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Africa's Pulse

An analysis of issues shaping Africa's economic future

WORLD BANK GROUP

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Summary

- Economic growth in Sub-Saharan Africa is projected to recover to 2.6 percent in 2017, following a marked deceleration in 2016. The upturn in economic activity is expected to continue in 2018-19, reflecting improvements in commodity prices, a pickup in global growth, and more supportive domestic conditions.
- The pace of the recovery is weak, however, as the region's three largest economies—Angola, Nigeria, and South Africa—are projected to post only a modest rebound in growth following a sharp slowdown in 2016. Investment growth will recover only gradually, amid tight foreign exchange liquidity conditions in major oil exporters and low investor confidence in South Africa. Growth will be limited in several metals exporters, as well as in oil exporters in the Central African Economic and Monetary Community, as these countries embark on fiscal adjustment to stabilize their economies. Among non-resource intensive countries, such as Ethiopia, Senegal, and Tanzania, growth is expected to remain generally solid, supported by domestic demand.
- Regional growth remains insufficient to raise per capita incomes. Per capita gross domestic product (GDP) is projected to contract by 0.1 percent in 2017, before rising moderately (by less than 1.0 percent a year) in 2018-19.
- With still high poverty rates, the region is faced with the urgent need to regain the momentum in growth and make it more inclusive. This will require deep reforms to improve institutions for private sector growth, develop local capital markets, improve the quantity and quality of public infrastructure, enhance the efficiency of utilities, and strengthen domestic resource mobilization.
- Public debt levels are rising in the region. In an environment of gradual normalization of monetary policies in advanced economies, many African countries face the challenge of undertaking much-needed development spending without jeopardizing hard-won debt sustainability.
- Downside risks to the regional outlook include, externally, stronger than expected tightening of global financing conditions, weaker improvements in commodity prices, and the threat of protectionism rising from populist sentiment, and, domestically, slippage on reforms, increasing security threats, and political uncertainty ahead of elections in some countries.
- The special topic of this report is infrastructure. Sub-Saharan Africa lags other developing regions in virtually all dimensions of infrastructure performance, although trends vary across key sectors. Progress has been inadequate in the power sector, where electricity-generating capacity per capita has changed little over 20 years, and although access to electricity more than doubled during 1990–2014, only 35 percent of the population has access. Sub-Saharan Africa also has the lowest road and railroad densities among developing regions, and road density declined during 1990–2011. By contrast, telecommunications infrastructure has improved dramatically: the number of fixed and mobile phone lines per 1,000 people increased from three in 1990 to 736 in 2014, and the number of Internet users per 100 people increased from 1.3 in 2005 to 16.7 in 2015. Access to safe water has also risen, from 51 percent of the population in 1990 to 77 percent in 2015.

- The growth benefits of closing Sub-Saharan Africa's infrastructure quantity and quality gaps are potentially large. Catching up to the median of the rest of the developing world would increase growth in GDP per capita by 1.7 percentage points per year, and closing the gap relative to the best performers would lift this growth by 2.6 percentage points per year. Closing the gap in electricity–generating capacity yields the largest potential benefit, and substantial gains also arise from narrowing the gap in the length of the road network.
- Public capital spending levels are too low to address the region's infrastructure needs. According to data collected by the BOOST initiative for 24 countries in Sub-Saharan Africa, annual public spending on infrastructure was 2 percent of GDP in 2009–15. Two-thirds of total capital spending was on roads and about one-sixth each on electricity and water supply and sanitation. Interest is growing in crowding-in private investment in infrastructure, but public-private partnerships remain a small market in Sub-Saharan Africa. Four countries (South Africa, Nigeria, Kenya, and Uganda) account for 48 percent of the public-private partnership infrastructure projects in the region in the past 25 years. The energy sector, especially renewables, is attracting an increasing share of these projects.
- A robust institutional and regulatory framework is critical in attracting private investment for infrastructure projects. Evidence shows that Sub-Saharan Africa performs below the global average in the regulatory frameworks for procurement in public-private partnerships, especially in project preparation.
- The impact of public investment on growth can be enhanced by implementing policies that foster the efficiency of public investment. For instance, improving the institutions and procedures governing project appraisal, selection, and monitoring can render considerable economic dividends. Evidence suggests that countries with sound public investment management systems tend to have lower but more efficient levels of public investment, crowd in more private investment, and exhibit higher growth rates.

Section 1: Recent Developments and Trends

GLOBAL DEVELOPMENTS

Global economic conditions are improving, following a year of depressed economic activity. The global economic recovery is strengthening, supported by a continued upturn in manufacturing activity. In January, global industrial production increased at an annualized rate of nearly 6 percent, the strongest pace in five years. Activity accelerated in the Euro Area, Japan, China, and India, while moderating somewhat in the United States, the United Kingdom, and the Russian Federation. The global manufacturing Purchasing Managers' Index (PMI) improved further in February, while the services PMI remained high. Following four consecutive months of small gains, global (median) inflation rose sharply in January, to about 2.3 percent year-over-year—the highest level since end-2014. The uptick reflected the delayed impact of rising energy prices in 2016. Global goods trade rebounded strongly in the fourth quarter of 2016. This improvement coincided with signs of a bottoming out in global investment growth, which tends to be more trade intensive than other components of aggregate demand. Global export orders point to further improvements in the coming quarters.

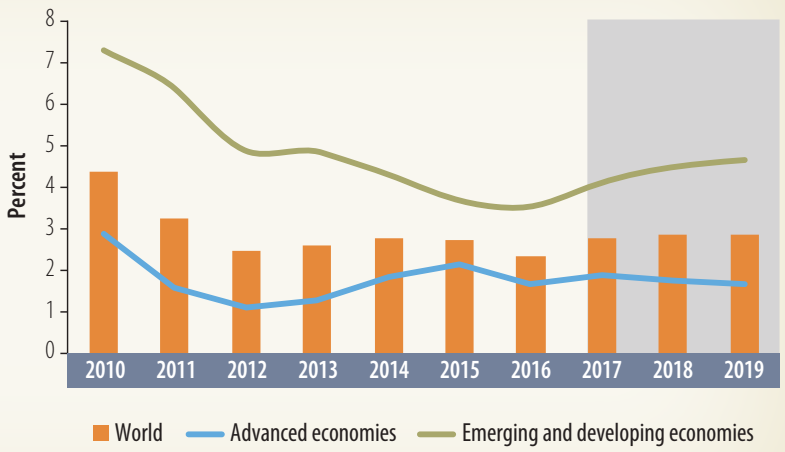
Global financing conditions have been favorable since the start of 2017. Financial markets have continued to focus on the prospects of strengthening global growth, while discounting elevated levels of policy uncertainty. Implied volatility in the equity and bond markets remains well below historical averages. The decision by the Federal Reserve to raise rates was expected, and markets reacted positively, with bond yields and the U.S. dollar declining somewhat, and global equity markets remaining buoyant. The European Central Bank kept its stance unchanged, but confirmed that it would begin scaling back its asset purchases in April. Supported by continued monetary policy accommodation, Euro Area bond yields remain exceptionally low.

Financial markets in emerging markets and developing economies (EMDEs) have continued to rebound, supported by the increased risk appetite of international investors, some improvement in growth prospects, and more stable credit ratings among commodity exporters. Accordingly, capital inflows to EMDE bond and equity mutual funds remained firm in March, while international debt issuance increased strongly from January to March. Recent bond issuances by the Arab Republic of Egypt, Nigeria, Oman, and Kuwait attracted strong demand. Bond spreads are currently around 300 basis points, which is lower than the pre-U.S. election levels. Excluding the República Bolivariana de Venezuela, Emerging Market Bond Index spreads are now back to mid-2014 levels.

Commodity prices have firmed. Crude oil price jumped 8 percent in the first quarter of 2017 averaging nearly $53/bbl. Prices dropped below $50/bbl in the second week of March due to concerns over compliance of the OPEC/non-OPEC cuts, larger-than-expected U.S. crude oil inventories, and robust recovery in U.S. shale oil activity. But, they recovered to $54/bbl in early April, on renewed expectations of tightening supply. However, rebalancing is under way as the global oil market is expected to tighten in the second half of the year. Meanwhile, metal prices, which made some further gains in 2017Q1 on stronger demand from China and some supply tightness are now 35 percent higher than their 2015Q4 lows. Agricultural prices have been broadly stable on favorable growing conditions in most regions.

Global economic conditions are improving, growth is projected to pick up in 2017 and continue to strengthen into the next year.

FIGURE 1.1: Global Growth



Source: World Bank.

Global growth is projected to pick up to 2.7 percent in 2017, and to an average of 2.9 percent in 2018–19, broadly in line with previous projections (figure 1.1). Activity in advanced economies is expected to strengthen in 2017, supported by a projected upturn in the United Sates. The forecasts for advanced economies have been slightly upgraded, reflecting strengthening domestic demand and exports. After accelerating to 1.9 percent in 2017, growth in advanced economies is expected to moderate somewhat, to an average of 1.8 percent in 2018–19. Aggregate growth in EMDEs is projected to reach 4.1 percent in 2017 and 4.5 percent in 2018. Modestly rising commodity prices, a cyclical rebound in investment, and export growth are supporting a gradual recovery in commodity-exporting EMDEs. Among commodity-importing EMDEs, growth continues to be robust, as a gradual deceleration in China is offset by the rest of the group.

SUB-SAHARAN AFRICA

Recent Developments

Economic Growth

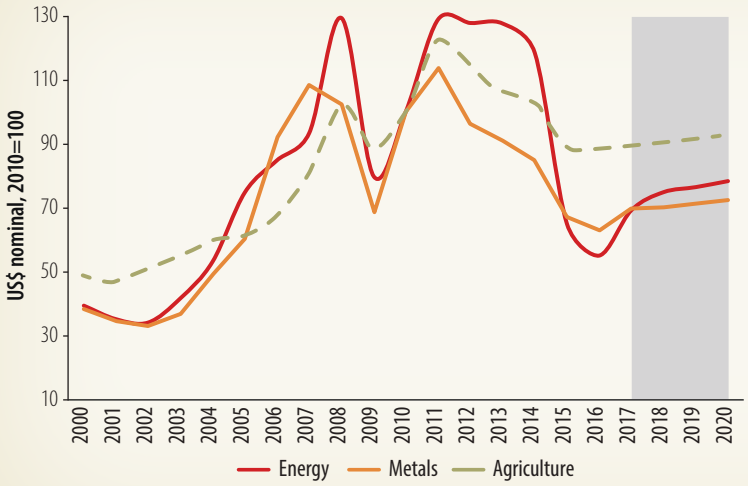
Economic activity decelerated sharply in Sub-Saharan Africa in 2016 to an estimated 1.3 percent growth, its worst outcome in more than two decades. This low growth rate was driven mainly by unfavorable external developments, with commodity prices remaining low, and difficult domestic conditions. Angola, Nigeria, and South Africa experienced a marked slowdown in economic activity. A decline in oil production halted economic growth in Angola. In Nigeria, gross domestic product (GDP) contracted by 1.5 percent amid tight liquidity conditions, budget implementation delays, and militant attacks on oil pipelines. Growth in South Africa weakened to 0.3 percent, reflecting contractions in the mining and manufacturing sectors and the effects of the drought on agriculture. Excluding these three countries, growth in the region was estimated to be 4.1 percent in 2016.

Other oil exporters struggled to cope with a large terms-of-trade shock, as activity contracted sharply. Metals exporters fared relatively better, as they benefitted from the large drop in oil prices. Nonetheless, output levels and investments in the mining sector were also hit hard and budgetary revenues fell. Average

growth among the non-resource-intensive countries remained high in 2016, reflecting their more diversified economies. Growth in these countries was partly supported by scaled-up public infrastructure investment.

Sub-Saharan Africa is seeing a recovery of growth in 2017. Rising commodity prices, strengthening external demand, and the end of the drought in several countries are among the factors contributing to the rebound. Prices of most commodities continued to rise in early 2017, from their lows in early 2016 (figure 1.2). The oil price increase in 2017Q1 reflects steady demand growth and the agreement between some OPEC and non-OPEC oil producers to limit output. However, persistently high global oil inventories along with an improved supply outlook by the in the U.S. shale oil sector, impose constraints in the longer term price outlook of oil prices. Metals prices are strengthening, partly reflecting increased demand from China. Meanwhile, above-average rainfalls are boosting agricultural production in countries that were hit by the El Niño–related drought in 2016 (South Africa, Malawi). Security threats subsided in several countries. In Nigeria, the decline in militants' attacks on oil pipelines has helped oil production to rebound. The slowdown in Angola, Nigeria, and South Africa—the region's three largest economies—appears to have bottomed out toward the end of 2016. Non-resource-intensive countries, including those in the West African Economic and Monetary Union (WAEMU), have been expanding at a solid pace.

FIGURE 1.2: Commodity Price Forecast



Source: World Bank.

Prices of most commodities continued to rise in early 2017, from their lows in 2016.

Several factors are preventing a more rigorous recovery in the region. In Angola and Nigeria, restrictions on access to foreign exchange continue. Although the Central Bank of Nigeria and the National Bank of Angola have recently increased the sales of foreign exchange in the interbank markets, foreign exchange liquidity conditions remain tight, and are holding back activity in the non-oil sectors. The manufacturing and services sectors remain particularly weak in both countries. In South Africa, policy uncertainty and low business confidence continue to constrain investment. Unemployment remains very high. The recent (April 2017) downgrade of the country's credit rating to sub-investment level by Standard and Poor's and Fitch is likely to weigh on the country's economic prospects (box 1.1).

BOX 1.1: Credit Rating Downgrade of South Africa

A controversial cabinet reshuffle by President Zuma on March 30 prompted Standard and Poor's to quickly (April 3) downgrade South Africa's long-term foreign currency debt rating to sub-investment grade—the country's first "junk" grade since 2000. Within a few days (April 7) of this rating action, Fitch downgraded local and foreign currency debt to sub-investment grade. These rating moves reflect mounting concerns about policy and institutional uncertainty in the country.

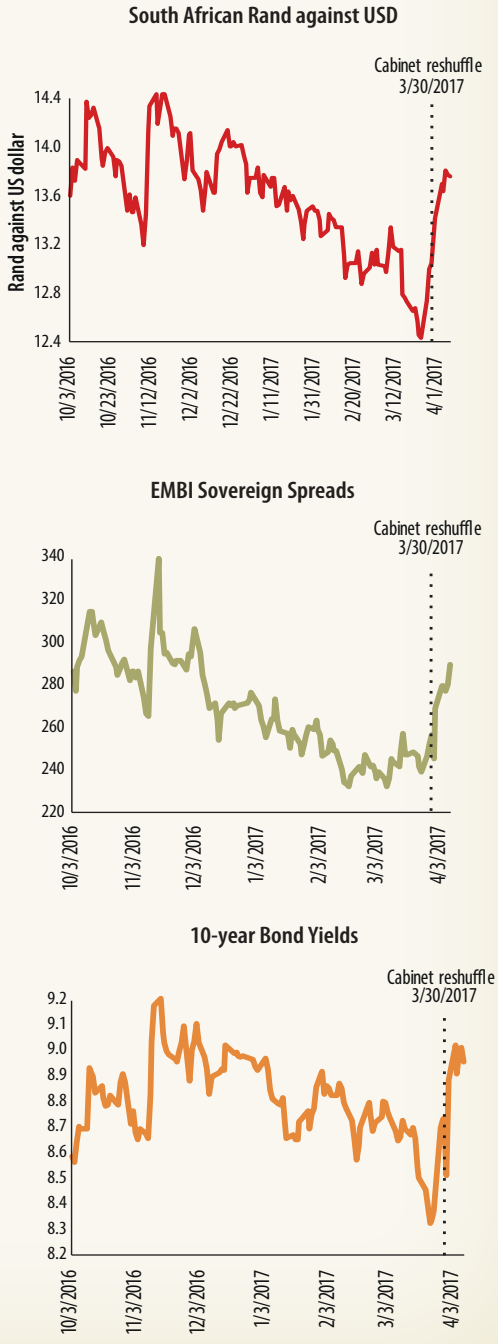
Most of the economic effects of the rating slippage are still evolving. Thus, the focus of this box is on (a) describing some of the channels of transmission of this event in the short term, and (b) reporting on the immediate effects that are observed in foreign exchange movements and borrowing costs in debt markets. Recent studies have examined what a rating downgrade could mean for the South African economy (Hanusch et al. 2016; World Bank 2017).

A decline in ratings implies a higher risk premium on debt. Broadly, the potential channels through which a rating shock affects the economy in the short run are by (a) raising the cost of borrowing and servicing debt; (b) increasing net capital outflows, as investors reassess risk (including institutional investors, who are reluctant to hold sub-investment grade assets), putting downward pressure on the exchange rate; and (c) increasing inflationary pressures from exchange-rate pass-through. The economic impact of a decline in sovereign rating will depend on whether the downgrade reflects new information on economic fundamentals and country risk. Often, rating changes are viewed as lagging the market, in which case the actual rating event might elicit little response. The monetary and fiscal policy response will shape outcomes as well, especially in the long term.

Short-Term Effects

How did the market variables react? Anticipating a downgrade, several market indicators had already started weakening: the South African rand lost 7.9 percent during March 27–31, sovereign bond spreads ticked up 30 basis points, and the 10-year local-currency bond yields rose 52 basis points (figure B1.1.1). The size of the pullback in the currency is larger than the decline of around 5 percent experienced in the immediate aftermath—that is, within two days—of the Brexit surprise. Markets continued to weaken in the wake of the downgrade announcements of April 3 and 7. In the two weeks ending April 7, the rand had depreciated by a cumulative 10.7 percent, sovereign bond spreads had risen by 50 basis points, and the 10-

FIGURE B1.1.1: Evolution of Market Indicators



year local currency bond yields had increased by 59 basis points. These indicators are now at levels comparable to those in late December 2016, when expectations of a rating downgrade were rife.

Although it remains to be seen how the policy framework and governance issues will evolve, the recent events represent a setback to business and investor confidence, and are likely to weigh down on the country's prospects.

BOX 1.1: *Continued*

Elsewhere in the region, several oil exporters in the Central African Economic and Monetary Community (CEMAC) are facing difficult economic conditions. The contraction of activity that began in the oil sector in Chad, Equatorial Guinea, and the Republic of Congo has spread to the rest of the economy. Although the economies of Cameroon and Gabon have not contracted—due in part to their relatively more diversified exports—activity has slowed notably and oil production continues to decline. Having delayed the adjustment to lower oil revenues, CEMAC countries are now embarking on fiscal tightening to stabilize their economies. In Chad, the ongoing fiscal adjustment has entailed significant reductions in recurrent and capital expenditures, which weakened domestic demand. Elsewhere, in Mozambique, the recent government default and debt burden are deterring investment. The drought in East Africa, which reduced agricultural production at the end of 2016, has continued into 2017, adversely affecting activity in some countries (for example, Kenya) and contributing to food insecurity in others (Somalia, South Sudan) (box 1.2).

BOX 1.2: Drought Need Not Lead to Famine

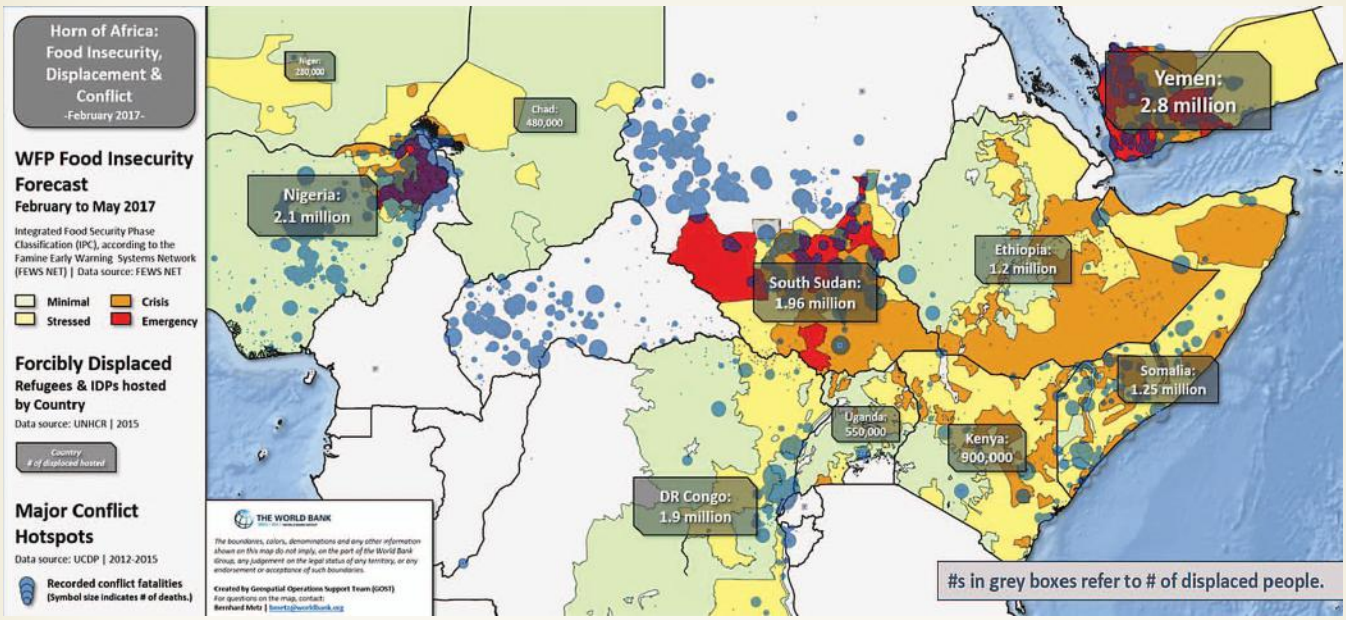
In 2016, rains failed across large swaths of countries in Eastern and Southern Africa. Although weather shocks are not uncommon in Africa, the 2016 drought stands out in scale and severity, because of the unusually large number of countries announcing significant drops in the levels of crop production, especially of staples, at the same time. For example, maize production in 2015/16 in the 15 member countries of the Southern African Development Community (SADC) fell by an average of 19 percent compared with the 2014/15 maize season. Similarly, in Eastern Africa, severe crop and livestock production losses were reported, especially in the Horn of Africa. The drought also led to power disruption, depressed economic activity, and increased poverty. Drought-induced declines in maize were estimated to reduce gross domestic product in the SADC area by 0.1 percentage point, and increase poverty by 1.4 million people. This particular drought is blamed on one of the strongest El Niño (and sister phase La Niña) effects in memory.

That said, droughts need not lead to famines. Rather, famines occur when households with depleted own resources are unable to access food because of public (government or community) inaction or willful neglect. Public inaction may be due to lack of financial resources or bureaucratic capacity to deliver needed food to the affected population. However, it could also be due to toxic politics that trigger conflicts or neglect the suffering of supporters of political opponents. In short, famines are almost always due to government failure. In early 2017, a famine was declared in South Sudan by the United Nations, and a pre-famine alert was issued for Somalia; there is a food crisis in northeast Nigeria (map B1.2.1).

Whatever the cause of famine may be, it leaves scars in the short and long terms. The most painful short-term consequence of famine is increased mortality, which results from a sustained period of increased food insecurity, a time when affected populations, especially children, are deprived of basic nutrition for months.

BOX 1.2 *Continued*

MAP: B1.2.1: Conflict Leads to Food Insecurity and Complicates Response



An estimated 260,000 people died from the 2010/11 famine in the Horn of Africa. In 2016, an estimated 250,000 South Sudanese children under the age of 5 were estimated to suffer from severe acute malnutrition.

An equally visible consequence of famine is forced displacement. Displacement may be a natural response by affected populations to move to "security" (where food and physical protection are available) or flee the environment that is threatening their lives. For instance, it is not uncommon that, during severe droughts, one group of herders competes for pasture and water with another, during which conflict and displacement ensue. Prices are also likely to spike, make food unaffordable, and exacerbate malnutrition. Although not immediately obvious, the long-term consequences of famines, especially on human capital, have been shown to be serious. Epidemiological studies of famine-affected populations have shown that famines cause psychological disorders, obesity, glucose intolerance, and blindness due to deprivation of vitamin A. Other studies that look at the impact of in-utero exposure to famines show that they lead to lower height, which has been shown to be a good indicator of long-term health and educational outcomes. These disadvantages in human capital, in turn, have led to lower prospects in the labor market—lower productivity, lower wages and earnings, and higher poverty.

As past and recent outbreaks of famine have shown, a reduction in conflict will almost certainly lead to fewer future famines. In addition, automatic stabilizers, such as safety net programs, which could be scaled up in the event of severe droughts, are necessary even for poor countries. Functioning markets are just as necessary, to provide price stability and affordability and accessibility to food.

Finally, even under conditions where conflict is absent, markets work, and safety net programs exist, the ability and efficiency with which to prevent famine for many countries is hamstrung by nonexistent or unreliable data. Therefore, building a credible early warning system is crucial to prevent future famines. Such a system would include data on living conditions, vulnerability, and livelihoods that are collected by national statistical offices and geospatial and satellite-based remote sensing data, and capacity to analyze and forecast. Cheap early warning systems in this age of the digital revolution are affordable and transformational for many poor countries. However, to take full advantage of these technologies to prevent famine, most poor countries are better served by investing in centers that receive satellite imagery from the multiple satellites that circle the African skies, and building the capacity to analyze such images to forecast crop failures and droughts.

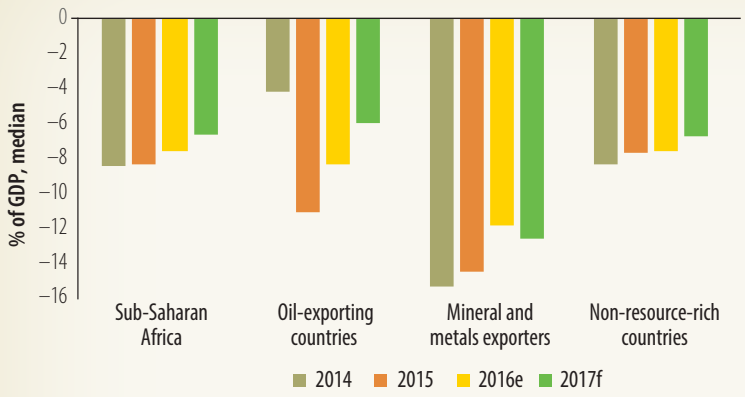
Annex 1A examines the behavior of growth, capital accumulation, and productivity after a commodity price plunge. Overall, the analysis finds that vulnerability to shocks represents a substantial cost in output and productivity for countries in the region. The challenge for resource-abundant countries is to go beyond capital accumulation, to formulating policies to boost productivity and the efficient allocation of resources within and across industries.

Current Account Deficits and Financing

The current account balances of oil exporters are improving, helped by the pickup in commodity prices (figure 1.3). Oil exports are rebounding in Nigeria on the back of an uptick in oil production. In metal exporters, the positive impact of an improvement in metals prices is being offset by a rise in investment-related imports. Current account deficits remain high in several non-resource-rich countries (including Rwanda and Uganda). In these countries, capital goods imports have also been strong, reflecting ambitious public investment agendas. Capital inflows in the region are rebounding from their low level in 2016, which saw foreign direct investment fall and Eurobond issuance decline. A strengthening of cross-border flows this year should help finance the still-elevated current account deficits. Gross foreign direct investment in Nigeria edged up in the fourth quarter of 2016, after declining in the first three quarters. Nigeria was able to tap the Eurobond market twice at the start of the year, reflecting improved investors' sentiment. More broadly, in a global environment characterized by low financial market volatility and increased investor risk appetite, sovereign spreads have generally narrowed across the region, with the notable exception of Ghana, where spreads rose because of concerns about fiscal policy slippages (figure 1.4). Sovereign spreads widened on South African debt in the wake of recent political developments and credit rating downgrade.

FIGURE 1.3: Current Account Balance

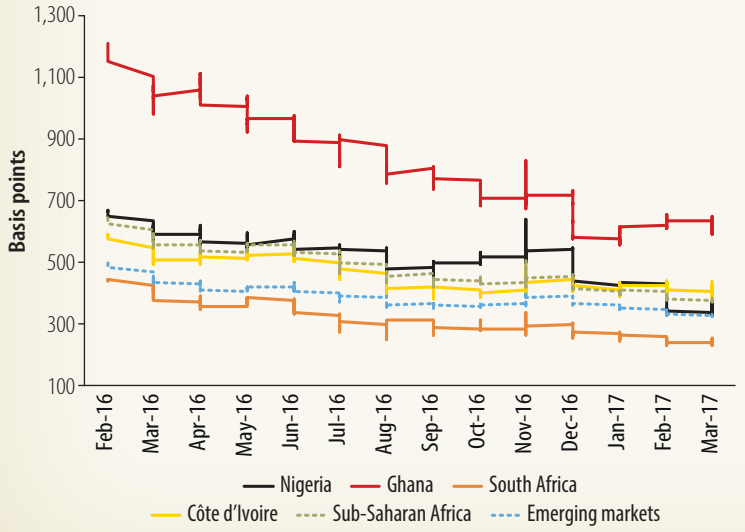
The current account balances of oil exporters are improving.



Source: World Bank staff estimates.

FIGURE 1.4: Sovereign Bond Spreads

Sovereign spreads have generally narrowed in the region; a notable exception is Ghana.



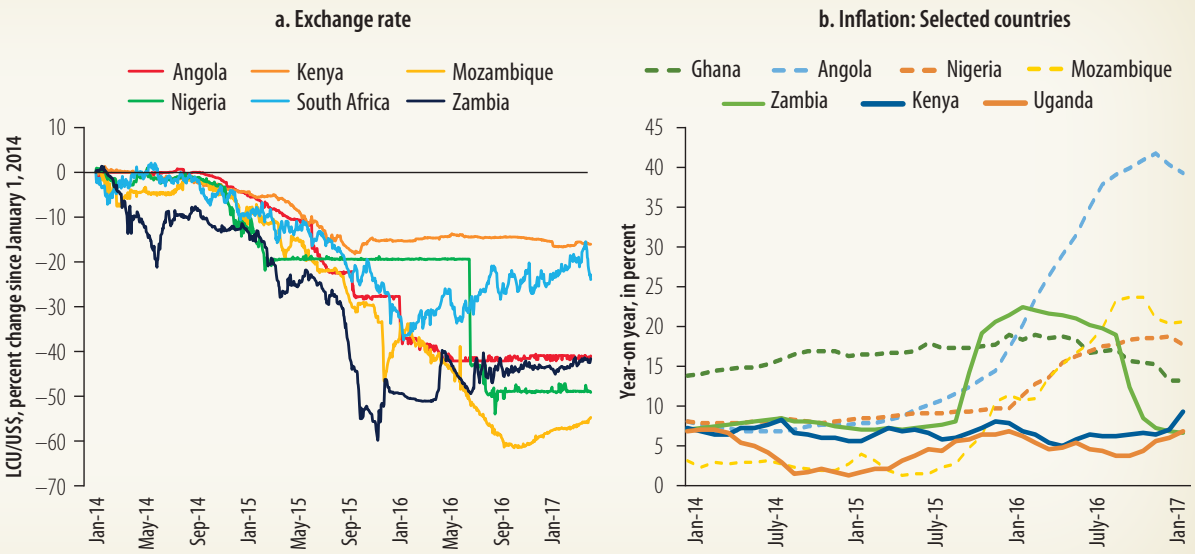
Source: Bloomberg, Haver Analytics, World Bank.

Exchange Rates and Inflation

The rebound in commodity prices and improved growth prospects in some countries have helped stabilize commodity exporter currencies (figure 1.5, panel a). However, with the Nigerian naira and Angolan kwanza remaining fixed against the U.S. dollar, the imbalance in the foreign exchange market remains substantial in both countries. Among metals exporters, the Congolese franc depreciated sharply against the U.S. dollar in the second half of 2016, with weakness continuing in 2017, reflecting heightened political uncertainty as well as loss of foreign reserves in the Democratic Republic of Congo. A debt crisis in Mozambique sharply lowered the value of the metical against the U.S. dollar in the second half of 2016, and the currency remains weak. Annex 1B explores foreign exchange market pressures in Sub-Saharan Africa.

Inflation in the region is decelerating from its high level in 2016, but remains elevated.

FIGURE 1.5: Exchange Rate and Inflation, Selected Countries



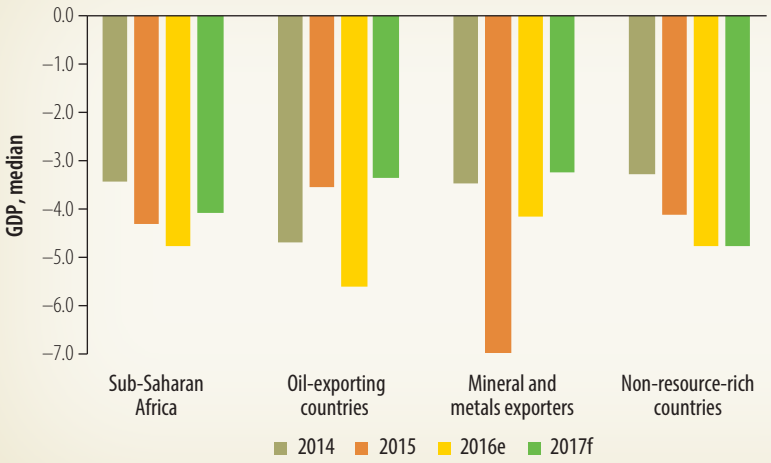
Source: Bloomber, Haver Analytics, World Bank
Note: LCU= local currency unit

Inflation in the region is gradually decelerating from its high level in 2016, but remains elevated (figure 1.5, panel b). Although a process of disinflation has started in Angola and Nigeria, inflation in both countries remains high, driven by a highly depreciated parallel market exchange rate. Inflation eased in metals exporters, because of greater currency stability and lower food prices due to improved weather conditions (Namibia, Zambia). In Mozambique, inflation was in high double digits in February. In non-resource-intensive countries, inflationary pressures have picked up in East Africa, as the drought led to an increase in food prices—notably in Kenya. However, in countries where the drought has been less severe, inflation has remained within the central banks' targets. Inflation continues to be low in most CEMAC and WAEMU countries, reflecting the stable peg to the euro. The low inflation environment in Tanzania, Uganda, and Zambia allowed their central banks to cut interest rates at the start of the year. Bank of Ghana also cut its policy rate. Although inflation in Ghana remains in double digits, it has narrowed from over 19 percent in 2016, to around 13 percent in January.

Fiscal Positions

Countries across the region face the need for fiscal consolidation to narrow fiscal deficits and stabilize government debt. Although commodity prices have recovered some ground, commodity exporters (especially oil exporters, such as Angola and Equatorial Guinea) are still running sizable fiscal deficits (figure 1.6). The fiscal balances of non-resource-intensive countries worsened in 2016, reflecting elevated investment spending levels. Widening fiscal deficits and, in some cases, sizable exchange rate depreciations have resulted in rising public debt levels in the region. Large non-concessional borrowing for infrastructure development has led to high debt servicing costs in several countries. South Africa's 2017/18 budget reaffirms the government's commitment to fiscal consolidation, with the introduction of a new personal income tax bracket to mobilize additional revenue. It remains to be seen whether the stance of fiscal policy will be affected by political developments. Among oil exporters, Angola's 2017 budget targets a stable fiscal deficit, but the risks of large expenditure overruns in the run-up to the election this year remain high. In Nigeria, the government plans to increase infrastructure spending, financed in part through borrowing. Elsewhere, Ghana's 2017 budget signaled a slowdown in fiscal consolidation, which could increase fiscal risks, given limited fiscal space. Mozambique's budget points to a moderate increase in spending. Reflecting the continued weakness of fiscal balances, caused by the fall in commodity prices and the continued upward trend in government debt, the region's rating outlook in 2017 remains negative.

FIGURE 1.6: Fiscal Deficit



Source: World Bank staff estimates.

Even though commodity prices have recovered somewhat, commodity exporters still have sizable fiscal deficits.

Financial Risks

Banking sector vulnerabilities remain elevated in the region, including in Angola, CEMAC countries, the Democratic Republic of Congo, and Nigeria. Foreign exchange restrictions, policy uncertainty, and weak growth have affected the soundness of the banking sector. Non-performing loans have increased, and profitability and capital buffers have decreased. Several proactive measures have been introduced to contain risks to financial stability, including through increased provisioning and by intensifying the monitoring and supervision of banks. While banking system resilience needs to be strengthened, steps by banks to limit credit risks, by tightening lending standards and reducing credit to the private sector while continuing to invest in government securities, are contributing to the slow recovery in economic activity.

