Commission data

Table 4.5
Social Accounting Matrix for MALI (billion FCFA)

	Expenditures										
			Factors		Institutions						
Receipts	Activities	Com-modities	Labor	Capital	House-holds	Firms	Gov.	Capital Account	Change in Stocks	Rest of the World	Total Receipts
Activities		1621.5								251.5	1873.0
Commodities	645.7				1020.0		210.6	316.4	13.5		2206.2
Factors											
Labor	269.7										269.7
Capital	931.5										931.5
Institutions											
Households			269.7	757.0			13.0			46.0	1085.7
Firms				130.0			81.4				211.5
	26.1	95.6		44.4	14.7	24.5				124.4	329.7
Government											
Capital					51.0	187.0	24.7			67.2	329.9
Accounts											
Change in								13.5			13.5
Stocks											
Rest of the		489.1			0.0		0.0				489.1
World											
Total	1873.0	2206.2	269.7	931.4	1085.7	211.5	329.7	329.9	13.5	489.1	

Source: Adapted from WAEMU Commission data

Table 4.5
Social Accounting Matrix for SENEGAL (billion FCFA)

	Expenditures										
			Factors		Institutions						
Receipts	Activities	Com-modities	Labor	Capital	House-holds	Firms	Gov.	Capital Account	Change in Stocks	Rest of the World	Total Receipts
Activities		3303.9								860.8	4163.7
Commodities	1909.3				1905.2		263.1	383.3	-8.3		4452.1
Factors											
Labor	600.5										600.5
Capital	1583.6										1583.6
Institutions											
Households			600.5	1431.4			42.7			59.8	2134.4
Firms				152.2			44.1				196.3
	70.3	178.3		0.0	62.3	34.1				38.9	383.9
Government											
Capital					127.8	162.2	34.0			51.0	375.0
Accounts											
Change in								-8.3			-8.3
Stocks											
Rest of the		970.9			39.3		0.0				1010.2
World											
Total	4163.7	4452.1	600.5	1583.6	2134.4	196.3	383.9	375.0	-8.3	1010.5	

Source: Adapted from WAEMU Commission data

Table 4.5
Social Accounting Matrix for TOGO (billion FCFA)

	Expenditures										
			Factors		Institutions						
Receipts	Activities	Com-modities	Labor	Capital	House-holds	Firms	Gov.	Capital Account	Change in Stocks	Rest of the World	Total Receipts
Activities		1613.1								237.3	1850.4
Commodities	1099.8				619.1		97.9	97.7	50.0		1964.5
Factors											
Labor	248.7										248.7
Capital	445.6										445.6
Institutions											
Households			248.7	389.0			14.8			4.9	657.4
Firms				56.6			47.7			47.9	124.3
	56.3	45.5		0.0	7.5	27.9				15.8	184.9
Government											
Capital					31.0	96.4	4.5				147.7
Accounts											
Change in								50.0			50.0
Stocks											
Rest of the		305.9			0.0		0.0				305.9
World											
Total	1850.4	1964.5	248.7	445.6	657.4	124.3	184.9	147.7	50.0	305.9	

Source: Adapted from WAEMU Commission data

APPENDIX C

PARAMETERS

Calibrated Parameters

Sector	αi	Ωi	δi	ξi= 1/B
Food crops	.043894853	.072899506	.13234631	.71822553
Cash crops	.10530663	.088084995	.00002270674	.98993300
Livestock	.026547052	.074080363	.0000051374256	.99531735
Forestry..	.14996115	.087678068	.55931062	.49417628
Mining..	.23083475	.11025537	.81148426	.74259697
Food processing	.31218905	.10733971	.82318912	.62089416
Textile..	.23700173	.10603044	.77443237	.50596019
Chemicals..	.26045236	.17698935	.86441291	.65373354
Basic metal..	.50333704	.064447167	.88148399	.63510511
Other industries	.32297830	.098976463	.85001942	.59939070
Electricity..	.38586387	.20562340	.61679212	.44002790
Construction	.50485437	.055276052	.045059853	.91394107
Transportation..	.33637306	.065678363	.30433615	.57584009
Finance..	.67748918	.12355759	.22343406	.65195225
Real estate..	.045743329	.078548507	.16370734	.72618551
Hotel..	.20187299	.073221574	.21599088	.66056319
Private service	.39683981	.042534789	.72878211	.60334907
Public service	.94292804	.0074672480	0	1

Estimated Parameters (Taken from other studies)

Sector	σi	ηi
Food crops	1.406	2
Cash crops	0.5	3
Livestock	0.5	3
Forestry..	3.4	3
Mining..	3.5	3
Food processing	3.549	3
Textile..	2.02	3
Chemicals..	2.04	3
Basic metal..	1.992	3
Other industries	2.000009	3
Electricity..	1.9687	3
Construction	2	3
Transportation..	1.9758	3
Finance..	1.9572	3
Real estate	1.9953	3
Hotel..	1.967	3
Private service	1.96592	2
Public service	2	2

