4

Impact of High Oil Prices on African Economies

This chapter reviews evidence of the economic and socio-environmental effects of high and rising oil prices on African countries. In the past, significant increases in the price of oil have led to worldwide economic recessions, such as the 1973 and 1979 energy crises. In many European countries, which have high taxes on fuels, such price shocks could potentially be mitigated by reducing the taxes as fuel costs rise. In many African countries, on the contrary, this option is not feasible, as there is limited taxation on oil products in the first place. In some cases, the oil prices are subsidized. African governments thus face a considerable dilemma: how much of the increase in oil product prices they should "pass through" to consumers. The negative effect of rising oil prices is thus potentially large for net oil-importing countries. In principle, the net effect should be positive for net oil-exporting countries, as positive effects offset

negative effects. This chapter provides a comprehensive analysis of these issues.

4.1 Impact of Oil Prices on Africa

This section reviews and discusses the impact of high oil prices on African economies. The importance of oil products for African nations and the marked tendency for significant oil price volatility were presented in Chapter 2. Only a brief account is thus provided here. This section focuses primarily on estimating and outlining the effect of these developments on Africa's socioeconomic development.[1]

A barrel of crude oil was trading between US$18 and US$23 in the 1990s; it crossed the US$40 mark in 2004; and rose to about US$60 from 2005. During the summer of 2007, the price of one barrel of crude oil jumped above US$70 and even crossed the US$147 mark in July 2008. Although oil prices are still lower than in the late 1970s and early 1980s in real terms (inflation adjusted), the recent upsurge can have dramatic consequences on oil-importing countries. The impact of high oil prices is likely to be even more severe in countries that are overly dependent on oil and/or have limited access to international capital markets. In principle, net oil-exporting countries stand to benefit from the influx

[1] The review in this chapter is based primarily on AfDB Research Department documents (2007); ESMAP (2006); and several (unpublished) Research Papers by the AfDB Research Department.

of foreign revenue, which they can harness to accelerate the implementation of poverty reduction strategies and the attainment of the Millennium Development Goals (MDGs). However, these countries face challenges in managing the oil windfalls for the benefit of the whole population, as well as for future generations, and in cushioning their economies against any Dutch disease effects (see Chapter 3).

For many developing countries, the increase in oil prices over the last few years has made structural reform of the domestic petroleum pricing system a critical component of their macroeconomic policies. Although in some countries oil price increases may have been partly offset by exchange rate movements (notably the weakening of the U.S. dollar against the euro), it has also had major socioeconomic impacts. Many governments have been reluctant to pass on to consumers a rise in international oil prices because of the potential for social resistance to a policy that could hurt the poor. However, if they do not pass on the higher prices, their countries could experience a significant fiscal burden, which, in turn, could oblige governments to cut social spending.

Africa has 38 net oil-importing countries (see Chapters 2 and 3). As outlined above, in these countries in particular, high oil prices have an adverse impact on businesses, consumers, and the government budget, to name a few. As a result, these net oil-importing countries see their terms of trade deteriorate—jeopardizing their

balance of payments positions and possibly leading to lower economic growth than in the absence of the oil shock.

4.1.1 *Literature Review*

A large number of studies have investigated the macroeconomic impact of oil price shocks, focusing in particular on the response of economic growth and consumer price inflation in oil-importing countries (see Barsky and Kilian, 2004; Hamilton, 2005; and Kpodar, 2006). A somewhat smaller body of literature has studied the impact of oil price shocks on external accounts (Bruno and Sachs, 1982; Ostry and Reinhart, 1992; and Gavin, 1990; and 1992), while yet other studies have concentrated on other relevant issues related to oil price shocks.[2]

There are fewer studies on the impact of high oil prices on African economies compared with other continents. However, specific studies have been conducted on the effects in Kenya, Nigeria, Mali, Mozambique, and

[2] These include the following: Krichene (2006) focused on monetary policy and the recent oil shock in the world crude oil markets; Hunt et al. (2001) studied the macroeconomic effects of high oil prices; Hamilton (2000) defined oil shocks and their effect on the economy; Daniel (2001) analyzed the possible solutions for high oil prices and market risks for governments; Hossain (2003) studied the taxation and pricing of petroleum products in developing countries; Kilian et al. (2007) looked at the relationship between oil price shocks and external balances; and Hunt (2005) studied the role of oil price shocks in the stagflation in the 1970s.

Ghana,[3] for example, while more general and continent-wide studies have gained attention in the last few years.[4]

4.1.2 *Impact of High Oil Prices on GDP*

There are two principal drivers of the demand for any product: growth in demand and the price of the product. These two drivers can in turn be divided into four factors: (i) The rate of growth of income; (ii) The income elasticity of demand for the product; (iii) The rate of increase of prices; and (iv) The price elasticity of demand for the product. Unfortunately, evidence on price and income elasticity in developing countries is sparse, partly because of lack of data, and tends to be based on data that is several years old (ESMAP, 2006).

Although the GDP of a country is a generic measure of economic performance, it gives a fairly good indication of the magnitude of the impact of oil prices on the economy of a given group of countries (see Table 4.1).

[3] Studies on the impact of high oil prices in African economies include works by the following: Semboja (1994) studied the effects of oil price changes in Kenya; Ayadi et al. (2000) and Ayadi (2005) studied the effects of oil production shocks in Nigeria; Kpodar (2006) looked at the way international oil prices are transferred to household expenditures in Mali; Nicholson et al. (2003) and Coady and Newhouse (2005) explored the distributional impact of an increase in the price of oil in Mozambique and Ghana, respectively; and Coady et al. (2006) studied the magnitude and distribution of fuel subsidies in developing countries, including in Ghana and Mali.

[4] This includes Bouakez and Vencatachellum (2007); and ESMAP (2006), which both address the impact of high oil prices in net oil-importing and net oil-exporting countries.

Table 4.1: African GDP Growth Rates, by Country Type, 1996–2005

Slow-growth economies GDP growth less than 4 percent a year (36.7 percent of population)		Diversified, sustained-growth economies GDP growth 4 percent a year or more (35.6 percent of population)		Oil exporters (27.7 percent of population)	
Country	**GDP growth (percent)**	**Country**	**GDP growth (percent)**	**Country**	**GDP growth (percent)**
Zambia	3.80	Mozambique	8.3	Equatorial Guinea	30.8
Guinea	3.70	Rwanda	7.6	Chad	9.0
Niger	3.50	São Tomé and Principe	7.1	Angola	8.5
Malawi	3.30	Botswana	6.7	Sudan	6.3
Mauritania	3.30	Uganda	6.1	Nigeria	4.3
Togo	3.30	Cape Verde	5.8	Congo, Rep.	3.4
Madagascar	3.20	Mali	5.8	Gabon	1.1
Lesotho	3.00	Tanzania	5.3		
Kenya	2.90	Ethiopia	5.2		
Eritrea	2.41	Sierra Leone	5.2		
Seychelles	2.30	Burkina Faso	5.0		
Comoros	2.13	Mauritius	4.8		
Central African Republic	0.85	Ghana	4.7		
Guinea-Bissau	0.47	Benin	4.6		
Burundi	0.43	Senegal	4.5		
Congo, Dem. Rep.	0.08	Cameroon	4.2		
Zimbabwe	−2.20	Gambia, The	4.2		
		Namibia	4.0		

Note: GDP growth rates are compound annual averages.
Source: World Bank Development Data Platform.