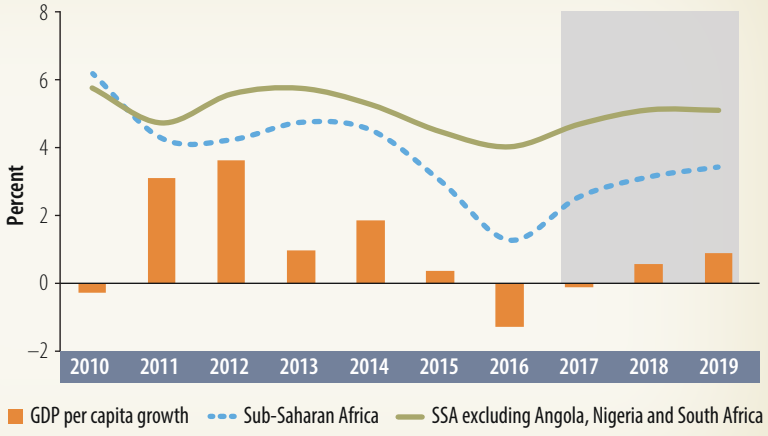
Outlook

Growth in Sub-Saharan Africa is forecast to pick up to 2.6 percent in 2017, rising to 3.2 percent in 2018 and 3.5 percent in 2019 (figure 1.7). The turnaround is predicated on the projected rise in commodity prices (box 1.3) and policy actions to tackle still-large macroeconomic imbalances in several countries. The forecasts are weaker than those in October, reflecting a more moderate recovery among metals exporters and a muted recovery in growth in South Africa. Non-resource-intensive countries are expected to continue to expand at a solid pace. Overall, growth is projected to rise only slightly above population growth, a pace that is largely insufficient for creating employment and supporting poverty reduction efforts in the region.

- Growth in South Africa is projected to recover to around 0.6 percent in 2017, rising to 1.1 percent in 2018 and 2 percent in 2019. Weaker growth of private consumption and investment is expected to offset a rebound in net exports, as the sovereign rating downgrade to sub-investment level raises borrowing costs. For Nigeria, growth is projected to rise from 1.2 percent in 2017 to 2.5 percent in (2018-19). The modest turnaround will be underpinned by a gradual rebound in oil production and an increase in fiscal spending. In Angola, growth is projected to increase from 1.2 percent in 2017 to 1.5 percent in 2019, spurred by a modest increase in oil production. In Nigeria and Angola, recovery in the non-oil sector will be constrained by foreign exchange restrictions and high inflation. The subdued outlook for Angola, Nigeria, and South Africa implies that per capita output will decline in these countries over the forecast horizon.

Growth in Sub-Saharan Africa is forecast to pick up to 2.6% in 2017, and rise to 3.2% in 2018 and 3.5% in 2019.

FIGURE 1.7: Growth Prospects of Sub-Saharan Africa



Source: World Bank.
Note: GDP – gross domestic product.

- Growth will be weaker than previously projected in the CEMAC area, as oil production increases at a slower pace than previously projected, due to maturing oil fields in several countries, and fiscal adjustment reduces public investment. In metals exporters, high inflation and tight fiscal policy will be a greater drag on activity than previously expected in several countries.
- Growth in non-resource-intensive countries should remain robust, based on infrastructure investments, buoyant services sectors, and the recovery of agricultural production. Ethiopia and Tanzania in East Africa, and Côte d'Ivoire and Senegal in WAEMU will expand at a solid pace, although some of these countries may not reach the high growth rates of the recent past. Growth is projected to strengthen in Ghana, as increased oil production boosts exports.

BOX 1.3: Commodity Markets Outlook

According to the World Bank's Commodity Markets Outlook, oil prices are expected to average $55/barrel in 2017, up 28 percent from 2016, as the stock overhang is expected to unwind during the second half of 2017. Oil prices are projected to average $60/barrel in 2018. There are considerable risks (especially downside) to the oil price forecast. Key among them is the resilience of the U.S. shale oil industry. Indeed, the U.S. Energy Information Agency reported higher than expected output in its March report, which was the key cause of the weakening in oil prices in March. On the upside, disruptions among politically stressed producers (Iraq, Libya, and Nigeria) or an extension of OPEC cuts into 2018 could exert upward pressure on prices.

Average annual prices of metals and minerals, which declined 6 percent in 2016, are projected to rise 11 percent in 2017 and 1 percent in 2018. Price forecasts have been increased since January due to stronger than envisioned demand in China and some unexpected supply constraints.

Agricultural prices are projected to remain broadly stable in 2017 and 2018. The stock-to-use ratios of the three key grains (maize, rice, and wheat) have reached 15-year highs, while supplies of other food commodities (such as edible oils) are adequate. Since agricultural production is energy intensive, lower costs due to lower energy prices (compared with pre-2015 levels) continue to have a dampening effect on grain and oilseed prices in 2017. In addition, lower energy prices reduce the incentive to divert land use away from food to biofuel commodities.

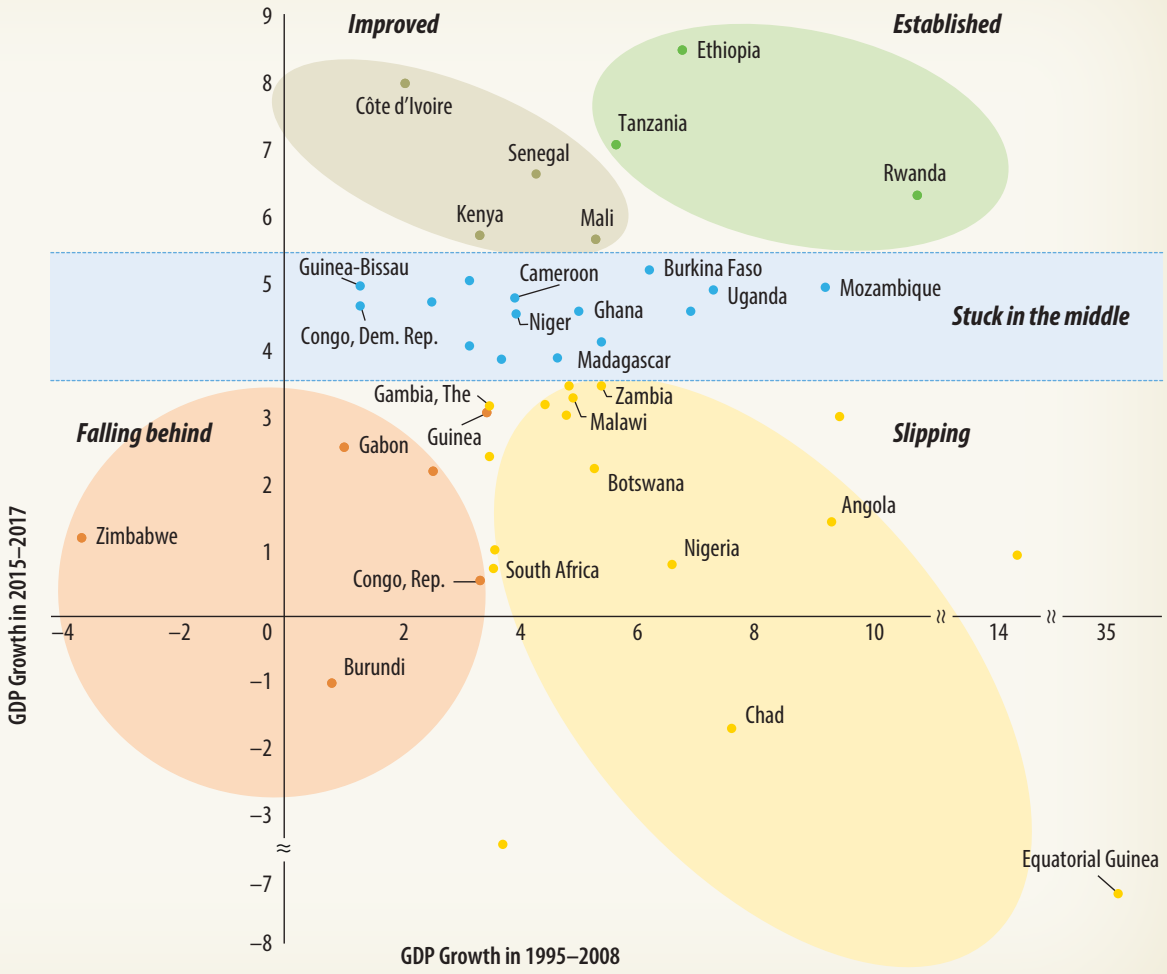
Underlying the outlook, lower inflation is expected across most of the region. The recovery of agricultural production, following the end of the drought, will help reduce food price inflation in several countries, including South Africa. Reduced inflation will allow central banks to loosen monetary policy. However, inflation is expected to remain elevated in Angola and Nigeria throughout the forecast horizon, reflecting limited adjustment in the foreign exchange market. Drought conditions remain in parts of East Africa—notably Kenya—and will exert pressures on inflation in these countries this year. Fiscal and current account deficits are expected to improve somewhat for commodity exporters, helped by the continued recovery of oil and metals prices and some reduction in fiscal spending. In non-resource-intensive countries, the fiscal and current account positions are likely to remain under pressure as countries struggle to strike a balance between the need for fiscal consolidation (Kenya, WAEMU) and public infrastructure investment spending.

Growth Resilience Revisited

Overall, the difficult economic conditions facing African countries in 2015 and 2016 have taken their toll on the economic resilience of the region. In the October 2016 issue of Africa's Pulse, 45 Sub-Saharan African countries were categorized into four groups based on the comparison of their average annual GDP growth rates during 1995–2008 and 2014–16. We revisit the categorization by using growth rates for 2015–17. This more recent period better captures the resiliency of countries to the commodity shock and difficult economic conditions and to the adequacy of policy response. The thresholds used to classify the countries remain the same: top and bottom terciles of the average annual growth rate of the 45 countries between 1995 and 2008—that is, 5.4 and 3.5 percent, respectively. The latest data reveal that only seven countries are seeing growth rates above 5.4 percent in 2015–17. The seven countries exhibiting resilience are Côte d'Ivoire, Ethiopia, Kenya, Mali, Rwanda, Senegal, and Tanzania (figure 1.8). These countries house nearly 27 percent of the region's population and account for 13 percent of the region's total GDP.

Côte d'Ivoire, Ethiopia, Kenya, Mali, Rwanda, Senegal, and Tanzania are the countries in the region showing resilience.

FIGURE 1.8: Taxonomy of Countries in Sub-Saharan Africa: GDP Growth in 2015–17 versus 1995-2008



Source: World Bank staff calculation based on the WDI database.

Several countries that were resilient in our earlier analysis are less so now: Benin, Cameroon, the Democratic Republic of Congo, Mozambique, and Togo. Mozambique's growth trajectory has been derailed by the rapid deterioration of the country's debt position, which has eroded investor confidence, sharply depreciated the currency, and prompted a tightening of monetary and fiscal policy. The deceleration in growth in the Democratic Republic of Congo reflects declining mining production and a fall in investment spending, combined with domestic political uncertainty. An additional seven countries, most of them resource-abundant countries (the Republic of Congo, Gabon, Mauritania, and Zambia), have moved into the slipping or falling behind category.

Resilient countries tend to enjoy robust and broad-based growth. Our previous analysis found that these countries generally have better macroeconomic management, and recent evidence continues to support this finding. These countries have managed to contain non-priority spending and mobilize domestic revenue, building fiscal space for investment and social spending. The size of debt relative to GDP is lower for this group of countries (averaging about 40 percent in 2016) compared with that of

other countries in the region (54 percent). Inflation rates in resilient countries are lower than in other countries in the region, averaging 4 percent and 5.8 percent, respectively, in 2015–16.

Risks

The economic outlook for the region is subject to significant downside risks, including the following on the external front:

- In Sub-Saharan Africa, sovereign bond issuance has become a key financing strategy in recent years, as countries have looked to global financial markets to facilitate domestic investment. Higher global interest rates could narrow the scope for this financing. Sustained increases in global interest rates could reduce the ability of governments in the region to raise this level of finance.
- Weakening of growth in advanced economies or emerging markets could reduce demand for exports, depress commodity prices, and curtail foreign direct investment in mining and infrastructure. Oil and metals exporters are particularly vulnerable to this risk, given their less diversified economies.
- The change in government in the United States following the elections in November 2016 is not expected to have major effects in the region. However, there is a risk that the United States will cut back official development assistance. This will hurt the region's smaller economies and fragile states, which have strong economic ties with the United States.

Risks on the domestic front include the following:

- In countries where significant fiscal adjustments are needed, especially in CEMAC countries, failure to implement appropriate policies could weaken macroeconomic stability and slow the recovery.
- Worsening security, drought conditions, or political uncertainty ahead of key elections pose risks to the outlook for some countries, including Kenya, Nigeria, and South Africa.

Challenges

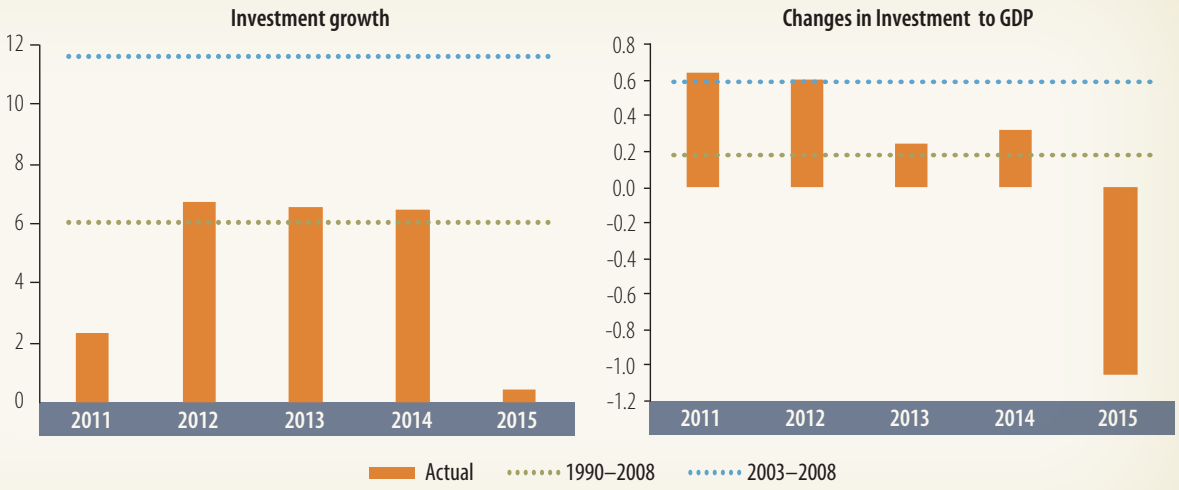
The region faces a myriad of challenges to regaining the momentum on growth. Addressing these challenges will require deep reforms to improve institutions for private sector growth, develop local capital markets, improve the quantity and quality of public infrastructure, enhance the efficiency of utilities, and strengthen domestic resource mobilization. In this report, we spotlight a few pressing challenges that several African countries are facing: a slowdown in investment, still high trade logistics costs that impede competitiveness and export diversification, and rising debt levels.

Slowdown in Investment

The low growth in Sub-Saharan Africa is reflected in part in the investment growth slowdown the region has experienced. Investment growth in the region slowed from nearly 8 percent in 2014 to 0.6 percent in 2015, well below the long-term (1990–2008) average of about 6 percent and the fast-paced growth of 11.6 during 2003–08 (figure 1.9). The sharp drop in investment growth in 2015 is evident across public and private investment. The deceleration in investment growth has pulled down the share of investment in GDP by 1.05 percentage points, reversing the cumulative gains in this measure over the three previous years.

Investment growth has slowed sharply, pulling down the share of investment in GDP.

FIGURE 1.9: Trends in Investment Growth (%)



Source: International Monetary Fund Investment and Capital Stock Dataset, 1960-2015.

Given the large investment needs of the region, increasing public investment will be a priority. Public investment directly boosts overall investment in the economy and can foster private investment. But few countries in the region are well positioned to ramp up public investment. Most countries have little fiscal space to increase public investment, because of their high debt-to-GDP ratios and the need for fiscal consolidation. External financing conditions have tightened with increased uncertainty in the United States and Europe, which makes tapping debt markets increasingly difficult and risky. At the same time, in many countries, low tax revenues, weak banking systems, and underdeveloped capital markets limit the share of domestic resources that can be allocated to public investment. In low-income countries, regulatory and implementation capacity constraints are key obstacles to scaling up public investment in infrastructure.

Four key areas of policy priorities to address investment needs and ensure sustainable financing are the following:

- *Sustaining public investments.* Domestic resources—tax and nontax revenue—are likely to remain the dominant source of financing for infrastructure. Increasing domestic revenue may provide the most sustainable way to finance infrastructure investment. This will require improving tax collection as well as cost recovery. In many countries, debt levels are still manageable, and borrowing to increase spending on infrastructure remains a viable option. However, debt sustainability should not be compromised.

- *Encouraging greater private sector participation in infrastructure.* Countries need to strengthen the pipeline of bankable projects that can meet the financial objectives of private investors. Innovative fund and deal structures, such as guarantees and risk sharing, should be developed to mitigate

risk. Blended finance instruments that can leverage private sector development financing should be promoted. Public-private partnerships (PPPs) are a tested strategy that can be applied to many sectors. However, governments must establish autonomous regulatory agencies to oversee private agents. The terms of the partnerships must be monitored carefully to ensure that PPPs deliver a normal return and not a monopoly profit.

- *Strengthening public investment management systems*. Effective public financial management capacity is critical for scaling up infrastructure investment spending. Countries should seek to strengthen the capacity for project selection and appraisal, and enhance the monitoring of project execution to minimize leakages. Operation and maintenance expenditures for existing infrastructure should be fully integrated into a medium-term expenditure framework to ensure that they receive adequate budgetary resources.

- *Promoting regional integration of infrastructure.* A regional approach to the provision of infrastructure services is needed to overcome the region's geographic and physical challenges. This will require effective regional institutions, setting priorities for regional investments, harmonizing regulatory frameworks and administrative procedures, and facilitating cross-border infrastructure.

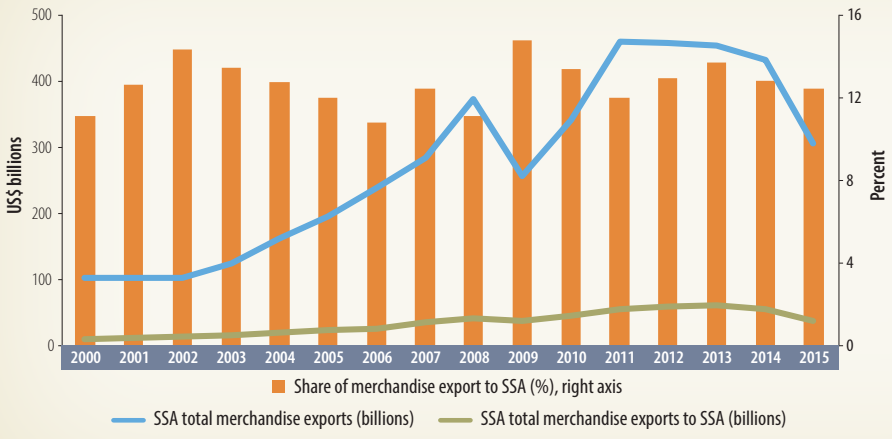
  These issues are discussed in more detail in the special topic of this report (section 2).

High Trade Logistics Costs

Trade logistics costs remain high in the region, constraining the competitiveness of local firms. Lowering these costs can help countries to exploit the opportunities for trading in goods and services, globally and within the region.

Trade logistics and intraregional trade in Sub-Saharan Africa are areas of untapped potential. So far, growth in regional trade has been limited. Although the total value of exports between African countries increased from $12 billion in 2000 to $38 billion in 2015, the average share of intraregional exports in total exports has remained about 13 percent (figure 1.10). This share is substantially smaller than intraregional trade among European Union countries (60 percent of total exports) and among East Asia and the Pacific region countries (46 percent).

FIGURE 1.10: Merchandise Exports of Sub-Saharan Africa, 2000–15



Source: World Integrated Trade Solution database 2017.

Growth in intraregional trade has been limited.

There is enormous untapped potential for intraregional trade in Africa to increase and drive export diversification, job creation, and poverty reduction. For example, greater regional trade integration could bring the following benefits:

- Food security can be enhanced by increasing intraregional trade in staple foods and processed agricultural products (box 1.4).
- There are emerging opportunities for cross-border trade in basic manufactures, such as metal and plastic products that are relatively costly to import from the global market.
- There are opportunities to develop regional value chains to drive global exports of manufactures, such as phosphates for fertilizers and regional processing of nickel and copper.
- There is considerable potential for cross-border trade in services, such as health, education, and business services.

BOX 1.4: De-Fragmenting Markets through Deeper Regional Integration

Increased regional trade can reduce the wedge between producer and consumer prices for essential food products, increasing the welfare of consumers in structural deficit areas where food prices are high, and that of producers in surplus areas where farm gate prices are relatively low. One way to quantify the effect of barriers that limit trade is to evaluate what would be the increased distance that would increase costs equivalently to crossing a border. Recent analysis of the prices of maize, rice, and cowpeas found that crossing the border between Niger and Nigeria is equivalent to pulling these countries 639 kilometers further apart; the Nigeria-Chad border effect is equivalent to adding 594 kilometers.

In addition, the segmentation of markets in Africa increases the volatility of food production prices. In every West African country, the volatility of within-country production is greater than that of the region, and production is imperfectly correlated across countries. The implication is that greater intraregional trade would help stabilize prices in individual countries in the face of local shocks. This would hold more strongly for the larger pan-African continental market. Hence, deeper integration with larger regional markets can reduce the impact on the poor of the price effects from localized shocks. In addition, lower trade barriers and better trade infrastructure allow faster and more efficient response to localized food shortages due to disasters of all types.

a. Cervigni and Morris (2016).
b. World Bank (2012)..

However, the high cost of connecting to markets is a fundamental detriment for African producers. It is estimated that intraregional trade costs are around 50 percent higher in Africa than in East Asia, and are the highest of intraregional costs for any developing region.[1] Achieving the trade potential of the region will require substantial improvement in the quantity, quality, and range of trade-related transport and logistics services. Various studies have shown that, in general, less developed and expensive trade logistics lead to the following:

- *High overhead costs for manufacturers.* The World Bank's 2011 report on Light Manufacturing in Africa showed how poor trade logistics increase production costs (often wiping out the advantage of lower

1 Based on regional estimates from the World Bank–UNESCAP Trade Costs Database.

labor costs) and lead to long and unreliable delivery times, making local firms in Africa uncompetitive in regional and global markets.

- *Inefficiencies in logistics services that undermine agricultural supply chains.* Continued productivity improvements in agriculture will require enhanced access to modern inputs, seeds, fertilizers, and pesticides, often through imports. Investment in new inputs requires access to markets and fast, efficient, and predictable transport and logistics. Increasing the productivity of the agricultural sector, and the resulting growth of the agro-processing sector, will be crucial for continuing rural development; however, it will be constrained if the trade logistics services available in the country are of poor quality and high cost.

- *Continuation of the current logistics systems in Africa, which impose very high costs on small firms participating in trade*. Thriving regional trade in staple foods and manufacturing, including processed agricultural products, will require efficient consolidation and distribution services if small firms are to benefit from economies of scale in transportation.

Although the region has made considerable progress in addressing the logistics constraints to trade, there is still much more to be done to reach the levels of other developing countries and help African firms compete on an equal footing in regional and global markets. Several countries in Sub-Saharan Africa have made some of the largest gains in trade logistics, as measured by the World Bank's Doing Business and Trading Across Borders indicators. For example, between 2009 and 2014, nine of the top 10 reformers globally in the trade indicator were in Sub-Saharan Africa, and 70 percent of the economies in Africa implemented at least one reform. Along corridors, there has been some success in removing roadblocks and reducing border-crossing times, with impacts on transport efficiency and cost, such as in East Africa.

However, Africa still has some catching up to do, compared with other regions, on broader measures of logistics quality, such as the World Bank's Logistics Performance Index, and in ensuring that poor people are connected to markets through efficient and reliable logistics services. The following are the key priorities for African countries as they seek to improve competitiveness and deepen regional integration:[2]

- Improvements in trade logistics need to facilitate trade not only along corridors to the main ports, but also across borders between African countries, to realize the potential from regional integration and regional sourcing of inputs in Africa.

- Improvements in physical infrastructure must be complemented by better policies and procedures applied to trade. Experience is increasingly showing that the largest impact often comes from the latter. Hence, there is a need to deepen the focus on simplifying trade rules and procedures, and ensure transparency and predictability in their implementation.

- Improvements in trade logistics are not just about goods in trucks and containers, although those are vitally important. These improvements are also about facilitating the movement across borders of people and services. The logistics of trade in services, whether it be issues related to virtual connectivity or mutual recognition of the qualifications of professionals, such as accountants,

2 Huria and Brenton (2016).

engineers, or health and education workers, require more attention to realize the enormous opportunities from trade in services.

- The political economy of reform is such that it is essential that the private sector is the main driver of change.
- Finally, benchmarking and measuring trade logistics performance are a critical part of any strategy that seeks to leverage trade, including regional trade, as a driver of diversification and poverty reduction. Monitoring is needed to ensure that (a) reforms are being implemented, and (b) the benefits of improved trade logistics are being passed on to producers and consumers in the form of a broader range of lower-priced and more widely available goods and services.

Governments in Africa can exploit a range of agreements and instruments to support the implementation of this reform agenda. Groups of like-minded countries in subregions in Africa can come together to address the logistics constraints that undermine mutual trade opportunities—such as is being done by countries in Southern Africa under the Accelerated Program of Economic Integration, and between the Democratic Republic of Congo and countries in the Great Lakes Region. Countries can enhance their efforts to implement the commitments to facilitate trade made through regional economic communities, as have the countries of the East African Community, and could leverage the Tripartite Agreement and the Continental Free Trade Agenda as vehicles to push a transformation agenda for trade logistics that prioritizes impacts on the poor.

Finally, global agreements, such as the Trade Facilitation Agreement, can be implemented in a way that ensures that the improvement of regional trade logistics accompanies efforts to improve connectivity to the global market.

Rising Debt

Debt levels are on the rise in Sub-Saharan Africa and, in some cases, rapidly. Public debt in the region has continued to rise amid large/widened fiscal deficits and weak growth. The median general government gross debt-to-GDP ratio stood at 48 percent in 2016, more than 10 percentage points above the level in 2014. But there is wide variation across countries. For the bottom quartile of countries in the region, general government gross debt is less than 40 percent of GDP; for the top quartile, it exceeds 60 percent of GDP.

Debt ratios among oil exporters have increased by about 15 percentage points of GDP over the past three years (2014–16), to a median value of 50 percent. Among non-resource exporters, Mozambique has public debt levels exceeding 100 percent of GDP, after information exposed government guarantees on debt by several state-owned enterprises (figure 1.11). Other countries have borrowed to finance much-needed infrastructure programs—for example, Ethiopia, with the second phase of the Growth and Transformation Plan.

Of 46 countries in the region (excluding South Sudan and Somalia due to lack of data), the debt ratios of 44 countries changed during 2014–16. Of the 35 countries with rising debt ratios, 18 saw at least a 10-percentage point increase in this ratio between 2014 and 2016. In six of these countries, the increase was greater than 20 percentage points: Zimbabwe, Mauritania, Sierra Leone, the Republic of Congo, São Tomé and Príncipe, and Mozambique (figure 1.12).

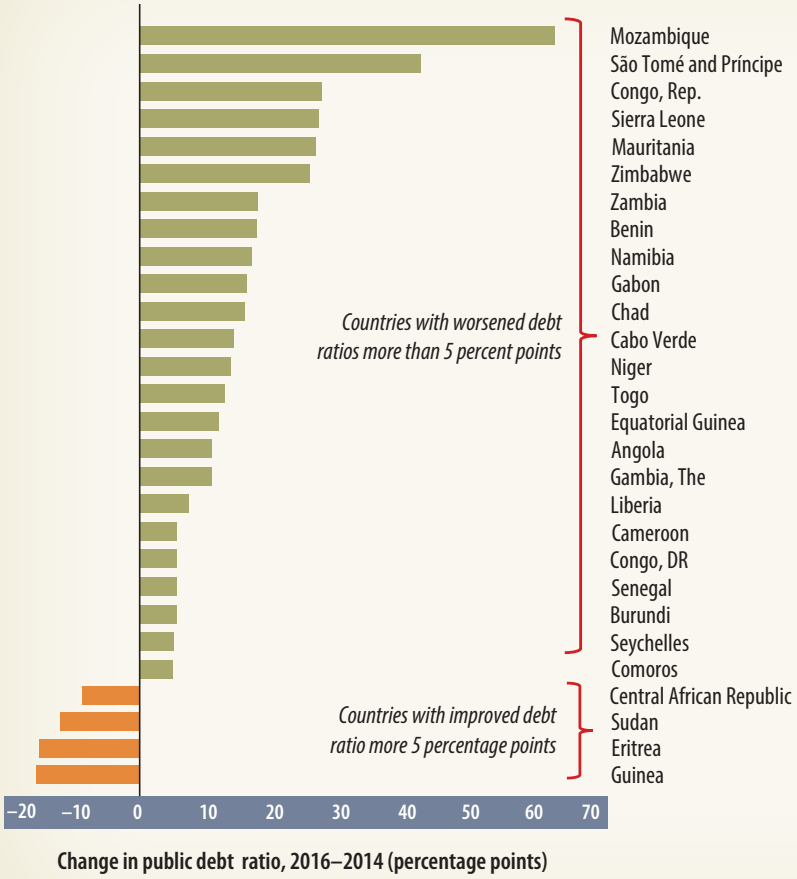
Public debt levels are sustainable to the extent that the funds borrowed generate returns that allow timely repayment. However, some countries in the region are caught in an environment of low growth prospects, widened fiscal deficits, weaker currencies, and lower export revenues, and could face problems in repaying their debt. At the same time, normalization of monetary policy in the United States and credit rating downgrades

FIGURE 1.11: Public Debt-to-GDP, Countries in Sub-Saharan Africa, 2014 and 2016

Source: Macro Poverty Outlooks, Africa Region, World Bank 2017.

Debt ratios among oil exporters have increased by about 15 percentage points of GDP over the past three years.

FIGURE 1.12: Change in the Public Debt-to-GDP Ratio between 2014 and 2016, Selected Countries in Sub-Saharan Africa



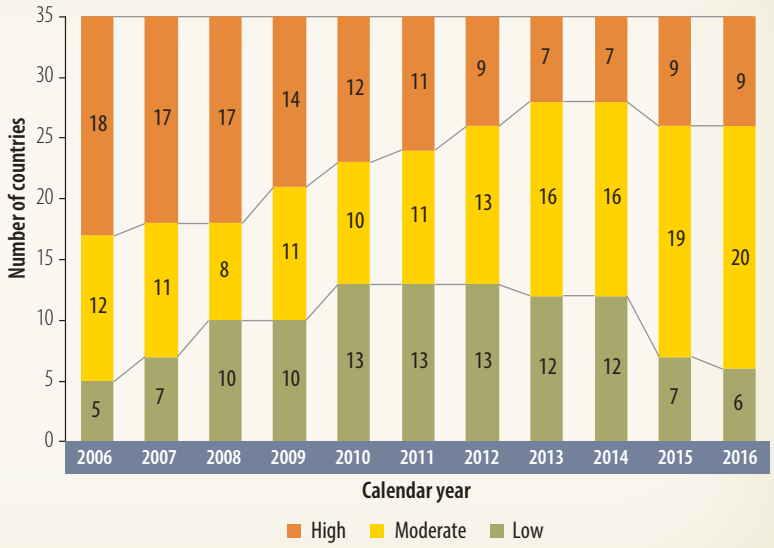
Source: Macro Poverty Outlooks, Africa Region, World Bank 2017.

Zimbabwe, Mauritania, Sierra Leone, the Republic of Congo, São Tomé and Príncipe, and Mozambique have seen their debt to GDP ratio increase by more than 20 percentage points.

in some African nations (for example, Angola, Mozambique, and the Republic of Congo) have raised borrowing costs for countries in the region. Among 35 low-income and lower-middle-income countries in the region, the number of countries with low risk of debt distress declined from 12 in 2014 to six in 2016 (IMF-World Bank Debt Sustainability Analysis) (figure 1.13).

Among low- and lower-middle-income countries, the number of countries with low risk of debt distress declined from 13 in 2012 to six in 2016.

FIGURE 1.13: Evolution of the Risk of Debt Stress: Low-Income Countries in Sub-Saharan Africa



Source: International Monetary Fund/World Bank, Debt Sustainability Analysis database, February 2017.

In an environment with tighter and more volatile global financial conditions, many countries in Sub-Saharan Africa face the challenge of undertaking their much-needed development spending without jeopardizing their hard-won debt sustainability. This will require not only conducting sound and sustainable monetary and fiscal policies, but also developing local currency bond markets. The ability of governments to issue debt in their own currency will reduce their dependence on external funding and, more importantly, exposure to exchange rate risk. At the same time, public bond issuances may gradually shift from short-term and floating debt to fixed rate debt, thus reducing the exposure to interest rate fluctuations. The capacity of debt management organizations across countries requires upgrading as well.

ANNEX 1A: GROWTH AFTER A COMMODITY PRICE PLUNGE: WHAT TO EXPECT?

Commodity Price Cycles

The post-2000 commodity super cycle the world recently witnessed is not an isolated phenomenon. Over the past century, three other super cycles (from trough to trough) have taken place in 1894–1932, 1932–71, and 1971–99. The World Bank (2015) argues that these long and protracted commodity price upswings were associated with the rapid industrialization and urbanization of a group of dynamic economies—U.S. growth in the late 19th and early 20th centuries, the post-World War II reconstruction of Europe, and the emergence of Japan as a major economic player. As the income per capita levels of these countries increase, their commodity consumption follows an S-curve pattern.[1] Once this commodity consumption stabilizes, a period of much lower commodity prices follows (Jacks 2013).

Commodity price boom-bust cycles take a toll on countries, especially developing and resource-rich countries. Resource-abundant countries in Sub-Saharan Africa are no exception to such economic upheavals owing to super cycles. To examine the behavior of economic performance after a commodity plunge, periods of sharp decline in commodity prices are identified. Specifically, the criteria identify episodes where the annual Energy Price Index declines by more than 25 percent, namely, 1986, 1998, 2009, and 2014.[2] This annex examines the behavior of growth per worker as well as the sources of growth—capital accumulation and total factor productivity (TFP)—after a plunge in commodity prices.[3] Given that some of the effects of the 2014 plunge are still evolving, inference from previous commodity price busts is used to extract some lessons for the current episode.[4]

Figure 1A.1 depicts the behavior of commodity prices over a window of time starting from the year before the bust year (labeled T). International prices of metals and mineral ores as well as agricultural goods also experienced a decline—although not as pronounced as that of energy commodities. Precious metals, typically regarded as safe-haven commodities, experienced an increase in prices. Energy prices did not fully recover to pre-crisis levels in the span of six years, while other commodities recovered relatively rapidly.

Evolution of Real Gross Domestic Product per Worker in Sub-Saharan Africa after a Plunge in International Energy Prices

The behavior of real gross domestic product (GDP) per worker after a price plunge in the region and in country groups classified according to their extent of resource abundance is presented in figure 1A.2. For the region, output per worker drops about 9 percent in the first year, and takes five years to recover to the pre-shock level (figure 1A.2, panel a). Looking at the regional aggregate masks differences across country groups (figure 1A.2, panel b). As expected, output per worker among oil-rich countries deteriorates sharply

1 Commodity consumption tends to stabilize at very high levels after rapid and accelerating growth (Roache 2012).

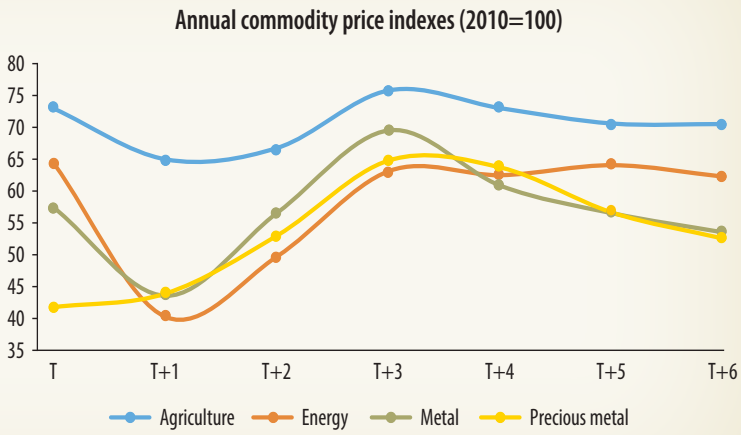
2 Energy price data were extracted from the World Bank Pink Sheet. The Energy Price Index is comprised of three commodities: coal, crude oil, and natural gas, and their weights are 4.7, 84.6, and 10.8, respectively.

