

Petroleum Markets in Sub-Saharan Africa



Analysis and Assessment
of 12 Countries

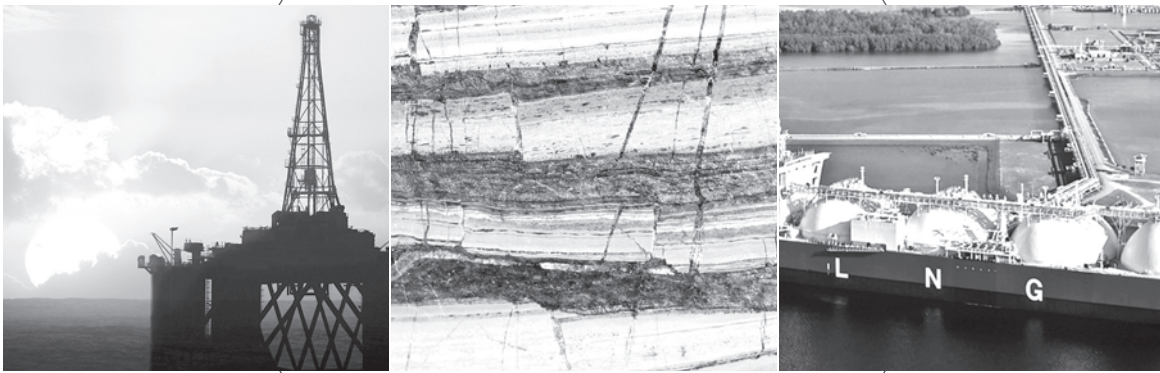
Masami Kojima
with
William Matthews and
Fred Sexsmith



THE WORLD BANK



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World Bank | Oil, Gas, and Mining Policy Division Working Paper





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Abbreviations

CIF	cost, insurance, and freight
DH	Direction des Hydrocarbures (Côte d'Ivoire)
EWURA	Energy and Water Utilities Regulatory Authority (Tanzania)
FOB	free on board
GDP	gross domestic product
HHI	Herfindahl-Hirschman index
KPRL	Kenya Petroleum Refineries Limited
LPG	liquefied petroleum gas
m ³	cubic meters
MEMD	Ministry of Energy and Mineral Development (Uganda)
MER	market exchange rate
MERA	Malawi Energy Regulatory Authority
NATREF	National Petroleum Refiners of South Africa
NOCK	National Oil Corporation of Kenya
OMC	oil marketing company
ONAP	L'Office National des Produits Pétroliers (Mali)
PPP	purchasing power parity
SAFREF	Shell and BP South African Petroleum Refineries
SAR	Société Africaine de Raffinage (Senegal)
SIR	Société Ivoirienne de Raffinage (Côte d'Ivoire)
SONABHY	Société Nationale Burkinabè d'Hydrocarbures (Burkina Faso)
SONIDEP	Société Nigérienne de Dépôt d'Essence et de Pétrole (Niger)

All tonnes are metric tonnes.

All dollar amounts are U.S. dollars unless otherwise indicated.



Acknowledgments

This report is based on two consultant studies, one in West Africa carried out by William Matthews and another in East and Southern Africa by Fred Sexsmith. The consultant reports are presented as annexes in the electronic report available at www.esmap.org/news/news.asp?id=127.

Masami Kojima of the Oil, Gas, and Mining Policy Division of the World Bank prepared this publication based on the consultant studies. The World Bank team who worked on the study includes Sanjoy Rajan, Robert Murphy, Masami Kojima, and Robert Bacon, all of the Oil, Gas, and Mining Policy Division. The report benefited from helpful comments provided by three World Bank peer reviewers: Istvan Dobozi, Energy Sector Management Assistance Program; Dino Merotto, Poverty Reduction and Economic Management, Europe and Central Asia Region; and Paivi Koljonen, Energy, Africa Region. The study was financed largely by the Energy Sector Management Assistance Program.

Paula Whitacre edited this document, and Esther Petrilli-Massey of the Oil, Gas, and Mining Policy Division oversaw its production.







Executive Summary

Petroleum products are used across the entire economy in every country. Gasoline and diesel are the primary fuels used in road transport. Oil is used in power generation, accounting for 11 percent of total electricity generated in Africa in 2007. Adequate and reliable supply of transport services and electricity in turn are essential for economic development. Households use a variety of petroleum products: kerosene for lighting, cooking, and heating; liquefied petroleum gas (LPG) for cooking and heating; and gasoline and diesel for private vehicles as well as captive power generation.

Prices users pay for these petroleum products have macroeconomic and microeconomic consequences. At the macroeconomic level, oil price levels can affect the balance of payments; gross domestic product (GDP); and, where fuel prices are subsidized, government budgets, contingent liabilities, or both. At the microeconomic level, higher oil prices lower effective household income in three ways. First, households pay more for petroleum products they consume directly. Seventy percent of Sub-Saharan Africans are not yet connected to electricity; most without access rely on kerosene for lighting. Second, higher oil prices increase the prices of all other goods that have oil as an intermediate input. The most significant among them for the poor in low-income countries is food, on which the poor spend a disproportionately high share of total household expenditures. Food prices increase because of higher transport costs and higher prices of such inputs to agriculture as fertilizers and diesel to operate tractors and irrigation pumps. For the poor who use transport services, higher transport costs also decrease effective income. Third, to the extent that higher oil prices lower GDP growth, household income is reduced.



Factors Affecting Costs of Supplying Petroleum Products

World oil prices increased four-fold between January 2004 and July 2008 and, after a sharp drop in the latter half of 2008, have been rising again. All sectors of the economy can benefit from an efficiently managed downstream oil sector that delivers petroleum products in the quantity



and at the quality required at least cost. For a given price of a petroleum product on the world market, end-user prices net of taxes are affected by a number of factors:

- Market size and economies of scale
- Mode of product transport—in terms of cost per liter of fuel transported over land, the least expensive is pipeline transport (in a handful of cases in Sub-Saharan Africa that have the requisite scale economy), followed by rail, and finally by trucks
- Liberalized versus controlled pricing
- Protection given to inefficient domestic suppliers
- Degree of competition
- Clear and stable legal framework with effective monitoring and enforcement
- Regular disclosure of industry statistics

Study Description

This regional study takes 12 oil-importing countries in Sub-Saharan Africa and asks the following two questions:

- Does each stage in the supply chain, from import of crude oil or refined products to retail, seem to be efficiently run *and* are the efficiency gains passed on to end-users?
- If not, what are the potential causes and possible means of remedying the problems?

The study focuses on Burkina Faso, Côte d'Ivoire, Mali, Niger, and Senegal in West Africa and Botswana, Kenya, Madagascar, Malawi, South Africa, Tanzania, and Uganda in East and Southern Africa, covering a wide range of conditions that affect price levels, such as the market size, geography (whether landlocked or coastal), existence of domestic refineries, degree of sector liberalization including pricing, and level of economic development.

The study relied on information collected during country visits by two consultants lasting an average of two days in each country (except Botswana and Malawi, for which information was collected through telephone calls and email) and publicly available information. The visits to the countries in East and Southern Africa took place in November 2008 and those in West Africa in January 2009. The short duration of each visit necessarily restricted the amount of information that could be collected, and the findings of this study and its recommendations should be interpreted in the light of these data limitations.

Infrastructure and Market Structure

The markets covered in this study are small, with all but three having annual domestic consumption of less than 25,000 barrels a day (table E.1). Against a world-scale refinery size of at least 100,000 barrels a day, only three out of seven petroleum refineries in the study countries are world-scale refineries in size and complexity, all in South Africa. In addition to the capacity shown in the table, South Africa also has an equivalent of 200,000 daily oil barrels of coal-to-liquids and gas-to-liquids plants, producing high-quality diesel and other liquid fuels.

Table E.1 Study Coverage of Sub-Saharan African Countries

Characteristics	West Africa				
	Burkina Faso	Côte d'Ivoire	Mali	Niger	Senegal
2008 Population, million	15.2	20.6	12.7	14.7	12.2
2008 GDP pc, MER, \$	523	1,137	688	365	1,082
Geographical and oil supply features	Landlocked	Coastal/transit	Landlocked	Landlocked	Coastal/transit
2007 Petroleum product consumption, daily barrels	10,200	17,800	12,900	3,600	32,200
Refining capacity, daily barrels	0	75,000	0	0	25,000
HHI	1,963	1,544	915	2,959	2,445

Characteristics	East and Southern Africa						
	Botswana	Kenya	Madagascar	Malawi	South Africa	Tanzania	Uganda
2008 Population, million	1.9	38.5	19.1	14.3	48.7	42.5	31.7
2008 GDP pc, MER, \$	6,808	895	469	299	5,685	482	459
Geographical and oil supply features	Landlocked	Coastal/transit	Island	Landlocked	Coastal/transit	Coastal/transit	Landlocked
2007 Petroleum product consumption, daily barrels	15,600	67,000	11,500	6,000	445,700	22,300	14,500
Refining capacity, daily barrels	0	60,000	0	0	485,300	0	0
HHI	2,367	1,937	2,675	2,800	1,699	1,107	1,831

Source: World Bank 2009a, official government statistics and data from industry associations, *Oil and Gas Journal* 2009, ipetrolenews.info 2007, KPRL 2010.

Notes: pc = per capita, MER = market exchange rate, HHI = Herfindahl-Hirschman index.



The refinery in Côte d'Ivoire is relatively small but has a cracking unit capable of making good-quality diesel. It is protected with a 5-percent premium over the import-parity cost. The refineries in Kenya and Senegal are not economic; the one in Senegal is much too small, and that in Kenya has no cracking facility and is in need of rehabilitation. The Kenyan refinery has frequently suffered from water shortages and power outages, reducing product output and causing shortages in the region.

Effective competition is deterred if a relatively small number of firms account for a relatively large share of the market. The degree to which this occurs is referred to as market concentration and is often measured by the Herfindahl-Hirschman index (HHI). A market with an HHI above 1,800 is generally considered concentrated, while less than 1,000 is generally considered unconcentrated. By this measure, the market in eight out of 12 countries is concentrated. Somewhat surprisingly, the least concentrated market is not South Africa, by far the largest market in the study, but Mali, with annual consumption of less than 15,000 barrels a day. The most concentrated market is Niger, closely followed by Malawi and Madagascar.

Maximum tanker sizes that can be accommodated at the primary ports for petroleum product imports are at the small end of scale economy at Abidjan and Vridi in Côte d'Ivoire and at Cotonou in Benin for imports into Niger, but are good in other countries. The four smallest markets in the study—Niger, Malawi, Burkina Faso, and Madagascar—have all adopted what amounts to a single-buyer model, presumably to achieve economies of scale in fuel importation to the extent possible.

Only Kenya and South Africa have product pipelines. The pipeline operation in Kenya has been frequently disrupted by power shortages. A project for extending the pipeline to Uganda has suffered from years of delay. The pipeline capacity in South Africa is currently constrained, but another multi-product pipeline is planned. These limitations in the availability of operating pipeline capacity have increased costs of fuel supply. There are long-term prospects for a product pipeline in Burkina Faso, Côte d'Ivoire, and Mali.


Rail transport is generally underutilized. The line connecting Senegal and Mali requires investment to improve its physical state and quality of service. In Malawi, Tanzania, and Uganda, the underutilization is similarly due to the rundown state of the rail infrastructure. In Madagascar, the market-based rate for road movements is more than 50 percent higher than that using rail, yet only 28 percent was transported by rail and the rest by road in 2008. Madarail is in a position to transport 40 percent or more of the volume moved and achieve cost savings.



Road transport is hampered by poor road conditions, congestion, and, where cross-border trade is involved, slow border clearance in some situations. More effective enforcement of load limits across the road freight sector will benefit road transport in the long run by reducing road damage, enhancing traffic safety, and eventually enabling use of larger and more fuel-efficient trucks. Although enforcing the three-axle rule in Tanzania and Kenya may have had short-term costs by reducing the amount of fuel that can be carried by each truck, long-term benefits—if accompanied by road improvement and other measures—should outweigh these costs.

Policies Affecting Fuel Prices

The government has a larger presence in the petroleum market in West Africa than in East and Southern Africa. In Burkina Faso, Côte d'Ivoire, and Niger, a state-owned monopoly entity procures all petroleum products, in the case of Côte d'Ivoire through both product imports and refining Nigerian crude oil. A monopoly supplier does not mean reduced efficiency—a recent benchmark audit of the state monopoly supplier in Burkina Faso found that the entity's procurement performance was close to best practice. Kenya has an Open Tender System, whereby crude or petroleum products are purchased by a single company for the entire market on the basis of a public tender and shared among all marketing companies in proportion to their share of the market. Questions have been raised about the cost-effectiveness of this system.



Eight countries have price controls, including all five West African countries. The eight countries use different variations of an import-parity structure with international spot reference prices, market marine freight rates, and the dollar-local currency exchange rates as the three key short-term adjustment parameters. With the exception of Malawi, the countries with price controls adjust prices monthly. Malawi has a price stabilization fund and has no pre-set automatic adjustment frequency. The stabilization fund ran up a large deficit in 2008.

Only in Botswana, Senegal, and South Africa is the price adjustment consistently automatic, based on pre-established administrative procedures. Despite having a pre-established procedure, there is ad-hoc intervention in each adjustment in Burkina Faso, Côte d'Ivoire, Mali, and Niger. As world oil prices soared in 2007 and 2008, the four countries smoothed retail prices. Mali and Niger did so by reducing taxes, and Burkina Faso and Côte d'Ivoire by reducing prices charged by their state supply companies. As world prices fell sharply during the latter half



of 2008, these countries kept retail prices relatively high to recover the losses suffered earlier when prices were kept artificially low.

Côte d'Ivoire, Madagascar, Mali, Niger, and Senegal have pan-territorial pricing, and Burkina Faso has two sets of uniform prices depending on location. Price uniformity is by government policy, with the exception of Madagascar, where a private monopoly logistics operator provides a common ex-depot price for all depots in the country. Mali achieves uniform prices by tax differentiation, whereby petroleum products sourced in the least-cost manner are taxed more to achieve the same price throughout the country. This pricing policy provides little or no incentive to minimize costs.

Côte d'Ivoire, Kenya, and Senegal provide explicit protection to their refineries. Côte d'Ivoire does so by adding 5 percent to the import parity cost for products consumed on the domestic market, which make up about 30 percent of the refinery output. The refinery in Senegal would need much greater protection; currently gasoline, kerosene, and diesel are levied a fee amounting to some \$0.07 per liter to help amortize the debt owed by the refinery. The government of Kenya provides protection to the refinery by requiring marketers to process about half of local consumption at the refinery according to their market share. The required amount was 70 percent until February 2009, when the government lowered the requirement to 50 percent in light of continuing operational problems faced by the domestic refinery. South African refineries are protected indirectly by restrictions on product imports.


The status of the legal framework in the 12 countries is mixed. Burkina Faso, Côte d'Ivoire, Mali, and Niger need to strengthen their legal and regulatory frameworks. The four countries have not updated their legal frameworks in decades and rely on disparate texts from French colonial times. With the exception of Botswana and South Africa, the study countries suffer from weak monitoring and enforcement, even in those countries where a strong legal and institutional framework has been established. Where too many small operators are in the market, as in East Africa, the response should not be to limit the number of companies but to ensure that the licensing criteria for operators are stringent and that compliance with rules to obtain and retain the licence is enforced.