APPENDIX D

GAUSS COMPUTER PROGRAM FOR BASE RUN 1996

Appendix D
GAUSS Computer Program for the Base Run Model 1996 Model

```
                /*  A CGE MODEL FOR WAEMU, 1996 (BILLION FCFA)

           ================ DYNAMIC VERSION ======================
           ========================================================*/

    new ;

/*-----------load data and set parameter values-----------------------
*/

         @ calculation of input-output coefficients
=============================================================================@


    @ inter-industry transactions@

    let Xij[18,18]= 144.4 13.0 19.2 44.5 0.0 315.3 3.9 0.1 0.0
                    0.1 0.0 0.0 1.0 0.0 0.0 21.4 1.2 0.6

                    0.8 30.4 0.0 0.0 0.0 236.8 96.5 1.0 0.0
                    23.7 0.0 0.0 0.0 0.0 0.0 0.4 0.3 0.1

                    13.7 7.1 2.8 1.2 0.0 207.5 1.2 0.0 0.0
                    0.0 0.0 0.0 0.0 0.0 0.0 8.9 0.5 0.1

                    0.0 0.0 2.5 1.7 1.0 175.0 2.8 7.2 11.6
                    87.1 0.0 18.8 0.1 0.0 0.0 9.6 0.5 0.0

                    0.1 3.5 0.0 0.0 13.7 0.5 0.0 9.1 0.0
                    51.7 256.2 81.0 0.0 0.0 0.0 0.3 0.0 0.0

                    9.0 18.0 26.1 17.0 0.0 262.7 4.0 70.8 0.1
                    1.3 0.0 0.0 1.2 0.0 0.0 66.1 15.5 10.4

                    0.0 0.5 0.2 2.6 0.2 3.7 64.1 0.6 0.0
                    2.0 0.2 20.5 0.9 0.0 0.0 20.6 1.8 7.3

                    36.8 67.0 2.2 13.8 30.8 25.1 41.6 115.0 24.2
                    23.0 15.7 81.7 37.5 0.5 3.2 11.5 21.8 34.1

                    4.6 16.5 0.1 25.1 30.0 47.0 10.2 8.2 151.3
                    27.3 15.8 156.3 68.8 2.2 1.5 16.7 58.3 56.7

                    1.8 16.7 0.3 4.1 2.6 44.3 7.5 16.2 8.1
                    195.8 5.6 285.9 42.4 15.1 3.9 37.1 21.3 59.7

                    3.3 17.3 2.0 17.5 56.4 58.2 15.4 15.3 14.0
                    44.3 125.5 72.2 170.1 7.8 4.0 57.4 43.1 102.9

                    0.2 1.8 0.0 1.0 7.2 15.5 1.5 9.3 4.7
                    7.8 21.5 179.1 27.0 2.8 48.2 35.4 16.1 61.4
```

```
                4.3 4.8 1.5 43.2 29.5 19.8 19.1 16.4 16.8
                11.3 17.0 56.9 78.9 9.8 4.2 349.6 35.1 73.5

                0.5 0.8 0.0 0.6 3.3 4.8 2.4 1.6 1.1
                2.5 4.3 6.8 13.7 297.7 1.8 16.6 1.9 2.7

                0.4 2.2 0.0 3.7 8.9 7.8 2.7 2.0 6.4
                5.0 2.9 12.6 16.7 4.4 2.1 52.0 24.0 78.0

                253.4 519.5 36.4 129.0 16.5 319.6 206.2 169.5 312.7
                100.1 90.5 7.7 18.3 1.7 1.1 9.2 2.7 18.3

                21.7 6.8 0.8 32.2 52.0 28.6 7.7 13.2 11.4
                14.5 21.4 68.0 45.8 27.3 3.1 107.7 79.4 55.6

                0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
                0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 ;

    @ net final demand @
    let NFD[18,1]=  1943.0 1459.0 400.6 417.4 -33.8 2030.7 599.4 20.3
95.5
                64.1 164.6 1098.8 752.9 81.8 641.3 500.7 297.6 1492.8 ;

    @ value added - net value added plus indirect taxes plus export
taxes@
    let VA[18,1] =  2012.6 1123.1 548.7 397.9 130.1 760.9 237.8 150.0
230.3
                234.9 415.4 492.2 1022.0 74.9 799.9 1892.5 571.2 931.1
;

    @ indirect taxes @
    let Indtax[18,1] = 19.2 9.5 1.7 11.8 12.7 72.2 7 4.1 50.5
                16.9 224.4 28.7 57 28.7 12.9 184 20.6 4.2;


    @ export taxes @
    let exptax[18,1] = 0.0 145.0 0.8 0.0 0.0 45.5 0.0 0.0 0.0
                15.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 ;

    @ total expenditure @
    X = sumc(Xij)  +  VA;

    @ the A matrix @
    A = (Xij'./X)' ;

    @ calculation of the production function  parameters @

    let profits[18,1] = 1905.9 866.6 531.7 328.2 90.3 442.4 176.1 107.9
89.3
                 137.3 117.3 229.5 640.4 14.9 751.0 1363.6 332.1
52.9 ;

    /* billion FCFA */
    K = profits./(.065); /* capital stock equals groo sectoral profits
                   divided by WAEMU 1996 interest rate */

    let wages[18,1] = 87.5 102.0 14.5 57.9 27.1 200.8 54.7 38.0 90.5
```

```
                65.5 73.7 234.0 324.6 31.3 36.0 344.9 218.5 874.0 ;

O = X ;

alpha = wages./(O - indtax- exptax  - sumc(Xij)) ;


let  L[18,1] =6537249 1979564 1483671 235377 95646 436828
          174522 33581 115893 180528 26259 228705
          153564 13854 26931 484134 204480 280259 ;

omega = X./((L.^alpha).*(K.^(1-alpha)));


@ values of exogenous variables and variables used to calculate
parameters@

P = ones(18,1);  @initial composite prices @

PD = ones(18,1); @ initial domestic prices @

LS = L;  @ sector labor supply @

W  = wages./L;  @ sectoral wages billions FCFA @

let C[18,1] = 1981.6 153.9 387.1 405.8 5.8 2124.0 426.4 433.1 252.2
          257.0 238.9 24.2 700.1 70.5 637.9 410.1 557.6 1492.8;
          @ sectaral consumption expenditures, billions FCFA @

let  Z[18,1] = 0.0 0.0 44.2 11.3 0.0 0.0 0.0 1.3 850.5
           8.2 0.0 1061.7 0.0 0.0 0.0 0.0 42.8 0.0;
          @ sectoral inve stment expenditures , billions FCFA @

let M[18,1] = 125.4 2.9 1.3 79.4 222.5 677.9 202.9 558.7 845.0
          490.0 250.6 3.1 142.0 22.3 23.3 125.1 641.3 0.0;
          @ import demand, billions FCFA @

let E[18,1] = 60.3 1203.1 49.8 136.7 131.8 532.2 397.4 215.6 152.3
          382.4 233.3 15.6 194.7 33.7 27.0 215.3 341.2 0.0;
          @ sectoral export demand, billions FCFA @

let tariffs[18,1] = 17.6 0.4 0.1 4.2 1.7 157.2 64.8 99.8 211.7
               123.7 74.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0;
               @ sectoral tariffs, billions FCFA @

let CHS[18,1] = 44.1 105.3 -79.1 -52.8 52.8 209.6 43.3 28.8 -102.8
            30.2 17.5 0.4 0.1 -0.1 -0.3 0.4 -2.7 0.0;
            @ changes in stocks, billions FCFA @


ER = 1; @base year exchange rate index FCFA/$ @

@ import world $ price indices@

let PWbar[18,1] = 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1;

@ export world $ price indices @
```

```
let phi[18,1] = 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1;

@ trade distribution parameters @

let delta[18,1] =

            .13234631 .00002270674 .0000051374256 .55931062
            .81148426 .82318912 .77443237 .86441291
            .88148399 .85001942 .61679212 .045059853
            .30433615 .22343406 .16370734 .21599088
            .72878211 0 ;

@ composite price scaling parameters @

let epsilon[18,1] =

            .71822553 .989933 .99531735 .49417628
            .74259697 .62089416 .50596019 .65373354
            .63510511 .5993907 .4400279 .91394107
            .57584009 .65195225 .72618551 .66056319
            .60334907 1 ;

@ trade substitution elasticities @

let sigma[18,1]= 1.406 0.5 0.5 3.4 3.5 3.549 2.02 2.04 1.992
            2.000009 1.9687 2 1.9758 1.9572 1.9953 1.967 1.9659 2 ;

@ export demand elasticities @

let eta[18,1] = 2 3 3 3 3 3 3 3 3
            3 3 3 3 3 3 3 2 2 ;

@ exogenous export, billion FCFA , constant prices @
```

```
    let Ebar[18,1] = 60.3 1203.1 49.8 136.7 131.8 532.2 397.4 215.6
152.3
                382.4 233.3 15.6 194.7 33.7 27.0 215.3 341.2 0.0;

    @tax rates @

    tex = exptax./X ; @ export tax rates@

    tau = indtax./X; @ indirect tax rates @

    tm = tariffs[1:11,1]./M[1:11,1] | zeros(7,1) ;@ tariff rates@




    @ export subsidy rates @

    let te[18,1] = 0 0 0 0 0 0 0 0 0
              0 0 0 0 0 0 0 0 0; @added to current (base year) rates @

    @ foreign capital inflow@

    Fbar  =  91.3 ;  @billions of FCFA @

    @ parameters @

    sp = 1672.6/(2875.5 + 8177.4); @private average saving rate @

     sg = 218.3/1819.9; @ government average saving rate @

    fc = C./sumc(C); @ sectoral consumption shares @


    let H = .0560618 .0387181 .0241243 .0315602 .0413092 .049857
                .0124295 .0581268 .0691565 .0762846 .0820725 .0437324
                .0785978 .0360475 .0230124 .2196211 .0592883 0 ;
    @sectoral investment shares @


    @ capital composition matrix, Sij @


    let Sij[18,18] =

                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

                .0222 .0222 .0222 .0222 .0222 .0222 .0222 .0222 .0222
                .0222 .0222 .0222 .0222 .0222 .0222 .0222 .0222 .0222

                .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062
                .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062
```

```
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

.0006 .0006 .0006 .0006 .0006 .0006 .0006 .0006 .0006
.0006 .0006 .0006 .0006 .0006 .0006 .0006 .0006 .0006

.419 .419 .419 .419 .419 .419 .419 .419 .419
.419 .419 .419 .419 .419 .419 .419 .419 .419

.004 .004 .004 .004 .004 .004 .004 .004 .004
.004 .004 .004 .004 .004 .004 .004 .004 .004



0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

.527 .527 .527 .527 .527 .527 .527 .527 .527
.527 .527 .527 .527 .527 .527 .527 .527 .527

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

.021 .021 .021 .021 .021 .021 .021 .021 .021
.021 .021 .021 .021 .021 .021 .021 .021 .021

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;



Ulag  = ones(18,1)*.95 ;

@ matrix that reduces number of supply-demand balance equations @

let df[17,18] = 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
            0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
            0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
            0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
            0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0
            0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0