3 The data on real GDP, capital stock, employment, and TFP were obtained from Penn World Tables 9.0 (Feenstra, Inklaar, and Timmer 2015).

4 Not all commodity price busts are alike. The plunge in 1986 was driven by oil supply factors, whereas those in 1998 and 2009 were demand driven.

Output per worker drops about 9% in the first year and takes five years to recover to the pre-shock level.

FIGURE 1A.1: Evolution of Commodity Prices after an Energy Price Plunge in Sub-Saharan Africa

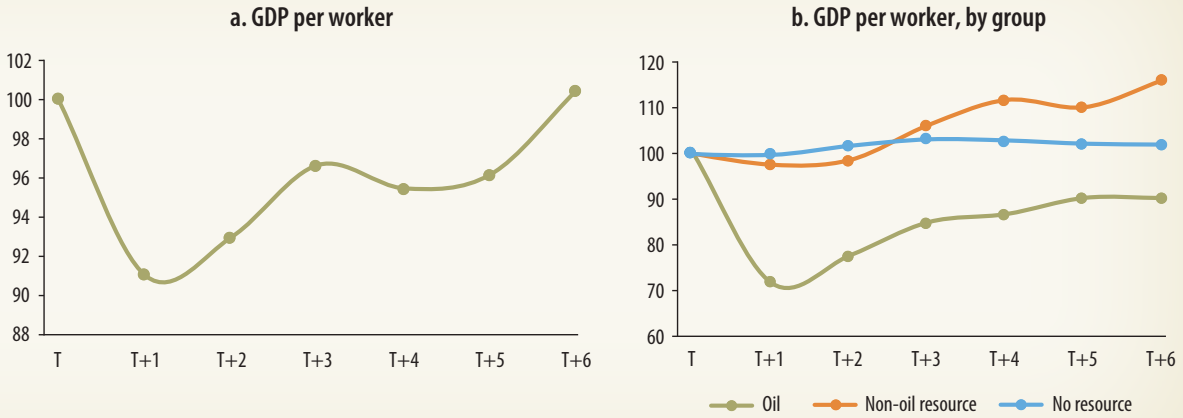


Source: World Bank.
Note: Period T represents the year previous to the energy price plunge.

(with a median peak to trough of about 25 percent). Among non-oil-rich countries, the drop in income per worker is not as pronounced, but it is protracted. Overall, resource-rich countries in the region (oil and non-oil) fail to recover to pre-shock levels during the next six years. Non-resource-dependent countries had a barely negative impact after the commodity price bust. In an environment of lower energy prices, these countries managed to build some growth momentum.

In non-oil-rich countries, the drop in income per worker is not as pronounced.

FIGURE 1A.2: Behavior of Income per Worker after an Energy Price Plunge in Sub-Saharan Africa (weighted average, index)



Source: Penn World Tables 9.0 (Feenstra, Inklaar and Timmer 2015).
Note: All real output per worker figures are rescaled to 100 for year T (the peak year before the energy price plunge).

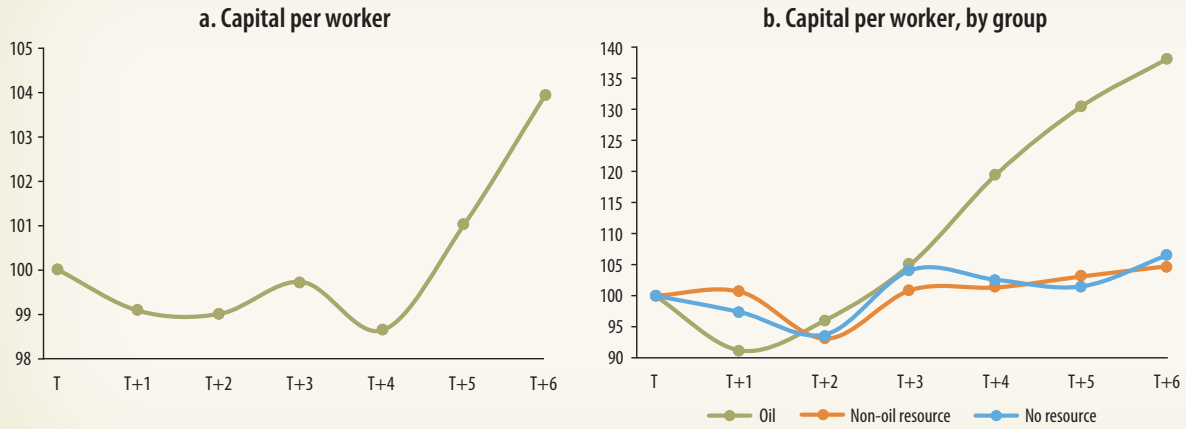
Sources of Growth and the Energy Price Plunge in Sub-Saharan Africa

The median recovery of income per worker after a sharp drop in commodity prices is about five years for the region as a whole. However, the speed of recovery appears to be slower for resource-abundant countries. What are the dynamics of the sources of growth underlying this recovery? What is the behavior of capital per worker and TFP across countries in the region after such a shock?

The behavior of capital per worker after a sharp deterioration of energy prices in Sub-Saharan Africa and selected country groups is plotted in figure 1A.3. For the region, capital per worker declines slightly over the next four years after the price decline, and increases afterward. The cumulative growth of capital per worker over the next five years after the commodity price shock is about 5 percent (figure 1A.3, panel a). When looking at country groups, non-oil and non-resource-rich countries have relatively unchanged

levels of capital per worker throughout the six-year window. However, oil-rich countries experience a faster increase in capital per worker, which is attributed to a large stream of capital investment in the aftermath of this profound shock (figure 1A.3, panel b).

FIGURE 1A.3: Evolution of Capital per Worker after an Energy Price Plunge in Sub-Saharan Africa
(weighted average, index)

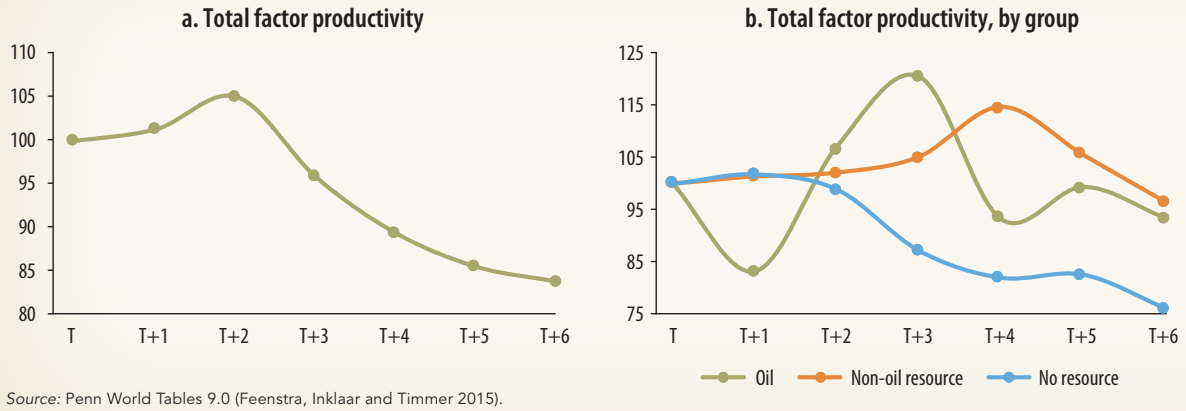


Oil-rich countries experience a faster increase in capital per worker due to a large stream of capital investment in the aftermath of a shock.

Source: Penn World Tables 9.0 (Feenstra, Inklaar and Timmer 2015).
Note: All capital per worker figures are rescaled to 100 for year T (the peak year before the energy price plunge).

The evolution of TFP is presented in figure 1A.4. For the region, TFP shows a slight increase in the first two years after the shock, which might reflect the shedding of inefficient vis-à-vis efficient workers. Afterward, TFP exhibits a marked downward trend. In the sixth year after the shock, TFP in Sub-Saharan Africa is still 15 percent below pre-shock levels (figure 1A.4, panel a). Furthermore, the behavior of TFP over time is particularly striking among oil-rich countries. TFP fluctuations in oil-rich countries after the energy price plunge are much more volatile than in the other two groups. Such volatility in productivity may suggest a greater extent of resource misallocation within these economies, which, in turn, may inhibit sustained economic growth. Non-resource-rich countries in the region also show no productivity improvement, suggesting that economic growth was primarily driven by capital accumulation.

FIGURE 1A.4: Evolution of Total Factor Productivity after an Energy Price Plunge in Sub-Saharan Africa
(weighted average, index)



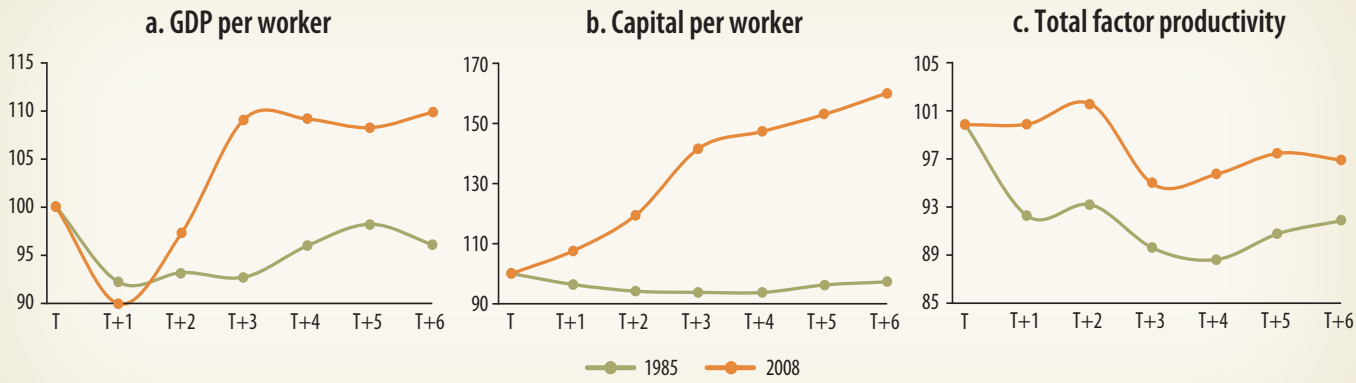
Six years after the shock, TFP in Sub-Saharan Africa is still 15% below pre-shock levels.

Source: Penn World Tables 9.0 (Feenstra, Inklaar and Timmer 2015).
Note: All TFP figures are rescaled to 100 for year T (the peak year before the energy price plunge).

The response of GDP per worker, capital per worker, and TFP during the commodity price plunge, from their peaks in 1985 and 2008, is examined in figure 1A.5. Although the magnitude and persistence of the drop in energy prices may differ between these two episodes, one reason for their comparison is the difference in the nature of the sources of the price declines. The 1985 episode is explained by shocks that expanded the supply of energy (say, technological innovations, increased supply coming from the Soviet Union, and the Organization of the Petroleum Exporting Countries' mandate to maintain market shares rather than defend prices, among others). By contrast, the price collapse in 2008 is attributed to a global demand shock, as the level of economic activity was severely affected by the global financial crisis.[5]

Some interesting results emerge from figure 1A.5. First, the fall in output per worker (measured by the distance from peak to trough) is sharper in the 2008 episode than in 1985; however, the recovery after 2008 is faster. Second, the recovery of output per worker in 2008 is primarily driven by massive capital deepening—as shown by the steady increase in capital per worker. For the 1985 episode, capital per worker declines moderately and slowly converges to pre-shock levels. Third, TFP levels decline over time in both episodes—although at a faster pace in the 1985 episode. From these findings, it can be inferred that supply-driven commodity price collapses (compared with demand-driven ones) are associated with slow recoveries in output per worker, stagnant capital ratios, and sharper TFP declines.

FIGURE 1A.5: Not All Commodity Price Shocks Are Alike in Sub-Saharan Africa (index values)



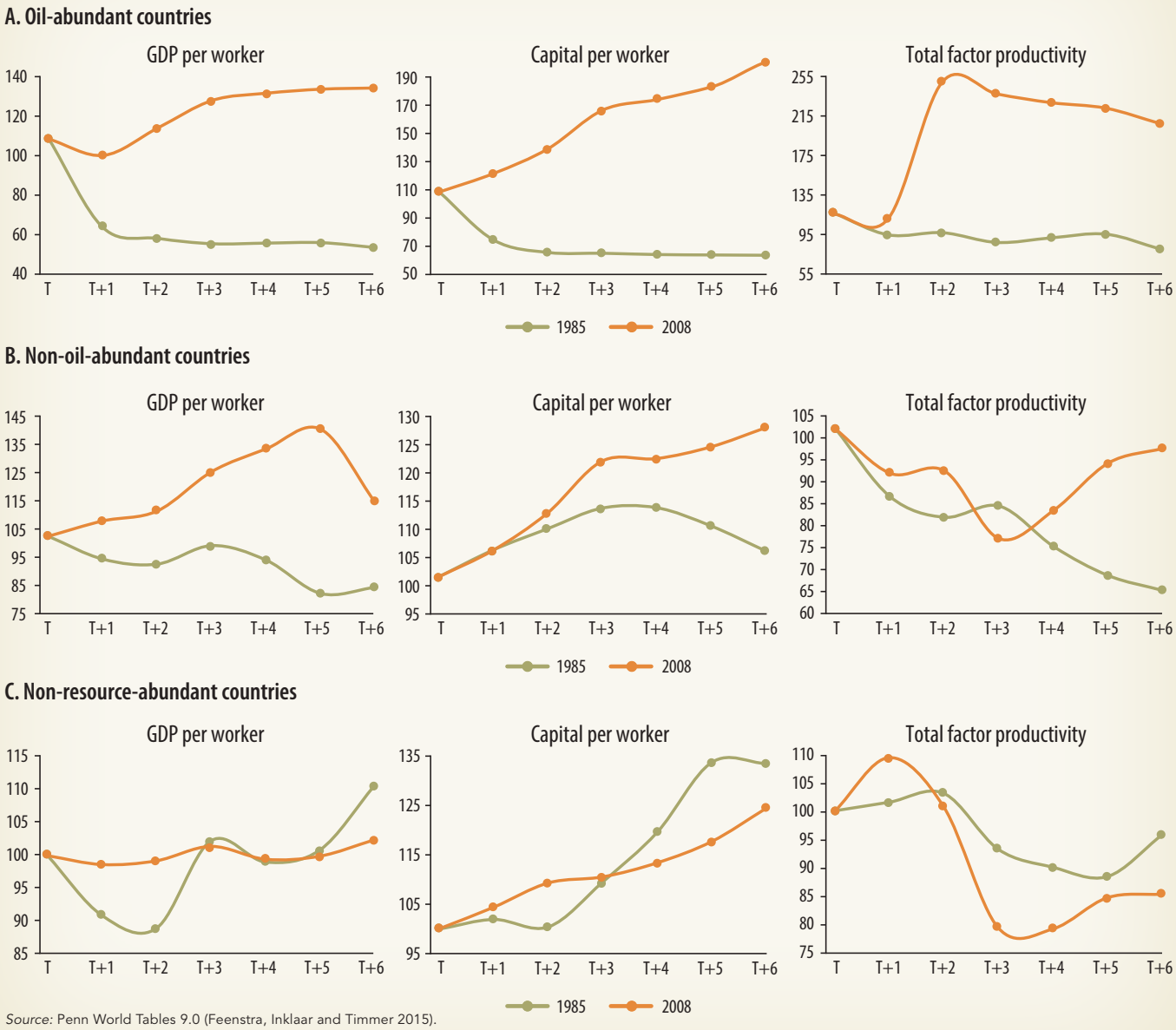
Source: Penn World Tables 9.0 (Feenstra, Inklaar and Timmer 2015).
Note: All TFP figures are rescaled to 100 for year T (the peak year before the energy price plunge). GDP = gross domestic product; TFP = total factor productivity.

Figure 1A.6 depicts the evolution of GDP per worker, capital per worker, and TFP after the two commodity price shocks (1985 and 2008) across country groups in Sub-Saharan Africa classified by their extent of resource abundance. Interestingly, the figure shows that when the commodity price plunge is explained by supply shocks (the 1985 episode), the output drop is larger than when it is driven by demand shocks (the 2008 episode). Looking at the supply-driven shock, output per worker declines the most among resource-abundant countries, and it does not recover to previous peak levels after six years. In the case of non-resource-abundant countries, output recovers in the second year after the shock hits. The behavior of output per worker in each group is primarily explained by the evolution of TFP.

5 The drivers of the 1985 price decline are more in line with those of 2014; see World Bank (2015) and Baffes et al. (2015).

In sum, vulnerability to shocks represents a huge cost (in output and productivity) for countries in Sub-Saharan Africa. Plunging energy prices—along with relatively moderate declines in agriculture and metals prices—may have constrained or delayed the decision of African economies to implement growth-enhancing policies. Particularly vulnerable is the group of oil-rich economies, where recovery in output per worker comes along with massive capital deepening, and it is not accompanied by TFP growth. This situation implies that the growth recovery financed by investment programs may not provide the biggest bang for their buck. The recurrence of commodity price busts poses challenges to resource-abundant countries, once again, to formulate policies to withstand these adverse shocks. In this context, countries should not only rely on capital accumulation for sustained growth. They need to formulate policies to boost productivity and the efficient allocation of resources within and across their industries.

FIGURE 1A.6: Not All Commodity Price Shocks Are Alike, by Country Groups in Sub-Saharan Africa (weighted index values)



Source: Penn World Tables 9.0 (Feenstra, Inklaar and Timmer 2015).
Note: All TFP figures are rescaled to 100 for year T (the peak year before the energy price plunge).

ANNEX 1B: HEIGHTENED EXCHANGE MARKET PRESSURES IN SUB-SAHARAN AFRICA

Stagnant economic growth coupled with declining oil and commodity prices have underpinned fiscal and external imbalances in countries in Sub-Saharan Africa. At the height of mounting economic pressures, countries in the region may react differently to such a terms-of-trade shock. Some countries may allow a significant but orderly depreciation of their currencies. Others with fixed exchange rate regimes may experience a large and abrupt decrease in foreign reserves. One method to assess the impact of such shocks on foreign exchange (FX) markets across countries in the region is to quantify the extent of exchange market pressure (EMP). Girton and Roper (1977) model EMP as a measure of excess demand for a currency. It was later modeled to compute pressure in FX markets under a flexible, intermediate, or fixed regime, thus enabling us to evaluate the impact of policy actions such as FX market interventions and/or interest rate adjustments.

In its simplest version, EMP is computed as the weighted sum of exchange rate depreciation and foreign reserve loss.[6] The analysis exploits monthly data on the exchange rates and international reserves of 40 Sub-Saharan African countries from April to September 2016, compared with the same period in the previous year. Based on the calculated EMP, countries in Sub-Saharan Africa are classified into three groups: high-pressure, moderate-pressure, and no-pressure.[7] The high-pressure group consists of countries with EMP greater than 25 percent. The moderate-pressure group is those with positive EMP but less than 25 percent. The no-pressure group is comprised of those with negative EMP, indicating no pressure of currency weakening observed during the period studied.

Table 1B.1 shows the list of countries in each group, with its dominant contributing factor. The overall average EMP of the high-pressure group is 50 percent, more than five times larger than that of the moderate-pressure group. About two-thirds of the pressure in the high-pressure group originates from foreign reserve losses. The moderate-pressure group has an EMP of 9.4 percent, with exchange rate depreciation and foreign reserve loss equally contributing to the cumulative FX pressure. Finally, the no-pressure group has an EMP of -25 percent. Small pressures coming through currency weakening are offset by foreign reserve accumulation among countries in the no-pressure group in the observed period.

When we look at the output-weighted averages of EMP for the different country groups, the results show a different picture. The high-pressure group still has an EMP of 50 percent and the contribution of exchange rate depreciation is now about two-thirds. This outcome is attributed to Nigeria's transition to a more flexible exchange rate regime in June 2016. This transition led to a weakening of the naira of about 50 percent in the following months. Angola is an example of another country that allowed its currency to undergo a significant level of depreciation when comparing April-September 2016 vis-à-vis April-September 2015. However, the Angolan kwanza has remained almost invariant since June 2015.

6 A more complete version of the EMP index includes not only changes in exchange rates and international reserves, but also interest rate differentials; see Aizenman and Hutchison (2012). The analysis undertaken for countries in Sub-Saharan Africa uses only exchange rates and reserves, because: (a) there is insufficient data on domestic and foreign interest rate differentials in many of the countries in the region, and (b) many countries in the region belong to a currency union and have no independent (interest-driven) monetary policy.

7 South Sudan is excluded from the analysis. Its computed EMP is about 1,291 percent.

TABLE 1B.1: Exchange Market Pressure Classification and Contributing Factors

		Exchange market pressure (EMP)		
		No pressure	Moderate pressure	High pressure
Factors	Exchange rate	Central African Republic* Senegal**	Liberia Rwanda South Africa Sudan Tanzania Uganda	Angola Lesotho Malawi Mozambique Nigeria South Sudan Swaziland Zambia
	Foreign reserves	Burkina Faso** Cabo Verde Cameroon* Comoros Ghana Guinea Guinea-Bissau** Kenya Madagascar Mauritius Namibia Seychelles Togo**	Côte d'Ivoire** Gabon* Niger**	Benin** Botswana Burundi Chad* Congo, Dem. Rep. Congo, Rep.* Equatorial Guinea* Mali**

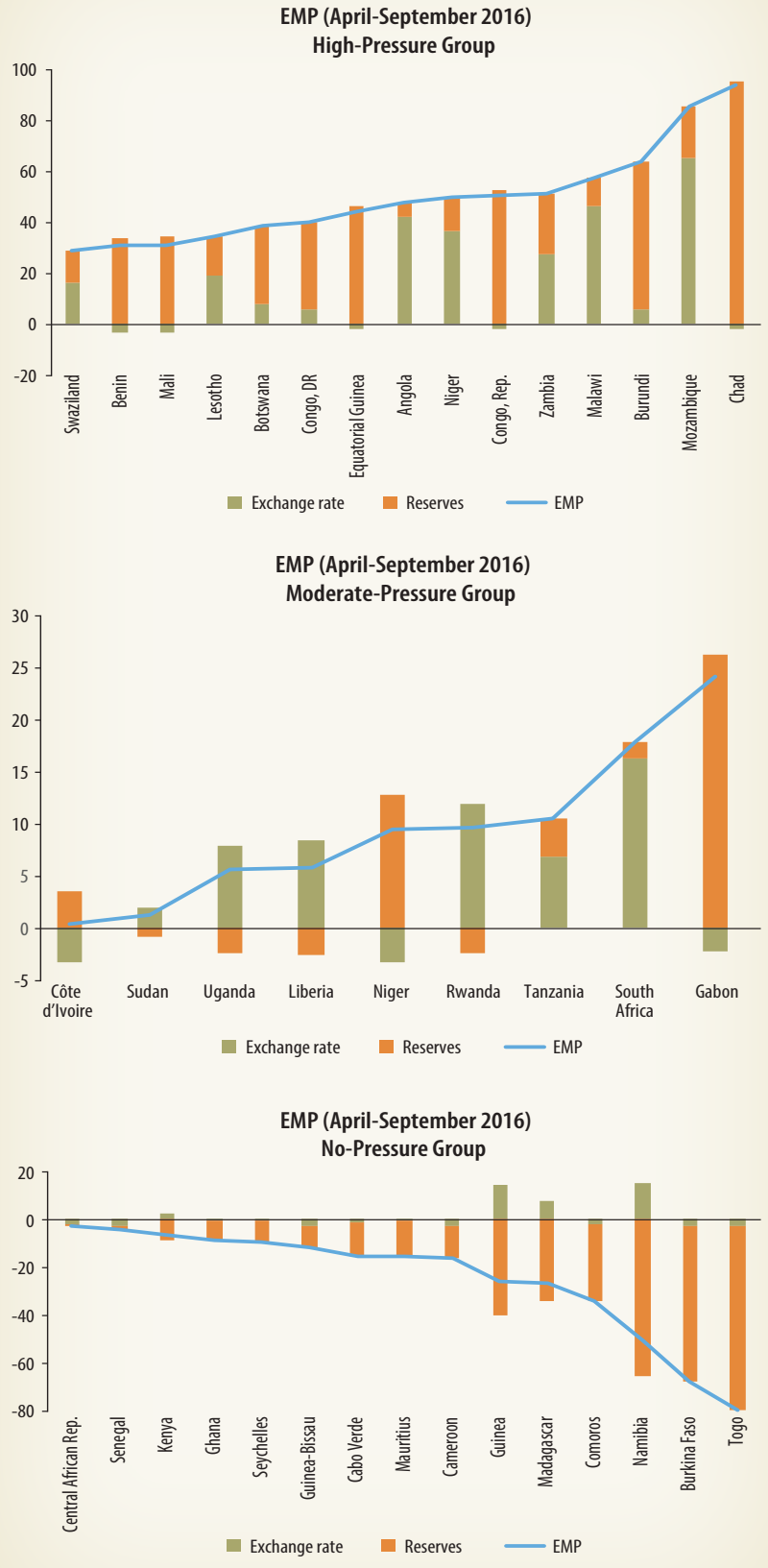
Note: * denotes CFA countries in the Central African Economic and Monetary Community. ** denotes CFA countries in the West African Economic and Monetary Union. EMP = exchange market pressure.

When faced with shocks, flexible exchange rate arrangements act as shock absorbers in some Sub-Saharan African countries. For instance, Mozambique has an EMP of 85 percent; the source of pressure primarily stems from exchange rate depreciation (figure 1B.1). A few countries in the moderate-pressure group, such as South Africa, Tanzania, and Rwanda, endure currency depreciation during the period.

Countries with fixed exchange rate regimes, particularly those in the Central African Economic and Monetary Community (CEMAC) and West African Economic and Monetary Union (WAEMU), had limited room for such adjustments. For example, Chad marks an EMP of 94 percent, most of which comes from loss of international reserves. Although the level of international reserves in Chad was relatively small, the country lost about 95 percent of its total reserves compared with the prior year. Two countries from the WAEMU (Benin and Mali) also endured rapid accumulation of pressure due to loss of international reserves. Although countries participating in the regional monetary unions have limited leeway to manage monetary shocks, the impacts of external shocks are not identical across the board. For example, Cameroon and Togo, both with CFA francs, increased international reserves by 13 and 77 percent, respectively.

The heterogeneity of EMP across countries participating in monetary unions could possibly be attributed to countries' dependence on natural resources, especially oil wealth. As depicted in figure 1B.2, the EMPs of six oil-rich countries in the region are on average 51.8 percent, slightly higher than the overall average of the high-pressure group. All the countries, except Gabon, are in fact in the high-pressure group, although Gabon is barely below the threshold. Finally, most countries in the no-pressure group managed to accumulate international reserves.

FIGURE 1B.1: Exchange Market Pressure, by Pressure Group



Source: Calculation based on IMF International Financial Statistics.

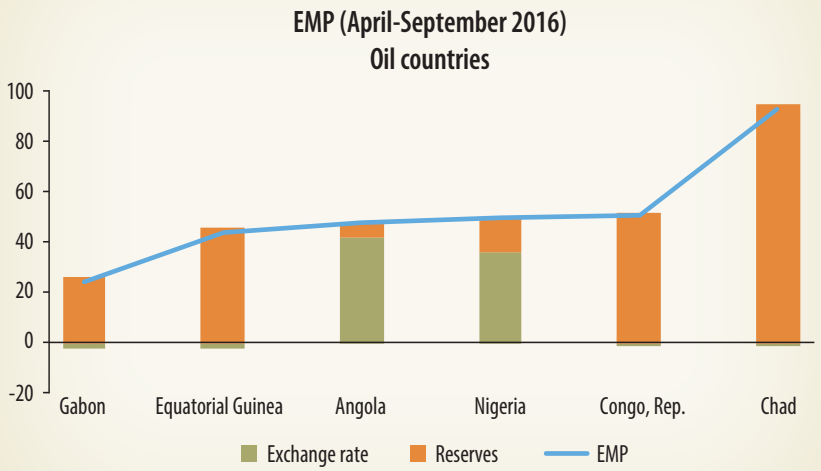
What Drives the Accumulation of Exchange Market Pressures in Sub-Saharan Africa?

According to the literature, domestic and global factors determine the level of exchange market pressures. Terms-of-trade and global interest rate shocks can have an impact on currency pressures in developing countries. Among domestic factors, the imposition of capital controls and the depth of financial markets may play a role (Bayoumi and Eichengreen 1998). Others argue that the strength of the macroeconomic framework—as signaled by money growth, long-term interest rates, and fiscal deficits—as well as external imbalances may put pressure on FX markets (Pentecost, Van Hooydonk, and Van Poeck 2001). Recent research by Aizenman and Hutchison 2012 finds that income per capita prior to a financial crisis, inflation, and the trade balance contribute to different degrees of EMP. The researchers also find that commodity-exporting emerging markets are more prone to the use of international reserves to mitigate exchange rate depreciation and absorb external pressures. Feldkircher et al. (2014) reinforce the finding that inflation is the most robust determinant of EMP during crises. They also add that the share of international reserves in GDP is related to the volatility of EMP during crisis periods.

To examine the correlates of FX market pressures across countries, the EMP is regressed on a set of variables that includes Consumer Price Index (CPI) inflation, terms-of-trade changes, fiscal balance, current account, and three dummy variables that capture exchange rate flexibility (hard pegs

and soft pegs) and oil abundance.[8] The findings from the regression analysis are reported in table 1B.2.[9] Column 1 reports the results of the baseline specification, which includes inflation, terms of trade, and dummy variables for oil dependence and exchange rate pegs. A positive and statistically significant coefficient is found for inflation. The estimated coefficient suggests that a one percentage point increase in CPI inflation adds 2.6 percent on the EMP index. Drivers other than CPI inflation fail to have a significant relationship with EMP. Column 2 shows a specification that includes terms-of-trade changes and the 2015 fiscal balances, as well as the dummy variables for oil abundance and exchange rate pegs. Terms-of-trade changes yield a negative and significant coefficient; that is, an increase in export prices (vis-à-vis import prices) reduces exchange market pressures—as the more favorable terms-of-trade tends to strengthen the currency. Furthermore, fiscal balances tend to have a negative and significant relationship with EMP. This finding suggests that an increase of one percentage point in the fiscal balance-to-GDP ratio reduces EMP by 3.2 percent. Column 3 combines the previous two specifications. Inflation remains significant, but none of the other variables reports any statistical significance. The fiscal balance is particularly noteworthy. The variable had a statistically significant coefficient in column 2, but it disappeared with the inclusion of CPI inflation in the model. This finding could imply that the impact of fiscal imbalance on EMP is an indirect one; that is, it is channeled through its impact on higher CPI inflation. Finally, column 4 includes the current account of the balance of payments as an additional determinant. When controlling for all the determinants, the econometric analysis still shows that inflation is the only variable yielding a significant coefficient. This finding implies that most macroeconomic outcomes—either fiscal imbalances or external imbalances—or global shocks—say, changes in the terms of trade—may affect EMP through their own effect on inflation.

FIGURE 1B.2: Exchange Market Pressure on Oil-Rich Countries



Source: Calculation based on IMF International Financial Statistics.

Overall, Sub-Saharan African countries have recently shown substantial signs of FX market pressure. Macroeconomic fundamentals, such as the level of inflation, seem to spark pressure on countries regardless of the monetary arrangements in place. Furthermore, attention should be paid to countries that lack monetary or fiscal space—that is, countries with lower reserves and widened fiscal deficits—as they have a reduced margin for staving off the impact of shocks on their currencies—for example, CEMAC countries.

8 The terms-of-trade index is the export price index divided by the import price index, and the data used in the analysis are percentage changes between 2014 and 2015. The inflation data are for 2016, and the other macroeconomic variables are as of end-2015. The hard pegs dummy includes countries in CEMAC and WAEMU and Zimbabwe. The classification of soft peg countries is taken from the International Monetary Fund's Exchange Arrangements and Exchange Restrictions (link: http://www.elibrary-areaer.imf.org/). The oil-abundant country dummy takes a value of one when the resource rents coming from oil in the country exceed 10 percent of GDP.

9 Most of the explanatory variables are lagged, so problems of reverse causality are ameliorated.

TABLE 1B.2: Correlates of Exchange Market Pressure
Dependent variable: Exchange market pressure index

Explanatory variable	(1)	(2)	(3)	(4)
Inflation	2.602***		2.592***	2.664***
	(0.0630)		(0.100)	(0.114)
Fiscal balance		-25.51*	-0.226	1.752
		(12.42)	(1.601)	(1.995)
Terms of trade	-0.330	-3.194**	-0.340	-0.421
	(0.316)	(1.431)	(0.337)	(0.324)
Current account				-1.332
				(0.834)
Hard peg	7.751	-56.98	7.469	13.28
	(14.69)	(43.20)	(15.14)	(14.95)
Soft peg	15.11	73.37	14.88	19.38
	(24.58)	(79.13)	(25.13)	(26.19)
Oil	28.72	28.28	28.37	24.60
	(22.97)	(56.38)	(23.90)	(23.05)
Constant	-14.68*	-102.9	-15.58	-21.37*
	(8.590)	(63.20)	(10.18)	(10.43)
Observations	32	32	32	32
R-squared	0.977	0.653	0.977	0.978

Note: Robust standard errors are in parentheses. *** p < 0.01, ** p <0 .05, * p < 0.1.

Section 2: Infrastructure in Sub-Saharan Africa

SUMMARY

An adequate supply of infrastructure services has long been viewed as a key ingredient for economic development, but Sub-Saharan Africa ranks at the bottom of all developing regions in virtually all dimensions of infrastructure performance. Yet, there are varying trends in the region's infrastructure performance across key sectors. In telecommunications, Sub-Saharan Africa has seen dramatic improvement in the quantity and quality of infrastructure, and the gains are broad-based. Access to safe water has also risen, with 77 percent of the population having access to water in 2015, from 51 percent in 1990, but disparities between rural and urban access rates persist.

In the power sector, by contrast, the region's electricity-generating capacity has changed little in more than 20 years. At about 0.04 megawatts per 1,000 people, capacity is less than a third of that of South Asia, and less than one-tenth of that of Latin America and the Caribbean. There is some variation by country, with little progress in electricity-generating capacity per capita in the region's low-income countries (LICs) and lower-middle-income countries (LMCs), but more than a doubling of capacity among upper-middle-income countries (UMCs). Access to electricity is low, at 35 percent of the population, with rural access rates at less than one-third of urban ones. Transport infrastructure is likewise lagging, with the region registering the lowest road and railroad densities among developing regions. Sub-Saharan Africa is the only region where road density has declined over the past 20 years (1990–2011). Despite a doubling in access to improved sanitation facilities, the access rate remains low, at about 30 percent in 2015; the largest gain in access has been in rural areas and LICs.

Controlling for geographic and demographic factors shows that most countries in Sub-Saharan Africa are close to the international norm that characterizes the relationship between infrastructure and development. This section considers that a country underperforms (overperforms) in a specific dimension of an infrastructure sector relative to an international norm if, after controlling for geographic and demographic factors, it has a level of infrastructure that is below (above) its level of economic development. But some countries are underperforming according to the international norm. For example, Angola, Gabon, Nigeria, Rwanda, and Tanzania underperform in telecommunications density and electricity-generating capacity; and Angola, Ethiopia, and Madagascar underperform in access to improved water source. Some countries do much better than predicted by the international norm, such as Kenya in Internet density and South Africa in Internet quality.

The growth effects of narrowing Sub-Saharan Africa's infrastructure quantity and quality gap are potentially large. For instance, growth in GDP per capita for the region would increase by an estimated 1.7 percentage points per year if it were to close the gap with the regional median (excluding Sub-Saharan Africa) of each infrastructure indicator. Eliminating the quantity gap would deliver 1.2 percentage points higher growth per capita per year; catching up in quality would bring about 0.5 percentage point higher growth per year. The growth effects of the quantity of infrastructure vary by sector, with the largest growth benefits obtained by narrowing the gap in electric power–generating capacity, at 0.7 percentage point higher per year. For quality, improving road quality provides the largest benefits.

Closing the infrastructure quantity and quality gap relative to the best performers in the world, as proxied by the top decile of the distribution of infrastructure stocks and quality, would yield higher

growth rates in GDP per capita of about 1.8 and 0.8 percentage points per year, respectively. That is additional growth in GDP per capita of 2.6 percentage points per year. Again, the largest potential growth benefits would come from closing the gap in electric power–generating capacity. Narrowing the gap in the length of the road network would render large gains as well.

The growth benefits for Sub-Saharan Africa are directly related to the potential gains of narrowing the gap for LICs and LMCs in the region. Energy appears to be a more binding constraint among LICs, whereas roads are the most binding constraint among LMCs, in quantity and quality.