Information about the downstream sector—about prices and price structure, sources and volumes of imports, differences between domestic and international prices, and companies operating in the country—is not readily available in many study countries. An important role of



government is to collect and make market information available to inform both suppliers and purchasers. If the public is well informed, it becomes more difficult to ignore sector inefficiencies. The Energy and Water Utilities Regulatory Authority of Tanzania provides up-to-date detailed prices throughout the country twice a month on its Web site. Where charges of price collusion and pressure on the government to re-introduce price control occur, as in Kenya and Tanzania, it would be useful to have historical price information available to the public so that perceptions can be checked against actual price trends. Historical prices in countries where prices are not controlled require price surveys and can be resource-intensive to collect. But the government agency in charge of the sector can begin by collecting price information in the capital city and, in due course, extend data collection to other major cities.

Fuel shortages have had serious adverse effects on price levels in some parts of Sub-Saharan Africa. Among the study countries, landlocked Uganda in particular has repeatedly suffered from prolonged fuel shortages and price spikes—including the last three months of 2008 and the beginning of 2009 even as world oil prices fell sharply—due to disruptions in the supply chain from Kenya. Over the longer term, ensuring sufficient fuel stocks is an often-used mechanism to protect against supply disruptions. Establishing such stocks is expensive, and as a result, plans to establish security storage capacity are not necessarily implemented for lack of financing. But there are also costs to the economy of fuel shortages. Assessing the costs and benefits of maintaining contingency stocks—and deciding how large, who maintains, and who pays—is important.



Governments of Burkina Faso, Côte d'Ivoire, Kenya, Mali, Niger, South Africa, and Tanzania have assigned agencies in charge of security stocks. Malawi's minister of natural resources, energy, and environment recently announced the government's intention to establish a national oil company aimed at ensuring the security of supply of petroleum products. Senegal has a 1998 decree fixing the modalities for maintaining security stocks. Botswana sub-contracts maintenance of contingency stocks to two oil marketing companies. The government of Uganda announced a plan in early 2009 to build a fuel depot in Kampala with a capacity of 150 million liters (about 1 million barrels).

Storage capacity at major consuming centers is generally adequate except in Malawi and Uganda. Uganda has storage capacity equivalent to about 20 days, and that in Malawi is even more limited. Given the frequent supply disruptions landlocked Uganda has experienced in recent

years, greater storage capacity is needed to protect the market against unanticipated supply shortages in the future.

Gasoline and Diesel Price Levels in December 2008

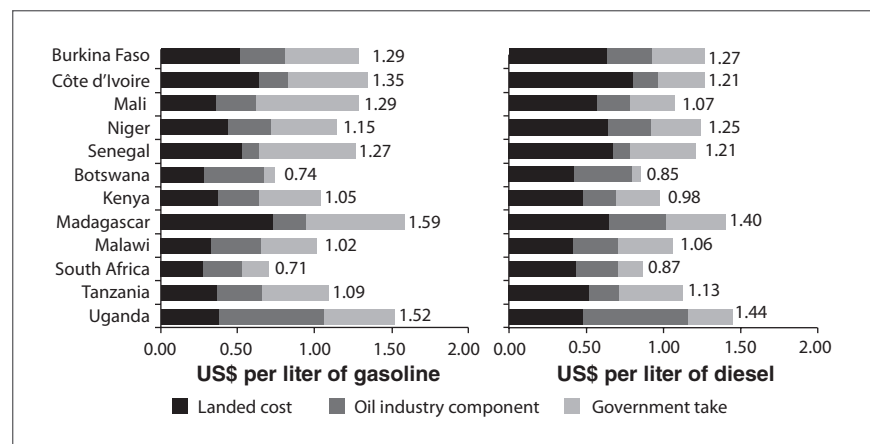
Figure E.1 shows retail gasoline and diesel prices in December 2008. Prices are broken down into

1. landed cost *or*, in countries with price control, hypothetical import-parity price corresponding to the landed cost used to calculate retail prices;
2. oil industry component, which covers all gross margins for storage, inland bulk transport, local delivery, wholesale, and retail distribution; and
3. government take, which includes all taxes, duties, and government fees.

The difference between the retail price and the sum of the landed cost and government take represents the gross margin component available to the downstream petroleum industry. In markets where prices are liberalized, this number is derived by difference and is the least accurate of the three components.

The landed costs at the primary coastal supply points varied nearly three-fold for gasoline and two-fold for diesel. The high landed costs in Burkina Faso and Côte d'Ivoire are in part due to price stabilization

Figure E.1 Retail Gasoline and Diesel Prices in December 2008



Sources: Government regulatory authorities, World Bank consultant interviews with government and industry representatives, and consultant estimates.

strategies that kept these values artificially high to recover losses suffered earlier.

Total government take varied nearly ten-fold across countries for gasoline and eight-fold for diesel. Taxes on petroleum products are a critical source of government revenue for low-income countries because taxing fuel is one of the easiest ways to get revenue: collecting fuel taxes is relatively straightforward, and the consumption of fuels as a group is relatively price inelastic and income elastic, ensuring buoyant revenue as income rises and tax rates are increased.

Because the oil industry component is a residual value obtained by subtracting a sum of two estimated numbers from the retail price, it is the least accurate of the three components and hence comparison across countries should be treated with caution. Uganda's totals of \$0.68 to \$0.69 per liter stand out; they are almost double the next highest country. A higher industry component in a landlocked country compared with a coastal one is expected because of higher transport costs, but the values for Uganda are much higher than those in other landlocked countries under study. Uganda experienced fuel shortages in November and December of 2008 and this in part accounts for the high value of this component.

An analysis and comparison of net-of-tax retail prices (sum of landed costs and oil industry component) would normally be one of the first approaches to comparing basic cost structures across countries. Because many events can affect the net-of-tax prices, observations that can be gleaned from a snapshot of price information at one point in time are limited. For both fuels, Madagascar and Uganda have the highest net-of-tax prices, followed by Côte d'Ivoire. South Africa at \$0.53 per liter has the lowest cost structure for gasoline. For diesel, Kenya, Malawi, South Africa, and Tanzania are comparable at \$0.70–0.71 per liter. At \$0.64 per liter, Senegal has a gasoline cost structure slightly higher than Mali's at \$0.62 per liter, while its net-of-tax diesel price is identical to that in Mali. As a coastal country, its net-of-tax price can be lower; the relatively high net-of-tax price in Senegal can be partially explained by the special fee of \$0.07 per liter charged to amortize the refinery debt.

Scope for Reducing Costs

There are varying degrees of scope for reducing the cost of supplying petroleum products in the study countries. Protection of domestic refineries that cannot compete with direct product imports places a clear burden on the economy. Refinery closure is often politically sensitive, especially if the refinery is government-owned, but Madagascar and

Tanzania have closed their refineries. Globally, the trend over the past three decades has been phasing out numerous small, simple refineries in favor of fewer, larger, and more complex ones.

Pipelines are most cost-effective but require large upfront capital investments, a reliable supply of electricity—unreliable and inadequate power is among the most serious problems in the energy sector in Sub-Saharan Africa—and regular maintenance. While challenging, shifting to pipeline transport over the long term will reduce costs in many countries.



Greater use can be made of rail to reduce costs, which, in some cases, requires rehabilitation and expansion of existing lines. One obstacle to greater rail use is ownership of trucking businesses by oil marketing companies, particularly in West Africa. In the near term, Madagascar is perhaps best positioned to expand the share of petroleum products moved by rail, since it has spare capacity that can be readily mobilized.

Universal overloading of vehicles and poor road and vehicle conditions go hand in hand. They deter professional fleet management committed to safety and on-time delivery. Longer and more fuel-efficient modern trucks capable of carrying as much as 60 tonnes, used in Europe and elsewhere, require much better road surfaces. Coordination with other sectors to gradually improve road conditions and vehicle technology can reduce costs over the long run.

Assessment of procurement procedures such as the Open Tender System in Kenya; port clearance procedures, particularly in Tanzania; and performance by monopoly suppliers in Burkina Faso, Côte d'Ivoire, Madagascar, and Niger may find alternative procedures and approaches that cost less. Where price control is in effect, identifying aspects that reduce the incentive to minimize costs and substituting them with alternatives that distort the market less could enhance efficiency. South Africa, which is a large market, may benefit from lower barriers to entry and less price regulation.


As mentioned above, storage capacity at major consuming centers is generally good except in Uganda, which has storage capacity equivalent to about 20 days, and Malawi, where storage capacity is even more limited. Given the price spikes caused by frequent supply disruptions landlocked Uganda has experienced in recent years, greater storage capacity would help protect the market against unanticipated supply shortages in the future.

Strengthened monitoring and enforcement of rules already in place is needed in most study countries. Commercial malpractice, if unchecked, can take over the market and drive out efficient operators known not to



engage in fraud. Short-selling transfers money rightly due to consumers to fraudulent operators. Other forms of fraud can be even more costly, especially if equipment or vehicles are damaged as a result.

Few governments in Sub-Saharan Africa make key sector data regularly available in a timely manner. Although resource-intensive, especially in countries with liberalized prices, such information empowers consumers and enables informed debates about prices and sector efficiency. Making price and other data widely available has taken on greater importance in recent years against the backdrop of soaring international oil prices and calls from different quarters in many countries for tightening or re-introducing price control to protect consumers. Price control, however, can never fully mimic an effective and well-regulated competitive market that imposes relentless pressure on participants to improve efficiency and—equally importantly—to share the gains with customers. Madagascar, South Africa, and Tanzania have been posting historical prices and other information on the Internet. The challenge is for other countries to begin to collect similar information and make it publicly available.



Chapter 1

Background

Petroleum products are used across the entire economy in every country. Gasoline and diesel are the primary fuels used in road transport. Oil is used in power generation, accounting for 11 percent of total electricity generated in Africa in 2007 (IEA 2009a). Adequate and reliable supply of transport services and electricity in turn are essential for economic development. Households use a variety of petroleum products: kerosene for lighting, cooking, and heating water; liquefied petroleum gas (LPG) for cooking and heating; and gasoline and diesel for private vehicles as well as captive power generation.

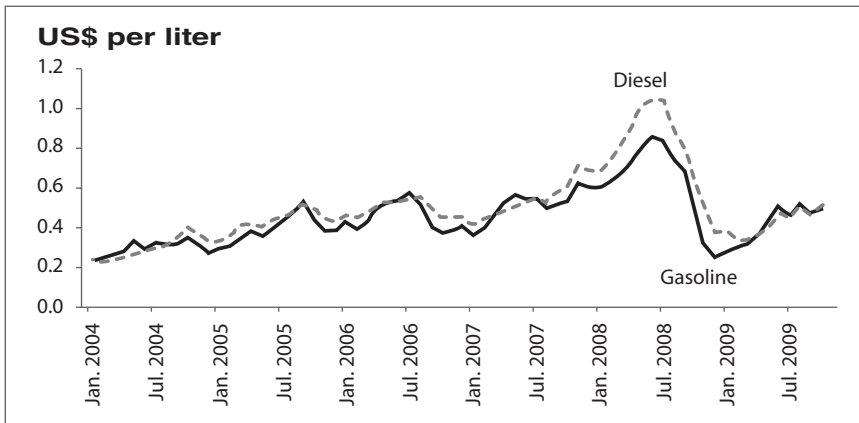
Prices users pay for these petroleum products have macroeconomic and microeconomic consequences. At the macroeconomic level, oil price levels can affect the balance of payments; gross domestic product (GDP); and, where fuel prices are subsidized, government budgets, contingent liabilities, or both. At the microeconomic level, higher oil prices lower effective household income in three ways. First, households pay more for petroleum products they consume directly. Most poor households in low-income countries do not own motorized vehicles or electricity generators and therefore purchase little or no gasoline or diesel; many people not yet connected to electricity rely on kerosene for lighting. Second, higher oil prices increase the prices of all other goods that have oil as an intermediate input. The most significant among them for the poor in many low-income countries is food, on which the poor spend a high share of total household expenditures—often exceeding 50 percent. Food prices increase because of higher transport costs and higher prices of such inputs to agriculture as fertilizers and diesel to operate tractors and irrigation pumps. For the urban poor who use public transport, higher transport costs also decrease effective income. Third, to the extent that higher oil prices lower GDP growth, household income is reduced.

Globally, oil prices began to rise in 2004 and, after a sharp drop in late 2008, have been rising again (figure 1.1). Global increases in petroleum product prices have adversely affected most economies

that are not large net exporters of oil. Earlier studies showed that the countries most vulnerable to oil price shocks are low-income oil-importing countries, which are disproportionately concentrated in Sub-Saharan Africa (ESMAP 2005a and 2005b). High costs for transporting and marketing petroleum products increase end-use prices further and exacerbate the adverse effects of high oil prices. In two recent studies that ranked retail fuel prices in August 2008 and January 2009 in 48 and 49 developing countries, respectively, Sub-Saharan Africa countries made up half of the top 20 for gasoline and diesel (Kojima 2009a and 2009b). An important question is then whether there is scope to reduce the costs of transporting and marketing petroleum products in Sub-Saharan Africa.

High oil prices affect the rural poor in the region directly because about 70 percent of Sub-Saharan Africans do not yet have access to electricity (IEA 2009b), and, as noted above, most households use kerosene for lighting. The urban poor are also affected because they are more likely to use kerosene and LPG for cooking. The impact of higher oil prices is illustrated by a study of household expenditures in Mali in 2000–2001. Examining households by income category, the study showed that an increase in kerosene prices would hurt the poor the most. The study also showed that the bottom 60 percent of households spent more than 80 percent of their total expenditures on food, and, for them, indirect effects of higher oil prices—mainly from higher food prices—were as large as direct effects (Kpodar 2006).

Figure 1.1 Gasoline and Diesel Prices between 2004 and 2009



Source: Energy Intelligence 2009.

Note: Gasoline is regular unleaded and diesel is gasoil with 0.2 percent sulfur in northwest Europe, free on board.

All productive sectors of the economy can benefit from an efficiently managed downstream petroleum sector. High fuel costs increase the operating costs of the transport sector, this in a region where transport costs are already high for a variety of other reasons. In the power sector, a recent publication identified more than 30 African countries that experience power shortages and regular interruptions to service. A common response to the crisis is to resort to diesel-based emergency power: at least 750 megawatts of emergency generation are operating in Sub-Saharan Africa, which for some countries constitute a large proportion of their national installed capacity (Foster and Briceño-Garmendia 2010).

Governments in Sub-Saharan Africa have historically provided protection to domestic refineries. Such protection hampers the development of an efficient sector and, by definition, raises prices paid by all consumers. Where the refineries are state-owned, protection of domestic refineries can also lead to contingent liabilities for the government. Fuel shortages are not uncommon in the region, and they have led to price spikes over and above the price movements on the world market. In addition, against the backdrop of steadily rising world oil prices in 2007 and 2008, quite a few governments abandoned formula-based pricing in order to shield consumers from the rising world prices and capped retail prices by lowering fuel taxes and other means. But such government intervention in pricing can deter effective competition and may even raise prices in the long run.

Study Description

This regional study takes 12 oil-importing countries in Sub-Saharan Africa and asks the following two questions:

- Does each stage in the supply chain, from import of crude oil or refined products to retail, seem to be efficiently run and *are* the efficiency gains passed on to end-users?
- If not, what are the potential causes and possible means of remedying the problems?

This study examines five countries in West Africa and seven in East and Southern Africa (table 1.1). Country selection aimed to cover a range of conditions that affect price levels, such as market size, geography (whether landlocked or coastal), existence of domestic refineries, the degree of sector liberalization including pricing, and the level of economic development.