            0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
            0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
```

```
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0;

    CPIlag = 1;  @initial CPI lagged one year @

    HHo=3299.6;

/*================================the cge
model================================*/

    #include eqsolve.ext;

    #include gauss.ext;

    eqsolveset;

     let x0[360,1]2507.6 1849.0 642.8 735.1 382.2 2533.1
                724.6 605.5 792.7 832.4 992 1539.7
                1544.4 444.2 873 2713 894.7 1492.5                    @ O @

                .79494337 .52385073 .84971998 .52523466 .30716902
                .25391812 .31852056 .24095789 .22681973 .24363287
                .19254032 .30103267 .62483812 .10400720 .90148912
                .62974567 .61540181 .62103853                         @ PN@

                6537249 1979564 1483671 235377 95646 436828
                174522 33581 115893 180528 26259 228705
                153564 13854 26931 484134 204480 280259               @ L @
                13385 51527 9773 245988 283336 459677
                313428 1131592 780893 362825 2806657
                1023152 2113777 2259275 1336749 712406
                1068564 3118544                                       @ W @
                2875.5                                                @ Yw@
                8177.4                                                @ Yk@
                1819.9                                                @ Yg@
                1890.9                                                @ TS@
                10981.9                                               @ TC@


                1981.6 153.9 387.1 405.8 5.8 2124.0 426.4 433.1 252.2
                257.0 238.9 24.2 700.1 70.5 637.9 410.1 557.6 1492.8  @ C @
```

```
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                    @ U @

0.0 0.0 44.2 11.3 0.0 0.0 0.0 1.3 850.5
8.2 0.0 1061.7 0.0 0.0 0.0 0.0 42.8 0.0                  @ Z @

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                    @PD @

1.1403509 1.137931 1.0769231 1.0528967
1.0076404 1.2318926 1.3193691 1.178629
1.2505325 1.252449 1.2972865 1 1 1 1 1 1                 @PM @

1 1.0850939 1.0012461 1 1 1.0182907 1 1 1
1.0186001 1 1 1 1 1 1 1                                  @PWE@

125.4 2.9 1.3 79.4 222.5 677.9 202.9 558.7 845.0
490.0 250.6 3.1 142.0 22.3 23.3 125.1 641.3 0.0          @ M @

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                    @ P @

60.3 1203.1 49.8 136.7 131.8 532.2
397.4 215.6 152.3 382.4 233.3 15.6
194.7 33.7 27.0 215.3 341.2 0.0                          @ E @

91.3                                                     @Fbar@
1                                                        @CPI@
0                                                      @expinf@



6.5                                                      @ r @
6.5                                                   @ nominf@
12900.486                                                @ GDP @

12900.486                                             @real GDP @
```

```
4100                                                    @ Md @
1                                                       @ Pa @
4100                                                    @ Ms @
3299.6                                                  @ Ho @

106.00726 73.212055 45.616639 59.677182 78.111566
94.274601 23.502942 109.91197 130.76803 144.24655
155.19089 82.693595 148.62058 68.162218 43.514147
415.28154 112.10825 0                                   @ dK @

1905.9 866.6 531.7 328.2 90.3 442.4 176.1 107.9
89.3 137.3 117.3 229.5 640.4 14.9 751 1363.6
332.1 52.9                                            @ Rki @
8177.4                                                  @ Rk @

.12313158 .12313158 .12313158 .12313158 .12313158
.12313158 .12313158 .12313158 .12313158 .12313158
.12313158 .12313158 .12313158 .12313158 .12313158
.12313158 .12313158 .12313158                           @ ri @

.23306919 .105975 .065020667 .040135006 .01104263
.054100325 .021534962 .013194903 .010920341
.016790178 .014344413 .028065155 .0783134 .001822095
.091838482 .16675227 .04061193 .0064690488              @ SPi@

.12313158                                             @  AR @

.23306919 .105975 .065020667 .040135006
.01104263 .054100325 .021534962 .013194903
.010920341 .016790178 .014344413 .028065155
.0783134 .001822095 .091838482 .16675227
.04061193 .0064690488                               @ Hplus1 @
```

```
            27140.05 12365.411 7587.4606 4714.9963 1358.9626
            6369.4519 2521.3753 1640.4084 1397.4347 2091.7643
            1819.0207 3338.0127 9232.3085 279.50974 10695.996
            19757.126 4822.7465 750.35461  ;                    @ Kplus1 @

vf = zeros(rows(x0),1); @ size of this vector is determined from x0 @
proc fsys(x);

@ set-up variables of model @
local

O, PN, L, W, Yw, Yk, Yg, TS, TC, C, U, Z, PD,
PM, PWE, M, P, E, Fbar, CPI, expinf, r, nomint,
GDP, realGDP, Md, Pa, Ms,Ho, dK, Rki,
Rk, ri, SPi, AR, Hplus1, Kplus1;
O = x[1:18,1]; PN = x[19:36,1]; L = x[37:54,1]; W = x[55:72,1];
Yw = x[73,1]; Yk = x[74,1]; Yg = x[75,1]; TS = x[76,1]; TC = x[77,1];
C = x[78:95,1]; U = x[96:113,1]; Z = x[114:131,1]; PD = x[132:149,1];
PM = x[150:167,1]; PWE = x[168:185,1]; M = x[186:203,1];
P = x[204:221,1]; E = x[222:239,1];Fbar = x[240,1];CPI = x[241,1];
expinf = x[242,1]; r = x[243,1]; nomint = x[244,1]; GDP = x[245,1];
realGDP = x[246,1]; Md = x[247,1]; Pa = x[248,1]; Ms = x[249,1];
Ho = x[250,1]; dK = x[251:268,1]; Rki = x[269:286,1];
Rk = x[287,1]; ri = x[288:305,1]; SPi = x[306:323,1];
AR = x[324,1];Hplus1 = x[325:342,1]; Kplus1 = x[343:360,1];

@ set-up equations of model @
/*-------------------------------production function---------------------*/
vf[1:18,1] = O - omega.*(L.^alpha).*(K.^(1 - alpha));
/*-------------------------------net prices-----------------------------*/
vf[19:36,1] = PN - (PD - (tau+tex).*PD - A'*PD);
/*--------------------labor market equilibrium--------------------------*/
vf[37:54,1] = PN.*alpha.*O - L.*W./1000000000; /* wages in FCFA */
```

```
vf[55:72,1] = (L) - (LS);


/*-----income generation and demand for commodities----------------------*/

vf[73,1] = Yw - (W'L./1000000000) ;
@  labor income, billion FCFA @

vf[74,1] = Yk - (PN'O - W'L./1000000000);
@ capital income, billion FCFA @

vf[75,1] =Yg -  (tau+tex)'(PD.*O)- tm'M -  Fbar*ER ;
@government income, billion FCFA @

vf[76,1] = TS - sp*(Yw + Yk) - sg*Yg  ;
@ tatal savings, billion FCFA @

vf[77,1] = TC - (Yw  +  Yk  +  Yg) +  TS ;
@ total consumption, billionFCFA @

vf[78:95,1] = C - fc.*TC./PD;
@ sectoral consumption, constant prices, billion FCFA @

vf[96:113,1] = U - Sij'*PD;
@ vector of capital prices @

vf[114:131,1] =   Z - Sij*(H.*TS./U);
@ sectoral investment demand by origin, constant prices, billon FCFA @


/*-------------------product market equilibrium--------------------------*/

vf[132:148,1]  = df*(PD.*O - (PD.*A*O + P.*C + P.*Z + P.*CHS - PM.*M)
                       - PD.*E);
@sectoral supply = demand @


/*---------------average price equation----------------------------------*/

vf[149,1] = (O./sumc(O))'*PD -1;
@ weighted sum of composite prices@

/*-------------import price equations-----------------------------------*/

vf[150:167,1] = PM - PWbar.*(1 + tm).*ER;
@supply price index of domestic imports in dollars @

/*------------export price equations-----------------------------------*/

vf[168:185,1] = PWE - PD./((1 + te-tex).*ER);
@supply price index of domestic exports in dollars @




 /*------------import demand equations----------------------------------
*/
```

```
vf[186:203,1] = M -(delta.^sigma).*((P./PM).^sigma).*(C + Z + CHS + A*O);

/*----------composite price equations----------------------------------*/

vf[204:221,1] = P - epsilon.*((delta.^sigma).*PM.^(1 - sigma) +

((1 - delta).^sigma).*(PD.^(1 -sigma)).^(1 -sigma)).^(1./(1 - sigma));
@ assumes a CES composite aggregate function @

/*---------export demand equations-------------------------------------*/

vf[222:239,1] = E - Ebar.*(phi./PWE).^eta ;

/*--------balance of payments equilibrium----------------------------*/

vf[240,1] = PWbar'*M - PWE'*E - Fbar;

/*-------monetary equations-----------------------------------------------*/

vf[241,1] = CPI - fc'*P;
@consumer price index @

vf[242,1] = expinf - 100*(CPI - CPIlag)/CPIlag;
@expected inflation@

vf[243,1] = r - (nomint - expinf);
@ real rate of interest@

vf[244,1] = nomint - 6.5 ;
@ nominal rate of interest @

vf[245,1] = GDP - (Yw + Yk + Yg) + Fbar*ER;

vf[246,1] = realGDP - GDP/CPI;
@ real GDP @

vf[247,1] = Md/Pa -  0.460605.*(realGDP.^1.0)*r^(-.2);
@real money balance @

vf[248,1] = Ms - (1.2702448*Ho - ER*Fbar) ;
@money supply @

vf[249,1] =Ho- HHo;
@High-power money, Billion CFA@

vf[250,1] = Md - Ms ;
@money market equilibrium@




/*---------------sectoral investment equations---------------------------*/

vf[251:268,1] = dK - H.*TS./U;
@real investment by sector of destination@

vf[269:286,1] = Rki - ((1 - alpha).*PN.*O);
@after tax sectoral profits@
vf[287,1] = Rk - sumc(Rki) ;
@total after tax profits @
```

```
vf[288:305,1] = ri - (Rki./(U.*K) + (U - Ulag)./Ulag);
@nominal sectoral profit rates defined as returns to
capital valued in current prices plus capital gains@

vf[306:323,1] = SPi - Rki./Rk;
@sectoral shares in aggregate profits@

vf[324,1] = AR - SPi'*ri;
@average profit rate@