Public investment as a share of gross domestic product (GDP) in Sub-Saharan Africa is below its recent peak of 5.8 percent in 2014. The average masks considerable variation across country groups. The evidence suggests that public and private investment are substitutes in 19 of the region's countries (of 45) and complements in 26 countries. Public spending tends to be less procyclical or more countercyclical in countries with stronger institutions, and more procyclical in countries with more inflows of foreign capital or when access to global capital markets is procyclical.

Public capital spending, based on data collected by the BOOST initiative for 24 African countries, is estimated at 2 percent of GDP annually between 2009 and 2015. Roads accounted for two-thirds of overall investments. Capital spending on electricity and water supply and sanitation each accounted for 15 percent of total capital expenditures. Overall, actual spending in infrastructure was considerably lower than capital allocations during the same period. The latter amounted to around 3.4 percent of GDP, reflecting substantial under-execution of such investments. Foreign aid continues to play an important role in some of the infrastructure subsectors, with the share of the overall capital budget allocations funded through external aid registering 36 percent in 2015. In electricity, a substantial increase in foreign funded projects has been driven mainly by the infrastructure push embedded in the "Power Africa" initiative. Road transport is the sector with the greatest share of domestic contribution.

Public-private partnerships (PPPs) in Sub-Saharan Africa remain a very small market, with projects concentrated in only a few countries, namely, South Africa, Nigeria, Kenya, and Uganda. Together they account for 48 percent of the 335 total PPP infrastructure projects in the region in the past 25 years. This amounts to $36.7 billion of investment commitments, or 62 percent of the $59 billion in total investment commitments in the region. In the past five years, PPP infrastructure projects in the region have mainly been concentrated in the energy sector (78 percent)—mostly renewables—followed by transport (22 percent) and water and sanitation (0.5 percent). International financial institutions play a larger role in financing PPPs in Sub-Saharan Africa than in other emerging markets and developing economies. A robust institutional and regulatory framework is critical in attracting private investment for infrastructure projects. The region performs below the global average in each of the four PPP thematic coverage areas—project preparation, procurement, unsolicited proposals, and contract management.

The impact on growth of public investment can be enhanced by implementing policies that foster the efficiency of public investment. For instance, improving the institutions and procedures governing project appraisal, selection, and monitoring can render considerable economic dividends. Recent studies show that the public investment multiplier could double if the gap between the bottom and top performers in public investment efficiency is closed. There is evidence that countries with sound public investment management systems tend to have lower but more efficient levels of public investment, crowd in more private investment, and exhibit higher growth rates.

INTRODUCTION

After two decades of per capita income growth rates that outpaced those of rich countries *(Africa Rising),* economic activity in the region has decelerated. There is an urgent need to regain the momentum on sustained growth. Amid an unfavorable external environment, observers in academic and policy circles are advocating a "big push" to help the region escape poverty and narrow the gap vis-à-vis the rest of the developing world (for example, Sachs et al. 2004; Collier 2006; IMF 2014). These calls for action propose a wide array of policy agendas; however, virtually all of them list infrastructure development among the top priorities in the region.

An adequate supply of infrastructure services has long been viewed as a key ingredient for economic development, in the academic literature (since the work of Aschauer 1989) as well as in policy debate (for example, World Bank 1994; IMF 2014). Over the past quarter century, academic research has devoted considerable effort to theoretical and empirical analysis of the contribution of infrastructure development to growth and productivity. More recently, increasing attention has also been paid to the impact of infrastructure on poverty and inequality (Estache 2005; World Bank 2003, 2006; Calderon and Serven 2004, 2010). Although the empirical literature on these two topics is far from unanimous, on the whole, a consensus has emerged that, under the right conditions, infrastructure development can play a major role in promoting growth and equity—and, through both channels, help reduce poverty.

Sub-Saharan Africa ranks at the bottom of all developing regions in virtually all dimensions of infrastructure performance. The region, in which almost one-seventh of the world lives, has a score of 2.91 in the World Economic Forums' (WEF's) Global Competitiveness Report.[1] This score clearly states that there is a severe infrastructure bottleneck to be addressed. The region has some inherent characteristics that may enhance the potential role of infrastructure for its economic development—notably, the large number of landlocked countries, which are home to a major proportion of the region's total population (about 40 percent), and the remoteness of most of the region's economies from global market centers (Calderon and Serven 2010).[2]

Sub-Saharan Africa's geographic disadvantages result in high transport costs that hinder intra- and inter-regional trade (Limao and Venables 2001; Elbadawi, Mengistae, and Zeufack 2006; Behar and Manners 2008). Limited openness to trade is the main factor behind the stylized fact that, ceteris paribus, landlocked countries tend to grow slower than others. However, adequate transportation and communication facilities can help overcome these geographic disadvantages. The region's problem is that poor infrastructure adds to its geographic disadvantage.

The analysis in section 2 addresses several aspects of infrastructure in Sub-Saharan Africa. First, it presents information on the performance of infrastructure in the region along three broad dimensions: quantity, quality, and access. It examines the trends in these three dimensions from an international comparison perspective. Then it compares infrastructure trends in the region with other benchmark regions, and the performance of countries in Sub-Saharan Africa is compared vis-à-vis their level of development while accounting for demographic and geographic drivers. Second, the section explores the relationship between infrastructure growth and economic growth in Sub-Saharan Africa. The potential growth benefits of closing the infrastructure gap in the region and the financing needs are considered. Third, it documents the stylized facts on public investment in the region, presents granular information on public spending collected by the BOOST initiative, and takes stock of public-private partnerships (PPPs) in

1 This index takes values from 0 to 7 and higher scores indicate more competitiveness.

2 Storeygard (2016) argues that the lack of infrastructure could also reflect the low population density in the region—which may play a role in explaining the low maintenance of most infrastructure networks.

infrastructure. Finally, the section examines the quality of infrastructure spending—as measured by the quality of public investment management systems and procurement methods.

A few conceptual issues about infrastructure are summarized in box 2.1.

A host of issues drive the gaps in infrastructure in the Africa region, beyond the financing gap. For instance, there is a lack of commitment to sustainable tariffs in infrastructure services, such as electric power, transport, and water. Yet, there is heavy reliance on public subsidies. Another problem is the poor performance of public utilities—affected not only by weak management, but also political interference. There is lack of political support for sector reforms that will help crowd in private investment in infrastructure—for example, opposition from state-owned enterprises (SOEs) to PPPs. In addition, domestic capital markets are not deep enough to provide local-currency long-term debt for infrastructure and, in some jurisdictions, tax systems may discourage the issuance of infrastructure-related bonds (for example, South Africa). Finally, an in-depth discussion of the issues mentioned above—although very relevant to understand infrastructure gaps in the region—goes beyond the scope of this section.

BOX 2.1: What Is Economic Infrastructure?

What is meant by infrastructure has evolved; it is now generally defined as a complex array of capital goods that provide services in combination with other inputs (Prud'Homme 2004; Snieska and Simkunaite 2009). Infrastructure can be identified by five characteristics (Kay 1990). First, infrastructure projects can be described as networks, which involve delivery systems and allow significant interactions in the provision of services to individual customers (Oughton and Tyler 2013). As a network is a *public good,* other individuals can still use it when delivered. This type of infrastructure is referred to as *collective capital goods*. The fact that *individuals* use these collective goods makes it difficult to reveal consumer preferences.

Second, when infrastructure is built, new projects form a small part of the total cost of the wide range of products in which they are used. In the case of service failure, the corrective cost becomes very large compared with the basic cost of service production (Ahmed and Donovan 1992). Since changing the marginal cost results in no revenues, and the users would always try to find someone else to pay for the service attained, or *free-ride* due to the lack of properly declared property rights, it becomes difficult for the private sector to be entirely responsible for infrastructure provision (Coase 1937; Varian and Repcheck 2010).

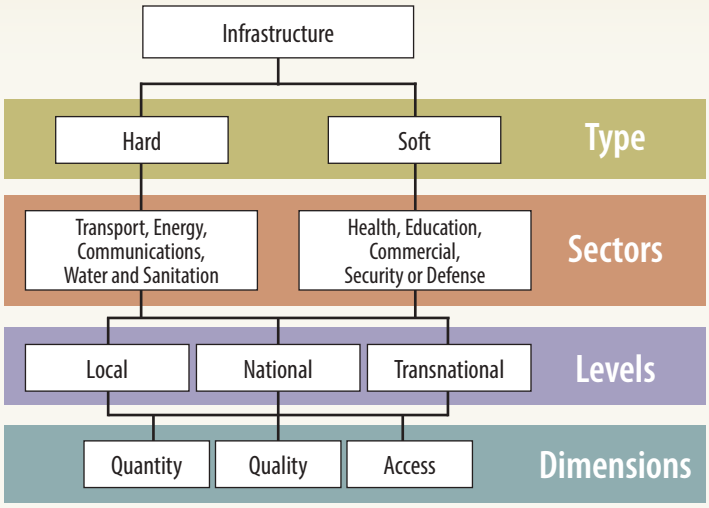
Third, infrastructure construction results in monopolistic elements. In turn, these elements rely on the combination of durable and immobile investments, and provide strong economies of scale. The government seeks control over the private sector in the delivery of infrastructure services, due to the lack of competition (that is, the high cost of network building). Regulation is a partial solution to setting fair rules over the relationship between the government and the private sector (Gómez-Ibañez 2003).

Fourth, the capital cost of infrastructure might be larger than its running cost.

Fifth, infrastructure projects usually incur relatively important sunk costs (Kay 1990). These are considerable proportions of the service's total cost, and have already been covered before the service has been used (Ahmed and Donovan 2002).

Infrastructure can be classified into *hard* or *soft*, which some call economic or social (Jerome 1999; Fourie 2006; Perkins, Fedderke, and Luiz 2005; Snieska and Simkunaite 2009) (figure B2.1.1). *Soft* or *social* infrastructure refers to the social, political, and cultural institutions and services supporting a community or nation (Wanmali and Islam 1997). Soft infrastructure includes different sectors, namely, education, commercial, housing, and security or defense. *Hard* or *economic* infrastructure refers to large physical networks that are needed to promote economic activity and maintain a functioning nation (Ahmed

FIGURE B2.1.1: Infrastructure Classification



Source: World Bank staff.

and Donovan 1992; Hansen 1965; Hirschman 1958). *Hard* infrastructure is typically classified into five *sectors*: telecommunications, transport, energy, water and sanitation, and solid waste (Diewert 1986; Calderón and Servén 2004; Gómez-Ibañez 2003; Oughton and Tyler 2013).

Hard and *soft* infrastructure comprise different sectors. At the same time, there is a great deal of heterogeneity within a single sector. For instance, the *transportation* sector includes roads, airports, water ports, railways, and subways, and each of these subsectors is characterized by different costs, planning techniques, and maintenance requirements. Furthermore, the energy sector is also composed of heterogeneous subsectors, like electric energy, hydro energy, gas, and oil, among others.

Another element to consider in the definition of economic infrastructure is its level, namely, local, national, and transnational (Fourie 2006).[a] The level adds spatial dependence and spatial heterogeneity to the data. The level is also relevant because it builds a component of endogenous placement for infrastructure (Anselin 1988). For instance, it might not be necessary to have a dam in every state—because a dam might provide services to neighboring states. Sharing a border and complying with globalization decisions will also affect the mode of infrastructure provision. For instance, very localized and globalized goods are becoming more important because of technological improvements (Fourie 2006; Taylor 2010).

Finally, infrastructure (*economic* and *social*) is a multidimensional concept: it involves measuring quantity, quality, and access (Rietveld and Bruinsma 2012; Calderón and Servén 2008). The quantity dimension refers to stocks of infrastructure—that is, physical capacity. It may also refer to flows—as proxied by measures of consumption and/or production. Measuring the *quality* dimension of infrastructure is not trivial. Typically, it is measured by qualitative indicators, like those in the World Economic Forum's Global Competitiveness Report. These indicators survey perceptions on the quality of infrastructure services.[b] However, the set of objective measures for quality is limited, namely, the *share of paved roads* in the *transport* sector, or the *percentage of distribution and transmission losses in electric energy* in the *energy* sector. The third dimension is *access*.

Most research focused on the impact of infrastructure on growth and productivity relies on *quantity* measures. Recent efforts to have a better assessment on the growth effects of infrastructure include the *quality* dimension (Calderón and Servén 2004, 2010; Loayza and Odawara 2010).[c] The *access* dimension is mostly used in studies of inequality or poverty. However, all the elements of infrastructure—dimension, level, sector, and type—coexist in the area of development.

a. Depending on the political division of the country, provincial or federal levels may be added (Fourie 2006).

b. The World Economic Forum (WEF) report surveys executives on their perception of the quality of different infrastructure sectors. These WEF measures on the quality of infrastructure are highly correlated with the corresponding quantity measures of road transport, electricity, and telecommunications. See Albino-War et al. (2014), Calderón, Cantu and Servén (forthcoming).

c. Where the information is available.

Source: Cantu (2017).

2.1 TRENDS IN INFRASTRUCTURE

Evolution of Physical Measures of Infrastructure

The infrastructure network in Sub-Saharan Africa remains poor on average, despite recent government efforts to improve it. This subsection assesses the patterns of infrastructure stocks and their accumulation across countries in the region. It updates the benchmarking analysis of infrastructure in the region conducted by Calderon and Serven (2010), and confirms the continuing existence of a wide gap in infrastructure provision between Sub-Saharan Africa and other developing regions.

Benchmarking the performance of infrastructure sectors in the region's countries involves the assessment of economic infrastructure across three dimensions: quantity, quality, and access. To place the infrastructure trends in Sub-Saharan Africa in context, the report uses a comparative perspective. First, the analysis uses different comparator regions, namely, South Asia, the Middle East and North Africa, Latin America and the Caribbean, and East Asia and the Pacific. Second, it examines infrastructure trends across income groups in the region—including LICs, LMCs, and UMCs. The full list of countries is presented in the appendix.

The evolution of infrastructure in Sub-Saharan Africa is evaluated for different sectors, namely, telecommunications, energy, transport, and water and sanitation. Within each of these sectors, and to the extent that data permit, the quantity, quality, and access dimensions are examined. Time series availability and country coverage across the different indicators of infrastructure are heterogeneous. Table 2.1 summarizes the indicators that are used to examine the performance of infrastructure in Sub-Saharan Africa.

TABLE 2.1: Indicators of Infrastructure Performance

Dimension	Telecommunications	Energy	Transport	Water and Sanitation
Quantity	Fixed telephone and mobile cellular subscriptions per capita Internet users Fixed broadband subscriptions	Total electricity-generating capacity per capita	-Total road length -Total railroad length -Total road and railroad length	
Quality	International Internet bandwidth Number of secure servers	-Energy quality (%) -WEF quality of power supply	-Paved roads (%) -WEF quality of roads -WEF quality of railroads	
Access		Access to electricity (% people)		Access to safe water (% people) Access to sanitation facilities (% people)

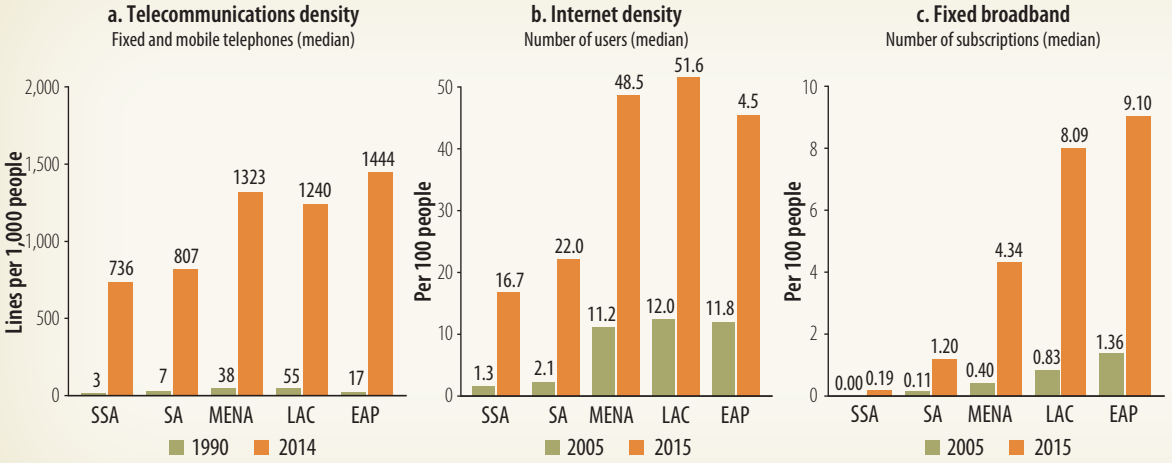
Sources: See the appendix.
Note: WEF = World Economic Forum.

Infrastructure Quantity

Telecommunications. Sub-Saharan Africa has seen a dramatic jump in telecommunications density over the past quarter century. The median number of fixed and mobile phone lines per 1,000 people has risen sharply, from three in 1990 to 736 in 2014 (figure 2.1). A similar pattern is observed in other benchmark regions in the world, reflecting the global nature of the boom in mobile phone technology. A comparison of telecommunications density across regions shows that, despite a surge, Sub-Saharan Africa lags behind other regions.

FIGURE 2.1: Telecommunications Infrastructure Quantity, by Region

Sub-Saharan Africa has made great progress in telecommunications density.



Sources: International Telecommunications Union's World Telecommunication/ICT indicators; World Bank, World Development Indicators.
Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

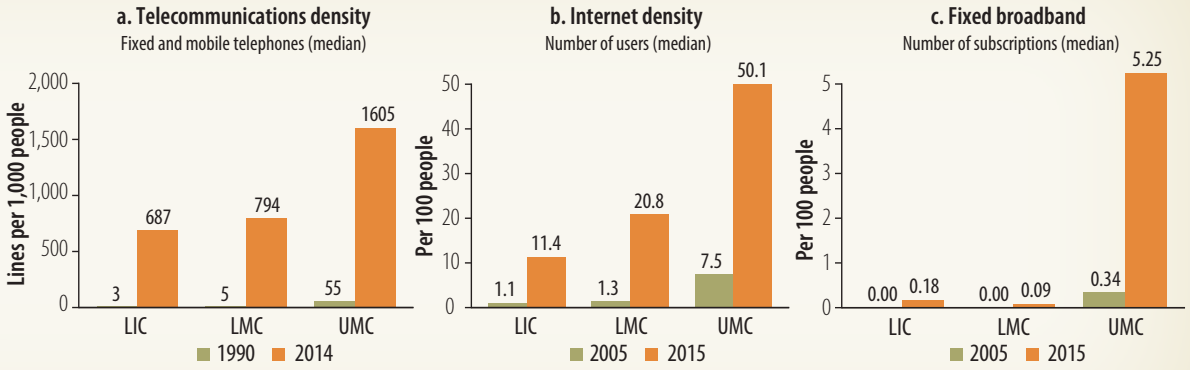
Modern technological innovation has provided other forms of telecommunications connectivity among people. In this context, the number of Internet users and fixed broadband subscriptions (both normalized by population) are proxies for telecommunications density other than phone lines. Internet density—as measured by the number of users per 100 people—in Sub-Saharan Africa in 2015 was only 16.7, less than that of any other benchmark region. Another indicator of Internet penetration is the number of fixed broadband subscriptions per 100 people.[3] Again, Sub-Saharan Africa, with a penetration rate of only 0.19, lags other regions.

Within Sub-Saharan Africa, gains are observed across all income groups. Telecommunications density expanded at the fastest pace among the region's LICs, although starting from low levels. Specifically, the number of fixed and mobile phones per 1,000 people grew among LICs, from three in 1990 to 687 in 2014 (figure 2.2). Moreover, the gap in telecommunications density relative to UMCs has narrowed significantly for LICs and LMCs over the past two decades. For instance, telecommunications density was only twice as high in UMCs compared with LMCs in 2014 (it was 11-fold in 1990). The fast growth of telecommunications density over the past two decades among the region's UMCs, increasing from 55 lines per 1,000 people in 1990, to 1,605 in 2014, has placed this group above the medians of other regions.

3 This indicator refers to fixed subscriptions to high-speed access to public Internet, at downstream speeds equal to or greater than 256 kilobits per second.

Telecommunications density expanded at the fastest pace among the region's Low Income Countries.

FIGURE 2.2: Telecommunications Infrastructure Quantity in Sub-Saharan Africa, by Income



Sources: International Telecommunications Union's World Telecommunication/ICT indicators; World Development Indicators.
Note: LIC = low-income countries; LMC = lower-middle-income countries; SSA = Sub-Saharan Africa; UMC = upper-middle-income countries.

Internet density has risen sharply over the past two decades for all income groups in Sub-Saharan Africa. For instance, the number of Internet users increased from 1.1 per 100 people in 2005, to about 11.4 in 2015 among LICs, while it grew from 7.5 to 50.1 for UMCs. Fast growth of Internet density among LICs and LMCs in the region has narrowed their gap relative to UMCs. Finally, the extent of Internet density among Sub-Saharan Africa's UMCs is above the regional median of countries in East Asia and the Pacific (45.5 users per 100 countries).

Reflecting the regional aggregate, the density of fixed broadband subscriptions is dismal for virtually all income groups in Sub-Saharan Africa. Notwithstanding the low penetration, there is a very large gap between the region's LICs and LMCs relative to UMCs. At the same time, the density of fixed broadband across UMCs (5.25 subscriptions per 100 people) is lower than that of Latin America and East Asia (8.1 and 9.1 subscriptions per 100 people, respectively).

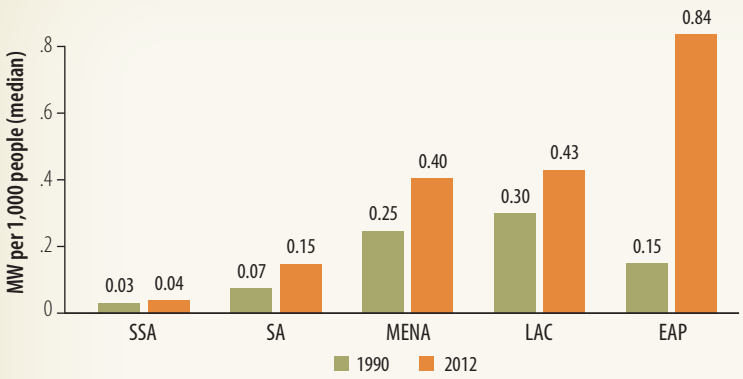
Power. Sub-Saharan Africa was vastly outperformed by the other benchmark developing regions in the power sector in 2012. The electricity-generating capacity of the region has changed little in over 20 years and is about 0.04 megawatts (MW) per 1,000 people—that is, less than a third of that of South Asia (with 0.15) and less than one-tenth of that of Latin America and the Caribbean (figure 2.3). Among the regions studied, East Asia and the Pacific registered the fastest growth in power-generating capacity over the past two decades—jumping from 0.15 MW per 1,000 people in 1990 to 0.84.

Insufficient electricity–generating capacity in Sub-Saharan Africa is explained by the trends observed in LICs and LMCs. There has been slight or no progress in MW of installed capacity per 1,000 people over the past two decades for these groups of countries; that is, keeping capacity at at a low 0.03 and 0.06 MW per 1,000 people for LICs and LMCs, respectively, by 2012 (figure 2.4). Electricity-generating capacity more than doubled among UMCs, growing from 0.33 MW per 1,000 people in 1990, to 0.72 MW per 1,000 people in 2012.

Transport. Assessing the performance of transport infrastructure involves examination of the trends in the lengths of road and rail networks (expressed in kilometers (km))—in this case, normalized by the surface area of the country (in square km). In 2011, Sub-Saharan Africa registered the lowest road density among the developing regions under analysis (figure 2.5). Moreover, Sub-Saharan Africa is the only region were road density has declined over the past 20 years. The density of the railroad network is likewise low, at less than 0.002 km per square km of surface area by 2014, and this density has been declining. Although South Asia has also seen a decline in rail density, it continues to outperform other regions in this measure.

FIGURE 2.3: Quantity of Power Infrastructure: Electricity-Generating Capacity, by Region

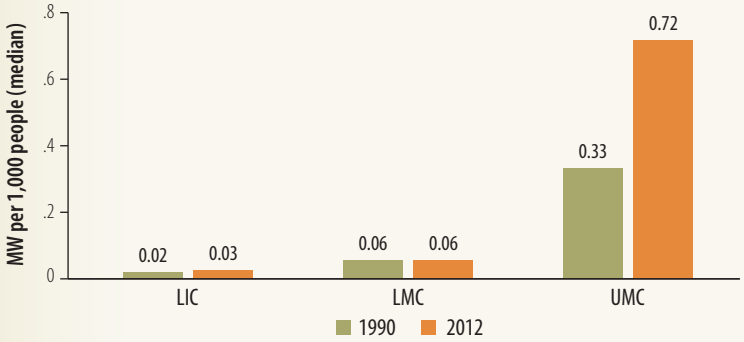
The electricity-generating capacity of the region has changed little in over 20 years.



Source: International Energy Agency, World Energy Outlook.

Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; MW = megawatts; SA = South Asia; SSA = Sub-Saharan Africa.

FIGURE 2.4: Quantity of Power Infrastructure in Sub-Saharan Africa: Electricity-Generating Capacity, by Income



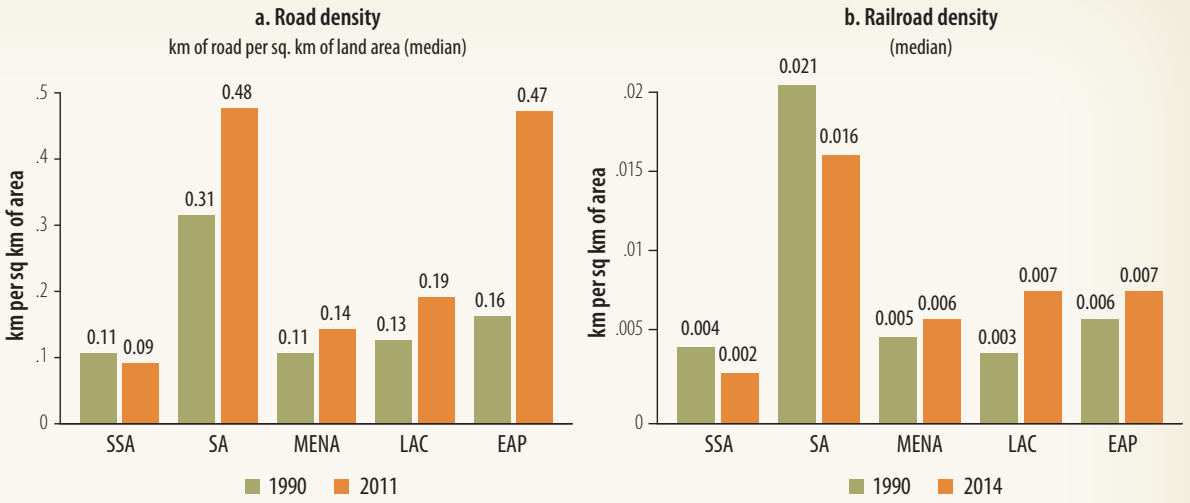
Source: International Energy Agency, World Energy Outlook.

Note: LIC = low-income countries; LMC = lower-middle-income countries; MW = megawatts; SSA = Sub-Saharan Africa; UMC = upper-middle-income countries.

The evolution of road density across income groups in Sub-Saharan Africa over the past two decades shows that road density has declined over time among LMCs (figure 2.6). This might capture the fact that the expansion of the road network is not as fast as the pace of urbanization in these countries. The data also reveal a large gap in road density for LICs and LMCs relative to UMCs, and that this gap has increased sharply over time. Finally, the road density among UMCs in Sub-Saharan Africa (1.04 km per square km of surface area) is larger than the regional median of all other developing regions. The trends observed in railroad density are similar to those in roads: there has been a decline in the density of railroads among the region's LICs and LMCs over the past two decades, which might be attributed to poor maintenance. At the same time, railroad density remained almost invariant among UMCs, and it was outperformed only by South Asia.

Sub-Saharan Africa is the only region where road density has declined over the past 20 years.

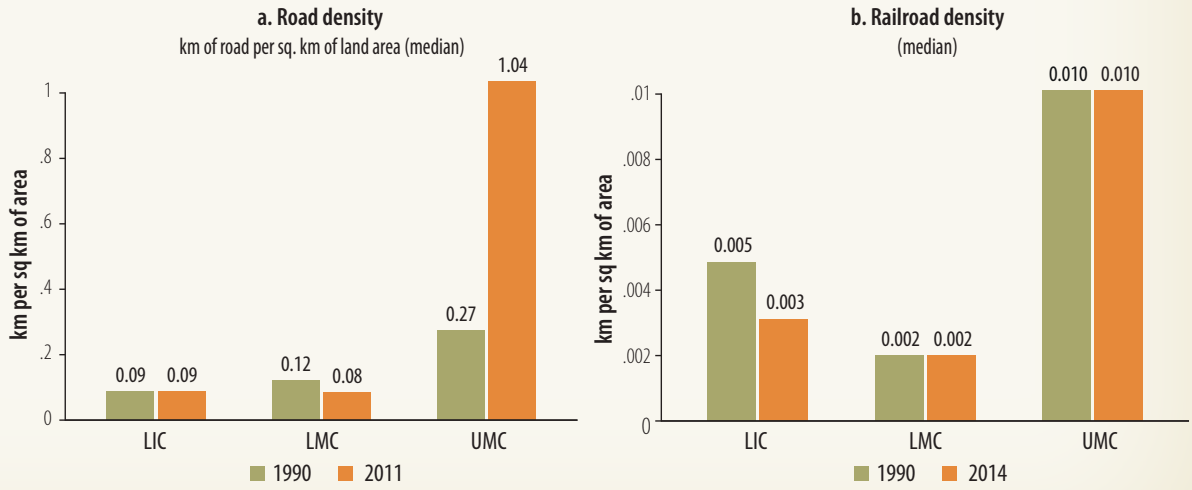
FIGURE 2.5: Quantity of Transport Infrastructure: Road and Railroad Density, by Region



Sources: International Road Federation, World Road Statistics; World Bank, World Development Indicators.

Note: EAP = East Asia and the Pacific; km = kilometers; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

FIGURE 2.6: Quantity of Transport Infrastructure in Sub-Saharan Africa: Road and Railroad Density, by Income



Sources: International Road Federation, World Road Statistics; World Bank, World Development Indicators.

Note: km = kilometers; LIC = low-income countries; LMC = lower-middle-income countries; SSA = Sub-Saharan Africa; UMC = upper-middle-income countries.

Infrastructure Quality

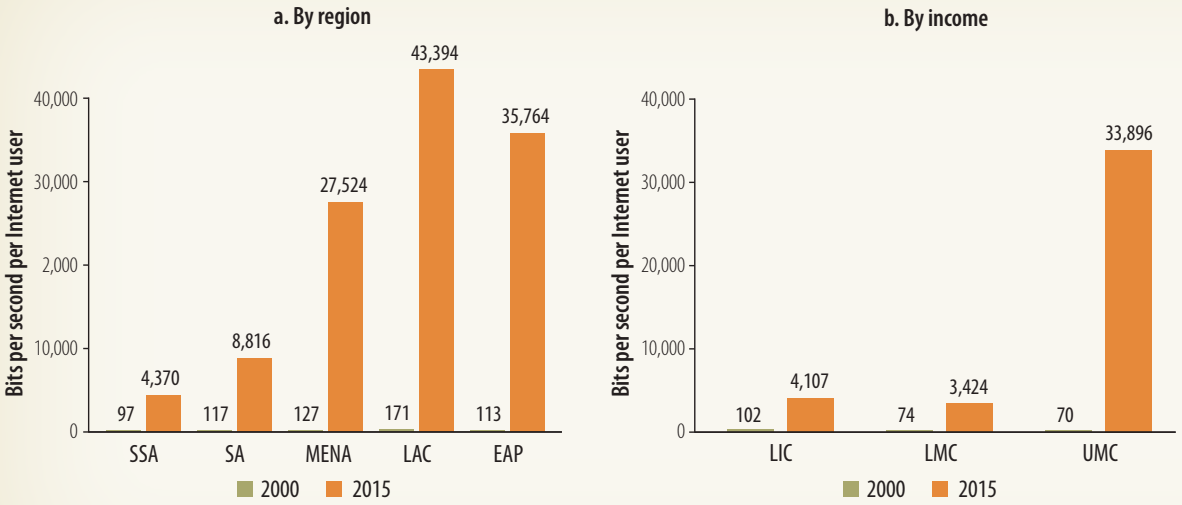
It is imperative for the region to reduce the gap in the quantity of infrastructure. At the same time, the quality of these service-providing capital goods will be the major contributor to their optimal usage. The quality measures examined here can be objective or subjective. The former refers to hard measurements (for example, electric power and transmission losses); the latter refers to perceptions of the quality and reliability of these services obtained from entrepreneur services—such as the quality of infrastructure indicators from the WEF's Global Competitiveness Report.[4]

4 It is important to note that this survey, which was conducted by the WEF's Global Competitiveness Report, captures the perceptions of businesspeople about the quality of infrastructure in the country. These indicators take values from zero (worst) to seven (best). The periods under analysis for this section are 2006 and 2015.

Telecommunications. Lack of data availability across sectors and, more importantly, over time prevents us from capturing the quality of the services of fixed telephone and mobile lines. However, the quality of Internet services can be approximated by the international bandwidth connection (which captures used capacity and average traffic load). Over the past 15 years, there has been a broad-based increase in Internet speed throughout the world. In Sub-Saharan Africa, the bits per second per Internet user grew from 97 in 2000, to 4,370 in 2015 (figure 2.7). In South Asia, this indicator is nearly twice as large (8,816), and in the remaining regions it is between 27,000 and 44,000 bits per second per Internet user.

FIGURE 2.7: Quality of Telecommunications Infrastructure: Internet Traffic

Internet capacity increased in Sub-Saharan Africa, with upper-middle-income countries leading the way.



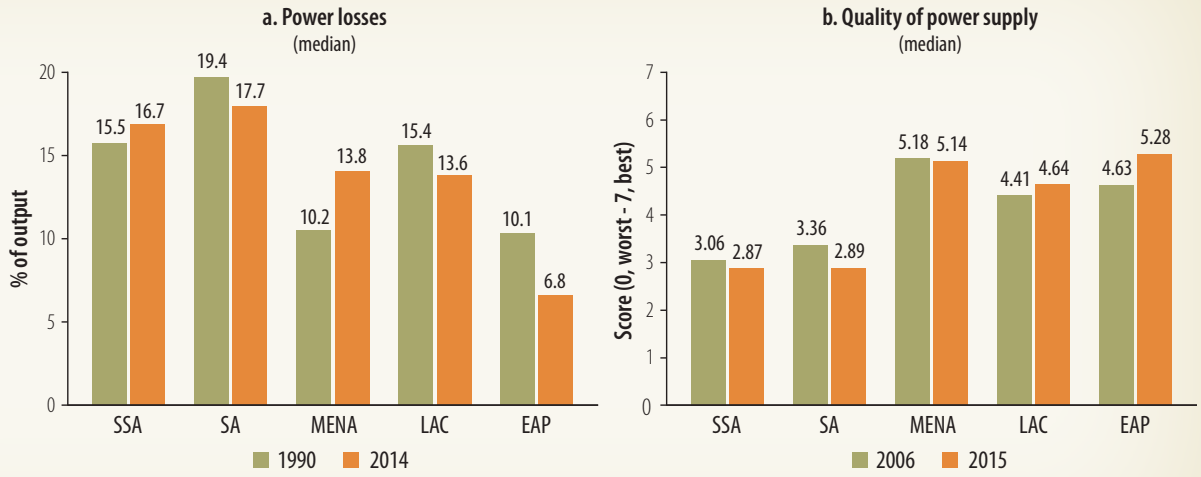
Sources: International Telecommunications Union's World Telecommunication/ICT indicators; World Bank, World Development Indicators.
Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; LIC = low-income countries; LMC = lower-middle-income countries MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa; UMC = upper-middle-income countries.

There has been an increase in capacity and traffic on the Internet for all income groups in Sub-Saharan Africa. The largest improvement is evidenced for UMCs, with this group seeing Internet traffic volume greater than the regional median of other developing areas—except East Asia and Latin America (35,764 and 43,394 bits per second for every user, respectively).

Power. One measure of the quality of the power infrastructure sector is captured by the percentage of electric power transmission and distribution losses (as a percentage of electricity output). Figure 2.8 depicts that electric power losses increased in Sub-Saharan Africa over the past quarter century, from 15.5 percent in 1990, to 16.7 percent in 2014, while declining in most other regions. Another measure of the quality of power supply is from WEF; it is a qualitative indicator that fluctuates from a low of 0 to a high of 7. According to this indicator, the perceived quality of power supply in the region dipped from 3.1 to 2.9 between 2006 and 2015. Sub-Saharan Africa registered the lowest scores in quality of power supply in 2015, with a regional median of 2.9, practically the same as for South Asia, which also experienced a decline in quality. Other benchmark regions, such as Latin America and the Caribbean and East Asia and the Pacific, saw an improving trend in quality and scored above 4.5.