**Table 1.1 Study Coverage of Sub-Saharan African Countries**

West Africa					
Characteristics	Burkina Faso	Côte d'Ivoire	Mali	Niger	Senegal
2008 Population, million	15.2	20.6	12.7	14.7	12.2
2008 GDP pc, PPP, \$	1,161	1,651	1,128	684	1,772
2008 GDP pc, MER, \$	523	1,137	688	365	1,082
Geographical and oil supply features	Landlocked	Coastal/transit	Landlocked	Landlocked	Coastal/transit

East and Southern Africa							
Characteristics	Botswana	Kenya	Madagascar	Malawi	South Africa		
					Tanzania	Uganda	
2008 Population, million	1.9	38.5	19.1	14.3	48.7	42.5	31.7
2008 GDP pc, PPP, \$	13,392	1,590	1,049	837	10,109	1,263	1,165
2008 GDP pc, MER, \$	6,808	895	469	299	5,685	482	459
Geographical and oil supply features	Land locked	Coastal/transit	Island	Land-locked	Coastal/transit	Coastal/transit	Land-locked

Source: World Bank 2009a

Notes: pc = per capita, PPP = purchasing power parity, MER = market exchange rate.

The sample includes two upper-middle-income (Botswana and South Africa), one lower-middle-income (Côte d'Ivoire), and nine low-income (Burkina Faso, Kenya, Madagascar, Malawi, Mali, Niger, Senegal, Tanzania, and Uganda) countries. The population in 2008 ranged from 2 million in Botswana to 49 million in South Africa.

The study relied on information collected during country visits by two consultants lasting an average of two days in each country (except Botswana and Malawi, for which information was collected through telephone calls and email) and publicly available information. The visits to the countries in East and Southern Africa took place in November 2008 and those in West Africa in January 2009. The short duration of each visit necessarily restricted the amount of information that could be collected, and the findings of this study and its recommendations should be interpreted in the light of these data limitations. In some areas of examination, this study was able to collect more country-specific data



in West Africa than in East and Southern Africa. For this reason, the treatment of the two regions is not fully harmonized in the report. The findings of the two consultants can be found in the annexes of the report available electronically (ESMAP 2009).

Two additional developments affect the interpretation of the data collected. First, as figure 1.1 shows, the latter half of 2008 saw a sharp fall in the price of oil after a doubling over the previous 18 months. The degree of price volatility requires that, for cross-country comparison, data on retail prices in effect at about the same time across the 12 countries be collected. Several countries, however, do not report retail prices on a regular basis to the public, and, with only two consultants visiting the countries two months apart, data collection could not be undertaken at the same time. Second, prices charged did not reflect costs in the countries where governments adopted policies to shield consumers from the world oil price increases in 2007 and 2008. Price smoothing typically consists of undercharging when international prices are high and overcharging when prices are low to make up for the losses suffered due to undercharging earlier. Such attempts at price smoothing make it difficult to assess the underlying cost structure.

Petroleum Product Supply Chain

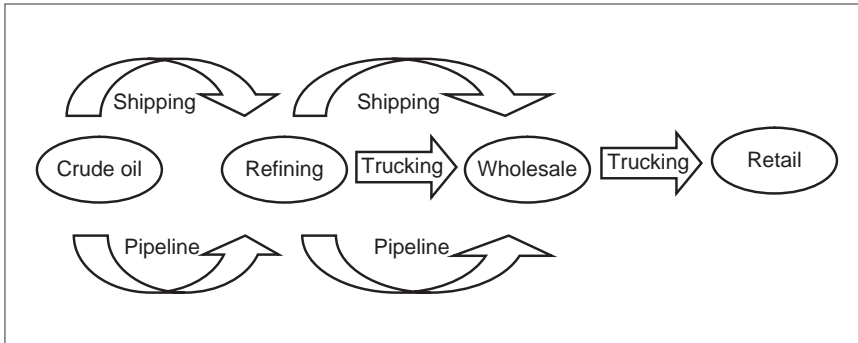
To understand what affects retail prices, it is useful to review different stages in the petroleum product supply chain (figure 1.2).

Crude oil is extracted and transported to a refinery, typically by ship or pipeline. Because each refinery is configured for specific types of crude, minimizing cost is not simply a matter of purchasing the lowest-cost crude. Economic refineries are generally located near major markets, are large-scale, and have complex processing facilities adapted to the market requirements. These requirements include relative amounts of different fuels consumed—a market with high ownership of cars may consume more gasoline than one that is dominated by industrial activities requiring more fuel oil for boilers and diesel fuel for freight transport—and fuel quality such as the octane number of gasoline. Crucially important, economic refineries today have cracking facilities to convert residual fuel oil (demand for which has been steadily declining) to so-called white products: LPG, gasoline, kerosene, and diesel, which are in growing demand.

Once refined, petroleum products of the required amount and quality are transported to storage facilities close to the final markets. This activity



Figure 1.2 Petroleum Product Supply and Distribution Chain



Source: Authors.

entails coordination of procurement and transport logistics, including considerations of volumes required, procurement methods, price, location, contracting terms, and supply reliability. Transport modes from refineries to secondary storage include marine tankers, pipelines, road tankers, rail, and barges.

Shipping crude oil or petroleum products incurs costs for freight, insurance, wharfage (charge assessed against cargo for usage of a wharf or pier and its facilities), inspection, demurrage (charge for detaining a ship over and above the time normally given to unload), and marine transit losses. Congested ports, slow customs clearance, and any other factor delaying discharging of the fuel could incur large demurrage costs. Once landed and sent to a bulk oil terminal, petroleum products incur additional costs, including storage, transport, retailing, and wholesalers' and retailers' profit margins.

Oil marketing companies usually act as the wholesale distributors. Wholesale marketing involves the acquisition from the bulk supply link of petroleum products of the quality and in the volume appropriate to the market. Products are delivered by road tanker to the oil marketing companies' affiliated (branded) retail service stations, as well as to bulk consumers such as power generation plants, industry, large commercial customers, government agencies, and transport fleet operators such as trucking companies and bus operators. In some markets, oil marketing companies may also deliver petroleum products to independent retailers under supply contract sales arrangements. Oil marketing companies may own the assets used in their operations or



outsource most of the road transport activities to independent owner-operators and use storage depots owned by others under throughput fee arrangements.

Retail marketing involves selling gasoline, diesel, and lubricants at service station outlets and selling kerosene and LPG through other shops. Depending on the arrangements with dealers, oil marketing companies have varying degrees of ownership of the assets of their own network.

LPG, which is stored under pressure, has special requirements. LPG can be sourced from a refinery or a natural gas processing plant. Worldwide, 60 percent of LPG comes from natural gas. LPG is transported by large carriers, pipelines, or trains to storage terminals, which may be underground, refrigerated, or pressurized. From storage terminals, LPG is delivered by train, road, coastal tanker, or pipeline to cylinder filling plants and intermediate-size storage areas where it is generally stored in pressurized vessels or spheres. Cylinders are filled with LPG at bottling plants. Trucks transport LPG cylinders from the bottling plant to retailers, as well as to bulk customers. LPG is available to end-users through cylinder sales points such as commercial stores and service stations.

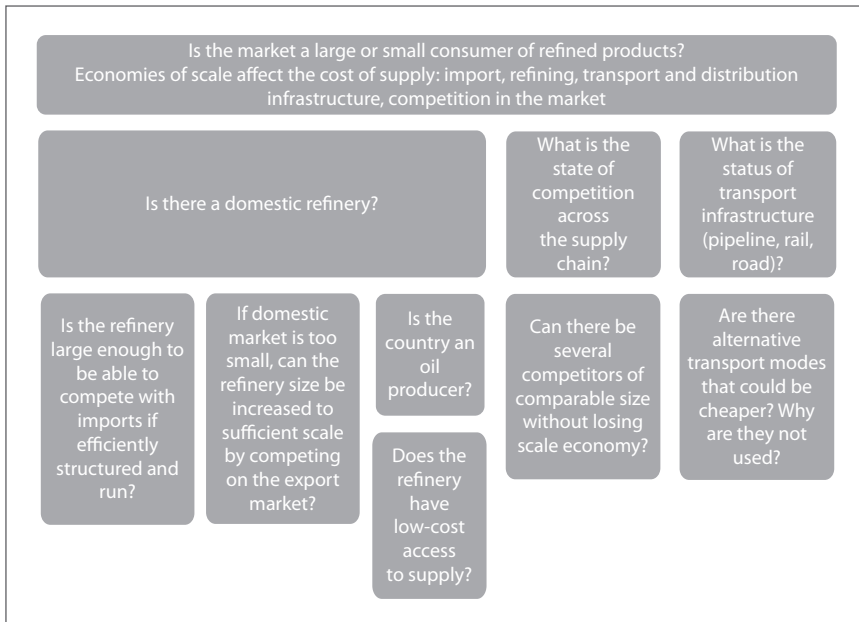
Storage capacity, which exists at every point in the supply chain, is important because stocks can be used to help reduce the magnitude of sharp price spikes due to physical disruptions to supply (Bacon and Kojima 2008). Such protection against supply shortages may be particularly important for landlocked countries. Storage capacity is expensive to build and holding stocks within this capacity also incurs substantial additional financial costs. As a result, companies hold contingency stocks to avoid stock-outs but use just-in-time inventory management just as in any other business; they strive to optimize their capacity with other links in their supply-and-delivery chain. Maximum cost efficiency is achieved when this optimization is achieved and contingency stock levels are the result of a careful risk assessment. The optimal level is situation-specific with no typical standard.

Factors Affecting Price Levels

For a given price of a petroleum product on the world market, a number of factors affect end-user prices net of tax. Some are under the control of the government to varying degrees; others are outside the control of the government and, in some situations, outside the control of any actor in the country.



Figure 1.3 Impact of Market Size on Price Levels



Source: World Bank staff.

Market Size

Market size is an important determinant and affects end-user prices through various channels. Large markets can enjoy economies of scale in procurement and supply infrastructure, and accommodate enough large actors to create healthy and effective competition (figure 1.3).

Economies of Scale

Economies of scale are particularly important for refining. Product demand has been increasingly moving away from fuel oil to gasoline, kerosene, and diesel, requiring cracking of residual fuel oil to white products. At the same time, fuel specifications are being tightened progressively, in particular requiring so-called sulfur-free gasoline and diesel in developed countries. Producing white products meeting tight fuel specifications requires processing units that enjoy large economies of scale. As a basic rule of thumb, a refinery needs to have a processing capacity of at least 100,000 barrels a day (or 5 million tonnes a year) to be economic in a liberalized market. Because it is disproportionately expensive to install small cracking units, small refineries tend to be hydroskimming refineries—hydroskimming refineries have no ability to convert residual fuel oil to white products and have only the units that raise the octane



number of gasoline but not the volume of gasoline produced (World Bank 2008a). If domestic demand for petroleum products is small and much less than the production capacity of an economic-scale refinery, as in many countries in Sub-Saharan Africa, then a refiner is faced with two options: build a sub-economic-scale refinery to serve primarily the domestic market, or build an economic-scale refinery and export some or even the bulk of the products. A sub-economic-scale refinery is unlikely to be able to compete with product imports from large and efficiently run refineries. A world-scale export refinery can take advantage of economies of scale, but will face full international competition. If a refinery is processing domestic crude oil, it has a potential cost advantage because it does not incur the cost of shipping crude or refined products. Similarly, a refinery may have access to relatively low-cost crude oil if, for example, it is a transit country for a crude oil pipeline. But such a cost advantage can be easily offset by higher refining costs if the refinery is small (World Bank 2008a and 2008b).

Competition

It is not easy to have effective competition in a small market, again because of economies of scale in establishing and managing supply assets and in fuel procurement. A large market can accommodate several actors, all enjoying requisite economies of scale, but a small market not necessarily so. This is particularly true for product import, refining, and wholesale. The larger the marine tanker carrying petroleum products, the lower is the unit cost of shipping. This requires two conditions: first, the volume to be purchased be sufficiently large to fill an economic-size tanker, and second, the port be capable of handling large tankers. Some small markets have used joint bulk import with varying degrees of success. Refining and pipeline transport effectively become natural monopolies in small markets. Provided minimal scale requirements are met—the requisite scale economy is not achieved in many markets in the region—and infrastructure is well maintained for long-distance transport over land, pipelines offer the lowest-cost option, followed by rail, and then road. But pipelines, like refineries, require large upfront investment, regular maintenance, and a reliable source of power.

International experience points to the importance of establishing fair, healthy, and transparent competition in the downstream petroleum sector. An effective and well-regulated competitive market imposes relentless pressure on participants to improve efficiency and—equally



importantly—to share the gains with customers. A competitive market also reduces opportunities for corruption and provides a sound basis for attracting new private investment without creating contingent liabilities for government. A monopoly supplier by definition is not competing, although small markets may have natural monopolies. Where effective competition is not possible, economic regulation is needed. Protection provided to domestic refineries through import tariffs increases government revenue in the short run but, by increasing petroleum product prices throughout the economy, could hurt economic growth and lower long-term government revenue.

State Ownership

State-owned enterprises face special challenges. Whether they can achieve sound operational and financial performance highly depends on their ability to be commercially focused, with clear objectives, an appropriate governance structure, and adequate human and financial resources to fulfill their objectives. State-owned enterprises that face soft budget constraints, or are monopoly suppliers, are less likely to pursue efficiency improvement aggressively.

Government Pricing Policies

Pricing policies can have large effects on supply efficiency. Subsidies require that a government estimate what would have been market prices in their absence. In a liberalized market, even the most efficient fuel supplier may lose money from time to time, but a guaranteed subsidy reimbursement, particularly if computed on a cost basis, may eliminate any loss of profit, potentially reducing the incentives to pursue efficiency improvement aggressively. Pan-territorial pricing, whereby fuels obtained in the lowest-cost and highest-cost manners are sold on the market at the same price by means of, for example, tax adjustment, may similarly reduce incentives to minimize cost. A firm that is guaranteed a purchase price through a price or subsidy formula may still pursue a business strategy of cost minimization, but the objective would be to retain surplus profits rather than to lower end-user prices to become more competitive; efficiency gains are not passed onto consumers. If government imposes price ceilings and the *de facto* subsidies are not reimbursed, or if reimbursement is several months or years behind schedule, companies will be drained of funds and not be able to regularly maintain their assets, let alone modernize and expand. This leads to operation of outdated and poorly maintained assets, raising



end-user prices in the long run. Ad-hoc government intervention in pricing to shield consumers from price volatility on the world market, resulting in unpredictable pricing policy, makes business planning difficult and could discourage entry and retention of experienced, efficient operators.