In Africa, 36.7 percent of the population lives in slow economic growth countries (GDP growing less than 4 percent a year); 35.6 percent in diversified and sustainable growth economies (GDP growing more than 4 percent a year); and only 27.7 percent in oil-exporting countries. This suggests that a 1 percent loss in GDP as a result of high oil prices will have a greater impact on slow growth economies and, consequently, on the majority of Africa's population.

Figures 4.1 to 4.5 show the GDP growth rate between 1999 and 2004 in selected countries by sub-region in Africa. In general, most countries show positive growth between the two periods analyzed (1990–1999 and 2000–2004). Although the growth pattern varies by period, it is clear that some countries recorded higher growth at the turn of the millennium (for example, the Democratic Republic of Congo, Rwanda, Comoros, Kenya, Tanzania, Algeria, Morocco, Tunisia, Sudan, Angola, Zambia, Mozambique, Botswana, Namibia, and South Africa). It is also worth noting that very few countries had outright negative economic growth (Central African Republic, Seychelles, and Zimbabwe).

Improved trade performance, particularly among oil exporters, is considered a major factor of economic growth in Africa in 2004 and subsequent years (AfDB, 2005). In 2004 oil prices rose 60 percent as a result of increased global demand, especially in China and Asia. According to the AfDB (2005), high oil prices are attributable to a rise in global demand rather than to supply-side factors. Nevertheless, supply-side factors such as

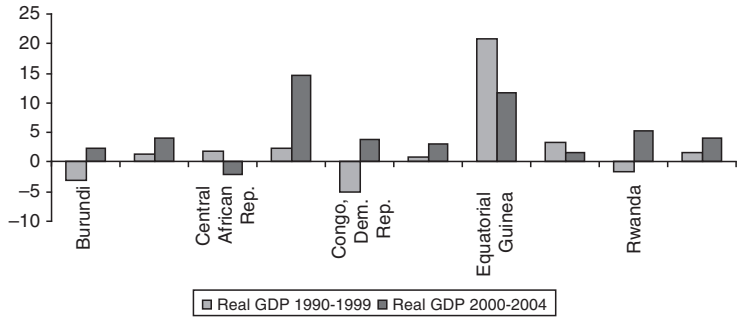


Figure 4.1: Average Annual Real GDP Growth in Central Africa

Source: IMF (2006); and AfDB Statistics Department Database (2007).

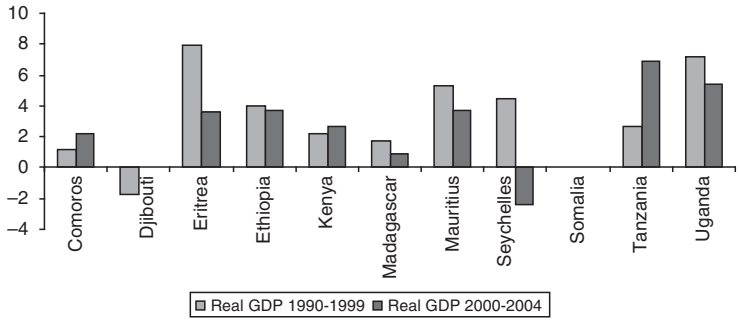


Figure 4.2: Average Annual Real GDP Growth in East Africa

Source: IMF (2006); and AfDB Statistics Department Database (2007).

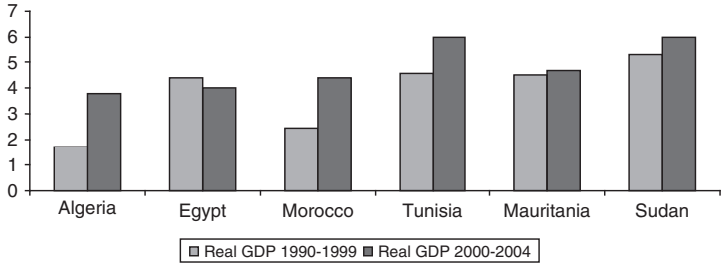


Figure 4.3: Average Annual Real GDP Growth in North Africa

Source: IMF (2006); and AfDB Statistics Department Database (2007).

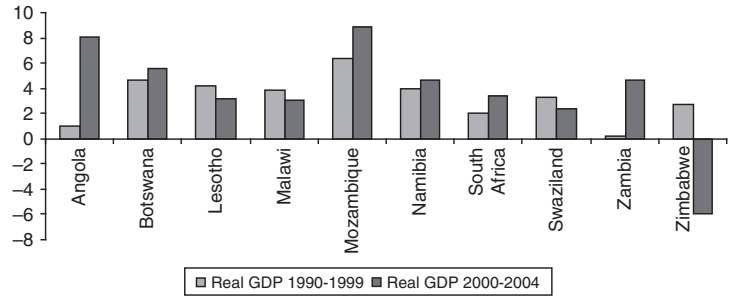


Figure 4.4: Average Annual Real GDP Growth in Southern Africa

Source: IMF (2006); and AfDB Statistics Department Database (2007).

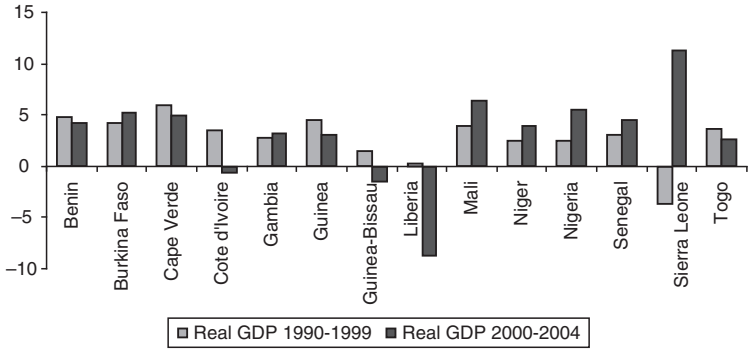


Figure 4.5: Average Annual Real GDP Growth in West Africa

Source: IMF (2006); and AfDB Statistics Department Database (2007).

the war in Iraq, policy developments in Venezuela, and conflicts in Nigeria contributed to the increase in oil prices in 2004. Suppliers have been attempting to comply with established quotas by increasing production. This was the case in 2004 when Angola, Chad, and Equatorial Guinea had their quotas raised four times. The

main result of high oil prices in oil-exporting countries is increase in export revenues and hence higher economic growth. For example, in 2004 countries like Angola (Figure 4.4), Chad, Congo, Gabon, and Nigeria (Figure 4.5) recorded gains of more than 3 percent.

The impact of high oil trade can also be discussed from the perspective of terms of trade in African subregions, as shown in Figures 4.6 to 4.9. The figures suggest terms of trade gain during the 2000–2004 period. Net oil-exporting countries (such as Algeria, Egypt, and Tunisia) have shown steady positive terms of trade index.