The quality of power supply in the region declined between 2006 and 2015.

FIGURE 2.8: Quality of Power Infrastructure, by Region



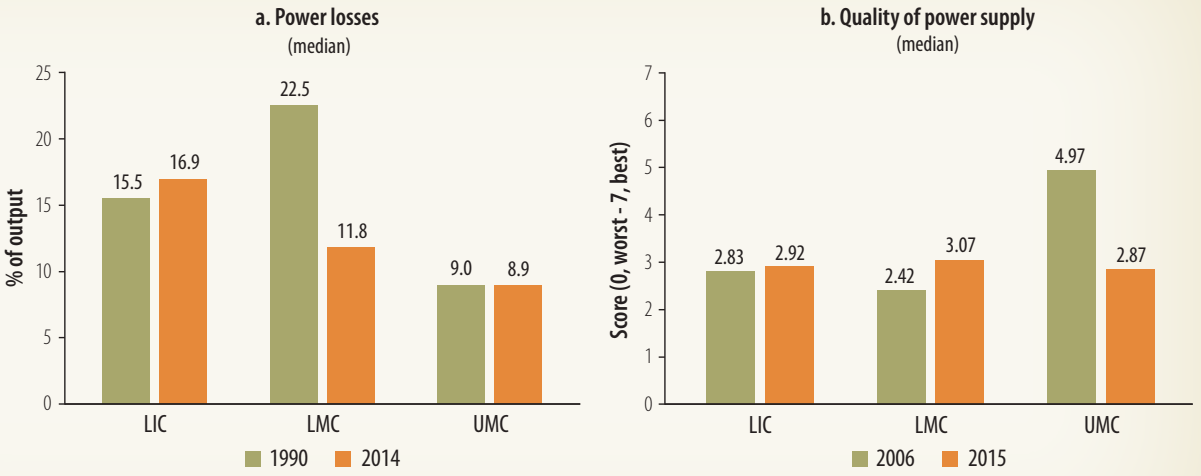
Sources: World Bank, World Development Indicators; World Economic Forum, Global Competitiveness Report.

Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

Within Sub-Saharan Africa, there is considerable disparity in the evolution over time of power losses across the different income groups. For instance, power losses declined sharply in LMCs, to 11.8 percent of output in 2014, from 22.5 percent in 1990; power losses in UMCs remained almost invariant over the past decade (figure 2.9). By contrast, power losses slightly increased, from 15.5 percent of output to 16.9 percent during this period among the region's LICs. Power losses in Sub-Saharan Africa's LMCs and UMCs are smaller than those in other regions, with the exception of East Asia.

The decline in the quality of power is evident in the continent's lower-middle-income countries.

FIGURE 2.9: Quality of Power Infrastructure in Sub-Saharan Africa, by Income



Sources: World Bank, World Development Indicators; World Economic Forum, Global Competitiveness Report.

Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; LIC = low-income countries; LMC = lower-middle-income countries; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa; UMC = upper-middle-income countries.

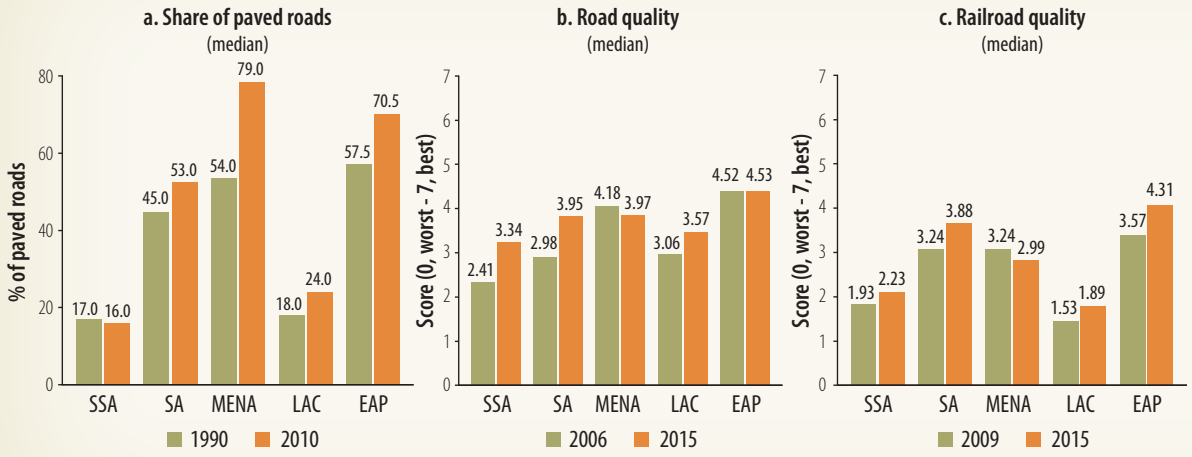
The perception of the quality of power supply in the region is comparable across income groups. This convergence is the outcome of different trends between 2006 and 2015: quality increased slightly among LICs, varying between 2.8 and 2.9; it increased from 2.4 to 3.1 among LMCs; and it declined sharply among UMCs, from about 5 to 2.9.

Transport. The quality of transport infrastructure is measured by (a) the share of paved roads in total roads, and (b) the WEF perception scores on the quality of roads and railroads. The results with the hard measures should be taken with caution, as not all road networks in the country are meant to be paved. Other likely measures—for example, percentage of roads in good condition—are not available for the wide array of countries and over time.

Figure 2.10 shows that in Sub-Saharan Africa the share of paved road declined from 17 percent in 1990 to 16 percent in 2010, bucking the rising trend observed in other regions. Sub-Saharan Africa also has the lowest share of paved roads in the total road network of any region, and well below that of South Asia (53 percent) and East Asia and the Pacific (71 percent).

FIGURE 2.10: Quality of Transport Infrastructure: Share of Paved Roads and WEF Perception of Road and Railroad Quality, by Region

Road quality continues to be a problem in the continent.



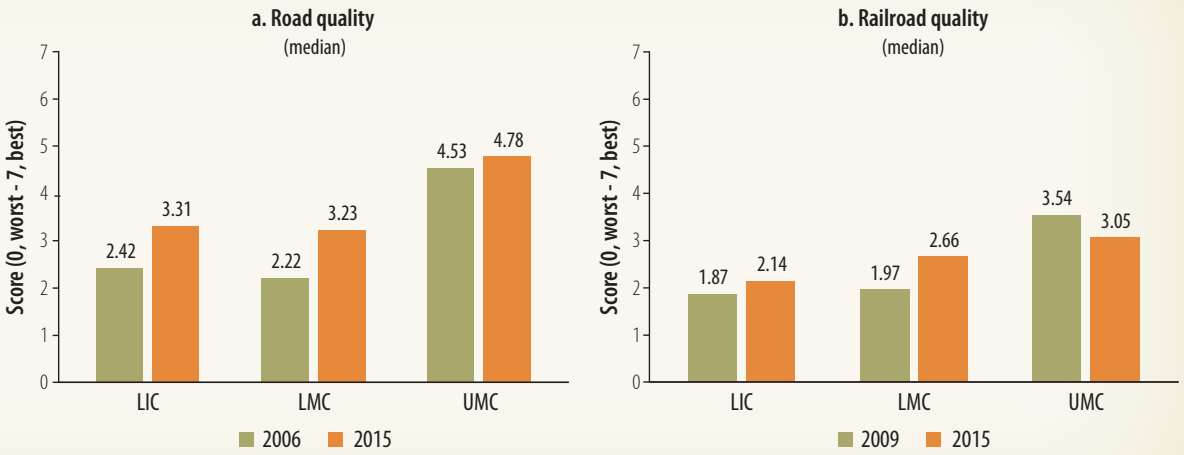
Sources: International Road Federation, World Road Statistics; World Bank, World Development Indicators; World Economic Forum, Global Competitiveness Report.
Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

The perception of road quality in Sub-Saharan Africa, as well as in other developing regions, shows an improving trend during 2006–15. WEF scores for Sub-Saharan Africa on perceived road quality climbed from 2.4 in 2006, to 3.3 in 2015. Still, Sub-Saharan Africa is the weakest performing region in this category of quality, well below the score of 4.5 for East Asia and the Pacific. There is also a slight increase in the surveyed perception of railroad quality in Sub-Saharan Africa, from a score of 1.9 in 2006, to 2.2 in 2015. But the region has among the lowest perceptions of railroad quality among developing regions, and is well below regions such as South Asia and East Asia, which have scores in the range of 3.9 and 4.3, respectively.

The share of paved roads in total roads is similar across income groups in Sub-Saharan Africa for 1990 (in the range of 16.5 to 17 percent). It grew slightly to 18 percent among LICs and declined to 10 percent among LMCs.[5] The trends in perceived road quality are quite different from those of the share of paved roads in the total road network. First, the perception of road quality increased for all income groups in Sub-Saharan Africa—although at different rates (figure 2.11). Second, at a score of 4.8, the median perception of road quality among UMCs in Sub-Saharan Africa outperforms the regional median of other developing areas. The evolution of the perception of railroad quality for the different country groups in Sub-Saharan Africa during 2006–15 shows improvement among LICs and LMCs in the region, and a decline among UMCs.

Even though perceptions of road quality improved in Sub-Saharan Africa, it is still the weakest performing region in the world.

FIGURE 2.11: Quality of Transport Infrastructure in Sub-Saharan Africa: WEF Perception of Road and Railroad Quality, by Income



Source: World Economic Forum, Global Competitiveness Report.
Note: LIC = low-income countries; LMC = lower-middle-income countries; SSA = Sub-Saharan Africa; UMC = upper-middle-income countries.

Infrastructure Access

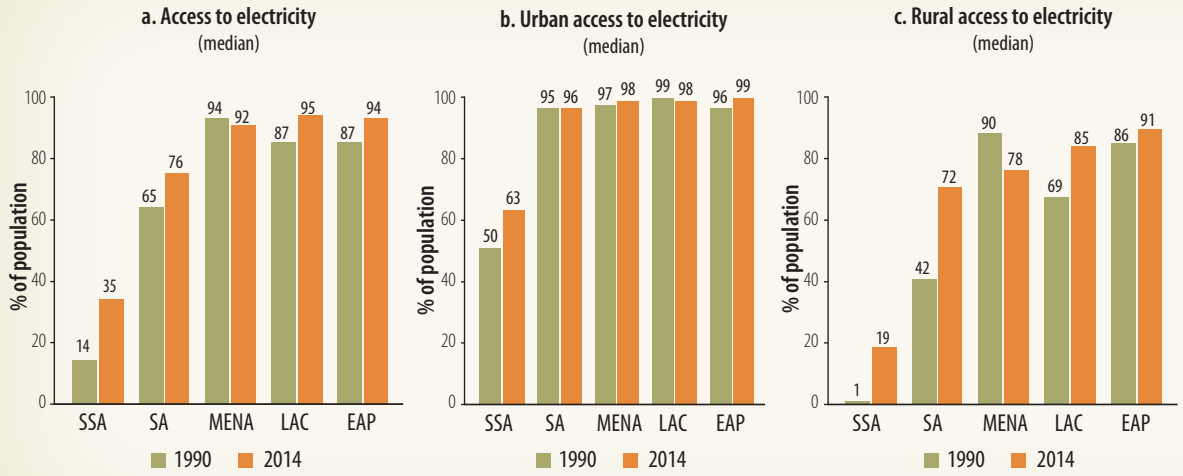
The performance of the infrastructure sector relies not only on quantity and quality, but also on the universality of access. From the point of view of equality of opportunities and poverty reduction, it is important to examine the extent to which infrastructure assets yield services to the broad population rather than just a few. This subsection discusses the evolution of indicators of access to electricity, safe water sources, and improved sanitation facilities.

Access to electricity. Figure 2.12 presents the percentage of the population with access to electricity in Sub-Saharan Africa and other developing areas for 1990 and 2014. The figure depicts overall access as well as access rates for urban and rural populations. The data show that total rates of access to electricity more than doubled during this period, growing from 14 percent in 1990, to 35 percent in 2014. Yet, all developing regions significantly outperformed Sub-Saharan Africa in access to electricity in 2014,

5 For UMCs, we do not have available information for that year.

FIGURE 2.12: Access to Electricity: Total, Urban, and Rural Access Rates, by Region

Access to electricity in the region more than doubled during 1990-2014.



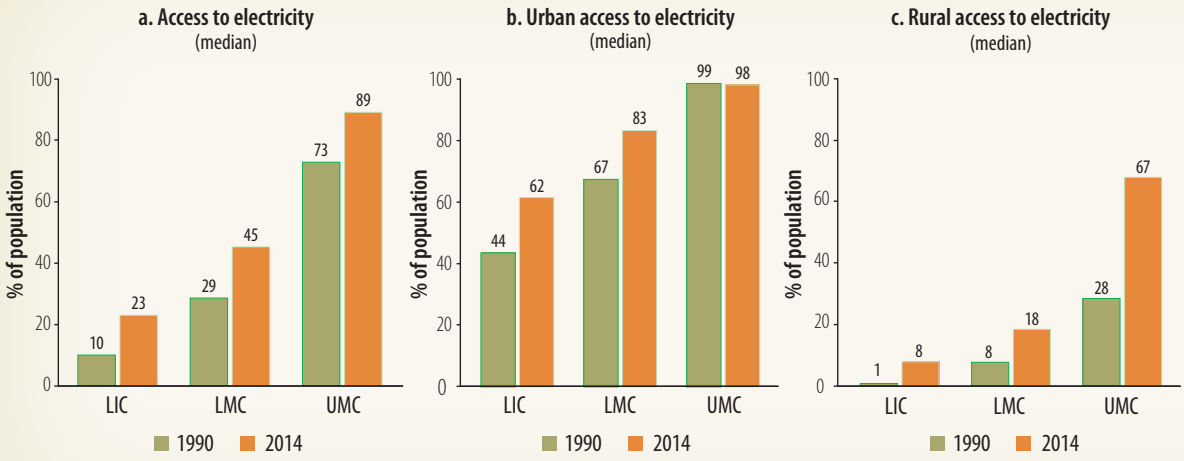
Source: World Bank, World Development Indicators.
Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

with universal access to electricity in East Asia. The disparity in rates of access to electricity between urban and rural areas is especially marked in Sub-Saharan Africa, where about 63 percent of the urban population and only 19 percent of the rural population had access to electricity in 2014.

Access to electricity has increased across all Sub-Saharan Africa income groups over the past two decades—although at a slower pace among LICs. Overall access rates to electricity went from 10 percent in 1990, to 23 percent in 2014 among this income group, while it increased from 29 to 45 percent among LMCs over the same period (figure 2.13). The region's UMCs have the largest overall access rate to electricity (with 89 percent of the population in 2014).

FIGURE 2.13: Access to Electricity in Sub-Saharan Africa, by Income: Total, Urban, and Rural Access Rates

Access to electricity has improved for all income groups.



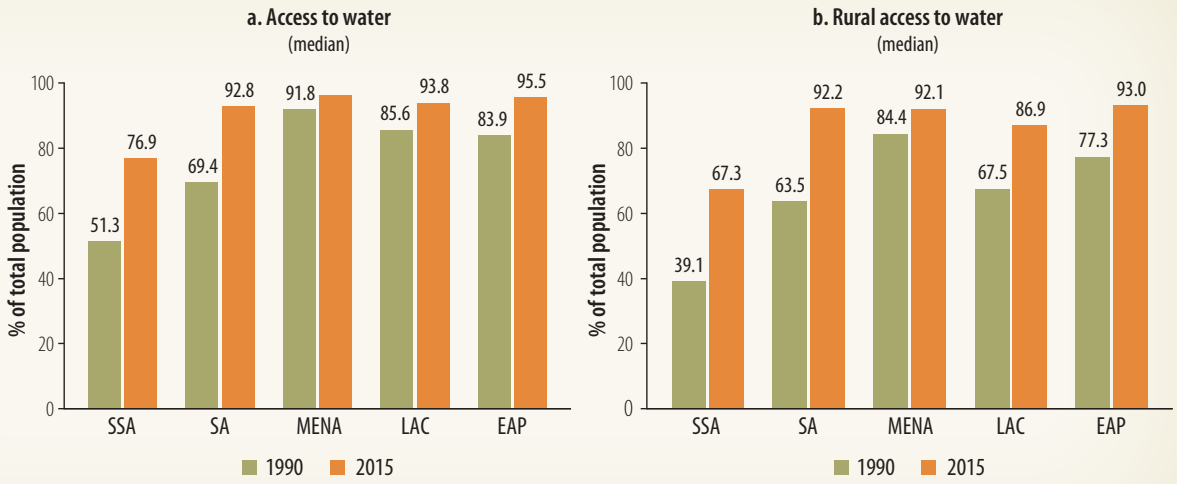
Source: World Bank, World Development Indicators.
Note: LIC = low-income countries; LMC = lower-middle-income countries; SSA = Sub-Saharan Africa; UMC = upper-middle-income countries.

The fast increase in the overall access rate in the region is driven by rising rural access rates—although they were coming from low levels in 1990. Yet, there is a great disparity between urban and rural rates of access to electricity across income groups in Sub-Saharan Africa. For instance, about 63 percent of the urban population had access to electricity in 2014, while only 19 percent had access in rural areas. The urban and rural rates of access for the region's LMCs are 83 and 18 percent, respectively. Finally, the rural rate of access to electricity in UMCs (about 67 percent) is still below than that of other developing regions.

Access to safe water. Total access rates to improved sources of water grew sharply in Sub-Saharan Africa over the past quarter century (to a median of 77 percent in 2015, from 51 percent in 1990). Although more than three-fourths of the region's population had access to water in 2015, other benchmark regions have access rates that exceed 90 percent (figure 2.14). Again there is a large disparity in urban and rural access rates in Sub-Saharan Africa, despite the sharp growth of urban access. In 2015, more than 90 percent of the urban population had access to water, while only 67 percent had access in rural areas. For other developing regions, rural access exceeded 85 percent of the population.

Sub-Saharan Africa has a large disparity in water access rates between urban and rural areas.

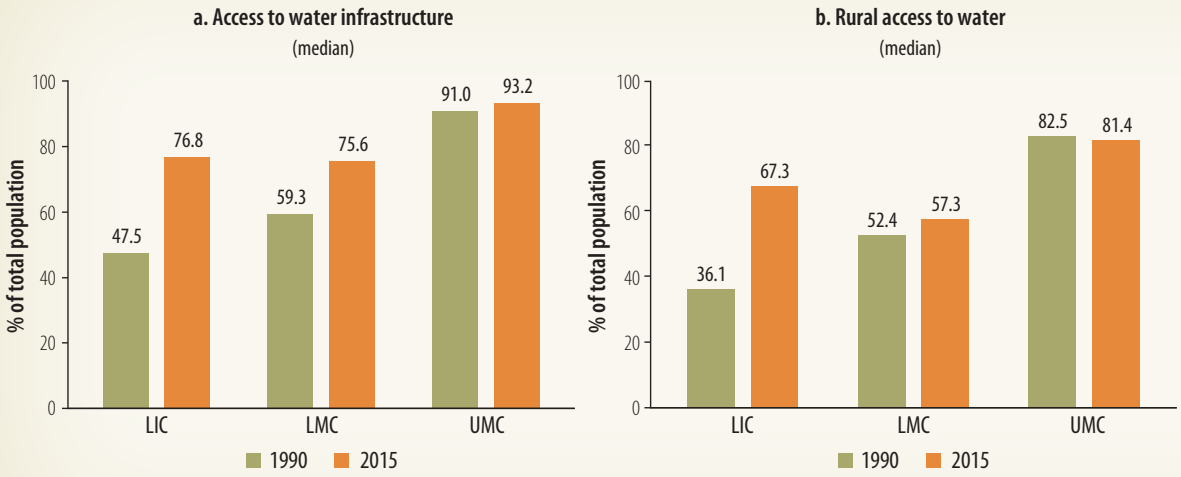
FIGURE 2.14: Access to Water Infrastructure: Total and Rural Access Rates, by Region



Source: World Bank, World Development Indicators.
Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

The percentage of the population with access to improved sources of water increased over the past quarter century across all income groups in Sub-Saharan Africa—with LICs showing the larger rates of improvement. Their overall access rates jumped from 48 percent in 1990, to 77 percent in 2015. The disparities across income groups are driven by those in rural areas. Interestingly, a greater proportion of the rural population has access to water among LICs in the region (67 percent in 2015) than among LMCs (57 percent) (figure 2.15). Among UMCs in the region, access is above 90 percent in urban areas, while it covers 81 percent of the population in rural areas. In spite of covering four-fifths of the rural population in 2015, rural access rates among UMCs in Sub-Saharan Africa are not higher than those in other developing areas.

FIGURE 2.15: Access to Water Infrastructure in Sub-Saharan Africa, by Income: Total and Rural Access Rates

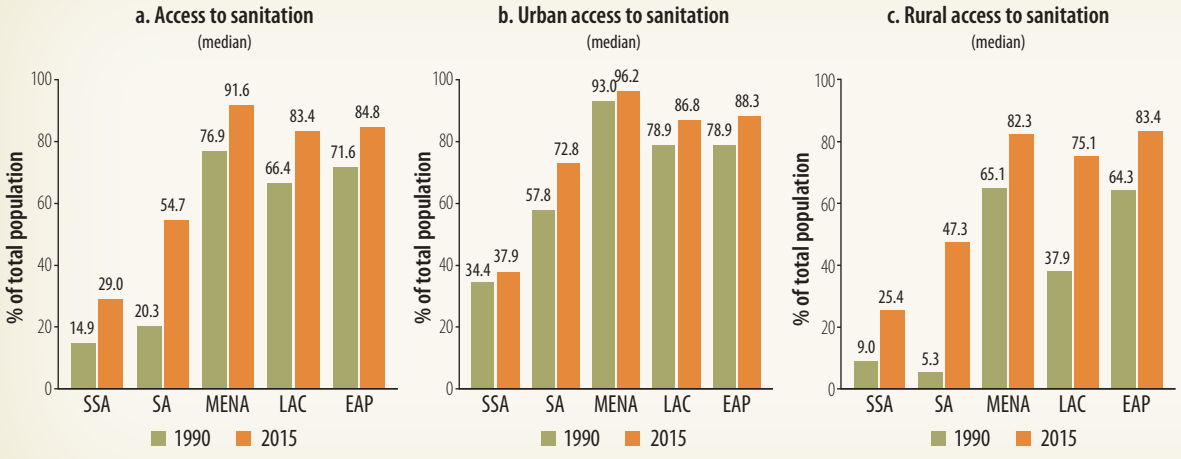


Access to improved sources of water increased across all income groups in Sub-Saharan Africa—with low-income countries showing the largest improvement.

Source: World Bank, World Development Indicators.
Note: LIC = low-income countries; LMC = lower-middle-income countries; SSA = Sub-Saharan Africa; UMC = upper-middle-income countries.

Access to improved sanitation facilities. Over the past quarter century, Sub-Saharan Africa has doubled total access rates to sanitation; however, they are still low relative to other benchmark regions. Sanitation access rates went from 15 percent in 1990, to about 30 percent in 2015 (figure 2.16). In 2015, about 55 percent of the population of South Asia had access to sanitation facilities, while that proportion exceeded 80 percent for Latin America and the Caribbean and East Asia. With a rate of 38 percent, access to sanitation has changed little for Sub-Saharan Africa's urban population. In the region's rural areas, only 25 of every 100 people had access to improved sanitation facilities in 2015, up from 9 in 1990.

FIGURE 2.16: Access to Sanitation Infrastructure, by Region: Total, Urban, and Rural Access Rates

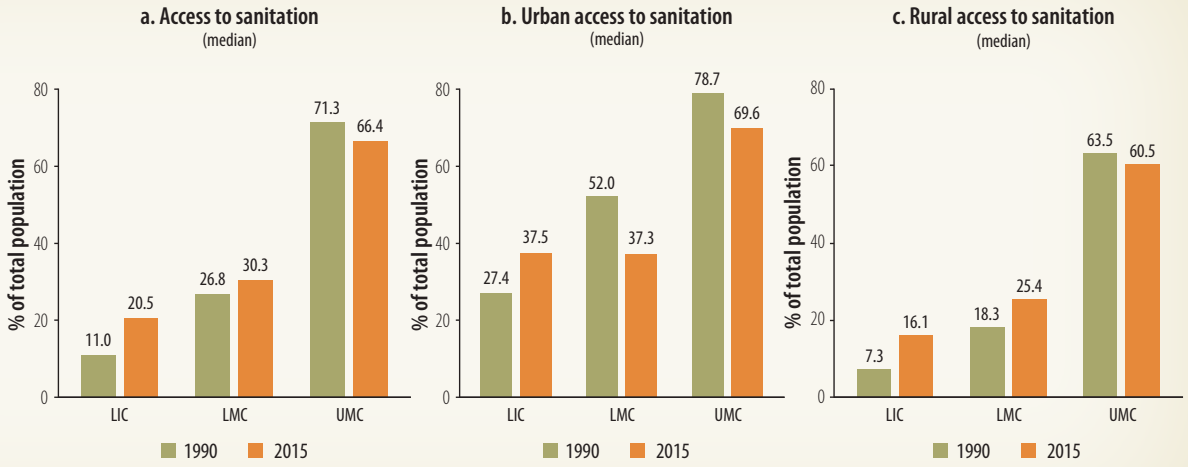


Access to sanitation in the region has doubled in the past 25 years, but remains low in comparison with other parts of the world.

Source: World Bank, World Development Indicators.
Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

Sanitation access rates more than doubled in low-income countries in the past 15 years.

FIGURE 2.17: Access to Sanitation Infrastructure in Sub-Saharan Africa, by Income: Total, Urban, and Rural Access Rates



Source: World Bank, World Development Indicators.

Note: LIC = low-income countries; LMC = lower-middle-income countries; SSA = Sub-Saharan Africa; UMC = upper-middle-income countries.

Overall access rates increased over the past 25 years for LICs and LMCs in Sub-Saharan Africa, and declined among UMCs. Again, these developments are primarily driven by the evolution of rural access rates. Across rural areas, access rates more than doubled among LICs (jumping from 7 percent in 1990 to 16 percent in 2015) (figure 2.17). Gains in access were significant, although not as high, in LMCs (they went from 18 percent in 1990, to 25 percent in 2015). Among UMCs, rural access rates declined, from 64 percent in 1990, to 61 percent in 2015. Finally, the rural access rate for UMCs is only higher than the regional median for South Asia.

Sub-Saharan Africa's Infrastructure Gaps: A Scorecard

Table 2.2 depicts a scorecard of Sub-Saharan Africa's infrastructure gaps in terms of quantity, quality, and access, as well as subregions and selected countries. The scorecard summarizes the information presented in figures 2.1 through 2.17. It captures the gap between the region, income groups, or percentile of the regional distribution vis-à-vis the top decile of the world excluding countries in Sub-Saharan Africa. This gap is represented by the ratio of the infrastructure measure in Sub-Saharan Africa vis-à-vis the equivalent measure for the top decile of the rest of the world. In this context, the regions, income groups, and countries in brown represent those whose ratio is lower than 0.25—that is, their infrastructure gap is greater than 75 percent. These are the most lagging areas in infrastructure provision. We denote in yellow those areas with a ratio between 0.25 and 0.5 (a gap that is greater than 50 percent but lower than 75 percent). Those with an infrastructure ratio relative to the benchmark between 0.5 and 0.75 are represented in light green, whereas those with a ratio greater than 0.75 (that is, a gap less than 25 percent) are depicted in dark green.

When looking at the region as a whole (as captured by the median across countries in Sub-Saharan Africa) and its different groups classified by income level, all of them (except UMCs) have a gap that exceeds 75 percent relative to the top decile of the world sample in energy-generating capacity as well

as road density and quality (table 2.2, panel A). For telecommunications penetration, the gap for most regions exceeds 50 percent—except for UMCs (with a gap lower than 10 percent). In the case of total access to improved water sources, the gap in Sub-Saharan Africa vis-à-vis the benchmark is lower than 50 percent—and it is even lower than 10 percent for UMCs in the region. Qualitatively, these gaps hold for rural access to improved sources of water.

Table 2.2, panel B, shows the gap for the best and worst performers in the region (relative to the top 10 percent of the world distribution), as approximated by the top decile, top quartile, bottom quartile, and bottom decile of the Sub-Saharan Africa distribution. For the bottom percentiles of the distribution (10th and 25th percentiles), the gap in quantity and quality of infrastructure is greater than 75 percent—regardless of the infrastructure sector. The same holds for access to electricity and access to sanitation. The gaps for the bottom percentiles are not as large in access to safe water. For the best performers in the region (75th and 90th percentiles), the performance is still dismal in electric power–generating capacity. For the top decile of the distribution in Sub-Saharan Africa, there is a narrow gap in telecommunications penetration (about 20 percent), overall access to electricity, and access to water. The gaps in energy quality and access to sanitation facilities are moderate.

TABLE 2.2: Infrastructure Performance in Sub-Saharan Africa: A Scorecard

Country Groups	Quantity			Quality		Access					
	Telecommunications	Energy	Transport	Energy	Transport	Energy - Total	Energy - Rural	Water-Total	Water-Rural	Sanitation-Total	Sanitation-Rural
Panel A. SSA and subregions											
Sub-Saharan Africa											
LIC											
LMC											
UMC											
Panel B. SSA percentiles											
Top 10%											
Top 25%											
Bottom 25%											
Bottom 10%											

***Color representation**: Brown represents a ratio lower than 0.25, yellow represents a ratio between 0.25 and 0.5, light green represents a ratio between 0.5 and 0.75, and dark green represents a ratio greater than 0.75.*

Quantity: Telecom *is fixed and mobile lines per 1,000 workers (in logs),* Energy *is electricity-generating capacity per 1,000 workers (in logs), and* Transport *is length of the road network in km. per sq. km (in logs).* ***Quality:*** Energy *is electric power transmission and distribution losses (% of output in logs), and* Transport *is the share of paved roads (% total in logs).* ***Access:*** Energy *is access to electricity (% of population in logs),* Water *is improved water sources (% of population in logs), and* Sanitation *is improved sanitation facilities (% of population in logs).*

LIC = low-income countries; LMC = lower-middle-income countries; SSA = Sub-Saharan Africa; UMC = upper-middle-income countries

Benchmarking Physical Infrastructure across Countries in Sub-Saharan Africa

Regional differences in infrastructure trends may partly reflect the differences across regions in key infrastructure drivers—for instance, geographic and demographic factors, as well as real income per capita (see Canning 1998). It is far from trivial to assess this hypothesis, since some of these drivers—notably, income levels—are themselves affected by infrastructure trends. The cross-regional comparison presented in the previous section implicitly takes some of these factors into account, to the extent that it focuses on infrastructure stocks normalized by population or labor force (or, in the case of transport networks, by country area) and includes benchmark groups among the relevant comparators for Sub-Saharan Africa.

Benchmarking infrastructure sectors across countries in Sub-Saharan Africa involves a systematic approach to examining the trends in infrastructure after adjusting for the effect of country-specific characteristics. This procedure is conducted in two stages. First, measures of adjusted infrastructure quantity—as well as quality and access—and adjusted income per capita are defined by the residuals from projecting these variables on indicators of country size (population and/or labor force) and geographic characteristics (surface area of the country). Second, the relationship between these adjusted measures of infrastructure and per capita income is examined—and this constitutes a partial correlation between infrastructure development and the levels of development. This exercise is conducted for two time periods: the averages for 1998–2002 and 2008–12. For reasons of space and without loss of generality, the focus here is on the benchmarking exercise for the latter period.

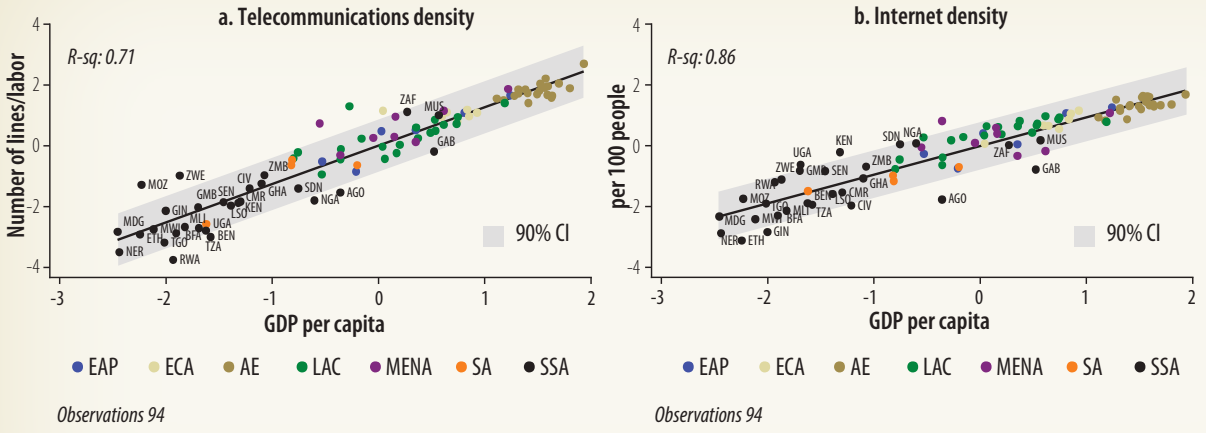
Infrastructure Quantity

Telecommunications. The partial correlation results show a positive association between telecommunications density and real income per capita. This implies that, even after controlling for geographic and demographic factors, countries with greater income per capita tend to have a greater density of telecommunications. The analysis also finds that there has been a significant increase in telecommunications density among some countries in Sub-Saharan Africa over time.

Given certain idiosyncratic features (say, demographic and geographic characteristics), some countries in the region perform above the international norm according to their level of development (as depicted by the regression line), while others remain below that norm. For 2008–12, South Africa and Mauritius register the highest extent of telecommunications density (as measured by the *adjusted* fixed and mobile lines per 1,000 people), and they are both above the international norm for that period (figure 2.18). However, some countries have similar levels of telecommunications density as that of South Africa but with lower levels of income per capita (say, Paraguay and Jordan), while other countries have similar levels of telecommunications density despite having higher levels of development (for example, Greece and Turkey).

A closer look at middle-income countries (MICs) in the region, other than South Africa and Mauritius, shows that most of these countries are below the international norm—especially Gabon, Nigeria, and Angola. This implies that, for their level of development, there is significant under-provision of telecommunications services in these countries. Most of the LICs in the region are along or below the international norm that characterizes the relationship between infrastructure and development. The weakest performers (as measured by the negative distance to the norm) are Rwanda and Tanzania. Finally, one of the most improved countries in the provision of telecommunications services is Ethiopia—a country that shifted from being one of the weakest performers in 1998–2002 to being at the international norm for its level of development in 2008–12. However, it has improved from a very low base, and it is still one of the most underachieving countries in the region.

FIGURE 2.18: Telecommunications and Income per Capita, 2008–12



Some countries, like Kenya, Mauritius and South Africa, perform above the international norm according to their level of development.

Sources: International Telecommunications Union's World Telecommunication/ICT indicators; World Bank, World Development Indicators. GDP per capita is from Feenstra, Inklaar, and Timmer 2015.

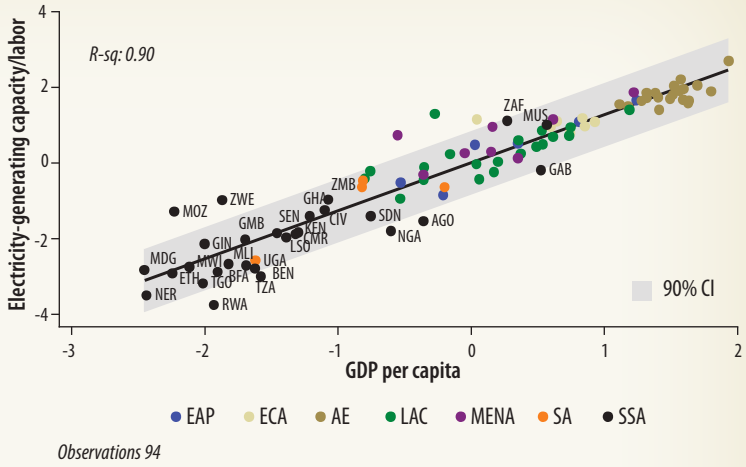
Note: CI = confidence interval, using PWT 9.0, adjusted by demographic and geographic features; EAP = East Asia and the Pacific; ECA = Europe and Central Asia; GDP = gross domestic product; AE = advanced economies; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

A positive conditional correlation between Internet density and income per capita is also observed, along with marked progress among countries in Sub-Saharan Africa over time—almost half the Sub-Saharan African countries in the sample are above the international norm in 2008–12. Nonetheless, the region still lags behind other developing countries with similar levels of economic development. For 2008–12, controlling for geographic and demographic variables, Mauritius, Nigeria, and Sudan show remarkable progress in Internet density (figure 2.18). Other MICs in the region (such as Gabon and Angola) have a level of Internet density that is significantly below their level of development. Kenya is significantly above the international norm and has experienced significant progress over the past decade. LICs in the region with significant under-provision of Internet services according to the international norm are Ethiopia, Guinea, and Côte d'Ivoire.