Regulation and Enforcement

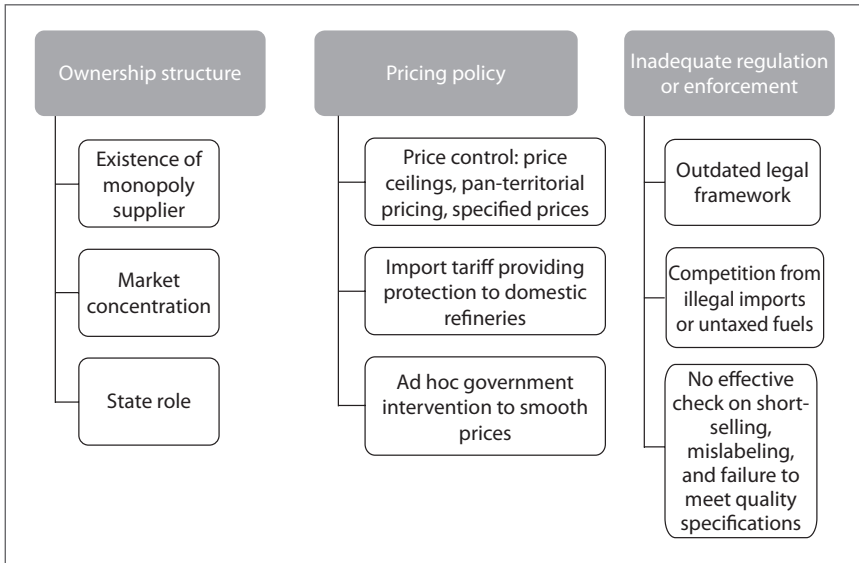
Inadequate regulation and enforcement can also harm the efficiency of fuel supply. Sector regulations that have not been updated in decades, lack sufficient coverage, or list outdated fuel specifications may deter entry of experienced operators adhering to high standards. An efficient legal framework for the downstream petroleum sector requires legislation that clearly defines and limits the role of the government in order to avoid undue interference and establishes principles and rules for the private and public participants in the supply chain in order to create a level playing field and promote fair, transparent, and healthy competition. Laws should not include technical details but create the legal basis for the adoption and application of internationally acceptable technical standards appropriate for the conditions in the country. Simple and clearly defined procedures for the implementation of the law and standards should be set in regulations.

Similarly, a lack of enforcement resulting in wide-scale sale of fuels evading taxes, illegal cheap imports from neighboring countries, short selling, mislabeling (for example, low-octane gasoline sold as high-octane), fuel adulteration, and sale of fuels that do not meet minimal quality standards may lead to partial or total product degradation. A low-quality product could drive out a high-quality product because of consumers' difficulty in distinguishing between the two, especially without effective monitoring and enforcement. Even if prices initially are kept at a level that would cover the costs of the high-quality product, the excess profits that unscrupulous firms can gain by selling a low-quality product would encourage them to cut prices in order to increase sales. Eventually prices could drop until they cover only the costs of the low-quality product. But with sufficient enforcement and reputational risk, firms known not to engage in abuses might be able to expand their market shares and drive out unscrupulous firms. In the short run, cheap illegal imports and fuels evading taxation may benefit consumers. Over the long run, two effects could harm both the sector and society—loss of tax revenues, which could otherwise be spent on primary health, education, and other

public services; and exit from the market of firms not prepared to engage in commercial malpractice.

The foregoing discussion on the impact of sector structure and government policies on the incentives for minimizing costs and delivering quality service is sketched in figure 1.4.

Figure 1.4 Sector Structure and Policies Affecting Price Levels



Source: World Bank staff.

Chapter 2

Overview of the Downstream Petroleum Sector

Different stages of the supply chain and the factors that can potentially affect price levels, presented in figure 1.3 in the previous chapter, are discussed below. This chapter begins with petroleum product consumption patterns in the 12 countries, describes the supply infrastructure and logistics, and concludes with a discussion on oil marketing companies and market concentration.

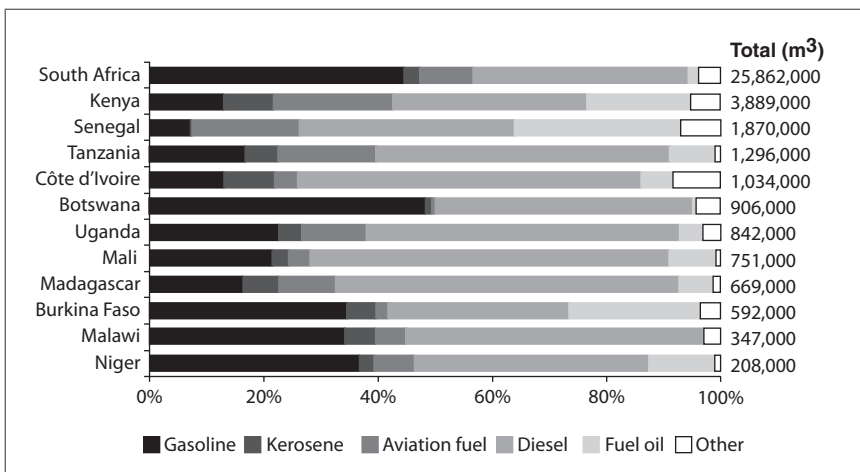
Petroleum Product Consumption

The market sizes of the countries under study varied in 2007 from 26 million cubic meters (m³)—or 450,000 barrels a day—in South Africa to 200,000 m³ (3,600 barrels a day) in Niger (figure 2.1). Daily consumption in Senegal, the third largest market, was 32,000 barrels, which is small by any global measure. The limited size of overall consumption in nine out of 12 countries illustrates the challenges they face in establishing an efficient and competitive downstream petroleum sector.

Diesel constituted more than half of total consumption in six countries: Côte d'Ivoire, Madagascar, Malawi, Mali, Tanzania, and Uganda. Even in Burkina Faso, where the share of diesel was the lowest among the 12, it was close to one-third. The share of gasoline was one-third or higher in five countries: Botswana, Burkina Faso, Malawi, Niger, and South Africa. It was close to one-half in Botswana and South Africa, two countries with the highest per capita income. In the remaining seven countries, the share of gasoline was less than one-quarter, and as low as 7 percent in Senegal. Kerosene consumption is modest in all countries and practically nonexistent in Senegal, where LPG sold in small cylinders is subsidized to promote its use by households as a cooking fuel. Demand for aviation fuel was high in Kenya, Senegal, and Tanzania, which have hub airports serving the region.



Figure 2.1 Demand by Product and Country in 2007



Sources: Official government statistics and data from industry associations.

Fuel oil demand is about 10 percent of the total on average, with Kenya, Senegal, and Tanzania double that at some 20 percent of their total consumption to use for power generation and marine bunkers. While fuel oil is much less expensive than diesel on international markets, it needs to be segregated and heated during shipping and requires certain scale economy for use. The specialized logistics investments required present a barrier to higher use of fuel oil, particularly in small landlocked countries.

Refining Capacities

Four study countries have domestic refineries. All four governments protect their refineries from competition from imports, although the extent of protection varies markedly. The refineries in Côte d'Ivoire and Senegal are majority-owned, and the refinery in Kenya is 50 percent owned by the government. Two refineries in South Africa are entirely privately owned; the remaining two and all synthetic fuel plants (making liquid fuels from coal and natural gas) are partly or wholly owned by the government.

Table 2.1 shows the total processing capacity and the combined capacity for cracking fuel oil—catalytic cracking for maximizing gasoline production and hydrocracking for maximizing diesel production—at each crude oil processing refinery. Taking 100,000 barrels a day as a leading-order benchmark for economic refineries in a liberalized market, it is clear that the refinery in Senegal cannot be economic. The refinery



Table 2.1 Oil Refineries in Study Countries

Country	Refinery	Total capacity (barrels a day)	Cracking capacity (barrels a day)
Côte d'Ivoire	Société Ivoirienne de Raffinage (SIR)	75,000	16,500
Kenya	Kenya Petroleum Refineries Limited (KPRL)	60,000	0
Senegal	Société Africaine de Raffinage (SAR)	25,030	0
South Africa	Caltex Oil	110,000	22,300
	Engen Petroleum Limited	118,750	20,385
	National Petroleum Refiners of South Africa (NATREF)	87,547	37,434
	Shell and BP South African Petroleum Refineries (SAFREF)	169,000	35,680

Sources: Oil and Gas Journal 2009, ipetrolenews.info 2007, KPRL 2010.

in Kenya, aside from its modest size, does not have any cracking capacity and is capable of running only at half of its nominal capacity, making it difficult to compete with imports. The refinery in Côte d'Ivoire is not large but has a hydrocracking unit. The four refineries in South Africa are all reasonably sized with cracking facilities. National Petroleum Refiners of South Africa (NATREF) is the only refinery in the table with both hydrocracking and catalytic cracking units. In addition, South Africa has coal-to-liquids and gas-to-liquids plants, manufacturing high-quality diesel. Combined, these units have a crude processing equivalent capacity of about 200,000 barrels a day.

The two state-owned refineries in West Africa are central to the supply of petroleum products, but both have experienced financial crises in recent years. *Société Ivoirienne de Raffinage* (SIR, Ivorian Refining Company) in Côte d'Ivoire encountered financial difficulties following a political decision to hold the ex-refinery prices down through the 2007–2008 international price escalation. In the case of *Société Africaine de Raffinage* (SAR, African Refining Company) in Senegal, which meets about half of the country's demand, the problem is more fundamental. The refinery is too small to compete with petroleum product imports and accumulated a large debt. Although SAR has weathered the immediate financial problem through the government imposition of a special charge for amortizing the



debt in the price structure, such a move does not address the question of its long-term viability.

Kenya Petroleum Refineries Limited (KPRL) is the only refinery in East Africa. While its nominal capacity is not much smaller than the country's total consumption, the refinery operates at far below the installed capacity. Its operations have also been disrupted by water shortages and grid power outages. In fact, the frequency of the disruptions to the refinery operation prompted the Kenyan energy minister in February 2009 to instruct the refinery to generate its own electricity (*Daily Nation* 2009). Lacking any cracking facility, the refinery's output does not match demand patterns, producing too much fuel oil relative to white products. New refinery management has committed to spending about \$400 million on upgrading the refinery and constructing a 24-megawatt power plant (*All Africa* 2009b).

Supply Infrastructure

In Botswana, Madagascar, South Africa, Tanzania, and Uganda, local oil marketing companies procure all petroleum products, free of government involvement. At the other extreme, Burkina Faso, Côte d'Ivoire, and Niger acquire all their products through state-owned monopoly suppliers. The remaining four countries use a mix of private sector supply and government supervision.



Ports

The primary import ports for all countries can receive adequately sized cargoes relative to their markets. The Kurmani Oil Jetty in Mombasa in Kenya is capable of receiving 80,000 dead-weight-tonne tankers, more than adequate for refined product cargoes, which are typically about 30,000–60,000 tonnes. All primary ports, except possibly Dakar, Senegal, and Durban, South Africa,¹ have adequate shore storage capacity. Senegal's capacity in the Dakar port is 65 days of consumption compared with the capacity of the Vridi port in Côte d'Ivoire equivalent to 141 days. Both the government and the industry recognize that the Dakar capacity is tight and are now in the process of expanding it. In Abidjan and Vridi in Côte d'Ivoire, there is considerable trans-shipping and export business and a requirement for the main storage operator, *Société*

¹Statistics on storage capacity in South Africa are, for reasons no longer valid, confidential. However, anecdotally several interviewees mentioned during the consultant visit that access to third-party storage was a serious problem.



de Gestion des Stocks de Sécurité (Security Stock Management Company), to hold the industry's security stocks.

Third-party imports into, and storage in, Durban are restricted. Madagascar's only significant import port, Tamatave, belongs to the Galena Refinery Terminal, a private oil marketing company; no other company has been able to obtain a permit to construct a terminal at the Tamatave port. Third parties cannot access storage terminals at the two primary ports in Côte d'Ivoire, Abidjan and Vridi, nor in Cotonou, Benin, which is the primary port of entry for petroleum products destined for Niger.

Pipelines

State-owned product pipelines exist in Kenya and South Africa. The 30-year-old Mombasa–Nairobi section of the oil pipeline in Kenya has at times operated at only 50 percent of capacity, partly because of erratic power supply (*East African* 2007). Undertaking pipeline repairs has also reduced the volume of fuel shipped. Switching to trucking is not easy because of poor road conditions and slow border clearance. Work was to begin in May 2009 on extending the product pipeline from Eldoret in Kenya to Kampala in Uganda, but the start of construction has been postponed, mainly because not all of the land for the route has been acquired. This vital project has been delayed for years: the first memorandum of understanding was signed in 1995, and an invitation for expressions of interest was issued in May 2004. With discovery of oil in Uganda, there is a proposal to redesign the pipeline to accommodate a reversed flow of oil and petroleum products. Such a redesign is likely to result in a further delay (IHS Global Insight Daily Analysis 2009).

South Africa has both crude oil and petroleum product pipelines. Petronet, a subsidiary of Transnet, which is majority owned by the government, is responsible for their operation. An impediment to price efficiency is a temporary capacity constraint on the Transnet pipeline from Durban to South Africa's industrial heartland, Gauteng. This affects the cost of product supply not only to South African markets, but also to Botswana. In response, Transnet has a plan to build a new multiproduct pipeline.

Storage

Storage capacity at major consuming centers is generally good except in Malawi and Uganda. Dar es Salaam has the greatest number and diversity of oil terminals in Sub-Saharan Africa: 13 separate installations with a total storage capacity of almost 500,000 m³, equivalent to 137 days of consumption. Terminal fees are low, despite the concerns expressed



in an October 2007 order by the Energy and Water Utilities Regulatory Authority (EWURA) about a lack of transparency in third-party access and complaints of high hospitality charges, discrimination, and denial of access to local oil marketing companies. Uganda has storage capacity equivalent to about 20 days, and that in Malawi is even more limited. Given the frequent supply disruptions landlocked Uganda has experienced in recent years, greater storage capacity would be needed to protect the market against unanticipated supply shortages in the future.

Thanks to storage and loading racks at most of Kenya Pipeline Company's and some of Transnet pipeline's take-off points, third-party access is not a problem in Kenya or South Africa. Because of the numbers of participants, third-party storage access is not a problem in Tanzania or Uganda. Third-party access in Botswana and Malawi is more problematic and is likely allowed only on a quid-pro-quo basis.

Land transport infrastructure and equipment for bulk movement of oil products is only fair, with potential for improvements. There are prospects for product pipelining in West Africa with the state oil company *Société Nationale d'Operations Pétrolières* (Petroleum Operation National Company) in Cote d'Ivoire engaged in the construction of an Abidjan-Yamoussoukro-Bouaké multi-product line with the possibility of future extensions to Bobo-Dioulasso in Burkina Faso and to Mali.



Rail Transport

To the extent that rail transport exists, it is generally underutilized. The 1,260-kilometer Abidjan-Bouaké-Bobo-Dioulasso-Ouagadougou line, operated by privately owned Sitarail, runs through Côte d'Ivoire and Burkina Faso. Products are also trucked from the railway station in Bobo-Dioulasso to Mali. The line is fairly well utilized and Sitarail is keen to do more business but volume has been constrained by the internal conflict in Côte d'Ivoire and falling procurement of petroleum products from SIR by the *Société Nationale Burkinabè d'Hydrocarbures* (SONABHY, Burkina National Hydrocarbon Company). The planned product pipeline presents competition to rail.

Since 2003 a private concession holder, Transrail Consortium, has managed the 1,250-kilometer line between Dakar in Senegal and Bamako in Mali. Transrail has not made much progress in rehabilitating and expanding the infrastructure and improving the quality of service. Its management reportedly has little incentive to invest in the rail infrastructure to maintain the capability to transport petroleum products. Tank wagons are left standing for weeks at a time at the unloading depots,



exposing them to theft and product deterioration, resulting in large non-technical losses. Most Mali importers have trucking businesses, further discouraging the promotion of rail transport. For these reasons, rail volume has declined to a fraction of the total volume moved in West Africa.