GDP data actually supports the view that the aggregate output performance of most African countries has not been as seriously affected as expected by the impact of higher oil prices in the post-1999 period. This is in contrast with the expected downturn in aggregate output predicted by macroeconomic models. In fact, economic growth in the first half of this decade was far higher than the record in the 1990s (AfDB, 2005;

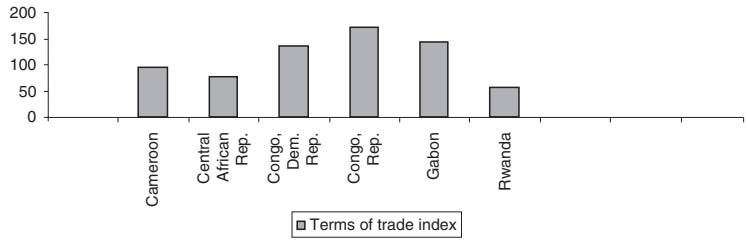


Figure 4.6: Terms of Trade in Central African Countries, 2000–2004

Source: IMF (2006); and AfDB Statistics Department Database (2007).

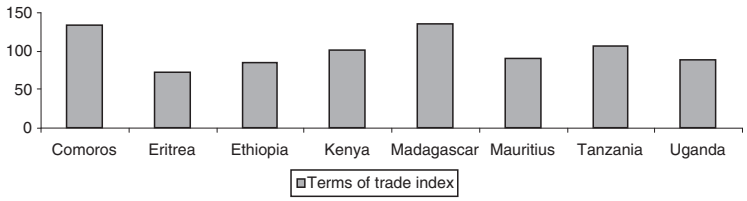


Figure 4.7: Terms of Trade in East African Countries, 2000–2004

Source: IMF (2006); and AfDB Statistics Department Database (2007).

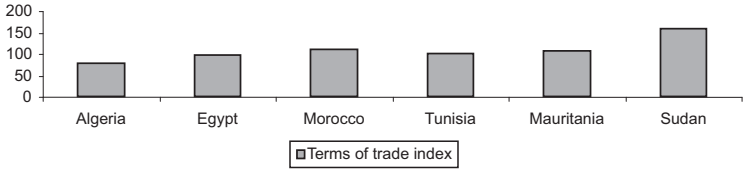


Figure 4.8: Terms of Trade in North African Countries, 2000–2004

Source: IMF (2006); and AfDB Statistics Department Database (2007).

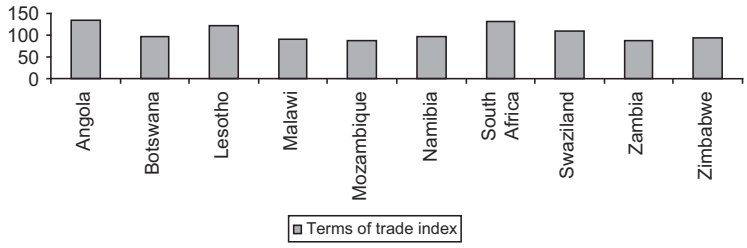


Figure 4.9: Terms of Trade in Southern African Countries, 2000–2004

Source: IMF (2006); and AfDB Statistics Department Database (2007).

World Bank, 2006*e*; IMF, 2006). Other macroeconomic variables such as investment, consumption, inflation, and fiscal balance also showed more robust performance. The available evidence thus suggests that the 2003–2005 oil price increase was not associated with any perceptible change in economic performance in net oil-importing countries unlike in the 1970s and the 1980s (Dudine et al., 2006). A similar conclusion was derived from a number of recent studies (World Bank, 2006*a*; 2006*c*; and 2006*d*), and earlier studies (ESMAP, 2005*a*; and 2005*b*) that quantified the magnitude of the oil price shocks relative to the size of the economy.

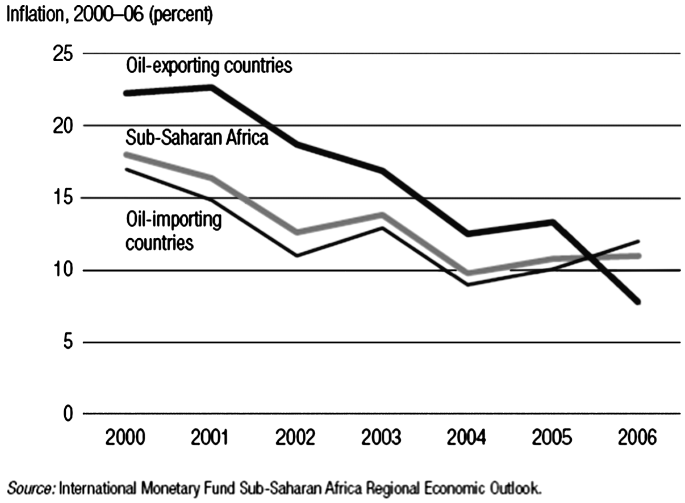
The impact studies tend to confirm that, based on data for 2004 and 2005, the slow down in GDP for non-oil exporters has been modest, and inflation has increased only slightly (Figure 4.10). These corroborative conclusions may just mean that the GDP and the terms of trade are too coarse as indicators of the real impact of high oil prices in African economies. African economies are very specific in the sense that they are dominated by informal economies, which are not adequately captured in macroeconomic indicators.

In practice, the situation is more complex because oil prices and GDP growth run both ways. High oil prices could dampen economic growth as experienced during earlier oil price shocks. A decline in economic growth would subsequently reduce demand, potentially leading to a large fall in world oil prices. During this latest relatively minor financial crisis, Brent oil prices fell below US$10 a barrel (December 1998).

4.1.3 *Impact of High Oil Prices on Domestic Prices*

In order to assess the real impact of high oil prices in African economies, it is important to understand that African economies are changing and significant improvements in terms of macroeconomic management are being reported, especially the very significant reduction in inflation (Figure 4.10).

The key policy response to the impact of high oil prices is the extent to which governments have passed on the price increases to consumers, or have moderated them with subsidies, tax reductions, or pressure on oil companies to hold down prices. In the countries that



Source: International Monetary Fund Sub-Saharan Africa Regional Economic Outlook.

Figure 4.10: Inflation in African Countries, 2000–2006
Source: IMF (2006).

have been raising prices, and especially in those that have been passing on the full price increases to end-users, it is expected that some reduction in the demand for oil will occur. Where domestic prices have not fully reflected international price movements, the demand for oil products tends to stay more buoyant, and the potential negative effects on the balance of payments and GDP are larger. A central issue in the adjustment of the economy to any price rise that has occurred is thus the magnitude of the price elasticity of demand for oil products (ESMAP, 2006).

The extent of pass-through can be observed in Figure 4.11. It has been high in most countries; partial in many countries; and complete in others. A special case is Eritrea, where the increase in domestic prices was eight times the change in the international price of oil.

Substantially higher prices in recent years are illustrated in Figures 4.12 and 4.13. In fact, domestic

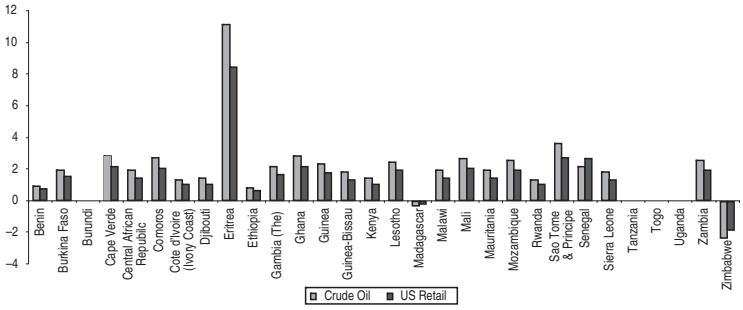


Figure 4.11: Oil Pass-Through in Selected African Countries, 2002–2005

Source: IMF (2006); and AfDB Statistics Department Database (2007).