vf[325:342,1] = Hplus1 - (SPi + SPi.*(ri - AR)./AR) ;
@sectoral shares of investment for following time period @

vf[343:360] = Kplus1 - (K + dK);
@sectoral capital stocks for the following period @

/*-----------------------------------------------------------------------*/

retp(vf) ;
endp ;

__altnam = {O1, O2, O3, O4, O5, O6, O7, O8, O9, O10, O11, O12, O13, O14,

     O15, O16, O17, O18, PN1, PN2, PN3, PN4, PN5, PN6, PN7, PN8, PN9,

     PN10, PN11, PN12, PN13, PN14, PN15, PN16, PN17, PN18, L1, L2, L3,

     L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18,

     W1, W2, W3, W4, W5, W6, W7, W8, W9, W10, W11, W12, W13, W14, W15,

     W16, W17, W18, Yw, Yk, Yg, TS, TC, C1, C2, C3, C4, C5, C6, C7, C8,

     C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, U1, U2, U3, U4, U5,

     U6, U7, U8, U9, U10, U11, U12, U13, U14, U15, U16, U17, U18, Z1, Z2,

     Z3, Z4, Z5, Z6, Z7, Z8, Z9, Z10, Z11, Z12, Z13, Z14, Z15, Z16, Z17,

     Z18,PD1, PD2, PD3, PD4, PD5, PD6, PD7, PD8, PD9, PD10, PD11, PD12,



     PD13, PD14, PD15, PD16, PD17, PD18,"PM1", "PM2", "PM3", "PM4", "PM5",

     "PM6","PM7", "PM8", "PM9", "PM10", "PM11", "PM12", "PM13", "PM14",

     "PM15", "PM16", "PM17", "PM18", PWE1, PWE2, PWE3, PWE4, PWE5, PWE6,

     PWE7, PWE8, PWE9, PWE10, PWE11, PWE12, PWE13,PWE14, PWE15, PWE16,

     PWE17,PWE18,M1, M2, M3, M4, M5, M6, M7, M8, M9, M10, M11, M12, M13,

     M14, M15, M16,M17, M18, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11,

     P12, P13, P14,P15, P16, P17, P18, E1, E2, E3, E4, E5, E6, E7, E8, E9,

     E10, E11, E12, E13, E14, E15, E16, E17, E18, "Fbar", CPI, "expinf",

     "r", "nomint", GDP,"realGDP", "Md", "Pa", "Ms", "Ho", "dK1", "dK2",
```

```
"dK3", "dK4", "dK5", "dK6", "dK7", "dK8", "dK9", "dK10","dK11","dK12",
"dK13", "dK14", "dK15", "dK16", "dK17", "dK18","Rki1", "Rki2", "Rki3",
"Rki4", "Rki5", "Rki6", "Rki7", "Rki8", "Rki9","Rki10", "Rki11",
"Rki12", "Rki13", "Rki14", "Rki15", "Rki16", "Rki17","Rki18", RK,
"ri1", "ri2", "ri3", "ri4", "ri5", "ri6", "ri7", "ri8", "ri9",
"ri10", "ri11", "ri12", "ri13", "ri14", "ri15", "ri16", "ri17",
"ri18","SPi1", "SPi2", "SPi3", "SPi4", "SPi5", "SPi6", "SPi7",
"SPi8", "SPi9","SPi10", "SPi11", "SPi12", "SPi13", "SPi14", "SPi15",
"SPi16", "SPi17","SPi18", AR, "Hplus1", "Hplus2", "Hplus3", "Hplus4",
"Hplus5", "Hplus6", "Hplus7", "Hplus8", "Hplus9", "Hplus10",
 "Hplus11",
"Hplus12", "Hplus13", "Hplus14", "Hplus15", "Hplus16", "Hplus17",
"Hplus18", "Kplus1", "Kplus2", "Kplus3", "Kplus4", "Kplus5", "Kplus6",
 "Kplus7", "Kplus8", "Kplus9", "Kplus10", "Kplus11", "Kplus12",
"Kplus13","Kplus14", "Kplus15", "Kplus16", "Kplus17", "Kplus18" };


output file=a:results reset;
_nlagr = 1 ;
__title = "WAEMU CGE Model : base run(1996) ";
{x1,tcode} = eqSolve(&fsys,x0) ;

period1 = x1;
```

```
/*=========================period2(1997)=================================*/
x0 = x1;
K = x1[343:360,1] ;
CPIlag = x1[241,1] ;
H = x1[325:342,1];
HHo = 3551.3;
let L[18,1] =   6537249 1979564 1483671 235377 95646 436828
                174522 33581 115893 180528 26259 228705
                153564 13854 26931 484134 204480 280259 ;
LS=L.*(1.035);

output file = a:results reset ;
_nlagr = 1 ;
__title = "WAEMU CGE Model, period2(1997)" ;
{x1,tcode} = eqsolve (&fsys,x0);
period2 = x1 ;
```

```
/*=========================period 3(1998)=================================*/


x0 = x1;

K = x1[343:360,1] ;

CPIlag = x1[241,1] ;

H = x1[325:342,1];

HHo=3691.6;

let L[18,1] =6537249 1979564 1483671 235377 95646 436828
             174522 33581 115893 180528 26259 228705
             153564 13854 26931 484134 204480 280259 ;

LS=L.*(1.035)^2;


output file = a:results reset ;

_nlagr = 1 ;

__title = "WAEMU CGE Model, period3(1998)" ;

{x1,tcode} = eqsolve (&fsys,x0);

period3 = x1 ;
```

```
/*=========================period4(1999)=================================*/


x0 = x1;

K = x1[343:360,1] ;

CPIlag = x1[241,1] ;

H = x1[325:342,1];

HHo=3901;


let L[18,1] = 6537249 1979564 1483671 235377 95646 436828
              174522 33581 115893 180528 26259 228705
              153564 13854 26931 484134 204480 280259 ;

LS=L.*(1.035)^3;

output file = a:results reset ;

_nlagr = 1 ;

__title = "WAEMU CGE Model, period4(1999)" ;

{x1,tcode} = eqsolve (&fsys,x0);

period4 = x1 ;
```

```
/*=========================period5(2000)=====================================*/

    x0 = x1;

    K = x1[343:360,1] ;

    CPIlag = x1[241,1] ;

    H = x1[325:342,1];

    HHo=4213.8;


    let L[18,1] = 6537249 1979564 1483671 235377 95646 436828
                  174522 33581 115893 180528 26259 228705
                  153564 13854 26931 484134 204480 280259 ;

    LS=L.*(1.035)^4;


    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period5(2000)" ;

    {x1,tcode} = eqsolve (&fsys,x0);

    period5 = x1 ;
```

```
/*=========================period6(2001)=======================================*/

    x0 = x1;

    K = x1[343:360,1] ;

    CPIlag = x1[241,1] ;

    H = x1[325:342,1];

    HHo=4462.4;

    let L[18,1] = 6537249 1979564 1483671 235377 95646 436828
                  174522 33581 115893 180528 26259 228705
                  153564 13854 26931 484134 204480 280259 ;

    LS=L.*(1.035)^5;

    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period6(2001)" ;

    {x1,tcode} = eqsolve (&fsys,x0);

    period6 = x1 ;
```

```
/*=========================period7(2002)=================================*/


x0 = x1;

K = x1[343:360,1] ;

CPIlag = x1[241,1] ;

H = x1[325:342,1];

HHo=4997.9;


let L[18,1] = 6537249 1979564 1483671 235377 95646 436828
              174522 33581 115893 180528 26259 228705
              153564 13854 26931 484134 204480 280259 ;

LS=L.*(1.035)^6;

output file = a:results reset ;

_nlagr = 1 ;

__title = "WAEMU CGE Model, period7(2002)" ;

{x1,tcode} = eqsolve (&fsys,x0);

period7 = x1 ;
```

```
/*=========================period8(2003)=====================================*/

    x0 = x1;

    K = x1[343:360,1] ;

    CPIlag = x1[241,1] ;

    H = x1[325:342,1];

    HHo=5947.5;


    let L[18,1] = 6537249 1979564 1483671 235377 95646 436828
                  174522 33581 115893 180528 26259 228705
                  153564 13854 26931 484134 204480 280259 ;

    LS=L.*(1.035)^7;


    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period8(2003)" ;

    {x1,tcode} = eqsolve (&fsys,x0);

    period8 = x1 ;
```

```
/*=======================period9(2004)=================================*/

x0 = x1;

K = x1[343:360,1] ;

CPIlag = x1[241,1] ;

H = x1[325:342,1];

HHo=7493.8;

let L[18,1] = 6537249 1979564 1483671 235377 95646 436828
              174522 33581 115893 180528 26259 228705
              153564 13854 26931 484134 204480 280259 ;

LS=L.*(1.035)^8;



output file = a:results reset ;

_nlagr = 1 ;

__title = "WAEMU CGE Model, period9(2004)" ;

{x1,tcode} = eqsolve (&fsys,x0);

period9 = x1 ;
```

```
/*=========================period10(2005)=====================================*/

    x0 = x1;

    K = x1[343:360,1] ;

    CPIlag = x1[241,1] ;

    H = x1[325:342,1];

    HHo=9966.8;


    let L[18,1] = 6537249 1979564 1483671 235377 95646 436828
                  174522 33581 115893 180528 26259 228705
                  153564 13854 26931 484134 204480 280259 ;

    LS=L.*(1.035)^9;


    output file = a:results reset ;

    _nlagr = 1 ;

   __title = "WAEMU CGE Model, period10(2005)" ;

    {x1,tcode} = eqsolve (&fsys,x0);

    period10 = x1 ;
```

```
/*=======================period11(2006)=====================================*/

    x0 = x1;

    K = x1[343:360,1] ;

    CPIlag = x1[241,1] ;

    H = x1[325:342,1];

    HHo=14053.2;


    let L[18,1] = 6537249 1979564 1483671 235377 95646 436828
                  174522 33581 115893 180528 26259 228705
                  153564 13854 26931 484134 204480 280259 ;

    LS=L.*(1.035)^10;



    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period11(2006)" ;

    {x1,tcode} = eqsolve (&fsys,x0);

    period11 = x1 ;
```

```
/*=========================period 12(2007)================================*/


x0 = x1;

K = x1[343:360,1] ;

CPIlag = x1[241,1] ;

H = x1[325:342,1];

HHo=20939.3;


let L[18,1] = 6537249 1979564 1483671 235377 95646 436828
              174522 33581 115893 180528 26259 228705
              153564 13854 26931 484134 204480 280259 ;

LS=L.*(1.035)^11;



output file = a:results reset ;

_nlagr = 1 ;

__title = "WAEMU CGE Model, period12(2007)" ;

{x1,tcode} = eqsolve (&fsys,x0);

period12 = x1 ;
```

```
/*=========================period 13(2008)================================*/


x0 = x1;

K = x1[343:360,1] ;

CPIlag = x1[241,1] ;

H = x1[325:342,1];

HHo=33084.1;

let L[18,1] = 6537249 1979564 1483671 235377 95646 436828
              174522 33581 115893 180528 26259 228705
              153564 13854 26931 484134 204480 280259 ;

LS=L.*(1.035)^12;


output file = a:results reset ;

_nlagr = 1 ;

__title = "WAEMU CGE Model, period13(2008)" ;

{x1,tcode} = eqsolve (&fsys,x0);

period13 = x1 ;
```

```
/*=============================================================================*/

    names = __altnam ;

    Y = names~period1~period2~period3~period4~period5~period6~period7~

    period8~period9~period10~period11~period12~period13 ;

    let mask[1,14] = 0  1  1  1  1  1 1 1 1 1 1 1 1 1 ;


    let fmt[14,3] =

    "*.*s"     7   7
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2     ;
    lprint ;

    d = printfm(Y, mask, fmt) ;

    output file = a:cgeoutput ;
```