In Malawi, Tanzania, and Uganda, the underutilization is due to the rundown state of the rail infrastructure. Two railways in Tanzania are not competitive and lose out to more expensive road haulers. The rail line from Nacala in Mozambique to Malawi is in poor condition. Given disruptions to pipeline operation in Kenya, rail is theoretically an alternative option but is slow and the rail freight tariffs are more than double the pipeline tariffs. In Madagascar, the sole (monopoly) distribution company, *Logistique Pétrolière S.A.* (Petroleum Logistics Company), appears to favor road transport over rail despite the ability of Madarail to move much more oil at a significantly lower cost.

Trucking

It is common practice in the long-distance petroleum product trucking business in West Africa and elsewhere to acquire imported second-hand trucks and reconstruct the tanks to carry far above the design capacity. Overloading is unsafe and causes excessive road damage, but enforcement is weak and the axle load limits are regularly exceeded. In the very short run, overloading can reduce transport costs: it would generally be cheaper to have two overloaded trucks carry 30 tonnes of freight between them than three properly loaded trucks carrying 10 tonnes each. Another aspect of long-distance trucking is the large number of formal and informal charges that must be paid on the routes between coastal depots and their inland depot destinations. These high costs provide incentives to minimize the number of trucks used to transport a given amount of fuel, such as by overloading. When Kenya started enforcing the three-axle limit rigorously in 2008, fuel shortages ensued. Over the long run, however, overloading causes more accidents and increases the cost of proper vehicle maintenance. Damaged roads slow the speed of even properly maintained and loaded trucks and rule out the possibility of using highly efficient, longer, and higher-gross-weight trucks.

Fuel supply arrangements and supply infrastructure are summarized for West Africa in table 2.2 and East and Southern Africa in table 2.3. Eight out of 12 countries rely entirely on petroleum product imports. Côte d'Ivoire and South Africa rely mostly on their domestic refineries, all others on imports. The sources of direct product imports through

Table 2.2 Supply Arrangements and Logistics Infrastructure in West Africa

Characteristics	Burkina Faso	Côte d'Ivoire	Mali	Niger	Senegal
2007 consumption ('000 m³)	592	1,034	751	208	1,870
Product imports (% of total)	100	5	100	100	60
Primary sources of supply	<ul style="list-style-type: none"> • SIR refinery in Abidjan, Côte d'Ivoire • Lomé, Togo • Cotonou, Benin • Tema refinery, Ghana 	<ul style="list-style-type: none"> • SIR refinery in Abidjan, Côte d'Ivoire 	<ul style="list-style-type: none"> • Dakar, Senegal • SIR refinery in Abidjan, Côte d'Ivoire • Lomé, Togo • Cotonou, Benin • Tema refinery in Ghana 	<ul style="list-style-type: none"> • Cotonou, Benin • Lomé, Togo • Tema refinery, Ghana • Fuel smuggling from Nigeria 	<ul style="list-style-type: none"> • SAR refinery • Product imports
Supply arrangements	SONABHY procures all petroleum products through a mix of open and restricted tenders, direct purchases, and long-term contracts with Abidjan, Cotonou, and Tema.	SIR procures Nigerian crude based on allocation from Nigeria.	More than 50 Mali importers largely negotiate their own arrangements with suppliers. There is still an official state-price from SIR, Abidjan and SAR, Dakar.	For legal imports, SONIDEP procures all supplies through restricted tenders or equivalent negotiations.	Government procures crude for SAR via state-to-state deal with Nigeria. A committee of government and licensed importers assesses product deficits every 15 days and allocates import entitlement to one or more operators.
Primary port for imports	Lomé	Abidjan/Vridi	Dakar	Cotonou	Dakar

(continued)

Table 2.2 Supply Arrangements and Logistics Infrastructure in West Africa (continued)

Characteristics	Burkina Faso	Côte d'Ivoire	Mali	Niger	Senegal
Maximum tanker size (dead weight tonnes)	50,000	30,000	50,000	30,000	50,000
Third party access to storage terminals	Yes	No	Yes	No	Yes
Secondary port for imports	Cotonou	No secondary port	Cotonou	Lomé	No secondary port
Primary transport to main consuming centers	Rail and road	Rail and road	Road	Road	Road
Current transport capacity	Good	Good	Good	Good	Good
Third party access	Yes	Yes	Yes	Yes	Yes
Main consuming center	Ouagadougou	Abidjan	Bamako	Niamey	Dakar
Third party access to storage depots	No	Same as primary port	Yes	No	Same as primary port

Sources: World Bank consultant interviews with government and industry officials.

Note: SONIDEP = Société Nigérienne de Dépôt d'Essence et de Pétrole (Niger Oil and Gas Depot Company)

Table 2.3 Supply Arrangements and Logistics Infrastructure in East and Southern Africa

Characteristics	Botswana	Kenya	Madagascar	Malawi	South Africa	Tanzania	Uganda
2007 consumption ('000 m³)	906	3,889	669	347	25,862	1,296	842
Product imports (% of total)	100	51	100	100	5	100	100
Primary sources of supply	South African refineries	KPRL refinery in Kenya, product imports	Middle East	South Africa, Middle East	South Africa	South Africa, Middle East	KPRL and Middle East
Supply arrangements	All done by OMCs without government involvement.	All registered OMCs must process crude oil at KPRL and participate in open tenders for that crude, and separately for 70% of petroleum products.	All four OMCs voluntarily import on a joint cargo basis; there is no government involvement.	Products are imported on an annual open tender basis by Petroleum Importers Ltd., a private company comprising the four OMCs.	All done by OMCs without government involvement.	All done by OMCs without government involvement.	All done by OMCs without government involvement.
Primary port for imports	Durban in South Africa	Mombasa, Kurmani	Tamatave	Beira in Mozambique	Durban	Dar es Salaam	Mombasa and Kurmani in Kenya
Maximum tanker size (dead weight tonnes)	45,000 to 50,000	80,000	Greater than 50,000	40,000	45,000 to 50,000	45,000	80,000

(continued)

Table 2.3 Supply Arrangements and Logistics Infrastructure in East and Southern Africa (continued)

Characteristics	Botswana	Kenya	Madagascar	Malawi	South Africa	Tanzania	Uganda
Third party access to storage terminals	Quid pro quo	Yes	In theory	Limited	Quid pro quo	Yes	Yes
Secondary port for imports	No secondary port	Mombasa and Shimanzi	None accepting ships greater than 20,000 dead weight tonnes	Dar es Salaam, Nacala	No secondary port for petroleum products	No secondary port	Dar es Salaam in Tanzania
Primary transport to main consuming centers	Pipeline to Gautang in South Africa	Pipeline	70% by road	Road and rail	Pipeline	Road	Pipeline to Eldoret, then road
Current transport capacity	Pipeline constraint in South Africa	Good	Good	Good for road, poor for rail	Constrained	Poor	Fair
Third party access	Yes	Yes	No	Yes	Yes	Yes	Yes
Main consuming center	Gaborone	Nairobi	Antananarivo	Lilongwe & Blantyre	Gauteng	Dar es Salaam	Kampala
Third party access to storage depots	Quid pro quo	NOCK grants access, or quid pro quo	Yes	Yes, if spare capacity	Quid pro quo	Yes	Limited

Sources: World Bank consultant interviews with government and industry officials.

Notes: OMCs = oil marketing companies, NOCK = National Oil Corporation of Kenya.

coastal terminals in West Africa are generally regional refineries (Nigeria, Côte d'Ivoire, Canary Islands) and continental Europe; in East and Southern African, imports are from regional refineries (South Africa, Kenya) or the Middle East.

Market Structure

The number of oil marketing companies and measures of market concentration are given in table 2.4. A standard measure of industrial concentration is the Herfindahl-Hirschman index (HHI), which is calculated by summing the squared market shares of all of the firms in the industry. The U.S. Department of Justice considers an industry concentrated if the HHI exceeds 1,800; it is unconcentrated if the HHI is below 1,000. The table shows the total number of oil marketing companies, the market share of the company with the largest market share, the combined market share of the top four companies, and the HHI in

Table 2.4 Market Structure Features of Study Countries

Country	2007 consumption (m ³)	Number of oil marketing companies	Market share of leader (%)	Market share of top four (%)	HHI	HHI if each company has an equal share
Botswana	910,000	5	31	93	2,367	2,000
Burkina Faso	590,000	19	38	71	1,963	526
Cote d'Ivoire	1,000,000	23	25	75	1,544	435
Kenya	3,900,000	25	32	80	1,937	400
Madagascar	670,000	4	34	100	2,675	2,500
Malawi	350,000	4	n.a.	100	2,800	2,500
Mali	750,000	53	15	46	915	189
Niger	210,000	18	48	83	2,959	556
Senegal	1,900,000	13	40	84	2,445	769
South Africa	26,000,000	9	25	71	1,699	1,111
Tanzania	1,300,000	25	16	50	1,107	400
Uganda	840,000	40	33	69	1,831	250

Sources: World Bank consultant interviews with government and industry officials, official government statistics, and authors' calculations.

Note: n.a. = information not available.

each country. The table also computes the hypothetical HHI if all the companies operating in the sector had an equal market share.

Mali has the largest number of operators and is the least concentrated. The Niger market is the most concentrated and is closely followed by Malawi, Madagascar, Senegal, and Botswana. The concentration of the Senegal market is surprising because significant legislative measures have been taken to promote open access to the depot capacity in Dakar. In Madagascar, Malawi, and South Africa, the actual HHIs do not depart significantly from the theoretical values assuming equal shares by all firms, suggesting that the market is fairly evenly shared.



Chapter 3

Policies that Affect Price Levels

Government policies—to establish and protect state-owned enterprises, exercise influence over price levels, and establish and enforce regulations, to mention a few—have immediate and long-term effects on price levels (as shown in figure 1.4).

Legal Framework

A clearly defined and stable legal framework that takes into account lessons learned from national and international experience, along with effective monitoring and enforcement of the laws and regulations in effect, is important to create a level playing field and foster effective competition.

The situation in the 12 study countries is mixed. With the exception of Senegal, the remaining four countries in West Africa need much work to strengthen their legal and institutional frameworks. The four countries have not modernized their legal framework in decades and rely on disparate texts from French colonial times. Their institutional setup also largely reflects the old French system, with the sector licensing and pricing reporting through each ministry of commerce, while the equivalent of an energy ministry is mandated to deal with such technical issues as petroleum product quality and the mechanical integrity and safety of installations.

Throughout the West African region, monitoring and enforcement of the regulations in effect are weak. Mali has made some progress with customs surveillance using a contracted inspection firm. Senegal has an updated legal framework and specialized regulatory institution, but has not yet developed effective enforcement.

A frequently encountered deterrent to developing a comprehensive legal framework and centralized, specialized regulatory and enforcement institutions is the presence of a strong state company, dominating a major segment of the sector. The state entity all too often ends up regulating



itself and, in some instances, other commercial operators. This may be the case in SONABHY in Burkina Faso, SIR in Côte d'Ivoire, and *Société Nigérienne de Dépôt d'Essence et de Pétrole* (SONIDEP, Niger Oil and Gas Depot Company) in Niger.

The seven countries in East and Southern Africa have established reasonably good legal and institutional frameworks, but oversight and enforcement are weak except in Botswana and South Africa. The remaining five countries need to strengthen their regulatory and institutional capacity. They have limited resources to afford the necessary structures required to achieve efficient pricing.

Tanzania's EWURA appears to be doing a good job. It is the only regulator in East Africa that regularly makes available on its Web site

- indicative retail prices and price ceilings for gasoline, kerosene, and diesel by location; and
- wholesale prices.

Its 2008 annual report provides detailed statistics about product quality test results, the number of operators and installations, capacities and physical conditions of the installations, import statistics, and monthly international and domestic retail prices.

An example of downstream oil sector legal texts that require review is fuel quality. On the books, Madagascar appears to retain a grade of leaded gasoline with a research octane number of 87 and with a maximum lead content of 0.30 grams per liter. Gasoline worldwide is unleaded today with a limit of 0.013 grams per liter. While gasoline in Madagascar is likely to be unleaded, aligning fuel specifications with minimally acceptable international standards is important.

The problem with fuel specifications is more serious for diesel. Burkina Faso, Côte d'Ivoire, Mali, and Niger retain an outdated maximum sulfur specification of 1.0 percent by weight. Senegal has a maximum specification of 0.5 percent, as do the countries in East and Southern Africa. The actual quality supplied in West Africa is generally in the range of 0.15 to 0.2 percent because the sulfur content of the crude oil used in local refining is low. However, having a high legally permissible maximum might tempt suppliers responding to open international competitive bidding, particularly those from outside the region, to exploit this lenient specification and use one or more of these countries as "dumping grounds" for high-sulfur fuels.

Tables 3.1 (West Africa) and 3.2 (East and Southern Africa) show the status of legal and institutional setups in the study countries.

Table 3.1 Legal and Institutional Framework in the Downstream Petroleum Sector in West Africa

	Burkina Faso	Cote d'Ivoire	Mali	Niger	Senegal
Ease of doing business ranking out of 183 countries (1=best, 183=worst)	147	168	156	125	157
Government participation					
Refining	No refinery	69%	No refinery	No refinery	65%
Importing products	100%	100%	None	100%	Oversight
Logistics infrastructure	100%	Significant	Limited	100%	Limited
Marketing products	None	Limited	None	None	None
Strategic stocks	Yes	Yes	None	Yes	None
Existence of comprehensive legislation (comments)	No (only some disparate texts relating to price, licensing, and SONABHY attributions)	No (only disparate few texts relating to price, licensing, fraud, and safety)	No (only few recent texts regarding price, licensing, and ONAP attributions)	No (few texts regarding price, licensing, and SONIDEP attributions)	Yes (fairly comprehensive recent texts)
Existence of centralized, specialized downstream regulatory institution (comments)	No (old French model of commerce ministry for licensing and price and mines/energy ministry for technical issues)	No (DH under ministry does not do much per old French model; commerce ministry controls licensing)	Yes (but effectiveness is questionable)	No (old French model of commerce ministry for licensing and price and mines/energy ministry for technical issues)	Yes (although actual regulatory function appears weak)
Oversight and enforcement	Weak	Weak	Weak to moderate	Weak	Moderate

Sources: World Bank consultant interviews with government and industry officials, World Bank 2009b.

Notes: DH = Direction des Hydrocarbures (Hydrocarbon Directorate), ONAP = L'Office National des Produits Pétroliers (National Office of Petroleum Products)

Table 3.2 Legal and Institutional Framework in the Downstream Petroleum Sector in East and Southern Africa

	Botswana	Kenya	Madagascar	Malawi	South Africa	Tanzania	Uganda
Ease of doing business ranking out of 183 countries (1=best, 183=worst)	45	95	134	132	34	131	112
Government participation							
Refining	No refinery	50%	No refinery	No refinery	Significant	No refinery	No refinery
Importing products	None	Oversight	None	None	None	None	None
Logistics Infrastructure	None	Significant	None	Limited	Significant	Limited	None
Marketing products	None	Limited	None	None	Some	None	None
Strategic stocks	None	Limited	None	Unknown	Significant	Significant	Minor
Existence of comprehensive legislation (comments)	Not known (believed to be yes)	Under development	Yes (good texts but lacking enforcement provisions)	Yes (reported by OMCs to be good)	Yes (very comprehensive)	Yes (2008 Petroleum Act)	Yes (fairly comprehensive recent texts)
Existence of centralized, specialized downstream regulatory institution (comments)	No (but possibly within a proposed regulator)	Yes (within the independent ERC)	Yes	n.a. (MERA may have an oil branch)	NERSAs oil department deals only with pipelines; DME manages fuel specifications and pricing	YES (within the independent EWURA)	There is a Commissioner of Petroleum within the MEMD
Oversight and enforcement	n.a. (but probably good)	Weak	Weak	n.a. (probably weak)	Good	Good oversight, weak enforcement	Weak

Sources: World Bank consultant interviews with government and industry officials, World Bank 2009b.