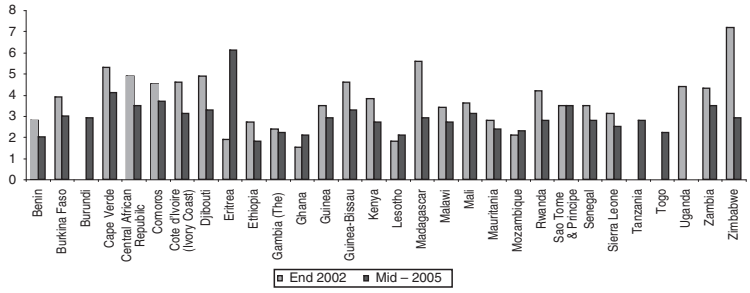


Figure 4.12: African Oil Product Prices Relative to Crude Oil Prices (Price in US Cents per Liter)

Source: IMF (2006); and AfDB Statistics Department Database (2007).

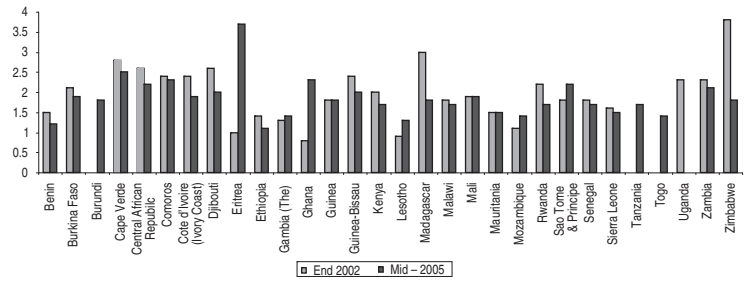


Figure 4.13: African Oil Product Prices Relative to US Retail Prices (Price in US Cents per Liter)

Source: IMF (2006); and AfDB Statistics Department Database (2007).

prices in most African countries, which are among the poorest countries in the world, are higher than in the United States.

4.1.4 *Social Impacts of High Oil Prices in Africa*

In African countries, the social impacts of high oil prices are direct and most outrageous in the poorest

communities, which do not have electricity and use kerosene for illumination. It is also well known that increases in the prices of commodities that feature prominently in the consumption basket of poor households have severe consequences on their living standards and well-being. In other words, higher oil prices exacerbate the incidence and depth of poverty and highly distort income distribution structures.

For net oil exporters, higher oil prices are expected to be a blessing. However, key economic and social indicators for oil-exporting countries suggest that oil wealth has not been able to support sustained economic growth and development (see Chapter 3). Moreover, inequitable distribution of oil revenue among the population can fuel social tensions as has been witnessed in the case of the Niger Delta region.

4.2 AfDB Model of the Impact of High Oil Prices

4.2.1 *Overview of the Model*

The Research Department at the African Development Bank (AfDB) has developed a model to quantify the impact of high oil prices on oil-importing and oil-exporting African economies.[5] The analysis is based on a dynamic stochastic general-equilibrium model of a small open economy. The model is rigorously

[5] "The Impact of High Oil Prices on African Economies," Working Paper Series (WPS) No. 93, December 2007, African Development Bank Group, Tunis.

micro-founded in the sense that agents are fully optimizing and form their expectations in a rational manner. This modeling approach has several advantages. First, the inter-temporal nature of the model permits a study of the effects of transitory as well as persistent oil price shocks. Second, because the time path of aggregate variables is determined by the optimizing behavior of economic agents, the model is robust to the *Lucas critique*, and, therefore, appropriate for policy analysis. Third, this approach allows proper welfare analysis as it provides an explicit account of households' preferences. Fourth, the general-equilibrium perspective ensures internal consistency and, more importantly, allows the study of the effect of oil prices without making arbitrary assumptions about what is exogenous and what is not.

Owing to these advantages, the proposed model supersedes existing naive data-based models, reduced-form models, and static computable general-equilibrium (CGE) models. Data-based models are useful to characterize the statistical relationships between economic variables and to establish relevant stylized facts; however, these models lack economic content and do not reveal mechanisms through which shocks propagate. Reduced-form models are often concise and easy to solve, but the aggregate relationships are usually not derived from first principles and the model parameters are not always invariant to shifts in policy regimes. The same criticism applies to CGE models, which, in addition, often ignore inter-temporal considerations.

The proposed model belongs to the class of new open-economy macroeconomic models, which have become the main tool used in modern international macroeconomics and are increasingly sought by international organizations and Central Banks around the world. It is a state-of-the-art model that uses cutting-edge techniques to address positive and normative issues related to the effects of oil price shocks, but which can easily be extended to examine broader questions of relevance to the AfDB.

The model is one of a small open economy and is adapted specifically to the context of oil and African economies. It is sufficiently flexible to represent virtually any African country. In particular, it is configured to describe oil importers and oil exporters, credit-constrained economies and those that have access to international financial markets, and countries with flexible, managed, and fixed exchange rate regimes. The economy consists of households, firms, a government, and a monetary authority. There are four types of goods: final goods, composite non-oil goods, oil, and intermediate goods.

4.2.2 *Results*

This section discusses the impact of a doubling in world oil prices on main macroeconomic variables both in the case of a median oil-importing economy and a median oil-exporting economy. The variables of interest are output, consumption, inflation, real exchange

rate, government budget deficit, and foreign debt. The simulations are performed under both a fixed exchange rate regime and a managed float. For each case, two different scenarios are considered: complete and zero pass-through. In all simulations, the oil price shock is assumed to be persistent, with a first-order autocorrelation coefficient of 0.85, as estimated from the data. This assumption is consistent with the view that the expected durability of high oil demand from East Asia (especially China) is sustaining the market expectations that oil prices will remain high.

4.2.2.1 MEDIAN OIL-IMPORTING ECONOMY

This economy is calibrated such that oil imports represent roughly 13 percent of total imports and 5 percent of total GDP in the steady state. Simulation results for this case are shown in Tables 4.2 and 4.3. The main conclusions are as follows:

- Under fixed exchange rates and complete pass-through, a doubling in the world price of oil leads to a decline in output and consumption, a slight increase in inflation, a small appreciation of the real exchange rate, and moderate changes in public and foreign borrowing. The output loss is about 6 percent during the first year, while the cumulative loss is about 24 percent during the five years following the shock. For consumption, the corresponding numbers are 5 and 19 percent, approximately.