Fixed broadband services, which is another quantity variable for telecommunications infrastructure, were only available in a few countries in Sub-Saharan Africa (only seven) in 1998–2002. With time, in 2008–12, more countries in Sub-Saharan Africa delivered fixed broadband subscriptions. In the latter period, Mauritius led all African countries; at the low end were Ethiopia, Malawi, and Guinea.

There is progress in electricity-generating capacity in Ethiopia, while, Rwanda, Togo, and Tanzania continue to underperform.

FIGURE 2.19: Electricity-Generating Capacity and Income per Capita, 2008–12



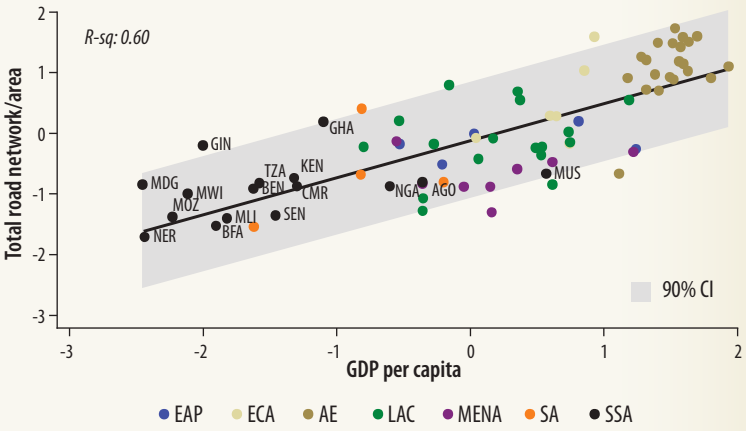
Observations 94

Sources: International Energy Agency, World Energy Outlook. GDP per capita is from Feenstra, Inklaar, and Timmer 2015.

Note: CI = confidence interval, using PWT 9.0, adjusted by demographic and geographic features; EAP = East Asia and the Pacific; ECA = Europe and Central Asia; GDP = gross domestic product; AE = advanced economies; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

Ghana's road density is the best in the region. It is also significantly above the international norm.

FIGURE 2.20: Road Density and Income per Capita, 2008–12



Observations 77

Sources: International Road Federation, World Road Statistics; World Bank, World Development Indicators. GDP per capita is from Feenstra, Inklaar, and Timmer 2015.

Note: CI = confidence interval, using PWT 9.0, adjusted by demographic and geographic features; EAP = East Asia and the Pacific; ECA = Europe and Central Asia; GDP = gross domestic product; AE = advanced economies; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

Power. There is a positive relationship between electricity-generating capacity and real income per capita across countries in the world. Hence, countries with greater income per capita tend to have larger electric power infrastructure stocks. For 2008–12, South Africa and Mauritius are the best performers in the region in power infrastructure quantity (after controlling for geography and demographics) (figure 2.19). Their adjusted levels of infrastructure provision are greater than those of countries with higher income per capita, like Hungary and Chile. Other MICs (for example, Gabon, Nigeria, and Angola) clearly underperform for their level of development. A closer look at low-income countries in the region shows sharp progress in electricity-generating capacity in Ethiopia over the past decade. By contrast, Rwanda, Togo, and Tanzania continue to underperform according to the international norm.

Transport. There is a positive partial correlation between real income per capita and road density in 2008–12 (figure 2.20). However, there appears to be a greater cross-country dispersion along the international norm when compared with infrastructure stocks in telecommunications and power. During this period, Ghana appears to be the best performing country in the region, with adjusted road density that is not only higher when compared with other countries in Sub-Saharan Africa, but also significantly above the international norm.[6] Other countries with good performance in transport infrastructure quality

6 South Africa did not have available information for this period.

include Guinea and Madagascar. Finally, most of the countries in the region lie close to or below the international norm for 2008–12.

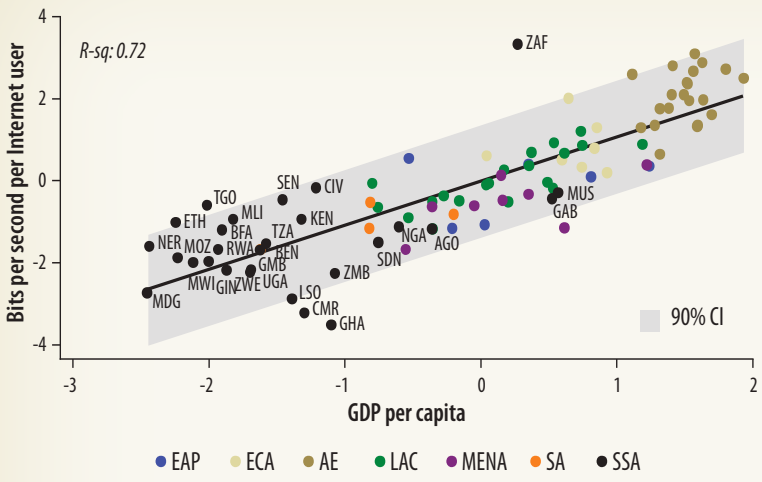
Another important mode of transportation infrastructure is the railroad sector. The data on the length of the railroad network are not as complete as those on the road network. There is information available only for 74 countries for 1998–2002 and 65 countries for 2008–12. Still, there is a positive and significant relationship between income per capita and rail density. For 2008–12, South Africa continues to have the highest rail density in the continent, and its rail network remains over the international norm. The adjusted rail density is larger than those of countries with larger GDP per capita (for example, Chile and Malaysia, among others). By contrast, Côte d'Ivoire, Cameroon, and Burkina Faso have underperformed relative to their level of income per capita, and also show the lowest density of railroads in the region.[7]

Infrastructure Quality

Telecommunications. Figure 2.21 depicts a positive relationship between international Internet bandwidth (in bits per second per Internet user) and real income per capita after controlling for demographic and geographic indicators. One finding that emerges from this analysis is that the partial correlation between Internet density and income per capita has increased over time (when comparing 1998–2002 vis-à-vis 2008–12), and most countries in Sub-Saharan Africa are above the international norm in the latter period.

In 2008–12, South Africa registered an astounding increase in Internet density, thus becoming the best performer in the region and a significant over-provider of these services according to the country's level of development (figure 2.21). Other MICs in the region (for example, Gabon, Nigeria, Angola, and Sudan) are below the international norm. Finally, when looking at LICs in the region, Ghana, Cameroon, and Lesotho have levels of Internet infrastructure quality that are way below what the international norm predicts for their level of economic development.

FIGURE 2.21: Internet Traffic and Income per Capita, 2008–12



Observations 94

Sources: International Telecommunications Union's World Telecommunication/ICT indicators; World Bank, World Development Indicators. GDP per capita is from Feenstra, Inklaar, and Timmer 2015.

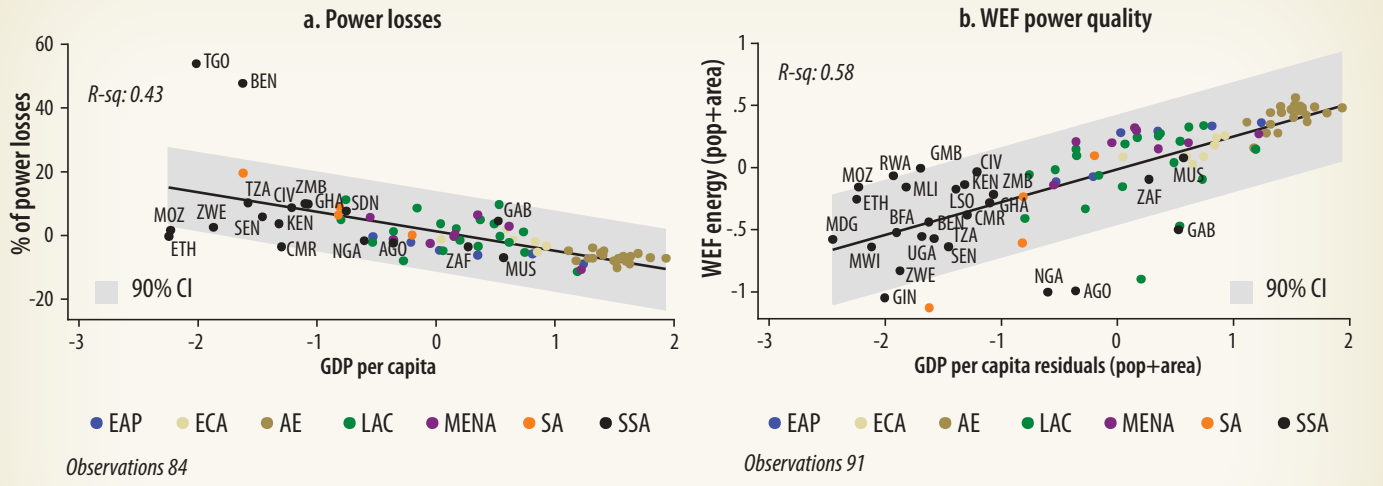
Note: CI = confidence interval, using PWT 9.0, adjusted by demographic and geographic features; EAP = East Asia and the Pacific; ECA = Europe and Central Asia; GDP = gross domestic product; AE = advanced economies; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

Internet density in South Africa is the best in the region, while Ghana, Cameroon, and Lesotho are way below countries with similar levels of development.

7 Adding road and rail networks and assessing their performance as a whole would lead to similar results to those for the total road network. This analysis is not reported, but it is available from the team upon request.

Power. The partial correlation analysis shows that countries with higher income per capita tend to have a lower percentage of power losses (that is, higher quality of electricity supply). For 2008–12, Mauritius, Cameroon, Ethiopia, and Mozambique are among the best performers in the region (with the lowest level of adjusted losses). All these countries overperform when compared with the predicted level of power losses according to the international norm (figure 2.22, panel a). Togo and Benin, by contrast, continue to underperform, with massive power losses.

FIGURE 2.22: Power Quality and Income per Capita, 2008–12



Sources: World Bank, World Development Indicators; World Economic Forum, Global Competitiveness Report. GDP per capita is from Feenstra, Inklaar, and Timmer 2015.

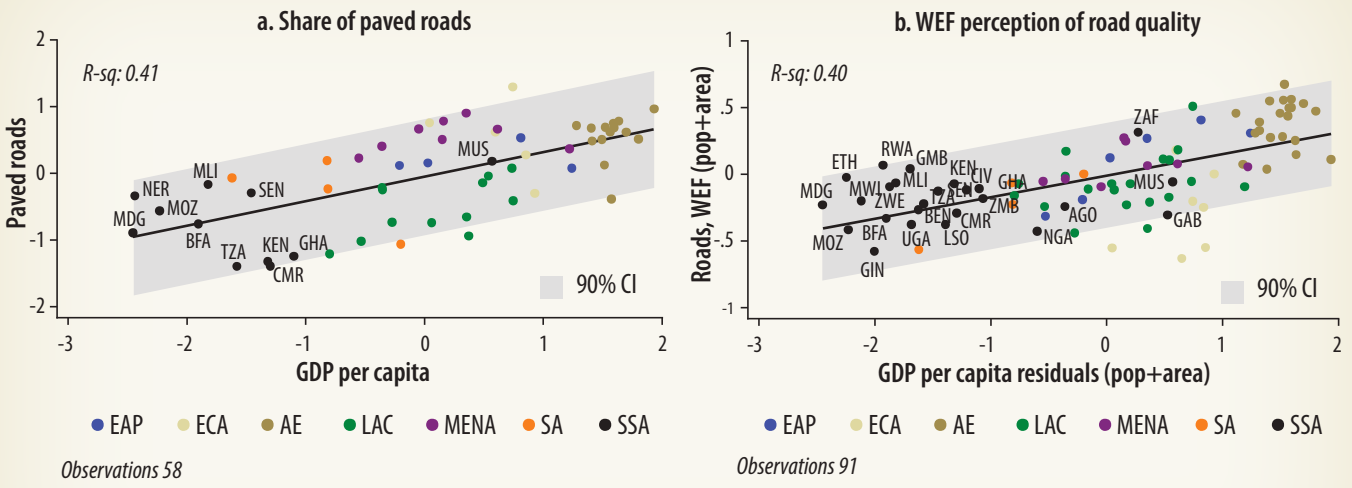
Note: CI = confidence interval, using PWT 9.0, adjusted by demographic and geographic features; EAP = East Asia and the Pacific; ECA = Europe and Central Asia; GDP = gross domestic product; AE = advanced economies; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa; WEF = World Economic Forum.

Benchmarking the quality of power infrastructure is complemented by the analysis of WEF perception measures of the quality of electricity supply. Figure 2.22, panel b, plots a positive partial correlation between income per capita and the *perceived* quality of power for 2008–12. For most MICs in Sub-Saharan Africa, the perceived quality of the power infrastructure sector is lower than what the international norm predicts for their level of income per capita. However, for some LICs, such as The Gambia, Côte d'Ivoire, and Rwanda, the perception of the quality of electricity supply is way above the level predicted by the international norm. Finally, Gabon, Nigeria, Angola, and Guinea have a level of power quality that is significantly below the one predicted by the international norm.

Transport. Benchmarking the quality of transport infrastructure involves assessing the performance of African countries on the hard and perceived measures of road and rail quality. Figure 2.23 depicts a positive relationship between the share of paved roads (a proxy for road quality) and income per capita for 2008–12. This implies that, after controlling for geographic and demographic factors, countries with higher income per capita tend to have a greater share of paved roads.

For 2008–12, Mauritius appears to be the leader in the share of paved roads (figure 2.23, panel a). The country's (adjusted) share of paved roads is close to the level predicted by the international norm, and it outperforms countries with greater levels of income per capita (for example, Poland). Tanzania, Cameroon, Kenya, and Ghana are the weakest performers in the region—with shares of paved roads that are significantly below those predicted by the international norm.

FIGURE 2.23: Transport Quality and Income per Capita, 2008–12



Sources: International Road Federation, World Road Statistics; World Bank, World Development Indicators; World Economic Forum, Global Competitiveness Report. GDP per capita is from Feenstra, Inklaar, and Timmer 2015.

Note: CI = confidence interval, using PWT 9.0, adjusted by demographic and geographic features; EAP = East Asia and the Pacific; ECA = Europe and Central Asia; GDP = gross domestic product; AE = advanced economies; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa; WEF = World Economic Forum.

Figure 2.23, panel b, depicts the partial association between income per capita and the WEF perception of road quality during 2008–12. The figure confirms the findings of figure 2.23, panel a, that countries with higher income per capita tend to have better road quality. Perceived quality of the road network is the highest in South Africa (and above the international benchmark) for 2008–12—thus, outperforming countries in South America, like Brazil and Colombia. Other MICs in the region (for instance, Nigeria and Gabon) clearly underperform for their level of income per capita. Among LICs in the region, Guinea appears to have the lowest level of road quality, whereas the quality of roads in Rwanda and Ethiopia is far better than the one predicted by the international norm.

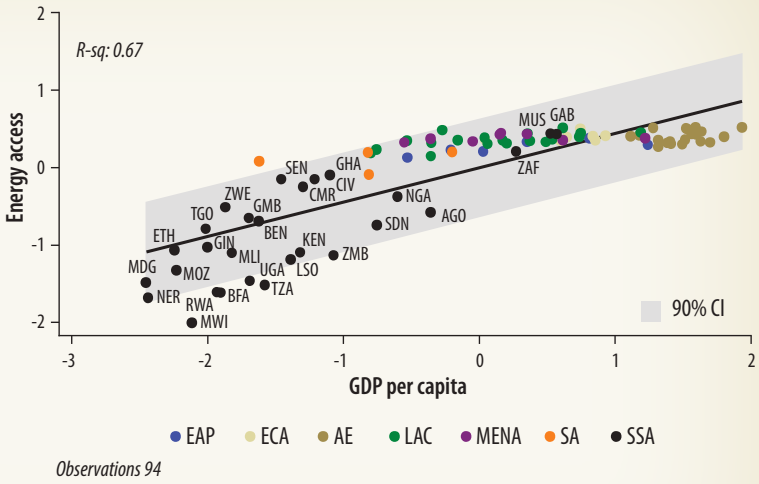
Railroad quality also exhibits a direct and positive relationship with income per capita after controlling for demographic and geographic indicators. The perception of railroad quality is the highest in Gabon, closely followed by South Africa. Among MICs in the region, the perception of rail quality in Nigeria and Angola is lower than that predicted by the international norm. In the group of LICs in Sub-Saharan Africa, Uganda exhibits the largest distance to the international norm.

Infrastructure Access

Electricity. Countries with greater income per capita tend to provide greater access to electricity. This finding holds after controlling for geography and demography (figure 2.24). For 1998–2012, the countries with the highest rates of access to electricity are Gabon and Mauritius—with adjusted rates that are higher than those of countries with similar income per capita (for example, Brazil and Mexico). Several LICs in this period have weak performance when compared with the international norm, namely, Malawi, Rwanda, and Lesotho. Over 2008–12, Gabon and Mauritius continued to display higher rates of access in the region. South Africa moved closer to the international norm. There was improvement over time in Rwanda and Tanzania, and Malawi remained the weakest performer in electricity access.

Gabon, Mauritius, and South Africa remain the best performing countries in the region when measuring access to improved electricity sources.

FIGURE 2.24: Access to Electricity and Income per Capita, 2008–12



Sources: World Bank, World Development Indicators. GDP per capita is from Feenstra, Inklaar, and Timmer 2015.

Note: CI = confidence interval, using PWT 9.0, adjusted by demographic and geographic features; EAP = East Asia and the Pacific; ECA = Europe and Central Asia; GDP = gross domestic product; AE = advanced economies; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

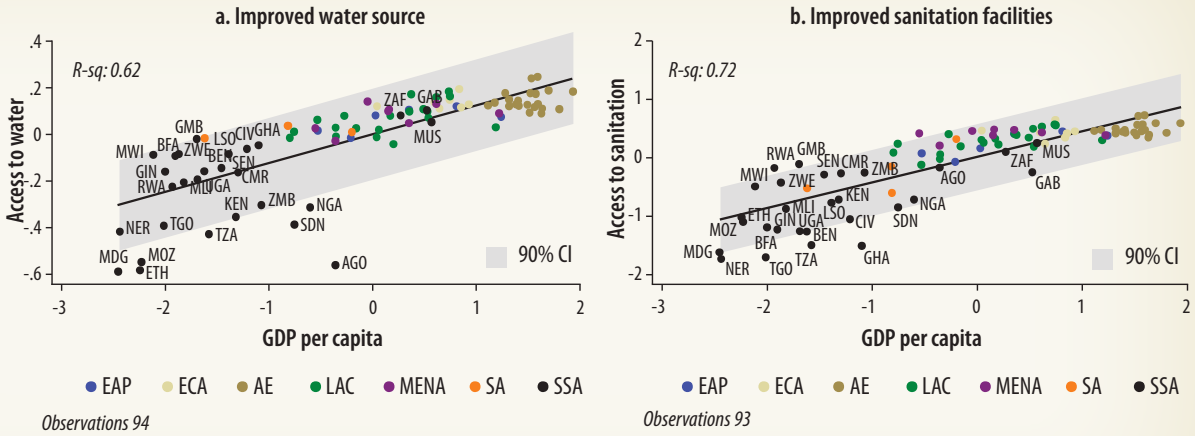
Access to improved water sources. Figure, 2.25, panel a, plots the conditional correlation between income per capita and access to safe water in 2008–12. For this period, Gabon, Mauritius, and South Africa remain the best performing countries in Sub-Saharan Africa in access rates to water, and these rates are either similar or slightly above the ones predicted by the international norm. MICs in the region, such as Sudan, Nigeria, and Angola, have access rates that are significantly lower than those predicted by the benchmarking exercise. The same holds for Madagascar and Ethiopia (both countries continue to underperform) among LICs.

Recent figures show that Ethiopia has made good progress in terms of extending access to water services. In urban areas, 93 percent of households now have access to an improved source of drinking water. Yet only 57 percent have access to water nationwide—in line with the Millennium Development Goals target.

Access to improved sanitation facilities. Countries with greater income per capita also tend to have greater rates of access to improved sanitation facilities. For 2008–12, Mauritius and South Africa remain along the international norm, while Gabon appears to have fallen off track (figure 2.25, panel b). Over the past decade, Ethiopia moved from being the weakest performer to being close to the access rates predicted by the international norm. Niger, Togo, and Tanzania continue to have the lowest adjusted rates of access in the region.

On this measure, Gabon appears to have fallen off track, while progress in Ethiopia has been significant.

FIGURE 2.25: Access to Water and Sanitation and Income per Capita, 2008–12



Sources: World Bank, World Development Indicators. GDP per capita is from Feenstra, Inklaar, and Timmer 2015.

Note: CI = confidence interval; Using PWT 9.0; Adjusted by demographic and geographic features; EAP = East Asia and the Pacific; ECA = Europe and Central Asia; GDP = gross domestic product; AE = Advanced economies; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa..

2.2 INFRASTRUCTURE, GROWTH, AND PRODUCTIVITY IN SUB-SAHARAN AFRICA

Introduction

In academic or policy circles, few experts would dispute the view that infrastructure development fosters growth. However, there is no consensus on the magnitude of the effect or the factors that shape it. Triggered by Aschauer (1989), there is a massive empirical literature that focuses on the impact of infrastructure on the level and growth rate of aggregate output or productivity. One strand of this literature examines the long-term growth impact of infrastructure—primarily using a reduced-form growth regression framework that links long-term growth to indicators of infrastructure, public capital, or public investment.[8] Growth regressions have used monetary measures of public capital and/or investment, as well as physical indicators of infrastructure stocks. Using physical indicators renders invariably significant growth effects. Some studies have focused on single-sector analysis (typically, indicators of telecommunications penetration or density); others have used synthetic indicators that capture stocks of physical infrastructure in different sectors—say, telecommunications, electric power, and transport.

Infrastructure in Sub-Saharan Africa: What Does the Evidence Tells Us?

Empirical research on the impact of infrastructure on long-term growth in Africa has taken off. Ndulu (2006) presents a diagnostic view of the main issues in infrastructure for the region. Ayogu (2007) surveys the literature on the growth and productivity effects of infrastructure development. For instance, Estache 2005 estimate an augmented Solow model using pooled ordinary least squares. They find that roads, power, and telecommunications infrastructure (rather than water and sanitation) have a significant association with long-run growth in Africa. Other studies follow a production function approach. For instance, Ayogu (1999) estimates an infrastructure-augmented production function using regional panel data from Nigeria, and finds a strong association between infrastructure and output. Kamara (2006) evaluates the dynamic effects of infrastructure in an aggregate production function for a panel of African countries. Analogously, Boopen (2006) estimates the output contribution of transport infrastructure using panel data.

Among country studies, South Africa and Nigeria have attracted special attention—partly reflecting the better quality of their data when compared with other countries in the region. Perkins, Fedderke, and Luiz 2005 estimate the existence of a long-run relationship between infrastructure (investment and capital stocks) and real economic activity over a span of 100 years. They find two-way causality for most of their monetary measures of infrastructure. Kularatne (2005) examines the impact of infrastructure investment (and spending on health and education) on output. He also finds bi-directional effects; however, the impact of infrastructure investment is indirect—it boosts growth by crowding in private investment. Dynkelman (2011) finds a significant impact of household electrification on employment in South Africa's rural labor markets.

8 The growth regression approach often includes standard control variables from the empirical growth literature (see Calderon and Servén 2004, 2010).

Few papers address the multidimensionality of infrastructure and its impact on long-term growth. Calderón and Servén (2010) find that the quantity and quality of infrastructure have positive impacts on growth and the distribution of income in Sub-Saharan Africa. Narrowing the infrastructure gap for countries in the region yields significant growth benefits, but the costs of financing are high. More recent evidence for the region shows that there are no short-term growth effects of improved quantity and quality of infrastructure (Kondongo and Ojah 2016). Box 2.2 summarizes some of the microeconomic evidence on the impact of infrastructure sectors on employment and output.

BOX 2.2: Microeconomic Evidence on the Impact of Infrastructure in Sub-Saharan Africa

Two distinct approaches have been developed to understand the cross-country differences in aggregate productivity from a microeconomic perspective. The first approach is to evaluate the drivers of the total factor productivity (TFP) of an individual firm in a country relative to its counterparts in another country—say, cross-country differences in the ability to adopt more efficient technologies (Parente and Prescott 1994) or to operate technologies efficiently (Bloom, Schankerman, and Van Reenen 2013; Bloom, Draca, and Van Reenen 2016). The second approach is to examine resource misallocation as a key factor in accounting for cross-country differences in TFP.

The resource allocation process is characterized by: (a) the types of establishments operating in the economy (if newcomers are more productive than incumbents or exiting firms), and, (b) the allocation of labor and capital across establishments in operation. Distortions in either of these two features will lead to resource misallocation and, in turn, lower aggregate TFP. The resource misallocation approach aims not only at quantifying the extent of resource misallocation (indirect approach), but also understanding the underlying sources of misallocation (direct approach)—namely, product and labor market distortions, trade restrictions, financial frictions, informality, entry barriers, and credit market imperfections, among others (Restuccia and Rogerson 2013).

In this context, poor infrastructure networks can restrict factor mobility and hamper productivity. Shiferaw et al. (2015) examine the impact of having an improved road network on the entry decision and entry size of manufacturing firms in Ethiopia. The analysis is conducted using geographic information system–based panel data on the road accessibility of Ethiopian towns and census-based panel data for manufacturing firms over 1996–2008. The authors construct three measures of road infrastructure: (a) total distance that can be traveled during a 60-minute drive, (b) total area accessible during the 60-minute drive, and (c) total travel time from a particular locality to major economic destinations.[a] The evidence shows that: first, the quality of local road infrastructure is positively associated with the number of firms present in the locality. However, the number of firms has no significant relationship with the connectivity of the road infrastructure. Second, the size of new entrants is more strongly associated with connectivity rather than with the quality of the local road infrastructure. In sum, local road infrastructure is important because it enables more firms to set up, but more extensive market connectivity may be important for the entry of large firms. In other words, poor infrastructure could be a source of resource misallocation through the selection channel.

BOX 2.2: *Continued*

Gollin and Rogerson (2014) build a general equilibrium model where the size of subsistence agriculture results from the interplay among sectoral productivities (in agriculture and manufacturing) and transportation productivity. Manufacturing goods are produced in urban areas. Agricultural activity takes place in near and remote rural areas. There are iceberg transportation costs of moving goods into and out of the remote region. Labor is mobile across regions, and people living in remote regions belong to the subsistence agriculture sector. After calibrating the model for Sub-Saharan Africa, it is found that improvements in agricultural productivity and lower costs of intermediate inputs free up labor from the agriculture sector—primarily from subsistence agriculture. Improving transport productivity (lower iceberg transportation costs) helps move individuals from subsistence agriculture into manufacturing, leaving the share of workers living in the near region unchanged. A boost in manufacturing productivity alone, by contrast, lowers the share of population in subsistence agriculture, but the magnitude of this effect is lower than that of greater agricultural productivity or lower transport costs. Therefore, structural transformation at low levels of development is mainly driven by productivity surges in agriculture and transportation. Economically speaking, a 10 percent increase in agricultural TFP combined with a 10 percent reduction in transport costs leads to a 14-percentage-point reduction in the labor share in subsistence agriculture. The welfare effects are significant—comparable to raising consumption per capita in the economy by 62 percent.

Other research papers provide evidence that deficient infrastructure hinders Africa's development. There is evidence that an unreliable supply of electricity deters firm-level investment in Uganda (Reinikka and Svensson 1999). Insufficient power-generating capacity limits growth in Ghana (Estache and Vagliasindi 2007). Poor transport infrastructure also imposes a high cost in the region. Diao and Yanoma (2003) show that growth in the agriculture sector is constrained by high marketing costs, which largely reflect poor transport (as well as other infrastructure) facilities. In general, it is found that higher costs of transportation alter the incentives for agricultural investment (Renkow, Hallstrom, and Karanja 2004; Stifel and Minten 2008). Overall, deficient infrastructure hinders the growth impact of private investment—especially foreign direct investment—in Africa (Lumbila 2005).

a. The measures in (a) and (b) capture primarily local improvements in road infrastructure, while that in (c) is a more comprehensive measure of how roads affect the connectivity of firms with local and distant markets.

Growth Benefits of Closing Sub-Saharan Africa's Infrastructure Gap

Computing Growth Benefits

Since Aschauer's (1989) seminal work on infrastructure, more sophisticated techniques have been developed to compute the short- and long-run effects of infrastructure on growth. Researchers have used monetary measures of public capital and/or investment (Devajaran et al. 1996) or physical stocks (Calderon and Serven 2004, 2010). Estimating the impact of infrastructure should address the issues of: (a) multidimensionality at the sector level, (b) improving the quantity and/or enhancing the quality of infrastructure, and (c) ameliorating issues of likely endogeneity and reverse causality.

Computing the growth benefits of narrowing the infrastructure gap in Sub-Saharan Africa is not trivial. It will depend on several factors, including (a) the economic approach used to examine this impact, (b) the infrastructure sectors included in the analysis, (c) the econometric techniques utilized, and (d) the sample of countries. This section uses the empirical estimation undertaken by Calderón and Servén (2010), that is, a cross-country panel data regression model that includes synthetic indicators of the quantity and quality of infrastructure. The analysis also uses other control variables that exert an influence on growth per capita, namely, education, financial development, trade openness, lack of price stability, government burden, institutional quality, and terms-of-trade shocks (see table 2.3). The econometric methodology and description of the instrument sets are summarized in box 2.3.

The synthetic measure of infrastructure quantity, IK_1, is the first principal component of three variables: (fixed and mobile) phone lines per 1,000 people (Z_1/L), electric power–generating capacity expressed in MW per 1,000 people (Z_2/L), and the length of the road network in km per square km of arable land (Z_3/A). Each of these variables is expressed in logs and standardized by subtracting its mean and dividing by its standard deviation. The three infrastructure stocks enter the first principal component with roughly similar weights:

$$IK_1 = 0.6036\ ln\left(\frac{Z_1}{L}\right) + 0.6105\ ln\left(\frac{Z_2}{L}\right) + 0.5096\ ln\left(\frac{Z_3}{A}\right)$$

We compute a synthetic index of infrastructure quality by computing the first principal component of the (arithmetic inverse of) electric power transmission and distribution losses as a percentage of output (Q_2), and the share of paved roads in the total road network (Q_3). The first principal component is defined as: $IQ_1 = 0.7071\ ln\ (Q_2) + 0.7071\ ln\ (Q_3)$.

Table 2.3 yields a positive and significant coefficient estimate for the infrastructure quantity index that is robust to the various sets of instruments used. Hence, expanding infrastructure quantity contributes positively to long-term growth—although the coefficient estimate is smaller when using external instruments than when using internal ones (columns [3] and [1], respectively). Furthermore, infrastructure quality also contributes positively to long-term growth. In this case, the coefficient estimate is larger when using external instruments than otherwise.

TABLE 2.3: Infrastructure and Economic Growth

Dependent variable: Growth in GDP per capita (annual average, percent), sample: 97 countries, 1960–2005 (non-overlapping 5-year period observations), GMM-IV system estimation

Variable	[1]	[2]	[3]	[4]
Infrastructure development (synthetic indexes)				
Infrastructure quantity (IK1)[a]	2.6641 **	2.1927 **	2.0260 *	1.0609
	(1.105)	(0.981)	(1.328)	(1.403)
IK1 squared	..	..	-0.0403	..
			(0.247)	
IK1 * Sub-Saharan Africa	..	..	..	0.2897
				(1.450)
Quality of infrastructure services (IQ1)[b]	..	1.9581 **	1.9373 **	1.5233 *
		(0.549)	(0.598)	(0.800)
IQ1 squared	..	..	-0.0265	..
			(0.298)	
IQ1 * Sub-Saharan Africa	..	..	..	1.3582
				(1.281)
Control variables				
Initial output per capita / per worker	-4.3056 **	-6.2404 **	-5.9773 **	-5.2489 **
(logs)	(1.099)	(1.285)	(1.815)	(1.635)
Education	1.9914 *	2.7857 **	2.8253 **	2.9420 **
(secondary enrollment, logs)	(1.095)	(1.160)	(1.175)	(1.376)
Financial development	0.4856	-0.0147	-0.0231	-0.0489
(private domestic credit as % of GDP, logs)	(0.605)	(0.492)	(0.508)	(0.640)
Trade openness	1.2705	1.0965	1.1278	0.9347
(trade volume as % of GDP, logs)	(1.053)	(1.410)	(1.380)	(1.363)
Lack of price stability	-0.0990 **	-0.0510 *	-0.0511 *	-0.0618 **
(inflation rate)	(0.036)	(0.033)	(0.033)	(0.031)
Government burden	-1.3229	-1.9217 *	-2.0330 *	-1.2706
(government consumption as % GDP, logs)	(1.274)	(1.281)	(1.297)	(1.363)
Institutional quality	0.4748	-0.3029	-0.2769	0.2056
(ICRG Political Risk Index, logs)	(2.418)	(1.735)	(1.632)	(2.408)
Terms-of-trade shocks	0.0197	0.0944 *	0.0991 *	0.0768
(first differences of log terms of trade)	(0.066)	(0.051)	(0.053)	(0.055)
Observations	**582**	**582**	**582**	**582**
Specification tests (p-values)				
(a) A-B test for 2nd-order serial correlation	(0.360)	(0.482)	(0.484)	(0.481)
(b) Hansen test of overidentifying restrictions	(0.241)	(0.275)	(0.211)	(0.190)
(c) Difference-Sargan tests				
All instruments for levels equation	(0.166)	(0.340)	(0.290)	(0.197)

Note: Numbers in parentheses are robust standard errors. The regression analysis includes an intercept and period-specific dummy variables. * (**) denotes statistical significance at the 10 (5) percent level. Standard errors are computed using the small-sample correction by Windmeijer (2005).

a. *See Calderon and Serven (2010) for a definition of the synthetic indexes of infrastructure quantity and quality.*

BOX 2.3: Measuring the Impact of Infrastructure on Growth

The econometric technique used to estimate the impact of infrastructure on long-term growth is the system generalized method of moments (GMM) estimator (Arellano and Bover 1995; Blundell and Bond 1998), which combines the growth equation expressed in first differences—using lagged levels of the regressors as internal instruments—and in levels—using lagged differences of the regressors as instruments. In addition to internal instruments (lagged levels and differences of the regressors), the analysis also uses demographic and geographic variables as external instruments.

The consistency of the system GMM estimator depends on the validity of the internal and external instruments. In turn, this is examined through two specification tests: first, the test of over-identifying restrictions (Hansen and Difference-Sargan tests), which tests the null hypothesis that instruments are uncorrelated with the estimated residuals. Failure to reject the null hypothesis gives support to the model. Second, the analysis uses tests of serial correlation of the residual, where the null hypothesis is that the estimated residuals of the regressions in differences do not exhibit second-order serial correlation. Again, failure to reject the null hypothesis gives support to the model.

The standard errors of the efficient two-step system GMM estimator are significantly downward biased in small samples. The bias arises from the fact that the approximation to the asymptotic standard errors does not account for the extra small-sample variation due to the use of estimated parameters in constructing the efficient weighting matrix. Windmeijer (2005) proposes a correction that accounts for this fact. The correction term vanishes with increasing sample size and provides a better approximation in finite samples when all moment conditions are linear.

Table 2.3 reports the GMM estimates of the parameters of the growth regression augmented by the synthetic indexes of infrastructure performance (quantity IK1 and quality IQ1, respectively). Columns [1] to [3] in the table report the coefficient estimates of the baseline growth regression equation including the synthetic quantity and quality indicators in the regression. This baseline specification is estimated using three sets of instruments for infrastructure: (a) lagged synthetic IK1 and IQ1 indicators (column [1]), (b) lagged values of the individual components of the synthetic indicators (quantity and quality of telecommunications, power, and transport) (column [2]), and (c) lagged values of external instruments, namely, urban population, labor force, and population density (column [3]).

Source: Calderón and Servén (2010).

Using the regression estimates in column [2] in Table 2.3, the growth effects of narrowing the infrastructure gap of Sub-Saharan African countries is computed. Two scenarios are presented: first, closing the gap of the region as well as selected groups within the region relative to the world median (excluding Sub-Saharan Africa) of the infrastructure distribution. The second scenario involves closing the infrastructure gap relative to the world's top decile of the infrastructure distribution. Table 2.3 depicts the region's gap for the second scenario.