Notes: n.a.= information not available, OMCs = oil marketing companies, MERA = Malawi Energy Regulatory Authority, NERSA = National Energy Regulator of South Africa, DME = Department of Minerals and Energy of South Africa, MEMD = Ministry of Energy and Mineral Development



Only Senegal in West Africa and South Africa, Tanzania, and possibly Botswana in East and Southern Africa can be said to have reasonable to good systems. It is too early to draw conclusions about Kenya or Malawi where new regulators have very recently been established. The tables also show the results from *Doing Business 2010*, which tracks regulatory reforms aimed at improving the ease of doing business (World Bank 2009b). *Doing Business* ranks economies based on 10 indicators of business regulation that record the time and cost to meet government requirements in starting and operating a business, trading across borders, paying taxes, and closing a business; the rankings do not reflect such areas as macroeconomic policy, security, labor skills of the population, or the strength of the financial system or financial market regulations.

Pricing Policy

As the vertical integration in the industry began to break down in the 1960s, transaction prices at each stage in the supply chain, and in each global refining and trading center, gradually became known and published. As with any fungible commodity, arbitrage ensured that the quality-adjusted price of a liter of gasoline or any other petroleum product in one center differed from that in another by only slightly more than the marginal cost of transport. More recently, long-term contracts gave way to contracts where prices are typically based on spot international reference prices at the time of purchase.

Table 3.3 summarizes the main petroleum product pricing features of the 12 countries. Eight have price control, including all five West African countries. They use different variations of an import parity structure with international spot reference prices, market marine freight rates, and the dollar-local currency exchange rates as the three key short-term adjustment parameters.

A system of price control consists of two basic elements:

1. The price buildup structure, starting with import-parity landed costs and adding storage, transportation, margins, and other costs
2. The adjustment mechanism comprising short-term adjustment parameters, and the frequency of and the trigger for adjusting prices

With the exception of Malawi, the countries with price control adjust prices monthly. Malawi has a price stabilization fund and has no pre-set automatic adjustment frequency. The stabilization fund ran up a large deficit in 2008. Only in Botswana, Senegal, and South Africa is the price adjustment automatic, based on pre-established administrative procedures.



Table 3.3 Pricing Policy

Country	Retail pricing Basis	Main short-term adjustment parameters	Adjustment frequency and trigger	Political interference with frequency and trigger	Provision for regular review and adjustment of parameters such as margins	Pan-territorial pricing
Burkina Faso	Controlled	Import parity	Monthly, automatic in principle but with ad-hoc intervention	Yes	No	2 sets of uniform prices depending on location
Côte d'Ivoire	Controlled	Import parity	Monthly, automatic in principle but with ad-hoc intervention	Yes	No	Yes
Mali	Controlled	Import parity	Monthly, automatic in principle but with ad-hoc intervention	Yes	No	Yes
Niger	Controlled	Import parity	Monthly, automatic in principle but with ad-hoc intervention	Yes	No	Yes
Senegal	Controlled	Import parity	4 weeks, automatic	No	Yes	Yes
Botswana	Controlled	Import parity	Monthly, automatic	No	Yes	No
Kenya	Liberalized	—	—	—	—	No
Madagascar	Liberalized	—	—	—	—	Yes

(continued)

Table 3.3 Pricing Policy (continued)

Country	Retail pricing Basis	Main short-term adjustment parameters	Adjustment frequency and trigger	Political interference with frequency and trigger	Provision for regular review and adjustment of parameters such as margins	Pan-territorial pricing
Malawi	Controlled	Import parity	Ad hoc	Yes	n.a.	n.a.
South Africa	Controlled	International spot prices, marine freight, and exchange rate	Monthly, automatic	No	Yes	No
Tanzania	Liberalized	—	—	—	—	No
Uganda	Liberalized	—	—	—	—	No

Sources: World Bank consultant interviews with government and industry officials

Notes: — = not applicable, n.a. = information not available.

In Burkina Faso, Côte d'Ivoire, Mali, and Niger, in spite of having pre-established procedures, ad-hoc interventions occur in each adjustment.

Pan-territorial pricing by definition means that true costs are not reflected in market prices, and reduces incentives to minimize costs because offering lower prices by improving supply efficiency is not an option. In Mali, for example, prices are maintained uniform through tax differentiation. Fuels obtained in the lowest-cost manner are taxed most heavily, and conversely highest-cost fuels are taxed the least. This means that cost savings cannot be passed onto consumers, and a firm cannot lower prices in the hope of expanding its market share.

In West Africa, for the most part, the prices are maintained uniform throughout each country. The only minor exception is Burkina Faso which adjusts ex-depot prices at Ouagadougou (Bingo depot) and Bobo-Dioulasso, and has two sets of prices depending on the location. The countries with sector liberalization have regional price variations established by the market. One exception is Madagascar where the logistics operator—*Société Logistique Pétrolière SA*, a private firm that owns and controls all terminals and depots—provides a common “postage stamp” ex-depot price from all the depots in the country. Such a setup is unlikely to lead to a strong drive to increase efficiency and reduce cost.

A recent review of developing country governments' response to the oil price volatility of the past two years showed that, against the severe price rises of 2007 and 2008, few governments were able to withstand the pressure to use or increase fiscal measures to lower prices (Kojima 2009b). As a result, some countries that moved to automatic price adjustment mechanisms years ago suspended price adjustment and bore financial losses. In West Africa, four of the five study countries engaged in price smoothing during the run-up in international prices from 2007 through mid-2008. Only Senegal maintained a consistent automatic adjustment process. The adjustment timing and process steps to be taken every four weeks are defined in the 1998 sector restructuring legislation and have been rigorously followed.

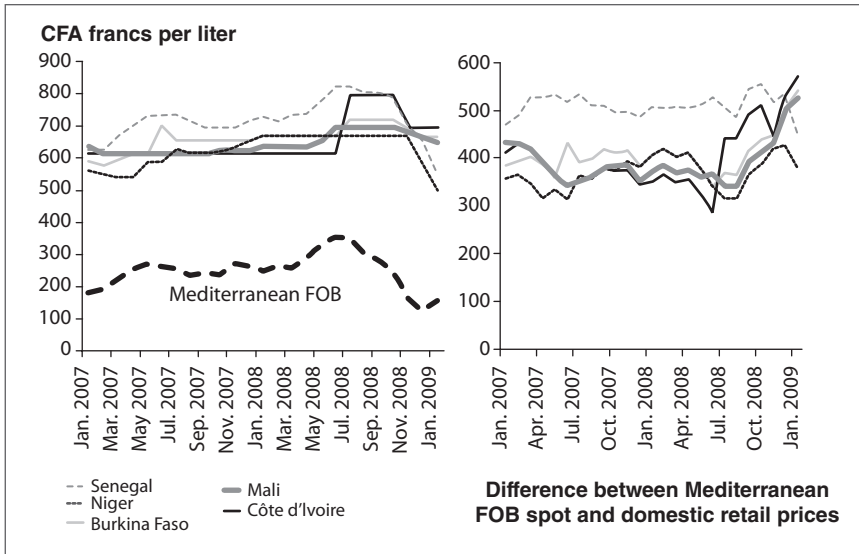
The other four countries, Burkina Faso, Côte d'Ivoire, Mali, and Niger, suspended automatic price adjustment based on a clearly defined import parity structure. Price stabilization was achieved through large fuel tax reductions (resulting in a loss of government revenue) or making the state supply company bear the financial losses.

An added positive element in Senegal's pricing regime is the provision built into the legislation for a regular review of longer-term adjustment parameters such as distributor and retail margins. The other four countries still rely on an ad-hoc approach to such adjustments.

Figures 3.1 through 3.3 show monthly retail prices for gasoline, kerosene, and diesel in the five West African countries between January 2007 and January 2009. Also shown are the spot Mediterranean free-on-board (FOB) reference prices (left graph) and the differences between the retail prices and the spot Mediterranean FOB prices (right graph).

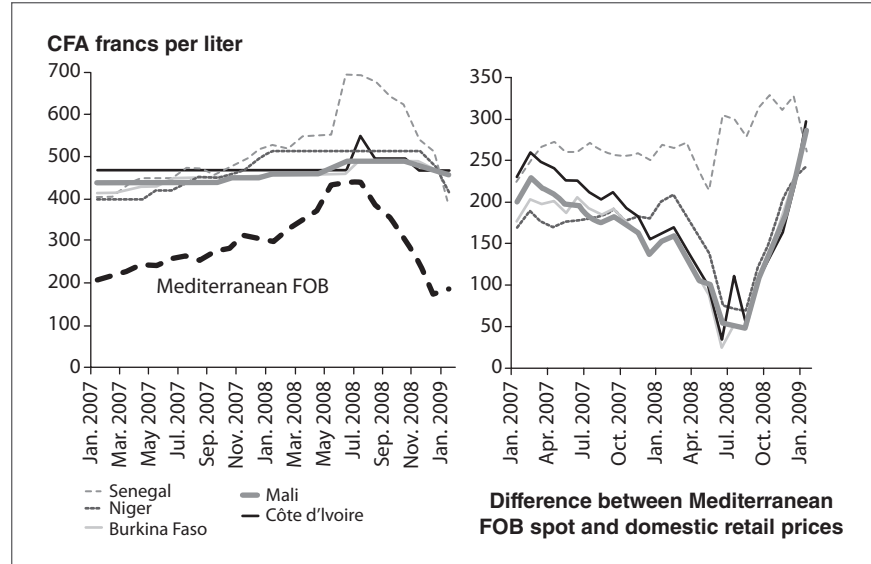
Attempts at stabilization are most pronounced for kerosene, since households use it for lighting and cooking, followed by diesel and then by gasoline. This order follows the generally accepted social impact of different fuels. Gasoline is a fuel of the rich in low-income countries and tends to be subsidized the least (or alternatively taxed most heavily), while many countries regard kerosene as a “social fuel,” and diesel to a lesser extent. Where stabilization became too costly and prices had to be raised, it is not clear that the shock to the economy following a large price adjustment, such as the one for diesel in Côte d’Ivoire in July 2008, was more than offset by the benefits of lower prices in the earlier months. As international prices began to fall rapidly in the latter half of 2008—the Mediterranean spot prices of the three fuels were lower in January 2009 than two years earlier—the countries tried to recover the losses suffered during the period of price smoothing and maintained relatively high prices, widening the differences between Mediterranean spot and domestic retail prices above the levels in early 2007.

Figure 3.1 Monthly Retail Gasoline Prices in West Africa (Jan. 2007–Jan. 2009)



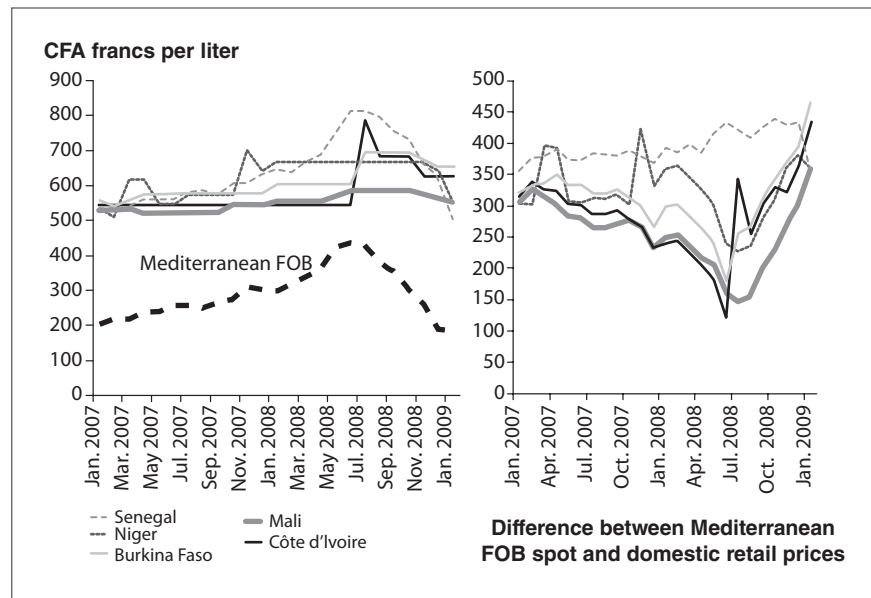
Sources: Monthly retail price series from government regulatory authorities, Energy Intelligence 2009, and authors’ calculations.

Figure 3.2 Monthly Retail Kerosene Prices in West Africa (Jan. 2007–Jan. 2009)



Sources: Monthly retail price series from government regulatory authorities, Energy Intelligence 2009, and authors' calculations.

Figure 3.3 Monthly Retail Diesel Prices in West Africa (Jan. 2007–Jan. 2009)



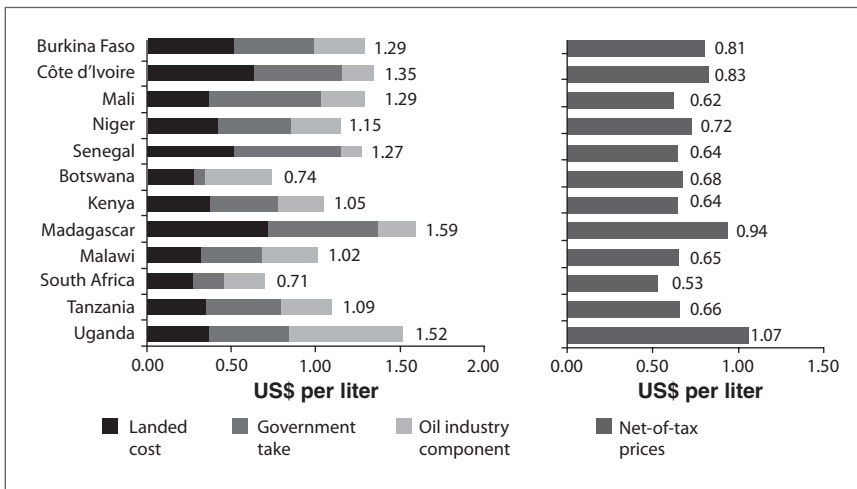
Sources: Monthly retail price series from government regulatory authorities, Energy Intelligence 2009, and authors' calculations.

Figures 3.4 and 3.5 show the retail prices in early December 2008 for gasoline and diesel, respectively. The left graph shows three principal components:

1. Landed cost including cost, insurance, and freight, which covers the FOB price at the port from which the petroleum product is imported, marine freight and all freight/cargo-related costs, evaporation and other losses en route, and port fees to land the product in the pertinent receiving port, or, in countries with price control, hypothetical import-parity price corresponding to the landed cost used to calculate retail prices
2. Government take (referred to as tax hereafter), which includes all taxes, duties, and government fees that are incurred in the supply chain that go to the treasury or to earmarked funds
3. Oil industry component, which covers all gross margins for storage, inland bulk transport, local delivery, wholesale, and retail distribution.