Table 4.2: Effects of a 100% Increase in the Price of Oil (Net Oil-Importing Country, Fixed Exchange Rate Regime)

	Impact effect (1 year) %	Cumulative effect (5 years) %
Output		
Complete pass-through	−6	−24
Zero pass-through	−1	−5
Consumption		
Complete pass-through	−5	−19
Zero pass-through	−6	−25
Investment		
Complete pass-through	−11	−39
Zero pass-through	−7	−25
Inflation		
Complete pass-through	2	1
Zero pass-through	−4	−4
Real exchange rate		
Complete pass-through	−2	−7
Zero pass-through	4	22
Budget deficit		
Complete pass-through	4	7
Zero pass-through	31	45
Foreign debt		
Complete pass-through	−1	2
Zero pass-through	9	11

Note: Budget deficit in percentage of steady-state output.

- The drop in output and consumption is attributed to a combination of two effects of high oil prices: a direct income effect, through the resource constraint, and a direct effect on production, through higher costs of inputs. The former decreases consumption and increases labor supply. The latter decreases demand for non-oil inputs and, by extension, demand for labor and capital. The net effect on

Table 4.3: Effects of a 100% Increase in the Price of Oil (Net Oil-Importing Country, Managed Floating)

	Impact effect (1 year) %	Cumulative effect (5 years) %
Output		
Complete pass-through	−6	−23
Zero pass-through	2	−1
Consumption		
Complete pass-through	−4	−18
Zero pass-through	−5	−25
Investment		
Complete pass-through	−10	−38
Zero pass-through	−1	−21
Inflation		
Complete pass-through	5	4
Zero pass-through	4	5
Real exchange rate		
Complete pass-through	−1	−5
Zero pass-through	9	30
Budget deficit		
Complete pass-through	0	−1
Zero pass-through	6	20
Foreign debt		
Complete pass-through	1	2
Zero pass-through	16	12

Note: Budget deficit in percentage of steady-state output.

hours worked is ambiguous, but labor income and investment unambiguously fall (due to lower marginal productivity of labor and capital). The resulting reduction in households' disposable income further decreases consumption and output.

- The increase in inflation is due to the fact that the domestic price of oil enters the aggregate price index, and since there is complete pass-through,

oil-price inflation contributes to core inflation. The higher inflation explains the appreciation of the real exchange rate (since the nominal exchange rate is fixed).

- Under zero pass-through, the increase in the price of oil still leads to a decline in output and consumption, but the magnitude of the effects differs significantly compared with the complete pass-through case. The decline in output during the first year is less than 1 percent and the cumulative loss during the five years following the shock is roughly 5 percent. Hence, by choosing a zero pass-through, the government shields the production sector of the economy, thus minimizing the output loss. However, the cost of this intervention is a dramatic deterioration in the budget deficit (31 percent during the first year and 45 percent after five years), and, most importantly, a large decline in consumption, which drops by more than 6 percent during the first year and 25 percent after five years.
- Under zero pass-through, there is a decrease in inflation, which translates into a real exchange rate depreciation of roughly 4 percent in the first year and 22 percent after five years.
- Under a managed floating exchange rate regime, the nominal exchange rate is, to a certain extent, free to adjust, thereby acting as a shock absorber. In principle, therefore, the adverse effects of high oil prices should be less severe compared to the case

with fixed exchange rates. A comparison of Tables 4.3 and 4.4 confirms this intuition. Under complete pass-through, however, there are only minor differences in the response of output, consumption, inflation, and, to a lesser extent, foreign debt across the two regimes.[6] The gain from letting the nominal exchange rate float is much more apparent under zero pass-through. For example, output initially increases by almost 2 percent (as opposed to a decline of 1 percent) following the rise in the price of oil, and the cumulative loss after five years is barely over 1 percent (as opposed to a loss of 5 percent). This smaller output loss is due to the larger depreciation of the real exchange rate relative to the case with pegged nominal exchange rates.

4.2.2.2 MEDIAN OIL-EXPORTING ECONOMY

This economy is calibrated such that oil exports represent roughly 88 percent of total exports and 35 percent of total GDP in the steady state. Simulation results for this case are shown in Tables 4.4 and 4.5. The main conclusions are the following:

- Under fixed exchange rates and complete pass-through, a doubling in the world price of oil leads to a 9 percent increase in output, a 42 percent increase in consumption, a 9 percent increase in inflation, a

[6] The only notable difference across the two regimes is the response of the budget deficit, which deteriorates under the peg one, but slightly improves under managed floating.

Table 4.4: Effects of a 100% Increase in the Price of Oil (Net Oil-Exporting Country, Fixed Exchange Rate Regime)

	Impact effect (1 year) %	Cumulative effect (5 years) %
Output		
Complete pass-through	9	53
Zero pass-through	10	56
Consumption		
Complete pass-through	42	152
Zero pass-through	41	149
Investment		
Complete pass-through	16	62
Zero pass-through	16	62
Inflation		
Complete pass-through	9	15
Zero pass-through	6	14
Real exchange rate		
Complete pass-through	−9	−71
Zero pass-through	−7	−63
Budget deficit		
Complete pass-through	−114	−147
Zero pass-through	−108	−139
Foreign debt		
Complete pass-through	−33	−47
Zero pass-through	−30	−45

Note: Budget deficit in percentage of steady-state output.

9 percent real appreciation, a 114 percent reduction in the budget deficit, and a 33 percent reduction in foreign debt during the first year. The magnitudes of the cumulative effects after five years indicate that the adjustment of output, the real exchange rate, and foreign debt is non-monotonic.[7]

[7] For example, the model predicts that the response of output to the 100 percent increase in the price of oil is hump-shaped, attaining its peak of 16 percent during the third year after the shock.

Table 4.5: Effects of a 100% Increase in the Price of Oil (Net Oil-Exporting Country, Managed Floating)

	Impact effect (1 year) %	Cumulative effect (5 years) %
Output		
Complete pass-through	4	25
Zero pass-through	4	27
Consumption		
Complete pass-through	16	75
Zero pass-through	16	76
Investment		
Complete pass-through	3	22
Zero pass-through	4	23
Inflation		
Complete pass-through	−13	−12
Zero pass-through	−14	−13
Real exchange rate		
Complete pass-through	−38	−136
Zero pass-through	−36	−130
Budget deficit		
Complete pass-through	−7	−24
Zero pass-through	−6	−23
Foreign debt		
Complete pass-through	−55	−39
Zero pass-through	−53	−38

Note: Budget deficit in percentage of steady-state output.

- The increase in the price of oil generates a positive income effect, through the resource constraint, which increases consumption. This rise in consumption translates into higher demand for the final good, which more than offsets the negative effect of the higher price of oil. As a result, the demand for oil and non-oil inputs increases (due to their complementarity), thereby raising the demand for labor and

capital. The resulting increase in labor demand and investment further boosts the demand for the final good, and, therefore, output.

- Under zero pass-through, there is a slightly larger increase in output, a lower inflation, and a smaller appreciation of the real exchange rate compared to the case with complete pass-through. However, this "gain" comes at the expense of a (marginally) smaller increase in consumption and a smaller improvement in the budget deficit.
- Under managed floating, the output and consumption gains induced by the increase in the price of oil are smaller than under fixed exchange rates. This result is mainly due to the larger appreciation of the real exchange rate under the former regime. The smaller increase in consumption implies that the budget deficit narrows less than under the fixed exchange rate regime.
- Under a managed float, the effects of an increase in the price of oil under complete and zero pass-through are strikingly similar.