APPENDIX E

GAUSS COMPUTER PROGRAM FOR NEW BASE RUN 2000

APPENDIX E
Gauss Computer Program for the New Base Run 2002 Model

```
            /* A CGE MODEL FOR  WAEMU, 2000 (billion FCFA)

    ==========================DYNAMIC VERSION====================
    ============================================================*/
    new ;

/*-----------load data and set parameter values----------------------
*/

         @ calculation of input-output coefficients
=============================================================================@


    @ inter-industry transactions@

    let Xij[18,18]= 144.4 13.0 19.2 44.5 0.0 315.3 3.9 0.1 0.0
                0.1 0.0 0.0 1.0 0.0 0.0 21.4 1.2 0.6

                0.8 30.4 0.0 0.0 0.0 236.8 96.5 1.0 0.0
                23.7 0.0 0.0 0.0 0.0 0.0 0.4 0.3 0.1

                13.7 7.1 2.8 1.2 0.0 207.5 1.2 0.0 0.0
                0.0 0.0 0.0 0.0 0.0 0.0 8.9 0.5 0.1

                0.0 0.0 2.5 1.7 1.0 175.0 2.8 7.2 11.6
                87.1 0.0 18.8 0.1 0.0 0.0 9.6 0.5 0.0

                0.1 3.5 0.0 0.0 13.7 0.5 0.0 9.1 0.0
                51.7 256.2 81.0 0.0 0.0 0.0 0.3 0.0 0.0

                9.0 18.0 26.1 17.0 0.0 262.7 4.0 70.8 0.1
                1.3 0.0 0.0 1.2 0.0 0.0 66.1 15.5 10.4

                0.0 0.5 0.2 2.6 0.2 3.7 64.1 0.6 0.0
                2.0 0.2 20.5 0.9 0.0 0.0 20.6 1.8 7.3

                36.8 67.0 2.2 13.8 30.8 25.1 41.6 115.0 24.2
                23.0 15.7 81.7 37.5 0.5 3.2 11.5 21.8 34.1

                4.6 16.5 0.1 25.1 30.0 47.0 10.2 8.2 151.3
                27.3 15.8 156.3 68.8 2.2 1.5 16.7 58.3 56.7

                1.8 16.7 0.3 4.1 2.6 44.3 7.5 16.2 8.1
                195.8 5.6 285.9 42.4 15.1 3.9 37.1 21.3 59.7

                3.3 17.3 2.0 17.5 56.4 58.2 15.4 15.3 14.0
                44.3 125.5 72.2 170.1 7.8 4.0 57.4 43.1 102.9

                0.2 1.8 0.0 1.0 7.2 15.5 1.5 9.3 4.7
                7.8 21.5 179.1 27.0 2.8 48.2 35.4 16.1 61.4

                4.3 4.8 1.5 43.2 29.5 19.8 19.1 16.4 16.8
                11.3 17.0 56.9 78.9 9.8 4.2 349.6 35.1 73.5
```

```
                0.5 0.8 0.0 0.6 3.3 4.8 2.4 1.6 1.1
                2.5 4.3 6.8 13.7 297.7 1.8 16.6 1.9 2.7

                0.4 2.2 0.0 3.7 8.9 7.8 2.7 2.0 6.4
                5.0 2.9 12.6 16.7 4.4 2.1 52.0 24.0 78.0

                253.4 519.5 36.4 129.0 16.5 319.6 206.2 169.5 312.7
                100.1 90.5 7.7 18.3 1.7 1.1 9.2 2.7 18.3

                21.7 6.8 0.8 32.2 52.0 28.6 7.7 13.2 11.4
                14.5 21.4 68.0 45.8 27.3 3.1 107.7 79.4 55.6

                0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
                0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 ;

    @ net final demand @
    let NFD[18,1]=  1943.0 1459.0 400.6 417.4 -33.8 2030.7 599.4 20.3
95.5
                64.1 164.6 1098.8 752.9 81.8 641.3 500.7 297.6 1492.8 ;

    @ value added - net value added plus indirect taxes plus export
taxes@
    let VA[18,1] =  2012.6 1123.1 548.7 397.9 130.1 760.9 237.8 150.0
230.3
                234.9 415.4 492.2 1022.0 74.9 799.9 1892.5 571.2 931.1
;

    @ indirect taxes @
    let Indtax[18,1] = 19.2 9.5 1.7 11.8 12.7 72.2 7 4.1 50.5
                16.9 224.4 28.7 57 28.7 12.9 184 20.6 4.2;


    @ export taxes @
    let exptax[18,1] = 0.0 145.0 0.8 0.0 0.0 45.5 0.0 0.0 0.0
                15.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 ;

    @ total expenditure @
    X = sumc(Xij)  +  VA;

    @ the A matrix @
    A = (Xij'./X)' ;

    @ calculation of the production function  parameters @

    let profits[18,1] = 1905.9 866.6 531.7 328.2 90.3 442.4 176.1 107.9
89.3
                 137.3 117.3 229.5 640.4 14.9 751.0 1363.6 332.1
52.9 ;

    /* billion FCFA */
    K = profits./(.065); /* capital stock equals groo sectoral profits
                    divided by WAEMU 1996 interest rate */

    let wages[18,1] = 87.5 102.0 14.5 57.9 27.1 200.8 54.7 38.0 90.5
                65.5 73.7 234.0 324.6 31.3 36.0 344.9 218.5 874.0 ;
```

```
O = X ;

alpha = wages./(O - indtax- exptax  - sumc(Xij)) ;


let  L[18,1] =6537249 1979564 1483671 235377 95646 436828
          174522 33581 115893 180528 26259 228705
          153564 13854 26931 484134 204480 280259 ;

omega = X./((L.^alpha).*(K.^(1-alpha)));


    @ values of exogenous variables and variables used to calculate
parameters@

    P = ones(18,1);  @initial composite prices @

    PD = ones(18,1); @ initial domestic prices @

    LS = L;  @ sector labor supply @

    W  = wages./L;  @ sectoral wages billions FCFA @

    let C[18,1] = 1981.6 153.9 387.1 405.8 5.8 2124.0 426.4 433.1 252.2
          257.0 238.9 24.2 700.1 70.5 637.9 410.1 557.6 1492.8;
          @ sectaral consumption expenditures, billions FCFA @

    let  Z[18,1] = 0.0 0.0 44.2 11.3 0.0 0.0 0.0 1.3 850.5
           8.2 0.0 1061.7 0.0 0.0 0.0 0.0 42.8 0.0;
          @ sectoral inve stment expenditures , billions FCFA @

    let M[18,1] = 125.4 2.9 1.3 79.4 222.5 677.9 202.9 558.7 845.0
          490.0 250.6 3.1 142.0 22.3 23.3 125.1 641.3 0.0;
          @ import demand, billions FCFA @

    let E[18,1] = 60.3 1203.1 49.8 136.7 131.8 532.2 397.4 215.6 152.3
          382.4 233.3 15.6 194.7 33.7 27.0 215.3 341.2 0.0;
          @ sectoral export demand, billions FCFA @

    let tariffs[18,1] = 17.6 0.4 0.1 4.2 1.7 157.2 64.8 99.8 211.7
                123.7 74.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0;
                @ sectoral tariffs, billions FCFA @

    let CHS[18,1] = 44.1 105.3 -79.1 -52.8 52.8 209.6 43.3 28.8 -102.8
            30.2 17.5 0.4 0.1 -0.1 -0.3 0.4 -2.7 0.0;
            @ changes in stocks, billions FCFA @


    ER = 1; @base year exchange rate index FCFA/$ @

    @ import world $ price indices@

    let PWbar[18,1] = 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1;

    @ export world $ price indices @

    let phi[18,1] = 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1;
```

```
@ trade distribution parameters @

let delta[18,1] =

            .13234631 .00002270674 .0000051374256 .55931062
            .81148426 .82318912 .77443237 .86441291
            .88148399 .85001942 .61679212 .045059853
            .30433615 .22343406 .16370734 .21599088
            .72878211 0 ;

@ composite price scaling parameters @

let epsilon[18,1] =

            .71822553 .989933 .99531735 .49417628
            .74259697 .62089416 .50596019 .65373354
            .63510511 .5993907 .4400279 .91394107
            .57584009 .65195225 .72618551 .66056319
            .60334907 1 ;

@ trade substitution elasticities @

let sigma[18,1]= 1.406 0.5 0.5 3.4 3.5 3.549 2.02 2.04 1.992
            2.000009 1.9687 2 1.9758 1.9572 1.9953 1.967 1.9659 2 ;



@ export demand elasticities @

let eta[18,1] = 2 3 3 3 3 3 3 3 3
            3 3 3 3 3 3 3 2 2 ;



@ exogenous export, billion FCFA , constant prices @

let Ebar[18,1] = 60.3 1203.1 49.8 136.7 131.8 532.2 397.4 215.6
152.3
```

```
            382.4 233.3 15.6 194.7 33.7 27.0 215.3 341.2 0.0;

@tax rates @

tex = exptax./X ; @ export tax rates@

tau = indtax./X; @ indirect tax rates @

tm = tariffs[1:11,1]./M[1:11,1] | zeros(7,1) ;@ tariff rates@




@ export subsidy rates @

let te[18,1] = 0 0 0 0 0 0 0 0 0
          0 0 0 0 0 0 0 0 0; @added to current (base year) rates @

@ foreign capital inflow@

Fbar  =  91.3 ;  @billions of FCFA @

@ parameters @

sp = 1672.6/(2875.5 + 8177.4); @private average saving rate @

 sg = 218.3/1819.9; @ government average saving rate @

fc = C./sumc(C); @ sectoral consumption shares @


let H = .0560618 .0387181 .0241243 .0315602 .0413092 .049857
           .0124295 .0581268 .0691565 .0762846 .0820725 .0437324
           .0785978 .0360475 .0230124 .2196211 .0592883 0 ;
@sectoral investment shares @


@ capital composition matrix, Sij @


let Sij[18,18] =

           0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
           0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

           .0222 .0222 .0222 .0222 .0222 .0222 .0222 .0222 .0222
           .0222 .0222 .0222 .0222 .0222 .0222 .0222 .0222 .0222

           .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062
           .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062

           0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