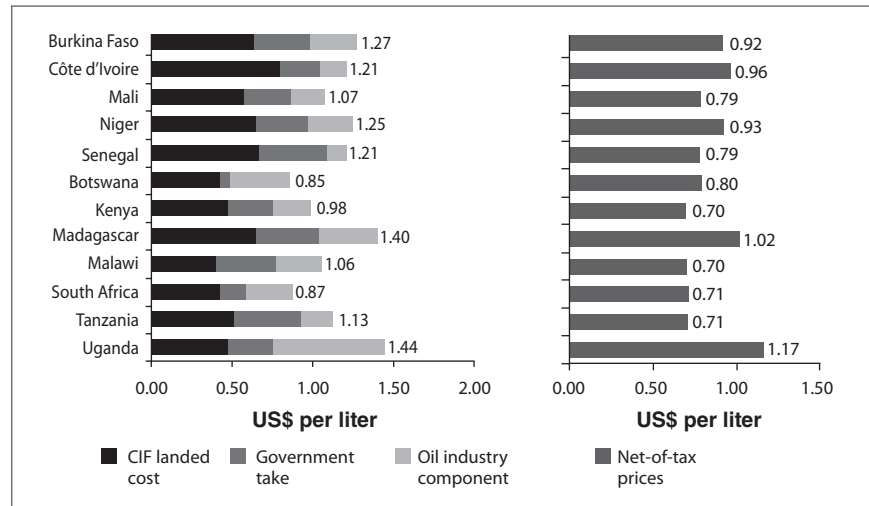
The difference between the retail selling price and the sum of the landed cost and government take represents the gross margin component available to the downstream petroleum industry. In markets where prices are liberalized, this number is derived by difference and is the least accurate of the three components. The right graph shows retail prices net of tax (government take), that is, the retail price minus component 2.

Figure 3.4 Retail Gasoline Prices in December 2008



Sources: Government regulatory authorities, World Bank consultant interviews with government and industry representatives, and consultant estimates.

Figure 3.5 Retail Diesel Prices in December 2008





Sources: Government regulatory authorities, World Bank consultant interviews with government and industry representatives, and consultant estimates.

The landed cost of gasoline at the primary coastal supply points range from a low of \$0.28 per liter in Botswana and South Africa to a high of \$0.73 per liter in Madagascar. The range for diesel was slightly smaller, from a low of \$0.41 per liter in Malawi to a high of \$0.80 per liter in Côte d'Ivoire. As shown in figures 3.1 and 3.3, Côte d'Ivoire and Burkina Faso kept their ex-refinery and ex-depot prices, respectively, well above actual costs as world prices declined in late 2008, and these price stabilization strategies explain the relatively high landed prices in December 2008.


Excluding Côte d'Ivoire's artificially high numbers, Madagascar has by far the highest landed cost, more than double the average of the others. A possible explanation for Madagascar's high numbers is its relative isolation and often very small import parcels; further analysis would be needed to account for such a large difference.

Total government take showed greater variation than landed costs, varying nearly ten-fold across countries for gasoline and eight-fold for diesel. The government take for gasoline ranged from a low of \$0.07 per liter in Botswana to a high of \$0.67 per liter in Mali and \$0.65 per liter in Madagascar, and for diesel from \$0.06 per liter in Botswana to a high of \$0.42 per liter in Senegal and Tanzania. Taxes on petroleum products are a critical source of government revenue for low-income countries. The reason is that taxing fuel is one of the easiest ways to get revenue: collecting fuel taxes is relatively straightforward, and the consumption of fuels as a group



is relatively price inelastic and income elastic, ensuring buoyant revenue as income rises and tax rates are increased (Bacon 2001). In setting tax rates on gasoline and diesel, many factors need to be considered. They include the government's revenue requirements, efficiency of resource use, the need to finance road maintenance, road congestion impacts, equity, the use of fuels in sectors other than transport, and the impact of the fuel tax structure on other economic activities and on the poor.

It is not possible to achieve all these objectives simultaneously through fuel tax policies alone. Most governments complement fuel taxation with other policy instruments, in particular to correct for externalities. The challenge of meeting the various objectives is especially difficult in low-income countries, where fewer policy instruments are available. In determining the levels and structure of fuel taxation, important compromises have to be made between the effects on government revenue generation, income distribution, the efficient use of roads, and environmental pollution. In so doing, attention must be accorded to the relative importance of each objective, the efficiency of fuel taxation as an instrument for achieving the objectives, and the magnitude of any perverse effects—such as adulteration of high-tax fuels with low-tax fuels—in relation to other aims (Gwilliam and others 2001).



Because the oil industry component is a residual value obtained by subtracting a sum of two estimated numbers from the retail price, it is the least accurate of the three components and hence comparison across countries should be treated with caution. Uganda's totals of \$0.68 to \$0.69 per liter stand out; they are almost double the next highest country, Botswana, at \$0.37 and \$0.40 per liter where there was a known temporary adjustment of between \$0.20 per liter (for diesel) and \$0.22 per liter (for gasoline). A higher industry component in a landlocked country compared with a coastal one is expected because of higher transport costs, but the values for Uganda are much higher than those in other landlocked countries under study, where this component is in the range of \$0.30 to \$0.40 per liter. Uganda experienced fuel shortages in November and December of 2008, which in part accounts for the high value of this component. The shortages were blamed on the new three-axle rule in Kenya, reducing the amount of fuel a truck could carry; delayed clearance of trucks at the Malaba border; and repairs on the Mombasa-Eldoret pipeline. Further, oil companies reported that they were still holding stocks procured at the high international prices of July 2008 (Dow Jones Commodities Service 2008; Monitor 2008). More analysis would be required to understand why Uganda in December 2009 had a much

higher oil industry component in U.S. dollars than other landlocked countries in the region.

An analysis and comparison of net-of-tax retail prices would normally be one of the first approaches to comparing basic cost structures across countries. Because many events can affect the net-of-tax prices, including inventory turnover and supply disruptions, observations that can be gleaned from a snapshot of price information at one point in time are limited. Since Mali and Niger used a reduction in taxes to stabilize prices earlier, it may be valid to compare the net-of-tax retail prices in these two countries with those in Senegal, which did not stabilize. Such comparison shows that net-of-tax prices were close in Mali and Senegal but much higher in Niger. Burkina Faso and Côte d'Ivoire, in contrast, reduced prices charged by their state supply companies to stabilize, and hence during the period of cost recovery (which includes December 2008), net-of-tax retail prices would be expected to be high. Indeed, the net-of-tax prices are higher in Burkina Faso and Côte d'Ivoire than in Senegal—this despite the fact that Côte d'Ivoire is a coastal country just like Senegal—but the net-of-tax diesel price in Niger is not any lower than in these two countries. The high cost of transporting fuels to consumption centers in Niger may in part account for this finding, but more data on prices are needed to draw conclusions.

For both fuels, Madagascar and Uganda have the highest net-of-tax prices, followed by Côte d'Ivoire. South Africa at \$0.53 a liter has the lowest cost structure for gasoline. For diesel, Kenya, Malawi, South Africa, and Tanzania were comparable at \$0.70–0.71 per liter. At \$0.64 per liter, Senegal has a gasoline cost structure slightly higher than Mali's at \$0.62 per liter, while its net-of-tax diesel price is identical to that in Mali. As a coastal country, its net-of-tax price can be lower; the relatively high net-of-tax price in Senegal can be partially explained by the special fee—\$0.07 per liter—being charged to amortize the refinery debt. Mali on average is relatively closer to the coastal supply points than Niger, and hence it is reasonable to expect a lower cost structure. Mali's liberalized supply regime compared with Niger's state monopoly may also account for some of this difference in the cost structure.

Procurement

Partly on account of small market size, several countries in the study rely on a single buyer to import crude oil or petroleum products, presumably to take advantage of the resulting economies of scale. In Burkina Faso and Niger, a state-owned company has a legal monopoly over the



importation and storage of petroleum products. Benchmarking analyses performed in the past in Burkina Faso on the import procurement performance of SONABHY—which uses a combination of procurement modalities including international competitive bidding, restricted tenders, direct purchases, and long-term contracts—suggest that it is efficient. *Société Nigérienne de Dépôt d'Essence et de Pétrole* in Niger uses a system of restricted tenders or direct-negotiated equivalents. SIR in Côte d'Ivoire has been assigned, by law, the monopoly right to handle all petroleum product imports. As a result, all petroleum products supplied to the domestic market—whether imported or refined by SIR—are channeled through it.

In Senegal, the SAR refinery can produce only about half of the country's requirements. Senegal purchases Nigerian crude under a state-to-state arrangement; the price is negotiated every three months and the government of Senegal pays the bill. The amount of petroleum products that need to be imported is assessed every 15 days by a committee—comprising representatives of the *Comité National des Hydrocarbures* (National Hydrocarbon Committee), a consultative body reporting to the Ministry of Energy; SAR; and all the licensed importers—which allocates the import entitlement to one or more operators.

Kenya, Madagascar, and Malawi have joint purchases of product imports. In Madagascar, oil companies voluntarily import on a joint cargo basis to minimize marine transport costs. In Malawi, Petroleum Importers Limited—a private company comprising all the four oil marketing companies operating in the country—handles all imports.

In Kenya, the government set up an Open Tender System to import crude oil for KPRL and petroleum products. Under the system, crude oil is purchased every month by a single company for the entire market on the basis of a public tender, transported through one terminal, and shared among all marketing companies in proportion to their share of the market. Petroleum products are similarly purchased through the Open Tender System. Depending on supply and demand, the oil marketing companies may source the balance of their needs independently.

The Open Tender System is intended to have the dual benefit of ensuring competitive prices (which are made public) and transporting the oil in a way that would minimize evasion of the import duty. Each company is required to take the crude oil allocation and pay for the consignment within a specified time frame or risk penalties for late payment. In times of high oil prices, some marketers could not pay on time for imports, and their late payments delayed subsequent crude shipments, lowered



refinery throughput, and caused fuel shortages. Kenya imports enough petroleum products to accommodate three separate tenders a month, opening up the possibility of options other than the current Open Tender System where the right to import is granted to only one company.



Import of petroleum products—and crude oil in the case of South Africa—to Botswana, Mali, South Africa, Tanzania, and Uganda is liberalized. Various implicit restrictions are imposed on product imports into South Africa, which offer what amounts to protection to domestic refineries.

Policy toward Domestic Refineries

Among the refineries in the study countries, SAR in Senegal and KPRL in Kenya are acknowledged to be uneconomic and in need of protection. SIR in Côte d'Ivoire is given protection through addition of 5 percent to the import-parity equivalent price for what is consumed domestically. A recent technical and financial audit of SIR identified investments in refinery processing and efficiency improvement/energy conservation that could eliminate the need for the 5 percent protection. As mentioned in the preceding section, South African refineries are effectively protected through product import restrictions.

SAR has recently come through a period of serious financial difficulties. In the years leading up to March 2006, its product revenues, based on costs of imported petroleum products, were not covering its crude oil and operating costs. The refinery accumulated some 85 billion CFA francs (\$160 million) in debt by March 2006 and the financing of its crude supply was halted. The refinery was forced to close for 11 months until February 2007, when a crude financing arrangement was agreed upon with BNP Paribas. A fund, financed by the product price structure, to amortize the debt was established. The special charges in the price structure amount to 35 CFA francs (\$0.07, based on the exchange rate prevailing in December 2008) per liter of white product and 25 CFA francs (\$0.05) per kilogram of black product. The debt principal stood at 17 billion CFA francs (\$34 million) in early 2009 and was fully repaid by the end of July. Looking to the future, SAR will need significant protection. A formula similar to that used in Côte d'Ivoire—where a percentage is added to the import-parity price—has been suggested; the percentage in Senegal would need to be much larger than the 5 percent used to protect SIR.

The government of Kenya provides protection to KPRL through the so-called base oil rule, whereby marketers are required to process about



half of local consumption at the refinery according to their market share. The required amount was 70 percent until February 2009, when the government lowered the requirement to 50 percent in light of continuing operational problems faced by KPRL (KBC 2009). The processing fee charged by the refinery requires government approval. In September 2009, KPRL submitted an application to the Energy Regulatory Commission to increase the fee from KSh188 (\$2.30) to KSh280 (\$3.50) per barrel to cover rising operational costs and to raise funds for refinery modernization (*All Africa* 2009c).

Observations

Small market sizes in the majority of the study countries, compared to requisite scale economy in the sector, make it difficult to achieve efficiency in the downstream petroleum sector. Problems in other sectors—such as power outages affecting refining and pipeline operations, or the poor state of rail and road infrastructure—and limited capacity in low-income countries to develop and enforce a suitable legal framework in the petroleum sector pose additional challenges.

Fuel Shortage

Fuel shortages have had serious adverse effects on price levels in some parts of Sub-Saharan Africa. Among the study countries, landlocked Uganda in particular has repeatedly suffered from prolonged fuel shortages and price spikes—including the last three months of 2008 and the beginning of 2009, even as world oil prices fell sharply—due to disruptions in the supply chain from Kenya. Fuel shortages raise the prices of not only petroleum products, but also their substitutes. For example, kerosene and LPG shortages in Uganda in late 2008 and early 2009 pushed up the prices of charcoal, used in cooking, as some shops ran out of kerosene and LPG (*All Africa* 2009a).

Fuel rationing is one possible immediate response to a shortage. Rwanda, which also imports petroleum products from Kenya, used fuel rationing effectively in January 2008 in response to supply disruptions following the Kenyan elections. The government limited gasoline sales for small cars to 10 liters and for jeeps to 20 liters a day (BBC 2008). Fuel rationing was ordered again at year's end, this time because of a regional fuel shortage again originating in Kenya. Gasoline sales were limited to an equivalent of 20 liters per vehicle (*All Africa* 2008). These steps appear to have helped avoid the large price fluctuations observed in the neighboring countries.

Over the longer term, ensuring sufficient fuel stocks is an often-used mechanism to protect against supply disruptions. Establishing such stocks is expensive. As a result, a plan to establish security storage

capacity, even if developed, may not necessarily be implemented for lack of financing. But fuel shortages also carry economic costs. Assessing the costs and benefits of maintaining contingency stocks—and deciding how large, who maintains, and who pays—is important. The value of maintaining some contingency stocks is universally accepted. Globally, according to a report published in October 2009 by Global Markets Direct, oil storage capacity rose from 2.39 billion barrels in 2000 to 2.96 billion barrels—or about one-tenth of world annual oil consumption—in the first half of 2009 (BMI 2009).

Several governments in this study have assigned agencies in charge of security stocks: SONABHY in Burkina Faso, *Société de Gestion des Stocks de Sécurité* in Côte d'Ivoire, the National Oil Corporation of Kenya, *Office National des Produits Pétroliers* (National Office for Petroleum Products) in Mali, SONIDEP in Niger, the Central Energy Fund in South Africa, and the Tanzanian Petroleum Development Corporation. Malawi's minister of natural resources, energy, and environment reported recently that the government planned to establish a national oil company aimed at ensuring the security of supply of petroleum products (Xinhua 2009). Senegal has a 1998 decree fixing the modalities for maintaining security stocks. Botswana sub-contracts maintenance of contingency stocks to two oil marketing companies. The government of Uganda announced a plan in early 2009 to build a fuel depot in Kampala with a capacity of 150 million liters.

Refining

Small hydroskimming refineries worldwide are finding it difficult to be financially viable. There is a cost to the economy in providing protection to such refineries; the costs are paid either by the government, if refineries receive a subsidy, or by consumers. SAR in Senegal, KPRL in Kenya, and SIR in Côte d'Ivoire are given explicit protection. In Senegal, the cost is high—currently \$0.07 per liter, equivalent to \$11 per barrel—which is still inadequate to make SAR commercially viable in the long run because the refinery is too small. In East Africa, competition comes from not only large, complex refineries in the Persian Gulf but increasingly very large, complex export-oriented refineries in Asia.