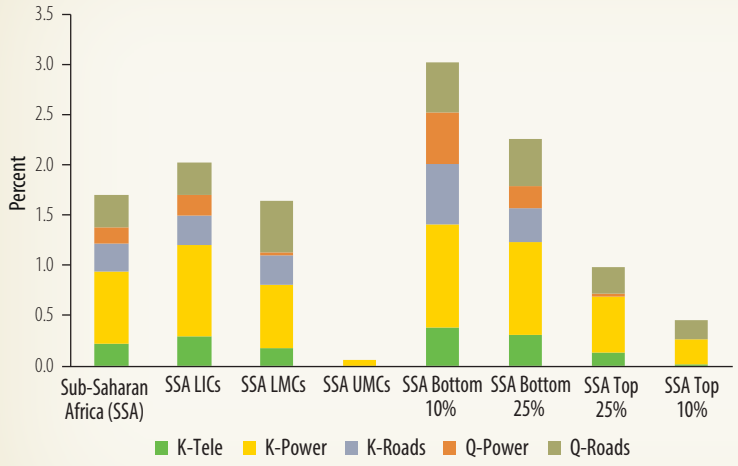
Closing the Infrastructure Quantity and Quality Gap Relative to the World Median (Excluding Sub-Saharan Africa)

Figure 2.26 depicts the growth benefits of closing the gap in terms of quantity and quality of infrastructure relative to the median of the world (excluding Sub-Saharan Africa) for each infrastructure sector.[9] For instance, growth in GDP per capita for the region would increase by 1.7 percentage points per year if it were to close the gap with the regional median of each infrastructure indicator.

9 If the contribution is zero, there is no gap between the region (and/or subregion in Sub-Saharan Africa) and the benchmark.

Narrowing the quantity gap would deliver growth per capita that is 1.2 percentage points higher per year, while catching up in quality brings about growth that is 0.5 percentage point higher per year. For the quantity of infrastructure, the largest growth benefits are obtained by narrowing the gap in electric power (0.7 percentage point higher per year). For quality, improving road quality provides the largest benefits.

FIGURE 2.26: Growth Benefits of Narrowing the Gap vis-à-vis the World Median in Infrastructure (% points per year)



Sources: World Bank staff.

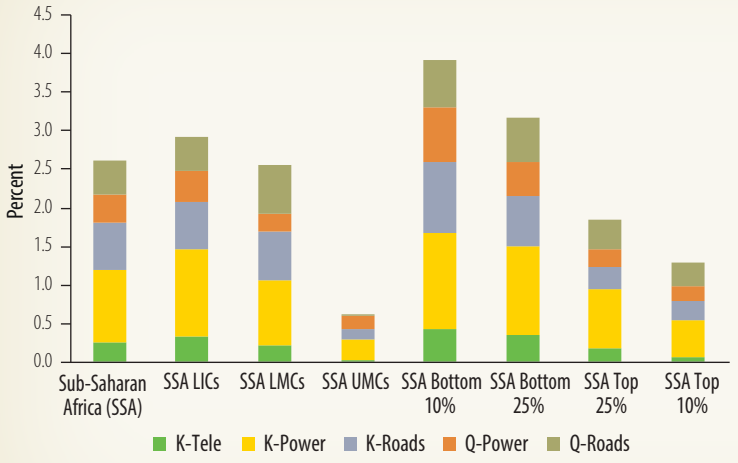
Note: The coefficient estimates are taken from column [3] in Table 2.3 (Calderon and Serven 2010). K = Quantity; LICs = low-income countries; LMCs = lower-middle-income countries; Q = Quality; SSA = Sub-Saharan Africa; UMCs = upper-middle-income countries.

Growth per capita for the region would increase by 1.7% per year by closing the infrastructure gap.

The results for the region reflect the infrastructure gaps observed in LICs and LMCs. The distance to the benchmark (and, hence, the growth effect) is greater for LICs in electric power installed capacity; it is greater for quality of roads among LMCs. UMCs in the region only trail the world median in electric power installed capacity. The gap is narrow and so are the growth benefits (about 0.05 percentage point per year). Narrowing the infrastructure gap among the worst performers in the region (the bottom 10 percent) improves growth per capita by 3 percentage points per year (2 percentage points attributed to closing quantity gaps), while it is only about 0.5 percentage point per year (0.2 percentage point attributed to closing quality gaps) for the best performers (the top 10 percent).

Figure 2.27 depicts the second scenario of countries in the region closing the infrastructure gap relative to the best performers in the world—the latter being proxied by the top decile of the distribution of infrastructure stocks and quality. For the region, closing the quantity and quality of the infrastructure gap renders higher growth rates per capita of about 1.8 and 0.8 percentage points per year, respectively. This amounts to greater growth per capita of 2.6 percentage points per year. The largest growth

FIGURE 2.27: Growth Benefits of Narrowing the Gap vis-à-vis the World's Top Decile in Infrastructure (% points per year)



Sources: World Bank staff.

Note: K = Quantity; LICs = low-income countries; LMCs = lower-middle-income countries; Q = Quality; SSA = Sub-Saharan Africa; UMCs = upper-middle-income countries.

Closing the infrastructure gap with the best performers in the world would translate into an increase of 2.6% in the region's per capita growth.

potential benefits come from closing the gap in electric power–generating capacity and the length of the road network.

The growth benefits for the region are directly related to the potential gains of narrowing the gap for LICs and LMCs in the region. Energy appears to be a more binding constraint among LICs, whereas roads are the most binding constraint among LMCs—in quantity and quality. The growth rate of the worst performer in the region (bottom 10 percent) would be 3.9 percentage points higher per year, if it were to close its infrastructure gap with the top decile of the world distribution. About two-thirds of these potential growth gains are attributed to closing the gap in quantity. For the best performers in the region, growth per capita might increase by 1.3 percentage points per year in this scenario (with 0.8 percentage point attributed to closing the quantity gap). Even for the top performers, the sectors with the greatest potential contributions to growth are electric power and roads.

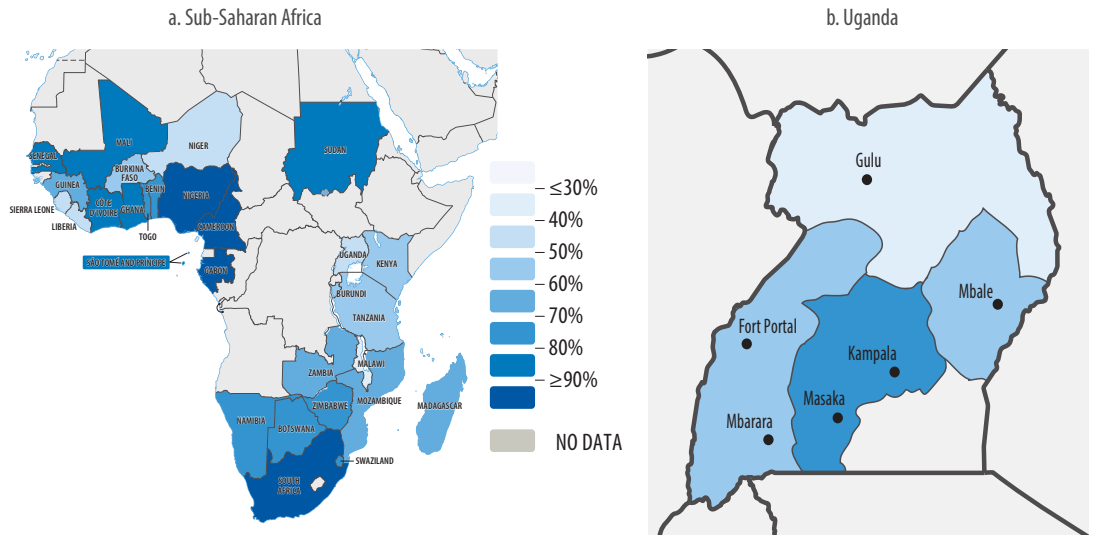
Although the focus is on supply-side issues for infrastructure, the demand side also requires consideration. This is especially the case for electricity. Box 2.4 shows that, in the case of electricity, there are important drivers of lower demand (lower uptake) among countries in Sub-Saharan Africa.

BOX 2.4: To Achieve Universal Access to Electricity, More Needs to Be Understood on the Demand Side

Access to Electricity

About one-third of the population in Sub-Saharan Africa has access to electricity, although various estimates indicate that a larger share of the population lives under the grid—ranging from 61 percent (Demographic and Health Surveys data) to 78 percent (Afrobarometer). Take-up rates are high in a few countries (South Africa, Nigeria, Gabon, and Cameroon), and they are very low and often below 50 percent in other countries (Malawi, Liberia, Uganda, Niger, and Sierra Leone) (map B2.4.1). There is also within-country variation in take-up rates, with a high concentration around big cities and urban centers. For instance, only the central region of Uganda, which includes the capital, Kampala, has a take-up rate that exceeds 50 percent.

MAP B2.4.1: Access Rate for Only the Households under the Grid



Note: Panel a shows take-up rates of electricity in 31 countries in Sub-Saharan Africa. The take-up rate is the share of households connected to the grid to households living under the grid. Panel b shows the take-up rate across regions in Uganda, which has a national access rate of 24 percent and take-up rate of only 45 percent.

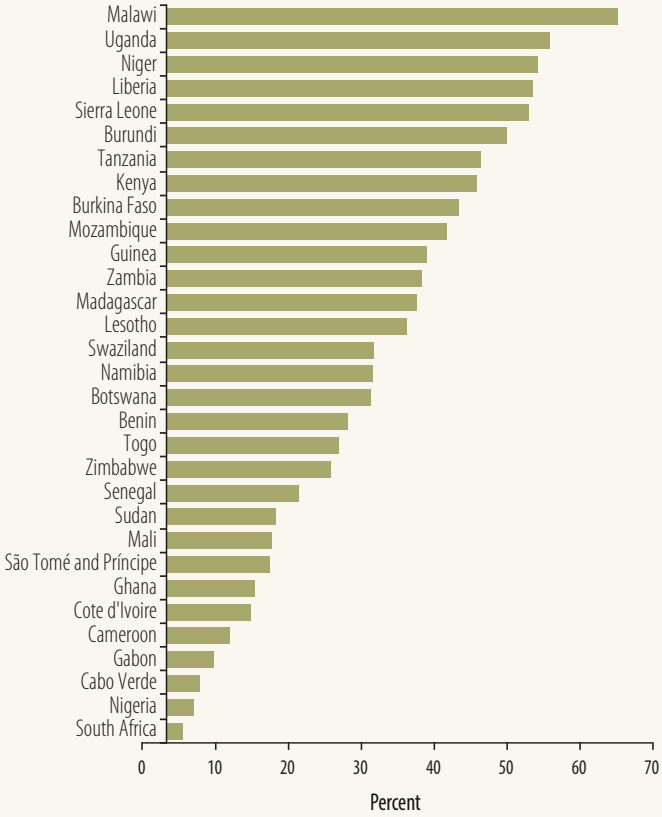
BOX 2.4
Continued

Low take-up is an important issue for understanding the demand side of electricity, especially given that most off-grid communities are rural and poorer—hence, ceteris paribus, take-up rates would be even lower in such areas if they were covered. This situation underscores the need for a deeper understanding of the constraints on the demand side and the incentives for take-up. To make electricity expansion financially viable and incentivize private sector participation in the sector, take-up rates need to be higher.

Some Findings on the Drivers of Take-Up across and within Countries

Low income levels in the region—especially in rural areas—hinder the capacity of households to afford a meaningful level of electricity consumption (Masami and Trimble 2016). Initial connection costs are excessively high relative to household income. Using granular data from western Kenya, Lee, Miguel, and Wolfram (2016) show that take-up rates are low and driven by expensive upfront connection charges. The authors also find that take-up increased significantly when connection charges were cut by more than half, albeit remaining relatively low.

FIGURE B2.4.1: Living Under the Grid but Not Taking Up



Some preliminary findings emerge from an ongoing study at the world Bank:[a]

(1) Macro drivers. Cross-country variation in take-up rates is tightly linked to economic growth, urbanization, and governance.

(2) Agriculture. A greater share of agriculture in gross domestic product is negatively associated with rates of electrification take-up. However, the modernization of agriculture (energy use for mills and irrigation) may foster some electricity expansion, which otherwise will not be financially viable due to insufficient demand (Banerjee and Malik 2016).

(3) Household evidence. Not only the level of income, but also its flow and predictability have an impact on the ability of households to connect to electricity services. Hence, the creation and enhancement of income-generating activities would raise take-up and enable households (businesses), the government (through taxes), and the utilities (revenues) to overcome financial constraints. Improvement in this area implies providing credit facilities to bundle access to electricity with access to certain appliances, to foster economic activity.

(4) High tariffs, high connection charges, and low household access are symptoms of underlying structural issues in the electricity market. The report will examine these issues by interacting the decision-making process of households, regulators, and utility companies.

a. The study on energy access in Sub-Saharan Africa is forthcoming in late 2017. For more information, please contact: Moussa P.Blimpo and Malcolm Cosgrove-Davies.

Infrastructure Gap, Financing Gap

The evidence shows that there are severe infrastructure bottlenecks to be addressed in Sub-Saharan Africa, and the potential growth benefits of addressing these bottlenecks are large.

However, fast-paced infrastructure catch-up requires the mobilization of resources for financing. The private sector has fairly limited involvement in the various infrastructure sectors across the region, except in South Africa. If the additional spending that is needed to close the infrastructure gap falls on the public sector, it imposes a heavy burden. First, the countries have limited domestic resource mobilization. Total government revenues fall short of 20 percent of GDP in many countries in Sub-Saharan Africa. Second, in the presence of scarce resources, governments must compare the benefits of investment in infrastructure relative to those of other pressing demands (such as education and health, among others).

Narrowing the infrastructure gap requires financing. It has been estimated that the infrastructure needs of the region exceed US$93 billion per year over the next decade. That amount is about 15 percent of the region's GDP (Foster and Briceño-Garmendia 2010). To date, less than half that amount is being provided: actual investments in infrastructure amount to US$45 billion annually—with more than half being funded by the public sector. This leaves a financing gap of US$48 billion per year. Estimates show that about one-third of the infrastructure gap can be met through operational optimization, thus narrowing the gap to US$31 billion (5 percent of the region's GDP). Public-private partnerships could potentially represent 40 percent of this optimized gap, with an amount of US$12 billion annually, or about 2 percent of GDP (figure 2.28).[10]

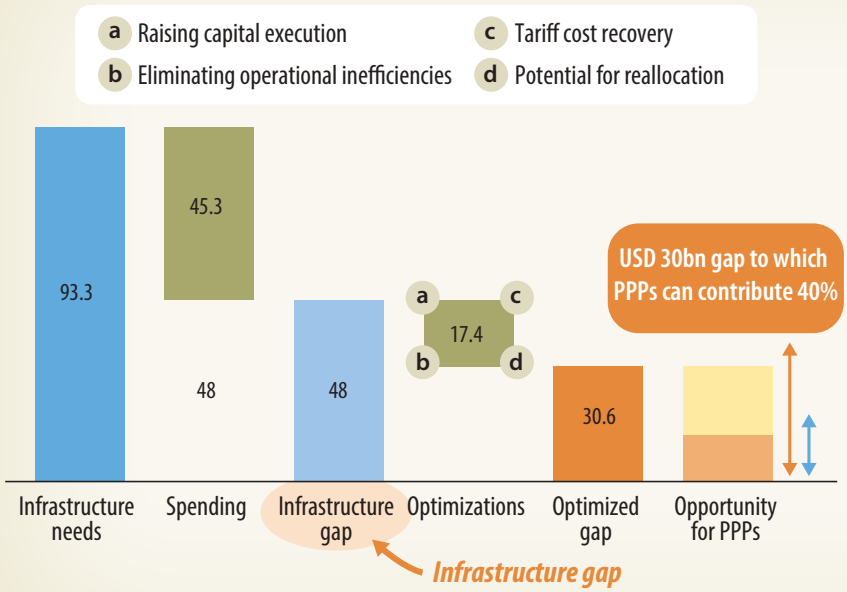
When the government drastically reduces growth-promoting spending (for example, in infrastructure, education, and health care), the present value of future government revenues falls by more than the immediate improvement in the cash deficit (Easterly, Irwin, and Serven 2008). Targeting short-term government cash flows introduces an anti-investment bias into fiscal discipline, which can turn into lower future growth and, hence, adverse consequences for the sustainability of public finances (Serven 2007).

Financing public infrastructure investment will indeed depend on a country's fiscal position. The real effects, more generally, would depend on how public investment is financed and the existing levels of debt and various taxes. Christie and Rioja (2012) developed a two-sector endogenous growth model to examine the impact on long-term growth of the composition and financing of infrastructure spending. The authors find that: (a) raising taxes to fund public investment may promote long-run growth in an environment where tax rates are not high; (b) public investment promotes growth if the investment is funded by restructuring the composition of total public spending, if tax rates are high; and (c) debt-financed public spending can have adverse effects on long-run growth if the spending results in rising interest rates and debt-servicing costs.

10 Recently, the African Development Bank launched an initiative, called Program for Infrastructure Development in Africa, to increase infrastructure provision. The main objective of the program is to build a strategic network for the development of regional and continental economic infrastructure over 2012–40.

Finally, efforts toward fiscal discipline have often been related to persistent declines in infrastructure investment. Reduced public investment is not a cause of concern, as long as it reflects improved efficiency of spending, improved public procurement, and reduced red tape and corruption, among others. If private and public investment are close substitutes, retrenchment of the public sector may have to be fully offset by private sector entry without adverse effects on service delivery. However, this has not been the case in many infrastructure sectors in developing countries. With reduced budgets, the government may try to crowd in private investment. When combined with better commitment to regulation, rising private investment in infrastructure will improve access, affordability, and the quality of infrastructure, and enhance public savings (Estache 2005). Box 2.5 presents the World Bank Group's "cascade" approach to deploying resources based on a hierarchy of financing conditions.

FIGURE 2.28: Infrastructure Financing Needs in Africa (US$ billions)



Source: Foster and Briceño-Garmendia 2010.

Estimates show that about one-third of the infrastructure gap in the region can be closed with operational optimization.

BOX 2.5: The Cascade Approach to Finance Infrastructure

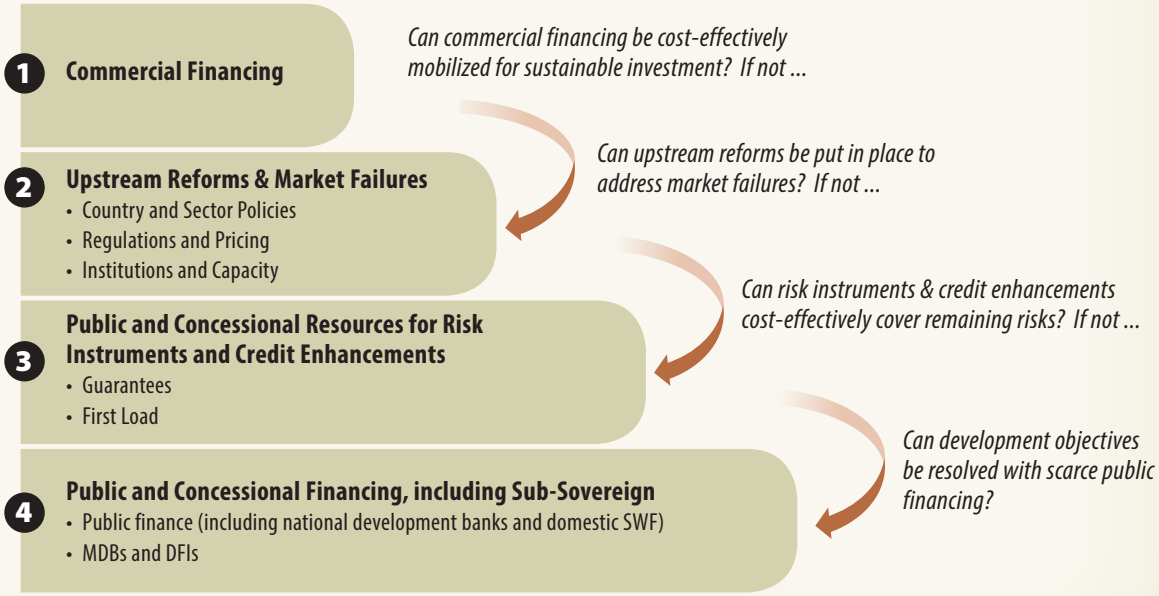
The World Bank Group estimates that about 50 percent of infrastructure needs in developing countries can be financed on a commercial basis. To maximize private investment in infrastructure, the World Bank Group has formulated a strategy called a "cascade" approach. This approach deploys resources based on a hierarchy of financing considerations. It examines a set of questions at each level of investment decision to promote the efficient use of public and concessional resources, crowd in commercial capital, and minimize public debt burden.

The cascade approach has four levels of diagnosis (figure B2.5.1). The starting point is to identify whether a development program can be financed on commercial terms. When diagnosed as commercially viable and cost effective without government guarantees, then the investment is not a priority for concessional or public financing. When commercial financing is not viable, due to perceived risks or market failures, upstream reforms to strengthen policies, regulations, and institutions and capacity are needed. If risk and cost remain high, governments need to explore the possibility for lowering financing costs by deploying concessional and public resources in risk-sharing instruments, such as guarantees. Finally, where commercial financing is not cost-effective or viable, despite sector reform and risk mitigation, governments need to mobilize public and concessional resources.

BOX 2.5
Continued

Countries determine whether and how to follow such an approach. The role of the World Bank Group is to assist governments to assess options systematically based on the approach. The cascade approach will allow a more systematic emphasis on upstream reforms at the national and sector levels, and maximize the development impact of concessional and public resources.

FIGURE B2.5.1: The Cascade Approach to Infrastructure



Source: World Bank, "A Cascade Decision-Making Approach Infrastructure Finance: Guiding Principles for the World Bank Group."
Note: DFIs = development finance institutions; MDBs = multilateral development banks; SWF = sovereign wealth fund.

2.3 PUBLIC INVESTMENT IN SUB-SAHARAN AFRICA

Introduction

Sub-Saharan Africa's two decades of unprecedented economic performance beginning in mid-1990, coined as Africa Rising, was characterized by many countries in the region growing at a rate that exceeded 5 percent per year. *Africa Rising's* earlier narrative attributes the region's rapid growth to external tailwinds, progress in macroeconomic management, and robust public investment. As economies in the region decelerated in the post-crisis period, there was a significant countercyclical effort to support aggregate demand among countries in the region, which was partly reflected in a large increase in public investment. For instance, the cumulative increase in public investment exceeded 5 percentage points of GDP in Togo, Guinea, and Ethiopia during 2008–15.

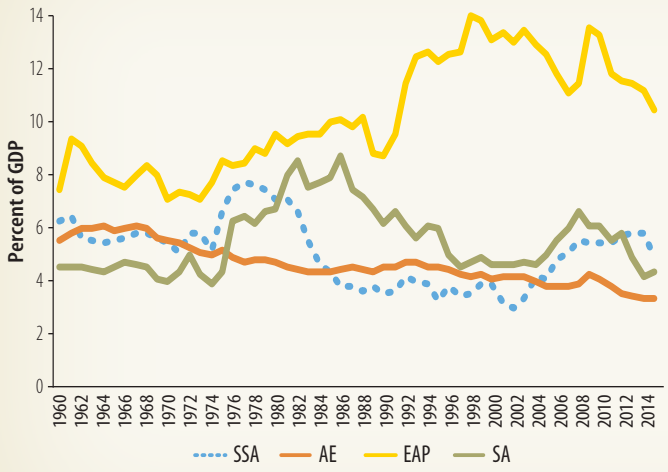
This section first documents stylized facts on public investment in Sub-Saharan Africa: (a) trends in public investment compared with other regions and across subregions in Sub-Saharan Africa, (b) the interplay between public and private investment (whether public investment crowds in or crowds out private investment), and (c) the behavior of public investment along the business cycle (whether public investment has been pro- or counter-cyclical). Next, the section takes a preliminary look at capital spending on infrastructure across 24 countries in Sub-Saharan Africa, using the BOOST program. This initiative takes a granular approach to government accounts and uncovers information on capital spending as well as capital allocations—which enables us to distinguish actual expenditure and the extent of under-execution of investment programs. Finally, the section takes stock of PPPs in infrastructure in the region, focusing not only on the uptake of this mode of financing, but also the country and sectoral breakdowns, project types, structure of financing, type of support from the government or multilateral development banks, and revenue sources, among others.

Public Investment across Sub-Saharan Africa: Trends, Complementarities, and Cyclicality

Public investment as a percentage of GDP in the region shows three marked periods: (a) a rising trend in the 1970s that reached a peak of about 7.8 percent in 1977–78, (b) a steady decline throughout the 1980s and stagnation in the 1990s that reached a trough of 3 percent of GDP in 2002, and (c) an increase in public investment that reached a peak of 5.8 percent of GDP in 2014. When comparing public investment across regions, East Asia and the Pacific outperforms all other regions, with levels of public capital spending that exceed 10 percent of GDP (figure 2.29)

Focusing on averages for Sub-Saharan Africa masks the heterogeneity across country groups. Disaggregating the data by countries' resource abundance shows different trends and phases in public investment across country groups (figure 2.30). On average, in oil-rich countries, public investment has followed a rising path since the early 1990s. After reaching a peak of about 6.9 percent of GDP in 2006-08, public investment among oil-rich countries declined sharply, to 3.1 percent of GDP in 2015, partly due to lower commodity-based public revenues. For non-oil-resource-rich countries and non-resource countries, public investment has experienced a steady increase since 2006 (with a cumulative gain up to 2015 of about 2.8 and 2.9 percentage points of GDP, respectively).

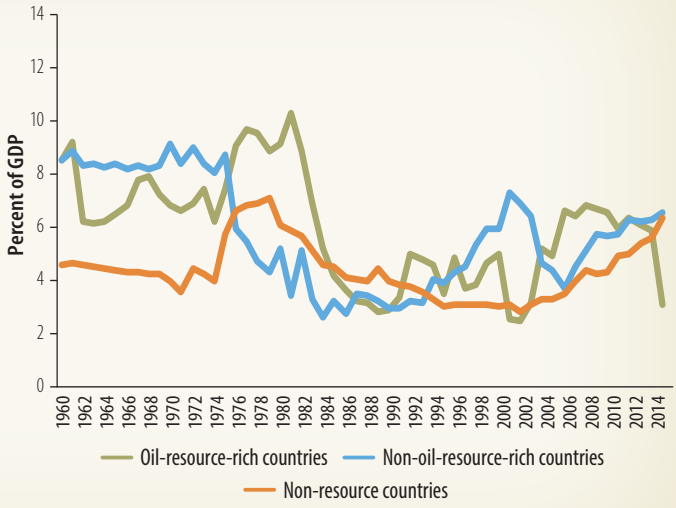
FIGURE 2.29: Public Investment, by Region 1960–2015 (% GDP)



Source: World Development Indicators, World Bank.

Note: AE = advanced economies; EAP = East Asia and the Pacific; GDP = gross domestic product; SA = South Asia; SSA = Sub-Saharan Africa.

FIGURE 2.30: Public Investment in Sub-Saharan Africa, by Group, 1960–2015 (% GDP)

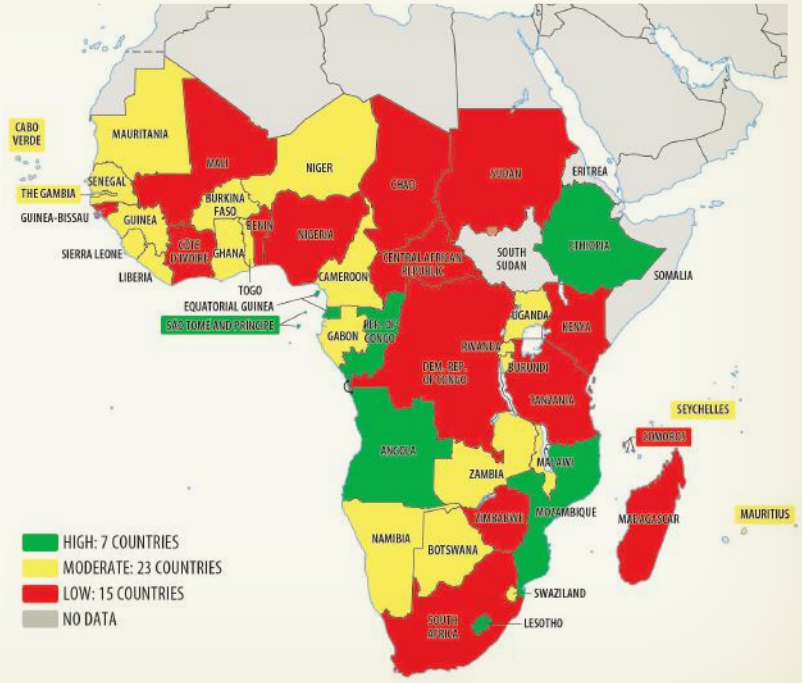


Source: IMF Investment and Capital Stock Database.

Map 2.1 depicts the cross-country heterogeneity in the distribution of public investment (as a percentage of GDP) in the Sub-Saharan Africa region. The figure classifies countries by their investment-output ratios as low (less than 5 percent of GDP), medium (between 5 and 10 percent of GDP), and high (more than 10 percent of GDP).[11] Seven of 45 countries in the region have low investment, 23 have medium investment, and 15 have high investment. Low-investment countries in the region have an average public investment of 3.1 percent of GDP; medium-investment countries have an average of 6.8 percent; and high-investment countries have an average of 18.2 percent. The medium public investment group has the highest average private investment rate, at 15.1 percent of GDP, followed by the high and low public investment groups (12.4 and 10 percent, respectively).

Low-investment countries in the region have an average public investment of 3.1% of GDP.

MAP 2.1: Public Investment across Countries in Sub-Saharan Africa (% GDP, average, 2011–15)



Source: IMF Investment and Capital Stock database.

11 The thresholds of 5 and 10 percent of GDP are similar to the bottom and top terciles of the distribution of investment-output ratios in the world for 2011–15.

Public Investment: Crowding-In or Crowding-Out Private Investment

The interaction between public and private investment remains a subject of controversy. Do public and private investment have different growth effects? If they both matter for growth, what are the possible links between them? If public investment crowds in, say, the participation of (domestic and/or foreign) private investors in transportation or energy projects, the relevant policy question becomes how to maximize the complementarities and prioritize public investment in sectors with high productivity and/or large positive spillover effects (for example, infrastructure). By contrast, if private investment is crowded out by public investment, the relevant policy question is what can be done to reduce this crowding-out effect, so that countries can reap more benefits from higher public investment (Cavallo and Daude 2011).

Figure 2.31 depicts the correlation between public and private investment ratios for 45 countries in the region over 1970–2015. The correlation ranges from -0.59 (Equatorial Guinea) to 0.85 (Chad), and the regional median (average) public-private investment correlation is 0.11 (0.08). Two findings emerge from this figure: first, 19 of 45 countries display a negative correlation between public and private investment, and the median correlation for these 19 countries is -0.275. Second, there is a positive association between private and public investment for 26 of 45 countries, and their median correlation is 0.282. In other words, the evidence suggests that public and private investment are substitutes in 19 countries, and complements in 26 countries. Although central measures of correlation do not appear to be large, there are countries where either the degree of substitutability is important (say, Equatorial Guinea, Zambia, South Africa, and Senegal) or the extent of complementarity (say, Botswana, Zimbabwe, Rwanda, and Chad).

FIGURE 2.31: Public and Private Investment: Complements or Substitutes?

In Sub-Saharan Africa, public and private investment are substitutes in 19 countries, and complements in 26 countries.

Source: IMF Investment and Capital Stock Database.
Note: The figure depicts the correlation between the private and public investment ratios to GDP during 1970–2015. These two ratios are expressed in first differences.

To reduce the crowding-out effect of public investment on private investment or to foster crowding-in effects, there is the need to formulate policies that elevate the marginal product of capital or alleviate financial constraints (Aschauer 1989; Cavallo and Daude 2011). In this context, policies to foster institutional quality and/or enhance access to international credit markets will help to reduce the substitutability or increase the complementarity between private and public investment. The correlates of the degree of substitutability/complementarity between public and private investment and measures of institutional quality, financial openness, and financial development are examined.

Cavallo and Daude (2011) estimate the private investment equation for 116 countries for 1980 to 2006, using dynamic panel data techniques that address issues of unobserved components and reverse causality. On average, they find a negative effect of public investment on private investment in developing countries: a 1 percentage point increase in public investment (as a percentage of GDP) reduces private investment by 0.22 percentage points. This finding suggests that the crowding-out effects of public investment through weak public institutions or borrowing constraints tend to outweigh the crowding-in effects from the rising marginal product of private capital.[12] Raising the efficiency of public investment and improving the ability to crowd in private investment should be at the top of the policy agenda. In this context, efforts to improve institutions (at the country and project levels) and implement policies to alleviate borrowing constraints (say, creating fiscal space and fostering financial openness) are necessary.

Table 2.4 presents a simple analysis of the correlates of the interaction between private and public investment for three samples: developing countries, developing countries excluding Sub-Saharan Africa, and countries in Sub-Saharan Africa.[13] Some preliminary findings emerge from the table: (a) political stability and government effectiveness have a positive (although not statistically significant) association with the interaction between private and public investment among developing countries (excluding Sub-Saharan Africa); (b) developing domestic financial markets may help boost the effectiveness of public investment to crowd in private investment; (c) an analogous result to (b) is observed when foreign capital flows into developing countries (as captured by a widened current account deficit); and (d) the correlates are weak when the regression analysis is restricted to countries in Sub-Saharan Africa. In sum, alleviating borrowing constraints—through deepening local financial markets or fostering financial openness—is associated with rising complementarities between public and private investment.

12 The empirical findings of Cavallo and Daude (2011) are consistent with those of Blejer and Khan (1984) and Everhart and Sumlinski (2001). The latter two papers use a smaller sample of countries and earlier sample periods.

13 This regression analysis captures associations at the cross-sectional level rather than causality. The analysis is not as exhaustive as the one presented in Cavallo and Daude (2011).

TABLE 2.4: Correlates of Public-Private Investment Interactions
Dependent variable: Correlation between public and private investment, 1970–2015

	Political Stability			Government Effectiveness			Control of Corruption		
	Developing countries [1]	Dev. Countries excl. SSA [2]	SSA countries [3]	Developing countries [4]	Dev. Countries excl. SSA [5]	SSA countries [6]	Developing countries [7]	Dev. Countries excl. SSA [8]	SSA countries [9]
Governance	-0.0094	0.0513	-0.1017	-0.0155	0.0079	-0.1218	-0.0230	-0.0067	-0.1036
(level)	(0.037)	(0.045)	(0.063)	(0.037)	(0.045)	(0.078)	(0.037)	(0.043)	(0.073)
Current account	-0.0114**	-0.0132**	-0.0092	-0.0113**	-0.0129**	-0.0062	-0.0112**	-0.0127**	-0.0070
(% GDP)	(0.004)	(0.004)	(0.008)	(0.004)	(0.004)	(0.009)	(0.004)	(0.004)	(0.009)
Financial development	0.0704**	0.0796*	0.0560	0.0694*	0.0776*	0.0204	0.0698**	0.0771*	0.0356
(% GDP, logs)	(0.035)	(0.046)	(0.059)	(0.036)	(0.046)	(0.067)	(0.035)	(0.046)	(0.061)
Observations	127	85	42	127	85	42	127	85	42
R-squared	0.073	0.111	0.099	0.073	0.098	0.0681	0.075	0.098	0.0561

Note: * (**) denotes significance at the 10 (5) percent level. The correlation is computed after expressing both variables in first differences.