```
            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

            .0006 .0006 .0006 .0006 .0006 .0006 .0006 .0006 .0006
            .0006 .0006 .0006 .0006 .0006 .0006 .0006 .0006 .0006

            .419 .419 .419 .419 .419 .419 .419 .419 .419
            .419 .419 .419 .419 .419 .419 .419 .419 .419

            .004 .004 .004 .004 .004 .004 .004 .004 .004
            .004 .004 .004 .004 .004 .004 .004 .004 .004



            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

            .527 .527 .527 .527 .527 .527 .527 .527 .527
            .527 .527 .527 .527 .527 .527 .527 .527 .527

            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

            .021 .021 .021 .021 .021 .021 .021 .021 .021
            .021 .021 .021 .021 .021 .021 .021 .021 .021

            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;


Ulag  = ones(18,1)*.95 ;

@ matrix that reduces number of supply-demand balance equations @

let df[17,18] = 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
            0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
            0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
            0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
            0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
            0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0
            0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0
            0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
            0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
            0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0;
```

```
CPIlag = 1;  @initial CPI lagged one year @

HHo=3299.6;


/*================================the cge model=========================*/

#include eqsolve.ext;

#include gauss.ext;

eqsolveset;

let x0[360,1] = 2656.58 1949.87 682.21 791.53 425.48 2763.71

           783.39 680.04 903.69 934.36 1129.8 1710.86

           1690.04 537.04 924.83 2947.63 986.45 1704.28            @ O @


           .84 .45 .93 .56 .27 .26 .32 .22 .17
           .2 .17 .32 .65 .09 .95 .64 .61 .66                      @ PN @


           7501644 2271595 1702547 270100.5 109756 501270.2

           200268 38534.97 132989.9 207160 30132.81 262444.3

           176218.2 15897.78 30903.94 555554.9 234645.5 321603.7    @ L @

           13069.41 40550.41 9884.74 244859.6 238091.2 444031.2

           300354.3 995946.5 596706 293858 2516692 1054462

           2111708 2146388 1296828 689837.3 1019766 3302591         @ W @

           3244.14                                                 @ Yw @

           8917.86                                                 @ Yk @

           2566.51                                                 @ Yg @

           2148.29                                                 @ TS @

           12580.22                                                @ TC @




           2247.33 199.44 425.85 466.92 7.35 2500.19

           510.22 530.93 320.82 327.75 300.63 29.02
```

```
817.64 88.53 726.94 480.63 672.63 1720.94                    @ C @

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                          @ U @

0 0 49.09 13.71 0 0 0 1.33 926.5
8.84 0 1165.31 0 0 0 0 46.44  0                               @Z@

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                          @ PD @

1.14 1.14 1.08 1.05 1.01 1.23 1.32 1.18
1.25 1.25 1.3 1 1 1 1 1 1                                    @ PM @

 1.05 1 1.08 1.04 .94 1.03 1 .97 .94
.95 .95 .99 1.02 .95 1.05 1.02 .99 1.03                      @ PWE @

136.79 3.19 1.47 81.84 249.15 778.68 235.47
641.04 959.64 565.84 296.21 3.46 155.88
30.42 24.47 138.31 742.08  0                                  @ M @

  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                        @ P @

54.64 1211.73 39.06 123.13 158.47 486.09
402.57 234.86 185.37 443.74 274.88 15.91
183.39 39.45 23.63 204.94 349.77  0                           @ E @

653.75                                                       @Fbar@

1                                                            @ CPI @

-.11                                                         @expinf@

6.61                                                          @ r @
```

```
 6.5                                                    @ nominf@

14074.76                                                  @ GDP @

14238.34                                               @real GDP @

4698.81                                                   @ Md @
1                                                         @ Pa @


 4698.81                                                  @ Ms
@

4213.8                                                    @ Ho @

539.66 173.51 158.4 95.33 20.04 123.28 48.86 24.87
15.53 27.8 27.03 69.29 186.97 3.34 210.53 379.29
90.71 16.76                                               @ dK @



2135.52 782.61 617.11 374.89 87.07 490.38
193.65 108.98 78.3 127.61 120.7 271.42
734.15 16.24 836.05 1515.19 363.69 64.29                  @ Rki @

8917.86                                                   @ Rk @

.09 .08 .1 .09 .08 .09 .09 .08 .07
.08 .08 .1 .09 .08 .09 .09 .09 .1                         @ ri @

.24 .09 .07 .04 .01 .05 .02 .01 .01
.01 .01 .03 .08 0 .09 .17 .04 .01                         @ SPi@

.09                                                       @  AR @

.25 .08 .07 .04 .01 .06 .02 .01 .01
```

```
            .01 .01 .03 .08 0 .1 .17 .04 .01                    @ Hplus1 @


            31489.5 14094.03 8821.45 5471.43 1552.59 7380.88
            2924.21 1875.16 1571.35 2374.03 2072.63 3865.84
            10711.99 312.59 12403.57 22859.12 5577.63 873.56 ;   @ Kplus1 @

vf = zeros(rows(x0),1);
@ size of this vector is determined from x0 @
proc fsys(x);


@ set-up variables of model @
local

O, PN, L, W, Yw, Yk, Yg, TS, TC, C, U, Z, PD,
PM, PWE, M, P, E, Fbar,CPI, expinf, r, nomint,
GDP, realGDP, Md, Pa, Ms, Ho, dK, Rki,
Rk, ri, SPi, AR, Hplus1, Kplus1;

O = x[1:18,1]; PN = x[19:36,1]; L = x[37:54,1]; W = x[55:72,1];
Yw = x[73,1]; Yk = x[74,1]; Yg = x[75,1]; TS = x[76,1]; TC = x[77,1];
C = x[78:95,1]; U = x[96:113,1]; Z = x[114:131,1]; PD = x[132:149,1];
PM = x[150:167,1]; PWE = x[168:185,1]; M = x[186:203,1];
P = x[204:221,1]; E = x[222:239,1]; ER = x[240,1];CPI = x[241,1];
expinf = x[242,1]; r = x[243,1]; nomint = x[244,1]; GDP = x[245,1];
realGDP = x[246,1]; Md = x[247,1]; Pa = x[248,1]; Ms = x[249,1];
Ho = x[250,1]; dK = x[251:268,1]; Rki = x[269:286,1];
Rk = x[287,1]; ri = x[288:305,1]; SPi = x[306:323,1]; AR = x[324,1];
Hplus1 = x[325:342,1]; Kplus1 = x[343:360,1];
@ set-up equations of model @
/*------------------------------production function---------------------*/
vf[1:18,1] = O - omega.*(L.^alpha).*(K.^(1 - alpha));
```

```
    /*-------------------------------net prices-----------------------------*/

    vf[19:36,1] = PN - (PD -(tau+tex).*PD - A'*PD);

    /*--------------------labor market equilibrium--------------------------*/

    vf[37:54,1] = PN.*alpha.*O - L.*W./1000000000; /* wages in FCFA */

    vf[55:72,1] = (L) - (LS);