For the sake of comparison, Table 4.5 is generated with the same parameters as Table 4.4, except for the exchange rate regime. The deflation reported in Table 4.5 arises because the appreciation of the local currency makes imported goods cheaper. Reducing the share of imported goods in the economy and running the simulation over would give positive inflation.

4.2.3 *Policy Implications*

4.2.3.1 GOVERNMENT INTERVENTION

The above analysis suggests that through local currency pricing (buying at world market prices, but selling at local prices), the government can cushion the economy from the adverse effects of oil price shocks in oil-importing countries. However, this policy amplifies a consumption loss and aggravates the government's budget deficit. Hence, the answer to the question of whether a government should intervene or not depends on its implicit objective function. To the extent that the government is concerned with stabilizing output, local currency pricing proves to be the optimal policy. Alternatively, if the government is a benevolent social planner, then laissez-faire and pass-through is likely to be the welfare-maximizing policy. For oil-exporting countries, government intervention does not seem to affect in a substantive way the outcome of the economy, especially in the case of a managed floating. This observation implies that both intervention and laissez-faire could be acceptable policy choices in these countries.

4.2.3.2 FOREIGN AID

Can foreign aid help African oil-importing countries cope with high oil prices? Are the required amounts prohibitive? Table 4.6 shows the permanent level of overseas development assistance (in percentage of steady-state output) that is required to completely offset the initial output loss associated with a persistent 100 percent

Table 4.6: ODA Needed to Offset Output Loss in the First Year (% of Steady-State Output)

	Fixed exchange rate regime	Managed floating
Complete pass-through	1.60%	1.98%
Zero pass-through	0.23%	—

Note: ODA: Official Development Assistance.

increase in the price of oil. The table shows that the largest amount of foreign aid needed is less than 2 percent of steady-state output. This amount is clearly non-prohibitive (foreign aid in a number of African countries represents more than 5 percent of GDP), implying that there is scope for international-community actions to help debt-burdened African economies mitigate the adverse effects of high oil prices.

4.2.4 *Summary of Results*

High oil prices can have very harmful effects on the economy of African oil-importing countries, especially those that are heavily debt-burdened. They lead to a decrease in output and consumption, and to a worsening of the net foreign asset position. For the median oil-importing country, the five-year cumulative output loss resulting from a doubling in the price of oil can be as large as 23 percent under a fixed exchange rate regime, as per the model applied. However, this recessionary effect can be cushioned through government intervention in

the form of limited pass-through of the oil price increase or through foreign aid. In this regard, the model can be used to determine the optimal degree of intervention by the government and donors given their objective functions.

For the median oil-exporting country, the five-year cumulative increase in output associated with a doubling in the price of oil exceeds 60 percent, regardless of the exchange rate regime under which the country operates. However, this scenario is accompanied by a sharp appreciation in the real exchange rate, which may hinder the competitiveness of the country. It is therefore important that accompanying measures be taken to offset the exchange rate appreciation effect on non-oil sectors.

It should be emphasized, however, that while the analysis above focuses on "median" countries, there is, in fact, a great deal of heterogeneity within the groups of oil-importing countries and oil-exporting countries. This means that the effects of oil price shocks can differ dramatically from one country to another. As stated above, however, the proposed model can be configured to represent any of these countries.

An important question that the model does not address is the effect of high oil prices on poverty, which is a crucial dimension in the African context. The model can, in principle, be extended to capture this feature by allowing for heterogeneity across households and by assuming that some of them have liquidity constraints. The model can also be extended to include other types

of shocks, such as productivity shocks, monetary-policy shocks, and world-interest-rate shocks.

4.3 Coping with High Oil Prices

Africa as a whole has in recent years been enjoying gains from macroeconomic management, improved political stability and governance, easing of regional conflicts, strengthening of regional economic blocks, and increased agricultural, mineral, and oil production. Before the financial crisis, many African economies were moving towards fast and steady economic growth. Their performance over 1995–2007 reversed the collapses over 1975–85 and the stagnations over 1985–95. And, for the first time in three decades, African economies were growing at the same rate as the rest of the world economies. Average growth in the Sub-Saharan economies was 5.4 percent in 2005 and 2006. However, sustaining high growth rates has been a chronic challenge for African countries as they confront shocks including high oil prices.

Coping with high oil prices requires a set of measures to maximize the positive impacts and mitigate the negative impacts. The negative impacts are more intense for net oil importers, but can (as described in earlier sections) be mitigated through government initiatives or through foreign aid. Specifically, some of the measures that governments can implement to cope with high oil prices include the following (ESMAP, 2006):

- Price-based policies (comprising full passing on of price increases and subsidies of end-user prices;
- Policies to reduce the cost of supply (hedging, economies of scale, security of stocks);
- Quantity-based policies;
- Diversification into non-petroleum sources of energy (natural gas, renewable power sources, biofuels);
- Increasing domestic supply; and
- Domestic policies (for example, winning public buy-in of government actions).

4.3.1 *Price-Based Policies*

4.3.1.1 FULL PASSING ON OF PRICE INCREASES

In a completely deregulated market, price increases are passed on fully to consumers. Linking domestic prices to international prices in a pricing formula attempts to mimic a deregulated market (Research Division, 2007). A formula-based pricing mechanism raises the question of the frequency of adjustment and the time period over which the reference price is averaged. Given the volatility of world product prices, in countries where governments wish to exercise some measure of control over pricing, it may be reasonable to take a moving average of actual prices spread over a period of more than one month. However, less frequent price adjustments based on a moving average of several months will lead to a temporary need to finance the difference between actual prices and smoothed recommended prices and

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possibly large adjustments when price adjustments are finally made. In these cases, there is the risk of allowing the formula price to diverge more sharply from the actual international price, with the consequent burden on financing. Less frequent price changes run the risk of needing to increase the formula-based price at a time when current market prices are decreasing, thus adding to consumer confusion and antagonism.

Adjusting formula prices very frequently, whatever the length of moving average chosen, is likely to track prices more closely, but it does impose increased administration costs for the process.

Another option to solve the problem would be to change prices when international (spot) prices change by more than a certain percentage in local currency. Retail prices in this case are adjusted as a result of foreign exchange fluctuations, international oil price movement, or both. The larger the minimum percentage change set to trigger an adjustment, the less frequently prices will be changed, but the larger the change. This mechanism shields consumers from small, frequent price changes, but does not achieve price smoothing in the face of large fluctuations (large price shocks outside of the price band are instantly passed on to consumers).

Petroleum product price stabilization funds have been used in some countries to manage revenue shortfalls in times of rising oil prices. However, a fund that has not accumulated large funds before the recent oil price increase would be unable to smooth prices without an initial transfer from the government.

A related policy is the establishment of a strategic stock, where the government acquires and stores crude oil or products at a time of lower prices, to be released when there is an actual supply shortage or a spike in world market prices. The difference in the prices experienced may be sufficiently large to cover the costs of financing the purchase and storing the oil. A further development for smoothing prices to final users would be for the appropriate government agency to hedge future product prices.