Uneconomic refineries are protected for a variety of reasons, such as enhancing the security of supply, creating jobs, and maintaining technical skills. In countries with no domestic oil, however, it is not clear that importing and refining crude oil enhances supply security any more than importing refined products. On the contrary, it could even be argued that

relying on one refinery diminishes supply security, especially if it experiences operational disruptions frequently as recent experience with KPRL in Kenya shows. As for job creation, refining does not generate much employment. Valero, the largest refiner in the United States with 15 refineries, employs on average about 510 workers at each refinery, which have an average size of 200,000 barrels a day (World Bank 2008a). The extent of technology-enhancing benefits of maintaining a small hydroskimming refinery is also questionable.

It may be politically difficult to allow a refinery to shut down, particularly if it is state-owned, but many countries have allowed market forces to close inefficient, uncompetitive refineries. In the study countries, both Madagascar and Tanzania used to have refineries that no longer operate. The experience of the U.S. refining industry offers a stark illustration. The average refinery size in the United States in 1969 was 42,000 barrels a day. In 1982, the *Oil and Gas Journal's* "Worldwide Refining Survey" found 301 refineries in the United States; by January 2008, the number had declined to 131, with an average size of 133,000 daily barrels. In the intervening years, 170 refineries—more than half of the refineries that existed in 1982—had been shut down and replaced by fewer, much larger refineries through expansion of existing refineries.

“Natural Monopoly”

Because of economies of scale in shipping crude oil and petroleum products, importing products in small parcels is costly. It is therefore not surprising that the four smallest markets in the study—Niger, Malawi, Burkina Faso, and Madagascar—have all adopted what amounts to a single-buyer model. It is encouraging that one monopoly supplier, SONABHY of Burkina Faso, has been assessed to be performing at close to a best-practice level in importation. Conducting similar benchmarking analyses of other monopoly suppliers, as well as storage handling of SONABHY and others, would be useful to identify potential scope for cost reduction.

Pipelines in particular, as well as large petroleum product storage terminals in small markets, constitute natural monopolies. Competition can be enhanced through third-party access, while monopoly rents can be reduced by economic regulation.

Transporting Petroleum Products

Transporting crude oil to domestic refineries in countries with refining capacity, and petroleum products from refineries—whether domestic or overseas—to final destinations in all countries, represent a significant



fraction of end-user prices, particularly in markets far from major refining centers.

Economies of scale involved in shipping have been treated earlier. Slow border clearance adds to the cost and has even caused fuel shortages. Waiting to discharge fuels at ports is particularly expensive. Demurrage is excessive at the modern Kurasini Oil Jetty in Tanzania, with the average discharge rate of 353 m³ an hour in the first ten months of 2008, compared to the design discharge rate of 700 m³ an hour. The main reason for the slow discharge is the Tanzania Revenue Authority's installation of flow meters to verify volume—instead of the almost-universally used tank dips—which have broken down frequently (EWURA 2008). Given the cost of excessive demurrage, priority attention should be given to address this problem, including possibly assessing other means to prevent fraud. Improving the efficiency of the Dar es Salaam port administration, including that of the Tanzania Revenue Authority, could lead to measurable savings.

In terms of cost per liter of fuel transported over land, the least expensive—provided that the requisite economies of scale are achieved—is pipeline transport (except for fuel oil, which would need to be heated to be pumped), followed by rail, and finally by truck. Only Kenya and South Africa have pipelines. There are medium-to-long term prospects for establishing a petroleum product pipeline system in Côte d'Ivoire, Burkina Faso, and Mali. Road transport is not allowed in Kenya for the domestic market or for exports if pipeline capacity exists. The operation of the pipeline system in Kenya has been disrupted by power outages. Repairing the pipeline has also reduced the volume of fuel shipped and caused shortages in the neighboring countries that import petroleum products from Kenya. Inadequate and unreliable supply of power is a chronic problem in Sub-Saharan Africa and adversely affects fuel supply by disrupting pipeline and refining operations. This is an example of problems outside the petroleum sector having serious negative effects on sector efficiency and costs.

There is scope for making greater use of rail. The line connecting Senegal and Mali requires investment to improve its physical state and quality of service. While the Dakar–Bamako railway line continues to be in poor state, road conditions from Dakar to Mali have improved, offering a viable alternative to rail and further shifting the mode of transport away from rail. Pan-territorial pricing in Mali, whereby petroleum products sourced in the least-cost manner are simply taxed more to achieve the same price throughout the country, provides no incentive to press for rail



rehabilitation and revival, or for cost reduction in general. In Madagascar, the market-based rate for road movements is more than 50 percent higher than that using rail, yet only 28 percent was transported by rail and the rest by road in 2008. Madarail is now in a position to transport 40 percent or more of the volume moved and achieve cost savings.

Poor road conditions, congestion, and, where cross-border trade is involved, slow border clearance in some situations hamper road transport. More effective enforcement of load limits across the road freight sector will benefit road transport in the long run by reducing road damage, enhancing traffic safety, and eventually enabling use of larger and more efficient trucks (which require much better road conditions). Although enforcing the three-axle rule in Tanzania and Kenya may have had short-term costs, long-term benefits—if accompanied by road improvement as well as other enforcement measures—should outweigh these costs.

Competition

Effective competition in a small petroleum market is difficult to achieve. One danger is that too few firms result in implicit price collusion. For this reason, some governments exercise economic regulation, for example by imposing price ceilings. Having many more firms does not necessarily enhance efficiency if they are individually too small.

Third-party access to storage terminals and other large infrastructure can enhance competition and reduce costs. Such access is not granted in Côte d'Ivoire and Niger, and is restricted in Botswana, Malawi, and South Africa.

Fair and healthy competition would be difficult to achieve if commercial malpractice is tolerated. Tax evasion is a serious concern in East Africa to the point where inspection slows down port clearance. In its 2008 annual report, the EWURA in Tanzania reported that 60 percent of the 189 samples taken at retail outlets and 77 percent of the 13 samples taken at depots failed product quality tests in 2007–2008. The EWURA increased penalties for commercial malpractice, including fuel adulteration, in August 2007 and plans to use modern testing techniques to curb adulteration (EWURA 2008).

An important step is reducing incentives for engaging in commercial malpractice to the extent possible. The incentive in turn depends on the relative benefit and cost (from the risk of being caught and fined or having one's business license revoked). One effective market-based approach is the practice in many industrial countries whereby oil companies market at retail and assume responsibility throughout the supply chain to guarantee fuel quality and quantity in order to protect their public image and market share.



Price Control

As the world economy recovers and demand for oil rebounds, the oil market may go through another cycle of price shocks. It is therefore important that the four West African countries that engaged in ad-hoc price stabilization schemes during the 2007–2008 price run-up define more clearly the rules beforehand to mitigate the impact on the state companies or the national treasury.

In Mali, equalization of prices of fuels obtained from different sources through differential taxation substantially reduces the incentives to minimize costs. Other means that do not interfere as much with market incentives are useful to consider.

The size of the South African market is sufficiently large so that the country should be able to dismantle its price control, liberalize oil product supply, and achieve effective competition.

Overall Legal Framework and Enforcement

Burkina Faso, Côte d'Ivoire, Mali, and Niger need to update and strengthen their legal and regulatory frameworks. With the exception of Botswana and South Africa, the study countries suffer from weak enforcement and policing, even in those countries where a strong legal and institutional framework has been established. Inadequate regulations and weak enforcement allow too many oil marketing companies to operate in Kenya, Tanzania, and Uganda. This overwhelms limited enforcement capacity, making commercial malpractice an attractive way of making profits. The remedy, in a liberalized market, is not to limit these companies by number but to ensure that the licensing criteria for operators are stringent and that compliance with rules to obtain and retain a licence is enforced.

One approach is to establish a separate body for inspection and enforcement, as in other developing regions such as South America, where strong, specialized, independent inspection institutions have been developed. These institutions have encouraged the formation of a cadre of private, certified inspectors, to which the enforcement institutions out-source work, minimizing their requirements for permanent staff.

Senegal has already identified the need to update the legal texts developed as part of the 1998 reform, particularly in the areas of product specifications, open access, security stocks, and regulatory institution building. Senegal plans to convert the *Comité National des Hydrocarbures* into a regulatory body, the *Organe de Régulation des Activités du segment aval du sous-secteur des Hydrocarbures* (Regulatory Body for Downstream Hydrocarbon Sub-Sector Activities).



Côte d'Ivoire has more trained staff in its ministry than other West African countries studied. With such absorptive capacity, the government can consider a medium-term measure to define a regulatory, enforcement, and institutional approach for the sector and begin to identify staff and train them. Over the long term, Senegal has the capacity to make good use of training and technical assistance for institutional building and reinforcement, including the development of a cadre of independent certified inspectors for the sector.

An assessment of the cost-effectiveness of Kenya's Open Tender System managed by the ministry of energy, given that the volume of imports can easily justify more than one tender a month, may be useful. The Open Tender System for crude oil is linked to the requirement that all oil marketing companies process crude oil at KPRL. Consideration may be given to applying modest duty protection, for example on the order of 5 percent, to the refinery as a temporary measure and liberalize product imports, allowing competition between domestic refining and imports.

Madagascar might consider amending its legislation to give the *Office Malgache des Hydrocarbures* (Madagascar Office of Hydrocarbons), which is responsible for providing oversight of the sector, the powers to require efficiency from both the Galena Refinery Terminal and the *Société Logistique Pétrolière S.A.* and the resources to enforce compliance with the legislation.

Information about the downstream sector—about prices and price structure, sources and volumes of imports, differences between domestic and international prices, and companies operating in the country—is not readily available in many study countries. One of the most important roles of government is to collect and make market information available, to inform both suppliers and purchasers. If the public is well informed, it becomes more difficult to ignore sector inefficiencies. The EWURA in Tanzania provides up-to-date detailed prices throughout the country twice a month on its Web site. Where charges of price collusion and pressure on government to re-introduce price control are made, as in Kenya, it would be useful to have historical price information available to the public so that perceptions can be checked against actual price trends. Historical prices in countries where prices are not controlled require price surveys and can be resource-intensive to collect. But the government agency in charge of the sector can begin by collecting price information in the capital city, building a database, and, in due course, extending data collection to other major cities.



Valuation of Cost Reduction Potential in West Africa

This study undertook a rapid assessment of possible investment and efficiency enhancing projects that could reduce supply costs in West Africa. Table 4.1 summarizes the findings.

As mentioned earlier, a benchmarking study has identified investment options for SIR that could make the refinery competitive with product imports without the current protection amounting to 5 percent. For the purpose of this exercise, SAR is considered to have a cost structure that is at least 10 percent higher than efficient import-parity price levels. The risk associated with the \$480 million investment in SAR is high; the project will make the refinery marginally competitive with direct product imports. Switching entirely to product imports requires much less investment. Senegal has a need to improve the infrastructure for receiving and storing LPG. This study estimates the cost to be in the range of \$30—35 million.

An audit/benchmarking study of the state-owned supply/storage companies in Burkina Faso and Niger could be used to identify ways of improving the efficiency of SONABHY and SONIDEP, respectively. SONABHY has been examined for procurement performance and found to be close to best practice but has not been benchmarked for other activities. SONIDEP has not been benchmarked. In both cases, this assessment assumes that a reduction of 10 percent in the gross margins of the respective companies can be achieved.

In addition, each country could benefit from training and technical assistance in legal, institutional, and enforcement efforts. Supporting five years of such activities could cost about \$10 million.

Conclusions

There are varying degrees of scope to reduce the cost of supplying petroleum products in the study countries. A clear burden on the economy is protection of domestic refineries that cannot compete with direct product imports. Refinery closure is often politically sensitive, especially if the refinery is government-owned, but Madagascar and Tanzania have closed their refineries. Globally, the trend over the past three decades has been to replace numerous small, simple refineries with fewer, larger, and more complex ones.

Pipelines are most cost-effective but require large upfront capital investments, a reliable supply of electricity—unreliable and inadequate power is among the most serious problems in the energy sector in



Table 4.1 Valuation of Potential Cost Reduction Measures in West Africa

Country	Cost-reduction measures	Retail price savings, CFA francs/liter	Savings in % of 2007–08 retail price	Annual savings in billion CFA francs	Annual savings in \$ million
Burkina Faso	10% reduction in SONABHY's gross margin through implementation of efficiency measures/investments in depot management and overall administration identified in an audit/benchmarking study, follow-up investment estimated to cost \$3-5 million	3	0.5	1.7	3.7
Côte d'Ivoire	5% reduction in import parity through elimination of SIR protection following an estimated \$150 million refinery logistics investment/efficiency program	15	2.5	16.5	36
Mali	True liberalization of product supply; elimination of cost equalization; 80% of supply assumed from cheapest source, 20% from present mix.	42	7.5	35.7	78
Niger	10% reduction in SONIDEP's gross margin through implementation of efficiency measures/investments identified in an audit/benchmarking study; follow-up investment estimated to cost \$3-5 million	3.4	0.5	0.7	1.5
Senegal	10% reduction in import parity through either a \$480 million SAR efficiency/investment program or switching entirely to petroleum product import; estimated \$30–35 million for improving LPG import and storage	30	4.6	58.5	13

Source: World Bank consultants' analysis and estimates.



Sub-Saharan Africa—and regular maintenance. While challenging, over the long term, shifting to pipeline transport will reduce costs in many countries. Greater use of rail can reduce costs, which requires rehabilitation and expansion of existing lines in some cases. One obstacle to greater rail use is ownership of trucking businesses by oil marketing companies, particularly in West Africa. In the near term, Madagascar is perhaps best positioned to expand the share of petroleum products moved by rail, since spare capacity can be readily mobilized.

Universal overloading of vehicles and poor road and vehicle conditions go hand in hand. They deter professional fleet management committed to safety and on-time delivery. Longer and more fuel-efficient modern trucks capable of carrying as much as 60 tonnes, used in Europe and elsewhere, require much better road surfaces. Coordination with other sectors to gradually improve road conditions and vehicle technology can reduce costs over the long run.

Assessment of procurement procedures such as the Open Tender System in Kenya; port clearance procedures, particularly in Tanzania; and performance by monopoly suppliers in Burkina Faso, Côte d'Ivoire, Madagascar, and Niger may find less costly alternatives. Where price control is in effect, identifying aspects that reduce the incentive to minimize costs and substituting them with alternatives that distort the market less could enhance efficiency. South Africa, which is a large market, may benefit from more competition and less price regulation.

Monitoring and enforcement of rules already in place must be strengthened in most study countries. Commercial malpractice, if unchecked, can take over the market and drive out efficient operators known not to engage in fraud. Short-selling transfers money rightly due to consumers to fraudulent operators. Other forms of fraud can be even most costly, especially if equipment or vehicles are damaged as a result.

Few governments in Sub-Saharan Africa make key sector data regularly available in a timely manner. Although resource-intensive, especially in countries with liberalized prices, such information empowers consumers and enables informed debates about prices and sector efficiency. Making price and other data widely available has taken on greater importance in recent years against the backdrop of soaring international oil prices and calls from different quarters in many countries for greater price control to protect consumers. Madagascar, South Africa, and Tanzania have been posting historical prices and other information on the Internet. The challenge is for other countries to begin to collect similar information and make it publicly available.



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