    /*-----income generation and demand for commodities----------------------
*/

    vf[73,1] = Yw - (W'L./1000000000) ;
    @  labor income, billion FCFA @

    vf[74,1] = Yk - (PN'O - W'L./1000000000);
    @ capital income, billion FCFA @

    vf[75,1] =Yg -  (tau+tex)'(PD.*O)- tm'M -  Fbar*ER ;
    @government income, billion FCFA @

    vf[76,1] = TS - sp*(Yw + Yk) - sg*Yg  ;
    @ tatal savings, billion FCFA @

    vf[77,1] = TC - (Yw  +  Yk  +  Yg) +  TS ;
    @ total consumption, billionFCFA @

    vf[78:95,1] = C - fc.*TC./PD;
    @ sectoral consumption, constant prices, billion FCFA @

    vf[96:113,1] = U - Sij'*PD;
    @ vector of capital prices @

    vf[114:131,1] =   Z - Sij*(H.*TS./U);
    @ sectoral investment demand by origin, constant prices, billon FCFA @


    /*------------------product market equilibrium-------------------------*/

    vf[132:148,1]  = df*(PD.*O - (PD.*A*O + P.*C + P.*Z + P.*CHS - PM.*M)
                         - PD.*E);
    @sectoral supply = demand @


    /*---------------average price equation---------------------------------*/

    vf[149,1] = (O./sumc(O))'*PD - 1 ;
    @ weighted sum of composite prices@

    /*-------------import price equations-------------------------------------*/

    vf[150:167,1] = PM - .90.*(PWbar.*(1 + tm).*ER) ;
    @supply price index of domestic imports in dollars @
```

```
/*------------export price equations-------------------------------------*/

vf[168:185,1] = PWE - PD./((1 + te-tex).*ER);
@supply price index of domestic exports in dollars @

/*------------import demand equations------------------------------------*/

vf[186:203,1] = M -(delta.^sigma).*((P./PM).^sigma).*(C + Z + CHS + A*O);

/*-----------composite price equations----------------------------------*/

vf[204:221,1] = P - epsilon.*((delta.^sigma).*PM.^(1 - sigma) +

((1 - delta).^sigma).*(PD.^(1 -sigma)).^(1 -sigma)).^(1./(1 - sigma));
@ assumes a CES composite aggregate function @

/*---------export demand equations-----------------------------------------*/

vf[222:239,1] = E - Ebar.*(phi./PWE).^eta ;

/*--------balance of payments rquilibrium--------------------------------*/

vf[240,1] = PWbar'*M - PWE'*E - Fbar;

/*-------monetary equations-----------------------------------------------*/

vf[241,1] = CPI - fc'*P;
@consumer price index @

vf[242,1] = expinf - 100*(CPI - CPIlag)/CPIlag;
@expected inflation@

vf[243,1] = r - (nomint - expinf);
@ real rate of interest@

vf[244,1] = nomint - 6.61 ;
@ nominal rate of interest @

vf[245,1] = GDP - (Yw + Yk + Yg) + Fbar*ER;

vf[246,1] = realGDP - GDP/CPI;
@ real GDP @

vf[247,1] = Md/Pa -  0.460605*(realGDP.^1.0)*r^(-.2);
@real money balance @

vf[248,1] = Ms - (1.2702448*Ho - ER*Fbar) ;
@money supply@

vf[249,1] = Ho - HHo;
@High-power money, billion FCFA@

vf[250,1] = Md - Ms ;
@money market equilibrium@


/*---------------sectoral investment equations--------------------------*/

vf[251:268,1] = dK - H.*TS./U;
@real investment by sector of destination@

vf[269:286,1] = Rki - ((1 - alpha).*PN.*O);
@after tax sectoral profits@
```

```
vf[287,1] = Rk - sumc(Rki) ;
@total after tax profits @

vf[288:305,1] = ri - (Rki./(U.*K) + (U - Ulag)./Ulag);
@nominal sectoral profit rates defined as returns to
capital valued in current prices plus capital gains@

vf[306:323,1] = SPi - Rki./Rk;
@sectoral shares in aggregate profits@

vf[324,1] = AR - SPi'*ri;
@average profit rate@

vf[325:342,1] = Hplus1 - (SPi + SPi.*(ri - AR)./AR) ;
@sectoral shares of investment for following time period @

vf[343:360] = Kplus1 - (K + dK);
@sectoral capital stocks for the following period @

/*-------------------------------------------------------------------------*/

retp(vf) ;
endp ;

__altnam = {O1, O2, O3, O4, O5, O6, O7, O8, O9, O10, O11, O12, O13, O14,

     O15, O16, O17, O18, PN1, PN2, PN3, PN4, PN5, PN6, PN7, PN8, PN9,

     PN10, PN11, PN12, PN13, PN14, PN15, PN16, PN17, PN18, L1, L2, L3,

     L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18,

     W1, W2, W3, W4, W5, W6, W7, W8, W9, W10, W11, W12, W13, W14, W15,

     W16, W17, W18, Yw, Yk, Yg, TS, TC, C1, C2, C3, C4, C5, C6, C7, C8,

     C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, U1, U2, U3, U4, U5,

     U6, U7, U8, U9, U10, U11, U12, U13, U14, U15, U16, U17, U18, Z1, Z2,


     Z3, Z4, Z5, Z6, Z7, Z8, Z9, Z10, Z11, Z12, Z13, Z14, Z15, Z16, Z17,

     Z18, PD1, PD2, PD3, PD4, PD5, PD6, PD7, PD8, PD9, PD10, PD11, PD12,

     PD13,PD14, PD15, PD16, PD17, PD18 ,"PM1", "PM2", "PM3", "PM4", "PM5",

     "PM6","PM7", "PM8", "PM9", "PM10", "PM11", "PM12", "PM13", "PM14",

     "PM15", "PM16", "PM17", "PM18", PWE1, PWE2, PWE3, PWE4, PWE5, PWE6,

     PWE7, PWE8, PWE9, PWE10, PWE11, PWE12, PWE13,PWE14, PWE15, PWE16,

     PWE17,PWE18,M1, M2, M3, M4, M5, M6, M7, M8, M9, M10, M11, M12, M13,

     M14, M15, M16,M17, M18, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11,

     P12, P13, P14,P15, P16, P17, P18, E1, E2, E3, E4, E5, E6, E7, E8, E9,

     E10, E11, E12, E13, E14, E15, E16, E17, E18, "ER",CPI, "expinf", "r",
```

```
"nomint", GDP,"realGDP", "Md", "Pa", "Ms", "Ho","dK1", "dK2", "dK3",
"dK4", "dK5", "dK6", "dK7", "dK8", "dK9", "dK10", "dK11", "dK12",
"dK13", "dK14", "dK15", "dK16", "dK17", "dK18","Rki1","Rki2","Rki3",
"Rki4", "Rki5", "Rki6", "Rki7", "Rki8", "Rki9", "Rki10", "Rki11",
"Rki12", "Rki13", "Rki14", "Rki15", "Rki16", "Rki17","Rki18", RK,
"ri1", "ri2", "ri3", "ri4", "ri5", "ri6", "ri7", "ri8", "ri9",
"ri10", "ri11", "ri12", "ri13", "ri14", "ri15", "ri16", "ri17",
"ri18","SPi1", "SPi2", "SPi3", "SPi4", "SPi5", "SPi6", "SPi7",
"SPi8", "SPi9","SPi10", "SPi11", "SPi12", "SPi13", "SPi14",
 "SPi15", "SPi16", "SPi17","SPi18", AR, "Hplus1", "Hplus2",
"Hplus3", "Hplus4","Hplus5", "Hplus6", "Hplus7", "Hplus8", "Hplus9",
"Hplus10", "Hplus11","Hplus12", "Hplus13", "Hplus14", "Hplus15",
"Hplus16", "Hplus17","Hplus18", "Kplus1", "Kplus2", "Kplus3",
"Kplus4", "Kplus5", "Kplus6" "Kplus7", "Kplus8", "Kplus9", "Kplus10",
"Kplus11", "Kplus12", "Kplus13", "Kplus14", "Kplus15", "Kplus16",
"Kplus17", "Kplus18" };
```

```
output file=a:results reset;

_nlagr = 1 ;

__title = "WAEMU CGE Model : base run(2000) ";

K = x0[343:360,1] ;

CPIlag = x0[241,1] ;

H = x0[325:342,1];

HHo=4213.8;

let  L[18,1] =6537249 1979564 1483671 235377 95646 436828
              174522 33581 115893 180528 26259 228705
              153564 13854 26931 484134 204480 280259;

LS= L.*(1.035)^4;

let tm[18,1] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ;

Fbar = 653.75;

ER = 1.05;

tau = .9*(indtax./X);

{x0,tcode} = eqSolve(&fsys,x0) ;

period1 = x0 ;
```

```
/*=========================period2(2001)=====================================*/

    K = x0[343:360,1] ;

    CPIlag = x0[241,1] ;

    H = x0[325:342,1];

    HHo=4462.4;

    let  L[18,1]= 6537249 1979564 1483671 235377 95646 436828
                  174522 33581 115893 180528 26259 228705
                  153564 13854 26931 484134 204480 280259;