Governments that consider a full pass-through of prices to consumers are more concerned with the effects on the rate of inflation as well as on fuel purchasers. If the price rise were to become embedded into the core rate of inflation, macroeconomic policies would be needed to control the inflation created. This usually calls for tighter control over monetary policy and some form of wage restraint. These issues will be even more severe for a government that subsidizes product prices and is considering removing the subsidies and setting prices at the international market level.

4.3.1.2 SUBSIDIES OF END-USER PRICES

Subsidies can be regarded as any government intervention that lowers the price of a fuel below its economic opportunity cost. These relate to the structure of costs, and to whether or not the country is an oil producer and refiner (Research Division, 2007). There are, indeed,

various points along the supply chain where subsidies can be introduced.[8]

Even before the recent acceleration in oil price increases, a number of countries were subsidizing some or all petroleum product prices for final users. Because the burden of a complete subsidy to cover all oil price rises since 2004 has been higher and higher, governments have been anxious to find schemes that subsidize only part of the price increase, largely by providing differential subsidies on the various products and to different consumer groups.

The amount of the subsidy and its magnitude for different products has to be decided by individual governments on the strength of country-based analysis. Government decisions on subsidies thus depend on various factors that include share distribution of the different petroleum products in their total demand, specific use, economic groups within society, but, first and foremost, the finance ability (funds) available to finance on a sustained basis. For example, in a country where gasoline imports are significant and gasoline is known to be consumed mainly by private vehicles owned by better-off households, the government may decide not to subsidize gasoline imports. In contrast, if diesel is used for agriculture and long distance transport of goods and people, usually benefiting a wider population and fueling the domestic economy, the government may

[8] ESMAP (2006) provides a framework and several relevant examples.

decide to subsidize—totally or partially—the impacts of high prices on diesel imports. The government may also decide to subsidize the import of kerosene, known to be largely used by low-income households, in a desire to protect this segment of the society.

Subsidies are usually enacted through controlled final prices, possibly fixed by a formula that passes on only a fraction of international price increases. Where petroleum product sales are in the hands of a state body, it may attempt to finance its shortfall through borrowing from the domestic banking system, but such a policy may not be sustainable.

4.3.2 *Policies to Reduce the Cost of Supply*

If the cost of supply can be lowered in a market-based way and the cost reductions passed on to consumers, end-user prices would not rise as much. Governments have sought to reduce costs or margins in the downstream petroleum product sector in a number of ways, depending on the government's ability to finance (Research Division, 2007).

4.3.2.1 CREATING ECONOMIES OF SCALE

In smaller economies, each supplier may be too small to obtain the lowest possible price for imported products. Accordingly, some countries have established bulk purchasing agencies (for example, in Mozambique all companies request the required quantity in a specific

period; the government body procures the products and after sealing the deal collects the equivalent value from each company) or agreements between companies, so that economies of scale can be obtained through single purchasing arrangements. The centralized procurement system allows governments to control the minimum and maximum prices according to an added transport differential and allowed maximum mark-up.

4.3.2.2 HEDGING PRODUCT PURCHASES

Commercial companies, particularly those that are subsidiaries of large international companies, may well have considerable experience to draw upon in hedging product purchases. This can help smooth out variations in the costs of purchasing products, but cannot be expected to lower the average price paid over a lengthy period. Governments may wish to be informed of purchasing costs, especially in a regulated system, but are unlikely to wish to mandate private sector hedging.

4.3.2.3 ENSURING SECURITY OF STOCKS

Many governments require product marketers to carry a certain amount of security stocks (measured in terms of a given number of days of normal consumption). This provides a buffer against disruptions in supply caused by possible delays in delivery. As a precaution against more erratic supply conditions that appear to be

associated with price spikes in the market, governments can increase this requirement, or establish their own security stocks. A mechanism for bearing the cost of the stocks has to be agreed. These costs include both the interest on working capital tied up, as well as the costs of the storage facilities themselves.

It is possible to use these stocks to smooth out large swings in prices, but this strategy is likely to be effective only in short-lasting price hikes; in this case, purchasing of supplies can be delayed until the price returns to normal. Security stocks are more likely to be used when there is physical disruption, and supplies are actually disrupted. Landlocked countries, which have very limited sources of supply, are usually the most vulnerable to such disruptions and have the greatest need of some security cover from extra stocks.

4.3.2.4 INTRODUCING COMPETITION FOR THE MARKET

If the government wishes to maintain ownership of the downstream sector but is prepared to entrust its management to a private sector company, it can use a "management contract" approach in which private sector operators bid for the right to operate the market. The bids can be tied to the price formula whereby the best bid is the one that will deliver the lowest price. These schemes usually limit the duration of the contract and give the government the right to appoint another operator after a period of time. This approach may be especially relevant

for supplying remote areas. Some governments impose pan-territorial pricing to protect consumers in remote areas that are expensive to supply. Instead of imposing pan-territorial pricing, it may be more cost-effective to liberalize pricing and offer protection to consumers in remote areas by means of, for example, competition for an exclusive right to supply certain regions at the lowest subsidy. The supervision and control of compliance with such measures will impose a big challenge to governments.

4.3.2.5 INCREASING THE NUMBER OF SUPPLIERS IN THE MARKET

Where the downstream market is already privatized, governments can still increase the number of suppliers by placing legal limits on market shares at various stages of the downstream. This policy requires existing firms to divest some of their assets. Policies toward the number of competing suppliers in a market depend on the size of that market. For a large market, each of a number of suppliers can achieve a large enough turnover to enjoy the available economies of scale. For a small market, however, dilution of market share can result in a loss of economies of scale that would negate any cost reductions from a more competitive environment. Countries that have permitted a very large number of firms at retail tend to find that these are not necessarily efficient and that they are difficult to monitor for pricing, quantity, and quality purposes.

4.3.3 *Quantity-Based Policies*

Many countries have considered quantity-based policies with respect to a wider issue of security of supply for oil and petroleum products, of which higher prices are a subset. These policies come in two principal forms:

- Policies that effectively ration the purchase of oil products; and
- Policies that effectively ration activities that intensively use oil products.

Schemes for rationing the purchase of petroleum products that are sold at a large number of outlets, as is typical for transportation fuels and for kerosene, cannot rely on the seller to impose a ration based on previous purchases by an individual consumer. These can be achieved by setting differentiated maximum limits per week for private and commercial vehicles. An effective ration system serves to cut demand, but rationing a commodity almost inevitably leads to a black market.

4.3.4 *Increasing Domestic Supply*

An increasing number of countries are promoting oil and gas development. With rising oil prices, the economics of exploration, development, and production have changed. Even in areas where past exploration did not yield promising results, there are hopes that newer exploration technologies might lead to commercial discoveries. This is the case of Africa, particularly in the

Indian Ocean shoreline, where exploration efforts have identified potential reserves in Madagascar, South Africa, Mozambique, Tanzania, Kenya, and Uganda as new ventures for oil companies.

A variation on increasing the domestic supply of oil and gas is increasing domestic refining capacity. Several arguments have been put forward in favor of enhancing refining capacity (ESMAP, 2006):

- Although a fundamental disagreement persists over the causes of higher oil prices, some industry analysts have argued that one reason is tight refining capacity. Increasing refining capacity would address this bottleneck directly and would, in time, help lower world oil prices.
- Sufficient domestic refining capacity could enhance security of supply of refined products.
- Refining margins have widened in recent years, especially for complex refineries with conversion capacity that can convert lower-priced heavy crude into light products (LPG, gasoline, kerosene, and diesel). Domestic refineries can capture higher margins and pass benefits on to the economy through taxes paid to the government. It is important to note, however, that refining margins fluctuate widely.

Significant economies of scale are an important asset in refining. Many refineries in developing countries are doing poorly even in the current climate of high refining margins because they are too small and lack sufficient

conversion capacity. Small-scale refineries are unable to capture the economies of scale that are necessary to bring costs to a level that can compete with international prices.

The other important factor in the refining industry is the capital costs of constructing competitive refineries, which are very large and would constitute a substantial fiscal burden for any government that chooses to support a state-owned oil company that wishes to enter such a market.

The refinery industry requires large quantities of crude oil, which means that the best location of a refinery is close to a deep sea port. African countries are already thinking about increasing the refinery capacity in the region. Mozambique, for example, is setting up a US$ 7 billion investment refinery in the Nacala deep sea port.

4.3.5 *Diversification into Non-Petroleum Sources of Energy*

Reliance on oil can be reduced by diversifying into non-petroleum sources of energy. The most common alternatives are natural gas and renewable sources of electricity such as hydro, geothermal, solar, and wind. Biofuels are attracting growing attention as a substitute for liquid transportation fuels. Some consumers are forced back to use more solid biomass, with damaging public health and environmental effects.

There are economies of scale in laying down pipelines. A pipeline network is economically viable if there

are large consumers (such as power plants and large industrial operations). Natural gas prices have risen markedly in recent years, broadly tracking world oil price increases.

A policy of promoting the blending of a certain proportion of ethanol into gasoline or biodiesel into diesel will reduce the total use of petroleum transportation fuels. This policy may help reduce the fuel import bill in the short run if a country can import at prices lower than those of petroleum fuels, or if there is surplus feedstock and production capacity.

The use of biofuels supports several major energy policy objectives:

- Energy security: Biofuels can readily displace petroleum fuels, and, in many countries, can provide a domestic rather than imported source of transport fuel. Even if imported, ethanol and biodiesel will likely come from regions other than those producing petroleum (for example, Latin America rather than the Middle East), creating a much broader global diversification of supply sources of energy for transport;
- Environment: Biofuels are generally more climate-friendly than petroleum fuels, with lower emissions of CO_2 and other greenhouse gases;
- Fuel quality: Refiners and car manufacturers have become very interested in the benefits of ethanol in order to boost fuel octane, especially where other

potential octane enhancers, such as MTBE (methyl-tertio-butyl-ether), are discouraged or prohibited;

- Sustainability in transportation is derived from renewable energy.

4.3.6 *Other Domestic Policies*

A number of governments that have attempted to eliminate subsidies on petroleum products by imposing large price increases have faced strong reaction from civil society—trade unions and non-affiliated groups (the riots in Mozambique in February 2008, for example, were due to a more than 50 percent rise in public transport costs as a consequence of high oil prices). Political opposition parties have also built on hostility to these price increases to encourage demonstrations and protests, which may be opportunistic, but which may also be aimed at wider dissatisfaction with the government.

Many governments have deliberately adopted policies that reduce the burden of higher prices on certain groups within society. Policies that are transparent in formulation and implementation are more likely to be accepted than those that are not. Transparency entails both making information widely available to the public and selecting measures that are easily verifiable.

4.4 Summary and Conclusion

In summary, the role of economic policy—at both the micro and macro levels—in mitigating the potential

adverse economic impact of higher oil prices cannot be overemphasized. The impact of changes in oil and gas prices will remain an important issue in the debate on Africa's social, economic, and political development. Sustained development and substantial improvement in the living standards of the people depend fundamentally on secure energy resources, and, in the short term, at least, adequate supplies of oil and gas at affordable prices.

A fundamental disagreement persists about the causes of higher oil prices, and some industry analysts have argued that one of the causes is tight refining capacity. Increasing refining capacity would address this bottleneck directly and would, in time, help lower world oil prices. Having sufficient domestic refining capacity could enhance security of supply of refined products.

Regardless of the reasons, the economic impact of higher oil and gas prices is devastating and includes reduction in economic growth and in household well-being as a result of real income decline, macroeconomic disequilibrium, and inflation. The adverse economic and social effects of higher oil prices are often greater in net oil-importing economies. The challenge is to design robust policies that will mitigate these economic effects. Notably, the emerging macroeconomic evidence suggests that net oil-importing and more oil shock-prone African countries have a greater capacity for coping with recent oil price shocks.

Higher crude oil prices are often associated with greater profits from upstream oil activities by international and national oil companies. Where these are

vertically integrated into refining and selling petroleum products, there is a widespread demand from consumers that some of the profit be returned to them in the form of lower prices. For companies that are not involved in upstream oil production, a policy that limits price increases may not be sustainable, unless there are inefficiencies in supply that they can remove under the pressure of reduced profits.

In several countries, especially in net oil-exporting countries, many governments are not willing to fully accept the tradeoffs between the distributive effect and efficiency considerations associated with competitive oil markets because of popular opposition to substantial upward adjustment in the pump prices of oil products. This makes the product essentially a political good in a number of countries. The price differential in oil- and non-oil-exporting countries reflects the political content of oil product pricing in the region—hence the appropriate price of oil products remains a controversial issue in many countries in Africa. Administered pricing is common in the region. The size of the pass-through is also contentious. In some countries, the pass-through is full, while in others, it is partial. Obviously, in dealing with the demand and supply dimensions of expended energy access, oil and gas pricing, the size of the pass-through and oil and gas market liberalization are essential elements in the energy equation.

Coping mechanisms depend on country-specific circumstances, especially the country's ability to cushion the effects of high oil prices on vulnerable groups.

Coping policy mechanisms could include issues related to strategic reserves and inventories, managed as a defensive stockpile. Oil price shocks in many African countries can be partially mitigated given innovative oil inventory management strategies. Yet, most of the countries do not have, or cannot afford to have, any sizable oil inventory.

In some countries, governments have ensured that prices charged by companies do not rise as fast as the costs of products on the world market. The policies used to achieve this have been either mandatory, where price caps have been placed on petroleum products, or exhortatory, whereby governments have encouraged such action. In either case, if there is no offsetting compensation from the government, the company bears the burden of the price rise.

The resilience of economies in coping with the challenges of oil price shocks is a function of their conditions prior to and during the shocks. How to finance higher oil prices, especially in developing countries, remains a contentious issue. Increased transparency will better inform consumers and policy-makers in the executive and legislative branches about factors that affect the level and volatility of prices for refined petroleum products.

African oil exporters need to establish and enforce prudent fiscal rules to smooth surplus export receipts over time, invest them for future growth, and minimize wasteful spending.

A key challenge for policy-makers in Africa is designing the optimal policy mix that would help African

countries cope efficiently with the economic and social costs of the external shocks accompanying higher oil and gas prices. In more recent times, macroeconomic policies have been more robust to the oil price dynamics. However, what has emerged as consensus among analysts is that micro- and macroeconomic policies can help mitigate the potential adverse economic impact of high oil prices.