    LS= L.*(1.035)^5;

    let tm[18,1] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;

    Fbar = 817.2;

    ER = 1.05 ;

    tau = .9*(indtax./X);

    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period2(2001)" ;

    {x0,tcode} = eqsolve (&fsys,x0);

    period2 = x0 ;
```

```
/*=========================period3(2002)=================================*/


    K = x0[343:360,1] ;

    CPIlag = x0[241,1] ;

    H = x0[325:342,1];

    HHo=4997.9;

    let  L[18,1]= 6537249 1979564 1483671 235377 95646 436828
                  174522 33581 115893 180528 26259 228705
                  153564 13854 26931 484134 204480 280259;

    LS= L.*(1.035)^6;

    let tm[18,1] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  ;

    Fbar =1021.5 ;

    ER = 1.05 ;

    tau = .9*(indtax./X);

    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period3(2002)" ;

    {x0,tcode} = eqsolve (&fsys,x0);

    period3 = x0 ;
```

```
/*=======================period4(2003)=====================================*/


    K = x0[343:360,1] ;

    CPIlag = x0[241,1] ;

    H = x0[325:342,1];

    HHo=5947.5;

    let  L[18,1 = 6537249 1979564 1483671 235377 95646 436828

                  174522 33581 115893 180528 26259 228705

                   153564 13854 26931 484134 204480 280259;

    LS= L.*(1.035)^7;


    let tm[18,1] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  ;

    Fbar = 1276.9 ;

    ER = 1.05 ;

    tau = .9*(indtax./X);

    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period4(2003)" ;

    {x0,tcode} = eqsolve (&fsys,x0);

    period4 = x0 ;
```

```
/*=========================period5(2004)=====================================*/


    K = x0[343:360,1] ;

    CPIlag = x0[241,1] ;

    H = x0[325:342,1];

    HHo=7493.8;

    let  L[18,1]6537249 1979564 1483671 235377 95646 436828

                 174522 33581 115893 180528 26259 228705

                  153564 13854 26931 484134 204480 280259;

    LS= L.*(1.035)^8;


    let tm[18,1] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  ;

    Fbar = 1596.1;

    ER = 1.05 ;

    tau = .9*(indtax./X);

    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period5(2004)" ;

    {x0,tcode} = eqsolve (&fsys,x0);

    period5 = x0 ;
```

```
/*============================period6(2005)================================*/

    K = x0[343:360,1] ;

    CPIlag = x0[241,1] ;

    H = x0[325:342,1];

    HHo=9966.8;

    let  L[18,1]= 6537249 1979564 1483671 235377 95646 436828
                  174522 33581 115893 180528 26259 228705
                  153564 13854 26931 484134 204480 280259;

    LS= L.*(1.035)^9;

    let tm[18,1] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  ;

    Fbar = 1995.1 ;

    ER = 1.05 ;

    tau = .9*(indtax./X);

    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period6(2005)" ;

    {x0,tcode} = eqsolve (&fsys,x0);

    period6 = x0 ;
```

```
/*============================period7(2006)================================*/

    K = x0[343:360,1] ;

    CPIlag = x0[241,1] ;

    H = x0[325:342,1];

    HHo=14053.2;


    let  L[18,1]= 6537249 1979564 1483671 235377 95646 436828
                  174522 33581 115893 180528 26259 228705
                  153564 13854 26931 484134 204480 280259;

    LS= L.*(1.035)^10;

    let tm[18,1] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ;

    Fbar = 2493.9 ;

    ER = 1.05 ;

    tau = .9*(indtax./X);


    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period7(2006)" ;

    {x0,tcode} = eqsolve (&fsys,x0);

    period7 = x0 ;
```

```
/*============================period8(2007)================================*/


    K = x0[343:360,1] ;

    CPIlag = x0[241,1] ;

    H = x0[325:342,1];

    HHo=20939.3;

    let  L[18,1]= 6537249 1979564 1483671 235377 95646 436828

                  174522 33581 115893 180528 26259 228705

                  153564 13854 26931 484134 204480 280259;

    LS= L.*(1.035)^11;


    let tm[18,1] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ;

    Fbar = 3117.4 ;

    ER = 1.05 ;

    tau = .9*(indtax./X);

    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period8(2007)" ;

    {x0,tcode} = eqsolve (&fsys,x0);

    period8 = x0 ;
```

```
/*============================period9(2008)=================================*/


    K = x0[343:360,1] ;

    CPIlag = x0[241,1] ;

    H = x0[325:342,1];

    HHo=33084.1;


    let  L[18,1]= 6537249 1979564 1483671 235377 95646 436828

                  174522 33581 115893 180528 26259 228705

                  153564 13854 26931 484134 204480 280259;

    LS= L.*(1.035)^12;


    let tm[18,1] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ;

    Fbar = 3896.7 ;

    ER = 1.05 ;

    tau = .9*(indtax./X);

    output file = a:results reset ;

    _nlagr = 1 ;

    __title = "WAEMU CGE Model, period9(2008)" ;

    {x0,tcode} = eqsolve (&fsys,x0);

    period9 = x0 ;
```

```
/*=============================================================================*/

    names = __altnam ;

    Y = names~period1~period2~period3~period4~period5

    ~period6~period7~period8~period9 ;

    let mask[1,10] = 0  1  1  1  1  1  1  1  1  1 ;

    let fmt[10,3] =

    "*.*s"      5  5
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2
    "*.*lf"    12  2;

    lprint ;

    d = printfm(Y, mask, fmt) ;

    output file = a:cgeoutput ;
```

APPENDIX F

DIFFERENT POLICIES SIMULATIONS

APPENDIX F
Different Policies Simulation Results (%)

Sectoral Effects

Sector	No policy change with fixed ER	No policy change with flexible ER	Free trade	Increase in Capital inflow	Devaluation	Indirect tax cut	Policy mix with fixed ER	Policy mix with flexible ER
Agriculture								
Food crops	16.29	13.96	17.95	18.85	17.25	18.15	16.79	18.09
Cash crops	12.45	13.64	13.91	13.48	14.25	13.65	14.42	13.82
Livestock	17.26	14.69	19.01	20.21	18.1	19.12	17.7	19.44
Forestry	18.21	17.5	18.5	19.95	19.54	19.75	18.3	18.5
Industry								
Mining	14.64	16.84	19.22	14.84	16.53	15.74	20.62	18.83
Food process.	19.75	19.93	16.7	20.98	21.37	21.32	17	16.6
Textile	18.25	19.42	17.57	19.14	20.12	17.53	18.16	17.33
Chemicals	16.37	16.87	21.66	17.22	17.67	17.41	22.08	21.4
Basic metals	20.08	19.54	21.33	21.11	20.88	21.32	21.54	21.45
Other ind.	16.34	17.54	21.41	16.72	17.66	17.16	22.24	21.12
Service								
Electricity.	19.13	20.15	18.23	19.79	20.55	21.33	19.87	19.24
Construction	24.35	20.21	24.62	26.71	23.96	25.41	23.11	25.52
Transportation	21.02	19.85	22.02	22.71	21.78	22.31	21.51	22.29
Finance	24.21	23.81	23.98	24.51	24.16	24.66	24.15	22.29
Real estate	16.12	14.16	18.05	18.51	17.23	17.99	17.06	18.11
Hotel	17.94	17.45	19.22	19.68	19.16	19.47	19.11	19.55
Private service	20.69	20.75	21.55	21.72	21.82	21.76	21.59	21.53
Public service	30.95	30.05	32.21	31.5	30.69	31.13	31.55	32.54
Total	17.77	17.31	18.53	17.91	18.77	18.95	18.29	18.68

Macroeconomic Impact

Variable	No policy with fixed ER	No policy with flexible ER	Free trade	Increase in capital inflow	Devaluation	Indirect tax cut	Policy mix with fixed ER	Policy mix with flexible ER
Output	17.77	17.31	18.53	19.71	18.77	18.95	18.29	18.68
Exports	6.24	19.4	7.19	-20.03	7.04	6.34	8.21	-15.72
Imports	22.01	12.28	22.13	43.32	22.1	22.09	21.96	43.5
Household income	22.43	5.24	23.34	51.33	22.84	22.06	24.42	51.42
Firm income	17.29	17.57	17.03	14.77	16.96	17.31	16.82	14.36
Government revenue	45.61	16.57	52.82	79.2	50.46	46.11	63.85	100.52
Total saving	22.92	14.88	23.08	34.93	23.05	22.91	23.51	35.59
Total consumption	23.99	14.94	24.16	37.15	24.21	23.94	24.7	37.97
Real GDP	19.31	5.07	19.35	42.07	19.61	19.31	19.69	39.53
Real investment	22.78	15.04	23.43	36.29	22.84	22.95	23.69	38.15
Average price	226.57	237	216.21	184.72	239.69	229.84	209.16	192.26
Exchange rate	1	9.83	1	-23.02	1	1	1	-21.39

VITA (2)

Remy Hounsou

Candidate for the Degree of

Doctor of Philosophy

Thesis: THE WEST AFRICAN ECONOMIC AND MONETARY UNION AND THE AFRICAN GROWTH AND OPPORTUNITY ACT: A COMPUTABLE GENERAL EQUILIBRIUM APPROACH

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