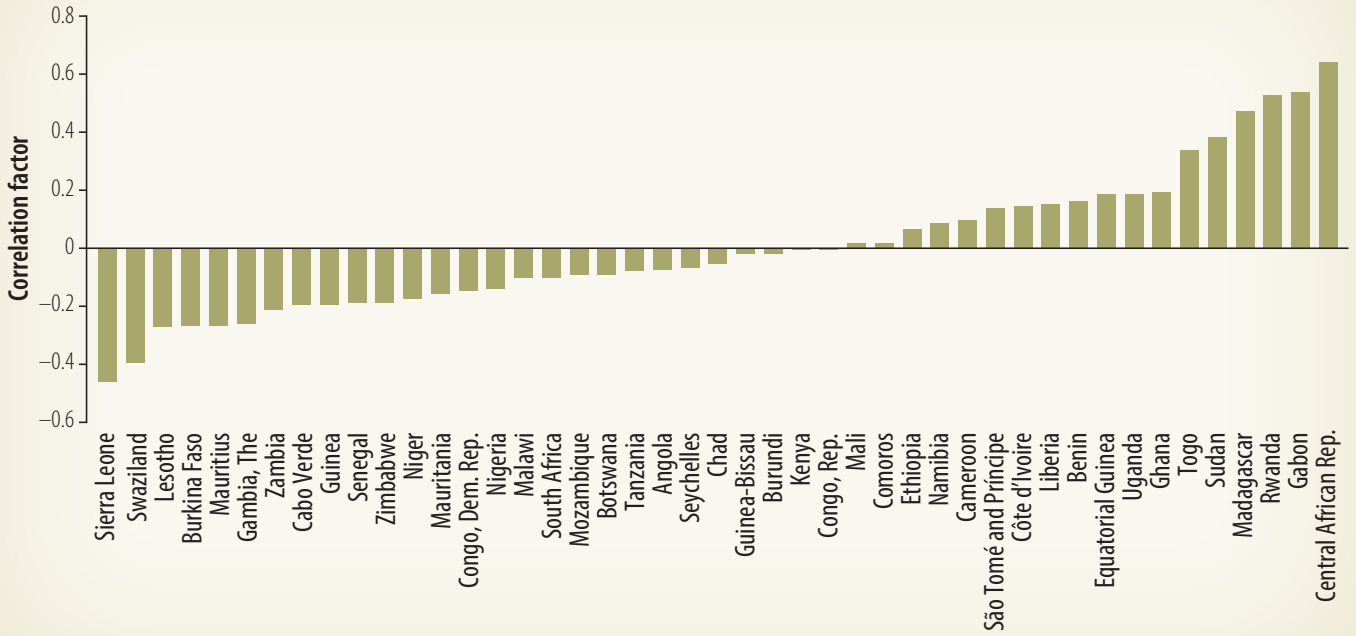
Public Investment along the Business Cycle in Sub-Saharan Africa

Fiscal policy in developing countries tends to be procyclical. Governments typically cut taxes and increase spending during booms, and retrench outlays—especially capital expenditure—and implement tax hikes during busts (Kaminsky, Reinhart, and Végh 2004). In the literature, this destabilizing policy behavior has been attributed to the limited access to (external) funding for policy actions or political economy distortions.

Historically, fiscal policy has behaved pro-cyclically among countries in Sub-Saharan Africa (Thornton 2008; Lledó, Yackovlev, and Gadenne 2011). The degree of procyclicality has been not only greater than that of other developing countries, but also higher in the 1980s and 1990s (Lledó, Yackovlev, and Gadenne 2011). Greater foreign aid inflows and fiscal space have played an important role in reducing the degree of fiscal policy pro-cyclicality among countries in the region.

Figure 2.32 depicts the correlation between the cyclical components of the ratio of public investment to GDP and the level of output across 45 countries in Sub-Saharan Africa for 1970–2015: 26 of the 45 countries exhibit a negative correlation between public investment and the level of economic activity, while 19 countries show a positive association. For those countries with a countercyclical relationship between public investment and the level of economic activity, the median correlation is about -0.12 (South Africa). The countries with the largest negative correlation (exceeding -0.25) are The Gambia, Mauritius, Burkina Faso, Lesotho, Swaziland, and Sierra Leone. The median correlation for the countries with a procyclical relationship between public investment and the level of economic activity is 0.14 (Côte d'Ivoire). The countries with the largest positive correlation (exceeding 0.35) are Sudan, Madagascar, Rwanda, Gabon, and the Central African Republic.

FIGURE 2.32: Cyclical Behavior of Public Investment across Sub-Saharan African Countries



Source: World Development Indicators, World Bank.

Table 2.5 looks at the correlates of the extent of cyclicality of public investment on the level of institutional quality, amount of external financing (as proxied by the current account balance as a percentage of GDP), and depth of local financial markets. The regression estimates show that:

(a) Public spending tends to be less procyclical or more countercyclical in countries with stronger institutions. It has been argued in the literature that public investment tends to be higher and more procyclical in countries with bad institutions. This reflects the enhanced rent-seeking incentives of governments in environments with insecure property rights (Keefer and Knack 2007; Alesina, Campante, and Tabellini 2008) and/or environments with common pool problems (Tornell and Lane 1999).[14]

(b) Public spending is more procyclical in countries with more inflows of foreign capital (that is, when the current account is in deficit). This finding is attributed to the fact that developing countries are unable to borrow in bad times—as these countries have procyclical access to global capital markets (Gavin and Perotti 1997; Catao and Sutton 2002).

In sum, stronger institutions supporting macroeconomic policies tend to be related to a lower extent of pro-cyclicality (and even counter-cyclicality) of capital spending. Access to global financial markets, by contrast, contributes to a larger degree of pro-cyclicality. These findings are consistent with those of Calderon and Nguyen (2016).

14 Analogously, public health and education spending has a positive and significant impact on child mortality and education failure rates only in countries with good governance (Rajkumar and Swaroop 2008).

TABLE 2.5: Cyclical Behavior of Public Investment

Dependent variable: Correlation of the cyclical components of public investment and real output, 1970–2015

Explantory variables	(1)	(2)	(3)
Governance	-0.0302***	-0.0229**	-0.0312**
(level)	(-0.00985)	(-0.00983)	(-0.0137)
Current account		-0.00722***	-0.00742***
(% GDP)		(-0.00242)	(-0.00243)
Financial development			0.0295
(% GDP, logs)			(-0.0415)
Constant	0.0379*	0.0155	-0.0854
	(-0.0205)	(-0.0234)	(-0.149)
Observations	169	166	166
R-squared	0.062	0.095	0.098

Note: * (**) [***] denotes significance at the 10 (5) [1] percent level.

Public Capital Spending in Infrastructure: BOOST Program Measures

Capital spending represents a major share of expenditures for national and subnational governments, and a critical instrument to lift people out of poverty by promoting economic growth and improving access to basic services. The recognition of the critical role that well-designed and efficiently implemented investments in infrastructure can play in addressing these access gaps and fostering potential GDP gains is well documented (for example, Calderón and Servén 2010; Bom and Ligthart 2008; Calderon, Moral Benito, and Serven 2015). The relevance of the role of such investments is also reflected in the Sustainable Development Goals and International Development Association (IDA) 18 frameworks, which place a much needed emphasis on the need to significantly scale up investments in infrastructure for the positive, cross-cutting spillover effects they can generate in promoting shared prosperity and poverty alleviation.

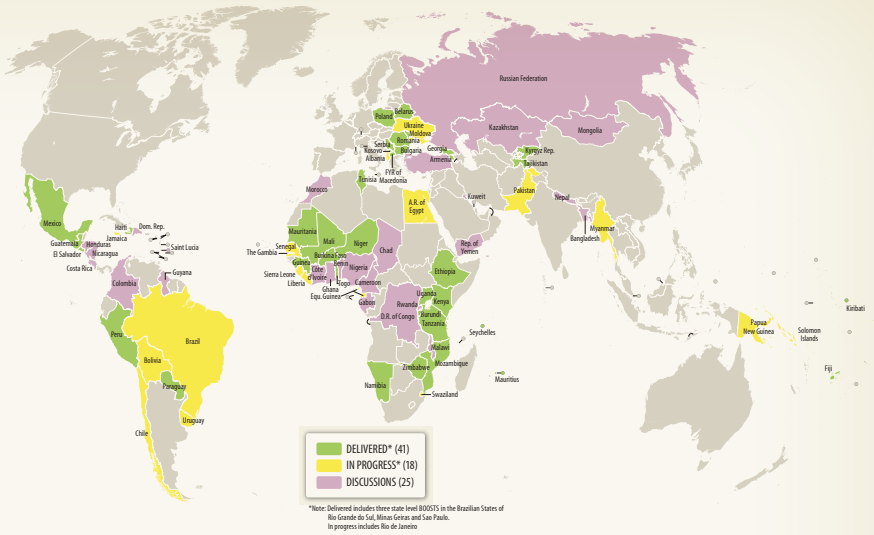
Despite the consensus on the relevance of investing in infrastructure as an accelerator for long-term growth and poverty alleviation, there still exists very little knowledge about how much is being spent, how well, and with what results. This lack of information is particularly compelling in Sub-Saharan Africa, where infrastructure needs are most acute and the overall quality of fiscal statistics is problematic. Without a strong empirical baseline of current public spending in infrastructure and a robust set of granular data and performance metrics, it is difficult to: (a) identify which geographic areas and sectors are being underserved, (b) assess whether policy stances are being translated into actions, and (c) isolate critical bottlenecks that are undermining efficiency in public investment management systems across the developing world.

Leveraging the wealth of micro fiscal data collected by the BOOST initiative (box 2.6), this subsection offers a baseline of public spending on infrastructure in Africa. Using an initial sample of 24 countries in Sub-Saharan Africa for 2009 to 2015, the subsection examines overall annual trends, execution rates,

funding sources, and levels of capital expenditure across infrastructure sectors, as well as the quality of their systems in producing high-quality data. Despite the preliminary nature of this work, and the need for further refinements in data quality and expansion to additional countries in the region, some important findings have already emerged. (See annex 2A on data challenges.)

BOX 2.6: About the BOOST Initiative

The BOOST[a] program is a World Bank collaborative effort that was launched in 2010 to provide quality access to budget data. The initiative strives to make well-classified and highly disaggregated budget data available for policy makers and practitioners in government, researchers, and civil society, and promote their effective use for improved budgetary decision making, analysis, transparency, and accountability. Since its launch, the program has centered its activities around three work streams: (a) supporting expenditure analysis, (b) advancing fiscal transparency and public dissemination of budget data, and (c) improving public financial management processes and systems.



Using the government's data from public expenditure accounts held in the governments' financial management information systems, and benefiting from a consistent methodology, the program transforms highly granular fiscal data into accessible and readily available formats to facilitate expenditure analysis. The program has designed and delivered more than 60 national and subnational BOOST data sets in standardized formats, whose contents are country specific. Each data set typically allows for approved, revised, and executed budgets to be cross-referenced across years with categories such as:

- Government levels (central or local)
- Administrative units (ministries, departments, agencies, schools, hospitals, and so forth)
- Subnational authorities (districts, municipalities, and other local government units)
- Economic classification categories (staff salaries, procurement of goods, and so forth)
- Sources of funding (budget funds, off-budget funds, external finance, and so forth)
- Budget programs (if the country uses a program-based budgeting system).

An expanding work stream of the BOOST program focuses on providing support for government efforts around fiscal transparency and citizen participation in the budget process. To this end, the program facilitated the dissemination of country BOOST data sets via (a) the World Bank's Open Budgets Portal, which has already witnessed the release of more than 40 million line items of expenditure data, and (b) development of country-owned web portals, such as in the cases of Burundi, Haiti, Paraguay, Togo, and Tunisia. The Open Budgets Portal is the largest repository of micro fiscal data in the world, offering invaluable resources for stakeholders involved in the systematic use of fiscal data in their countries or globally, as a catalyst to motivate other countries into action. The portal is accessible at www.worldbank.org/openbudgets.

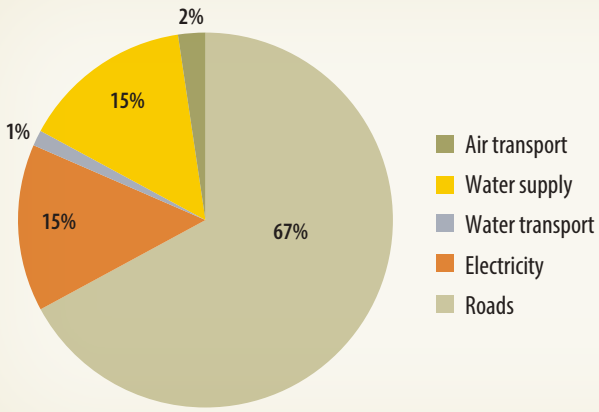
a BOOST is not an acronym. It is the name of a new data tool developed at the World Bank to help enhance public sector performance.

Current Spending Levels Are Too Low to Address Infrastructure Needs

A summary of the stylized facts of capital spending in infrastructure for the sample of 24 countries in Sub-Saharan Africa across the main infrastructure subsectors—roads, water, air transport, electricity, telecommunications, and water and sanitation—for 2009–15 is presented below. The sample accounts for about 70 percent of the regional GDP, and is compared with five countries from other regions, namely, Albania, Guatemala, Moldova, Peru, and Tunisia. The list of countries in the sample along with basic indicators on data quality is presented in annex 2b.

On average, the 24 countries in Sub-Saharan Africa in the sample have spent around 2 percent of GDP annually between 2009 and 2015 to build, rehabilitate, or improve the existing capacity of infrastructure across the main subsectors. Roads accounted for two-thirds of overall investments. Capital spending on electricity and water supply and sanitation each accounted for 15 percent of total capital expenditures (figure 2.33). Overall, actual spending on infrastructure was considerably lower than capital allocations during the same period, amounting to around 3.4 percent of GDP, reflecting substantial under-execution of such investments.

FIGURE 2.33: Sectoral Distribution of Capital Spending



Expenditures on infrastructure are considerably lower than allocations, amounting to just 2% of GDP.

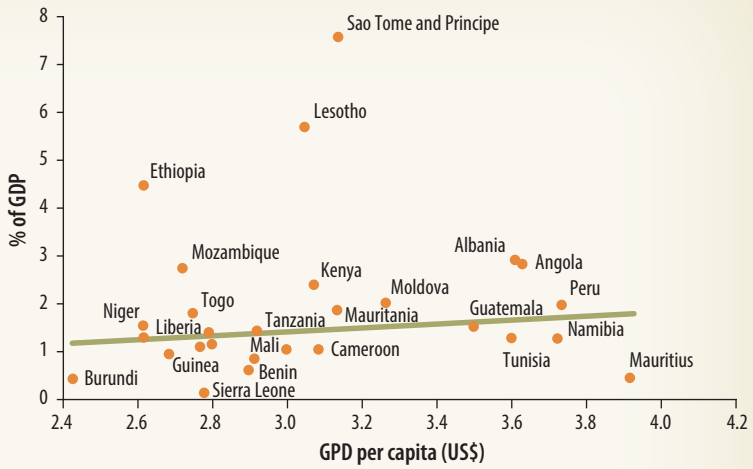
Source: World Bank, BOOST data, staff calculations.

Figure 2.34 shows that there is a positive relationship between capital spending and income per capita; that is, wealthier countries tend to investment more on average—although with notable exceptions. For instance, São Tomé and Príncipe, Lesotho, and Ethiopia exhibited high spending levels during the period, despite low per capita income levels, while Namibia underspent vis-a-vis the expected threshold for its income level.

The quality of governance and institutional capacity has a dual impact on the size of capital spending. On one hand, the overall size of infrastructure capital allocations tend to be larger among countries with low to moderate institutional quality as measured by the Worldwide Governance Indicators (WGI). This is consistent with the notion that countries with lower levels of governance might allocate more on infrastructure due to greater rent-seeking behavior, lack of technical capacity to prepare projects, among other things (figure 2.35). On the other hand, under-execution rates (as measured by the gap between capital allocation and spending) are more pervasive in countries with low to moderate levels of governance effectively reducing the size of actual capital spending (figures 2.35 and 2.40). This finding is consistent with the prevailing notion that countries with good governance tend to exhibit higher growth rates in the long run, as a result of higher efficiency, quality and effectiveness of infrastructure investments.

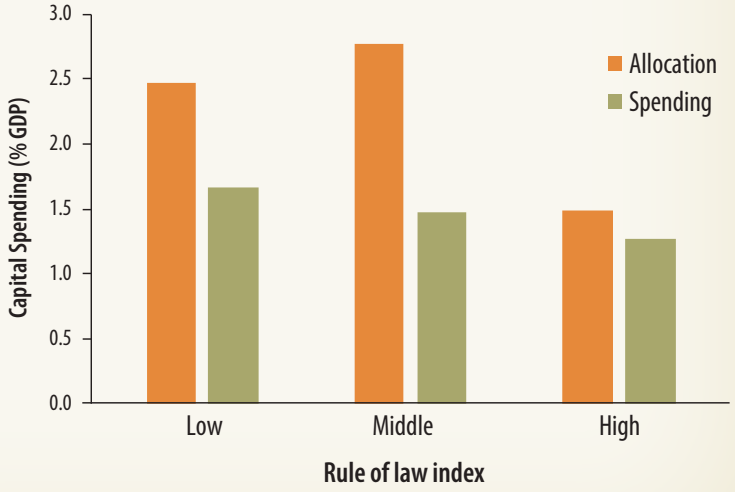
Overall, capital spending appears insufficient to cover basic needs.

FIGURE 2.34: Capital Spending in Infrastructure versus GDP, 2009–15



Source: World Bank, BOOST data, staff calculations.

FIGURE 2.35: Capital Allocation, Capital Spending and the Rule of Law



Source: World Bank, BOOST data, staff calculations.

The amounts of capital spending appear to be insufficient compared with overall needs.[15] Several top-down approaches have estimated that global infrastructure needs throughout the developing world require sustained levels of spending of over 6 percent of GDP annually.[16] Other studies have estimated global infrastructure needs to be equivalent to slightly below 4 percent (OECD 2006; McKinsey 2016). Although no exact measurement of infrastructure gaps exists, with estimates being sensitive to applied methodologies, available empirical studies suggest that current levels of spending are not sufficient to address the acute shortfalls suffered by populations in Africa, a region that typically lags behind global averages in the stock and quality of infrastructure.

Furthermore, trend analysis suggests that general government capital allocations have stagnated over the past seven years, especially in the three main subsectors. Total capital budget allocations in roads has been decreasing after reaching a peak of 2.6 percent of GDP in 2011 (figure 2.36). Similarly, capital allocations for water supply and sanitation have reverted to 2009 levels, after experiencing a surge between 2009 and 2012, during which they reached 1 percent of GDP. Electricity allocations have remained stable, at around 0.5 percent of GDP, with increasing reliance on externally funded investment projects and limited domestic revenue mobilization toward this sector.

However, there are significant differences among the Sub-Saharan African countries in the sample. For capital budget allocation, countries like Togo, Mauritania, and Kenya experienced large increases of 3

15 The infrastructure spending cited above does not incorporate capital spending potentially undertaken by state-owned enterprises, and does not always capture the entirety of foreign funded capital spending that stays off budget.

16 See Fay and Yepes (2003), Bhattacharya, Romani, and Stern 2012, and Fay et al. (2011).

FIGURE 2.36: Evolution of Capital Budget Allocation

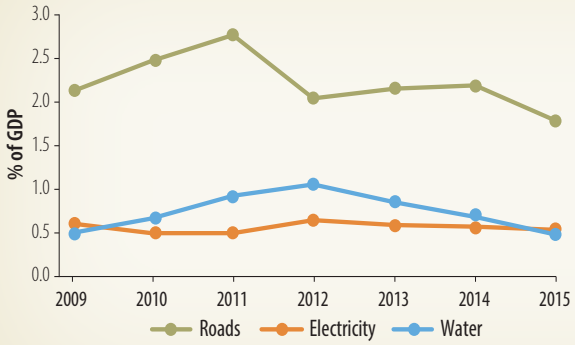
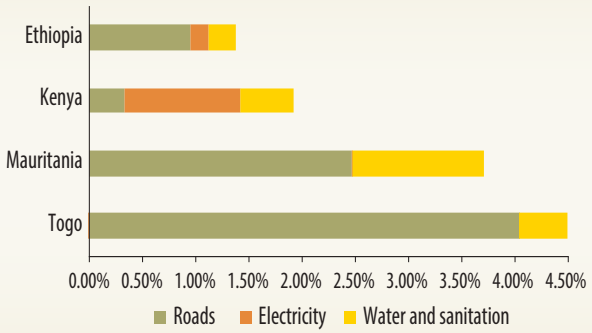


FIGURE 2.37: Drivers of Spending Allocation Increases



General government capital allocations have stagnated in these three sectors.

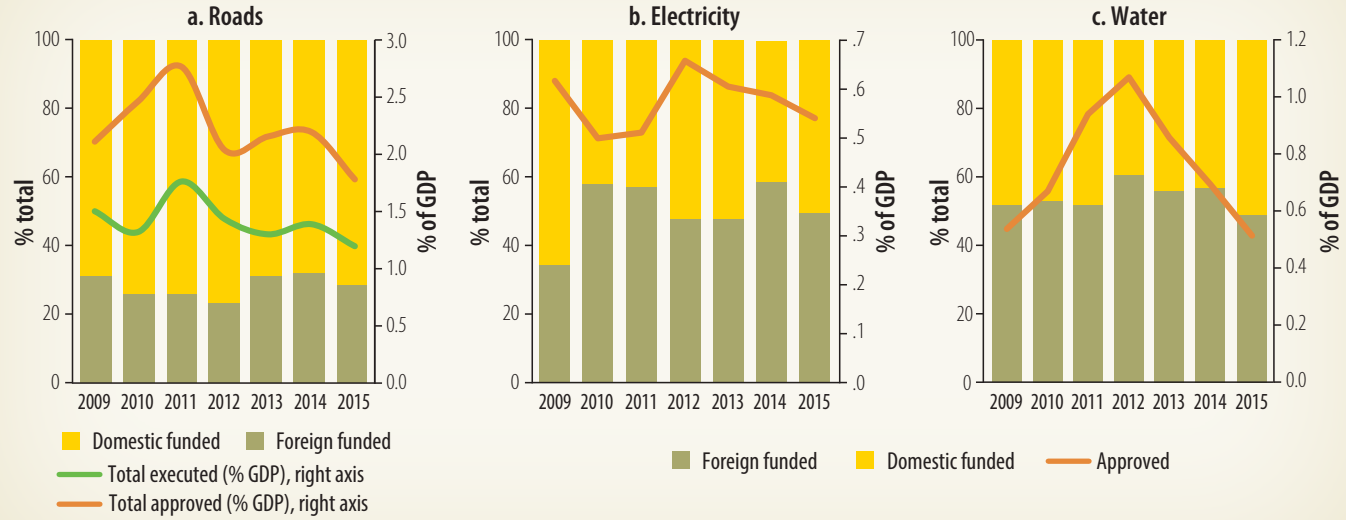
Source: World Bank, BOOST data, staff calculations.

percent or more between 2009 and 2015, driven mostly by allocation increases in roads (figure 2.37). On the other side of the spectrum, São Tomé and Príncipe, Lesotho, Angola, and Benin recorded the largest percentage decreases in public capital allocations in infrastructure from 2009 levels. Although São Tomé and Príncipe, Lesotho, and Angola continue to experience large levels overall (5.6, 4.2, and 4.5 percent of GDP, respectively), the slowing pace of capital allocations in Benin—driven mostly by roads and water and sanitation—is more problematic in light of lower spending levels overall and acute infrastructure gaps.

High Dependence on Foreign Aid Can Crowd Out Domestic Sources

Foreign aid continues to play an important role in some of the infrastructure subsectors. Although the share of the overall capital budget allocations funded through external aid decreased from 39 percent in 2009 to 36 percent in 2015, the distribution of this change was different across sectors. Road transport is the sector with the greatest share of domestic contribution, with the foreign funded share steadily accounting for around 30 percent of total allocations (figure 2.38, panel a).

FIGURE 2.38: Evolution of Spending, Total and by Source, 2009–15



Source: World Bank, BOOST data, staff calculations.

For electricity, there has been a substantial increase in foreign funded projects, driven mainly by the infrastructure push embedded in the *"Power Africa"* initiative (figure 2.38, panel b). Uganda, Angola, Kenya, and Burkina Faso are among the countries in the sample that recorded the largest increases in foreign funded capital allocations in the sector. However, the data suggest that the increased reliance on foreign funding might be crowding out domestic spending in the sector, making it particularly vulnerable to sudden drops in aid volume (as experienced in 2015), as well as the unpredictability of funding that is typical of these interventions.

Capital spending in water and sanitation is also vulnerable to sudden drops in foreign assistance and crowding out of domestic capital. The significant decrease of foreign funds devoted to this sector since 2012—moving from 60 percent to less than 50 percent of the total—was the main driver behind a corresponding decrease in overall capital allocations by Sub-Saharan African countries in the sample, moving from 1 percent of GDP in 2012 to less than 0.5 percent in 2015 (figure 2.38, panel c). In Niger and Benin, for instance, foreign assistance traditionally accounted for a major share of total capital allocations. When foreign assistance was reduced in 2015, this generated a significant drop in overall capital allocations in the sector. Similar patterns were found in Mozambique, Tanzania, and Sierra Leone, although overall capital reductions were less significant. Given the strategic importance of improving the size and quality of public spending in the sector, it is imperative for African countries to reduce their exposure to and reliance on foreign aid, by striving to reach a better balance of funding sources for the sector toward greater domestic mobilization.

Under-Execution Affects the Efficiency of Public Investment

Analyzing the under-execution of public investment is important for assessing the magnitude of efficiency losses, and examining the underlying determinants of these inefficiencies. This analysis focuses on the difference between what was originally approved versus what was actually spent in any given year. Focusing on the deviations from original approved budgets (rather than mid-year supplementary budgets) enables the assessment of the level of credibility built into approved capital budgets. Given the uneven availability of spending of foreign funded aid, the analysis relies on examining the deviation between capital allocations and execution of domestic funded projects. This provides a better assessment of the ability of national systems to implement capital projects.

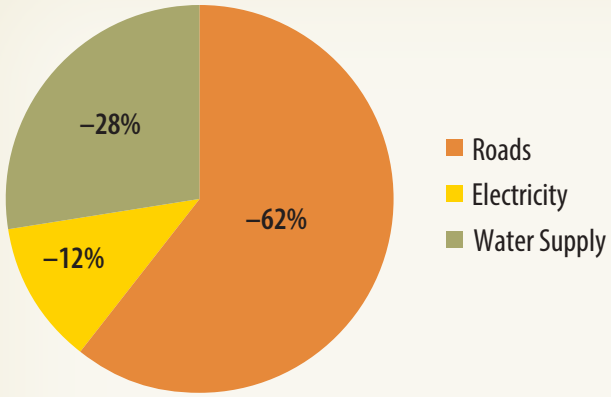
The Sub-Saharan Africa region displays very large levels of under-execution. On average, over 30 percent of total domestic allocations was not executed annually from 2009 to 2015. This amounted to almost 1 percent of GDP per year remaining unspent on capital infrastructure. Roads account for two-thirds of the total underspending, well above underspending in electricity and water and sanitation (figure 2.39). This is particularly worrisome, since most of the domestic resources are mobilized toward roads, with capital spending on electricity and water and sanitation still dominated by foreign assistance.

Several factors account for these levels of under-execution. Historically, most African countries have taken a residual approach to capital spending, which often results in mid-year decreases in disbursement in typical scenarios of over-optimistic revenue projections leading to in-year prioritization toward recurrent expenses. Further drivers include late releases in countries without a proper medium-term capital commitment

framework; implementation gaps due to absorptive capacity and other institutional bottlenecks (that is, inefficient procurement systems); and the pervasiveness of corruption and lack of accountability, leading to suboptimal delivery of infrastructure.

Not surprisingly, our analysis revealed positive correlation between levels of under-execution of capital projects and levels of governance (that is, the WGI Government Effectiveness Index) (figure 2.40). This positive association confirms the hypothesis that issues of absorptive capacity and regulatory frameworks affect the ability of countries to execute annual capital allocations.

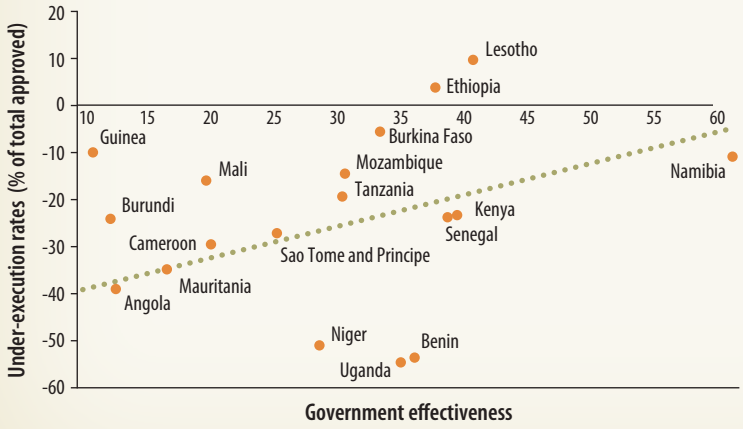
FIGURE 2.39: Drivers of Under-Execution in Capital Spending



Execution of capital spending is a problem. Close to one-third of total domestic allocations were not executed annually from 2009 to 2015 in these three sectors.

Source: Boost data, staff calculations.

FIGURE 2.40: Under-Execution Rates in Domestic Funded Infrastructure, 2009–15



Source: BOOST data, staff calculations.

New Frontiers in Measurement and Analysis of Capital Spending on Infrastructure

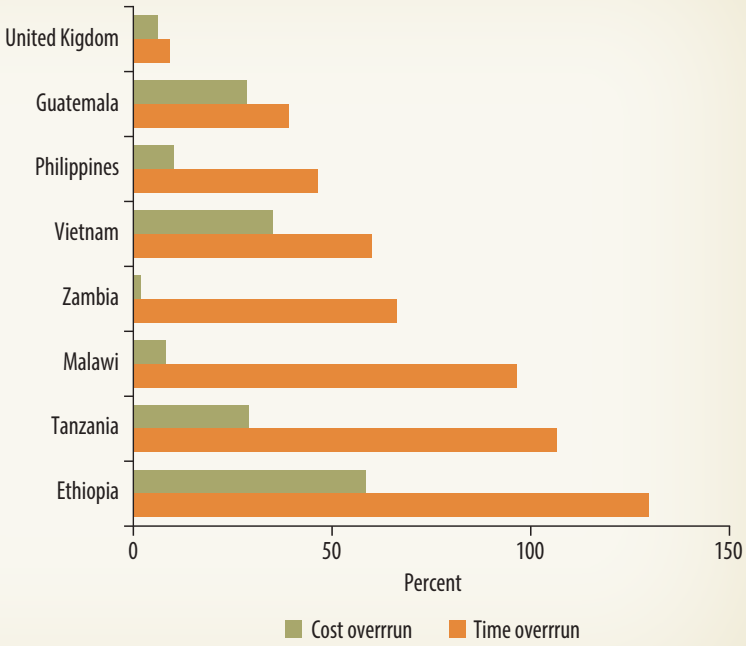
One of the biggest challenges faced by many developing countries is understanding the factors hindering the implementation of public investment projects. The ability of public investment management systems to provide an accurate, integrated view of the project cycle is very weak, especially in low-capacity countries across Africa. In the few countries where the financial management systems capture individual project information, the data recorded are typically limited to that year's budget, allocation, and expenditure amounts.[17]

A recent study carried out by the Construction Sector Transparency Initiative—a multi-stakeholder initiative that seeks to promote transparency and accountability in public infrastructure—involved collecting data on the costs and quality of public projects during the preparation and construction phases in eight countries—including four countries in Sub-Saharan Africa (Ethiopia, Malawi, Tanzania,

17 More detailed data on each of the projects exists, but they are recorded only on spreadsheets and scattered among various departments and ministries.

Data such as these collected to increase accountability in public infrastructure, are key for monitoring the evolution of performance indicators.

FIGURE 2.41: Cost and Time Overruns, CoST Baseline Sample



Source: Brumby and Kaiser (2013).

and Zambia) (figure 2.41). This simple analysis not only provides an important baseline for monitoring the evolution of performance indicators, but also emphasizes the importance of the ability of national financial management systems to produce these portfolio output visualizations on a routine basis.

A further challenge centers on the adequacy of the operations and maintenance expenditures relative to existing public capital stock as well as projected capital expenditures. Underspending on operations leads to suboptimal levels of public capital stock depreciation, which reduces the lifespan of the asset. In this context, very few countries in Sub-Saharan Africa provide a precise distinction between pure capital expenditure—that is, gross capital formation—and the operational expenses of the investment. A best case scenario is represented by Namibia, which neatly distinguishes between the two categories, allowing for quick visualization of the ratio of gross capital formation versus related operational expenditures.

Public-Private Partnerships in Sub-Saharan Africa

Amid heightened interest in crowding-in private investment, there is renewed interest in public-private PPPs. PPPs in Sub-Saharan Africa remain a very small market. The development of PPPs, which has been slow, started in the early 1990s, beginning with projects in South Africa and Côte d'Ivoire in 1990. Eventually, PPPs spread to 41 of the 48 countries in the region, most recently Botswana and Somalia in 2011 and 2013, respectively. Burundi, Eritrea, Equatorial Guinea, Mauritania, the Seychelles, South Sudan, and Swaziland do not have any PPPs. According to the World Bank's Private Participation in Infrastructure (PPI) database, there are 335 PPPs[18] in infrastructure[19] projects in Sub-Saharan Africa that have reached financial closure[20] in the past 25 years.

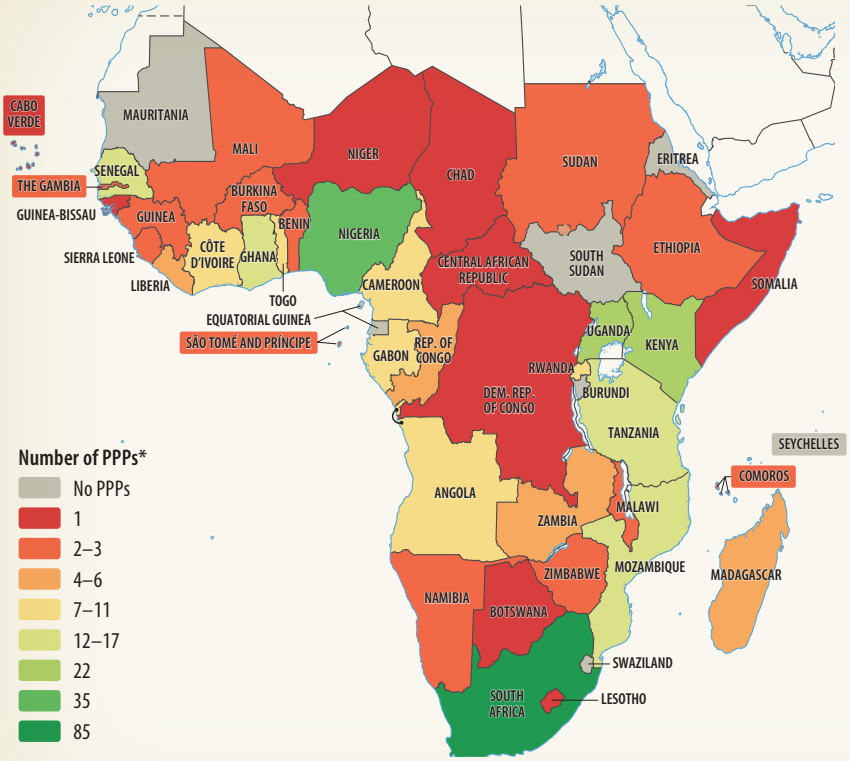
18 A PPP is defined as "any contractual arrangement between a public entity or authority and a private entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility."

19 Infrastructure refers to the energy, transport, and water and sanitation sectors, as defined by the PPI database (www.ppi.worldbank.org).

20 The definition of financial or contractual closure varies among types of private participation as a result of the availability of public information. (a) For management and lease contracts, a contract authorizing the commencement of management or lease service must be signed with the private consortium assuming the operation of the services. (b) For brownfield concession projects, contractual closure is reached when the concession agreement is signed and the date for taking over the operations is set. (c) For greenfield projects, financial closure is the date whereby (i) there is the existence of a legally binding commitment of equity holders and/or debt financiers to provide or mobilize funding for the full cost of the project; and (ii) the conditions for funding have been met and the first tranche of funding is mobilized. If this information is not available, the construction start date is used as an estimated financial closure date. (d) For divestitures, the equity holders must have a legally binding commitment to acquire the assets of the facility. Such commitment usually occurs at the signing of the share purchase contract.

However, the entry year is not the best indicator of how active each country is in bringing PPP projects to the market. Despite that many countries in Sub-Saharan Africa started early, they never produced another PPP after their first one—for example, Central African Republic (1991), Guinea-Bissau (1991), and the Democratic Republic of Congo (1995). The most active countries in the region are South Africa (85 projects), Nigeria (35), Kenya (22), and Uganda (22) (map 2.2). Nine countries have only produced one PPP, and another 13 have produced only two or three in the past 25 years. The low number of PPPs in these countries can be attributed to the fact that some are small economies; others have been in conflict for several years; or they have weak legal and regulatory frameworks for procuring and implementing PPPs.

MAP 2.2: Number of PPP Projects by Country (1990–2015)



Countries with the most projects in the region are South Africa (85 projects), Nigeria (35), Kenya (22), and Uganda (22).

Source: World Bank PPI Database, February 7, 2017.
**Note:* Number represents unique projects per country. Cross-border projects are counted once for each country.

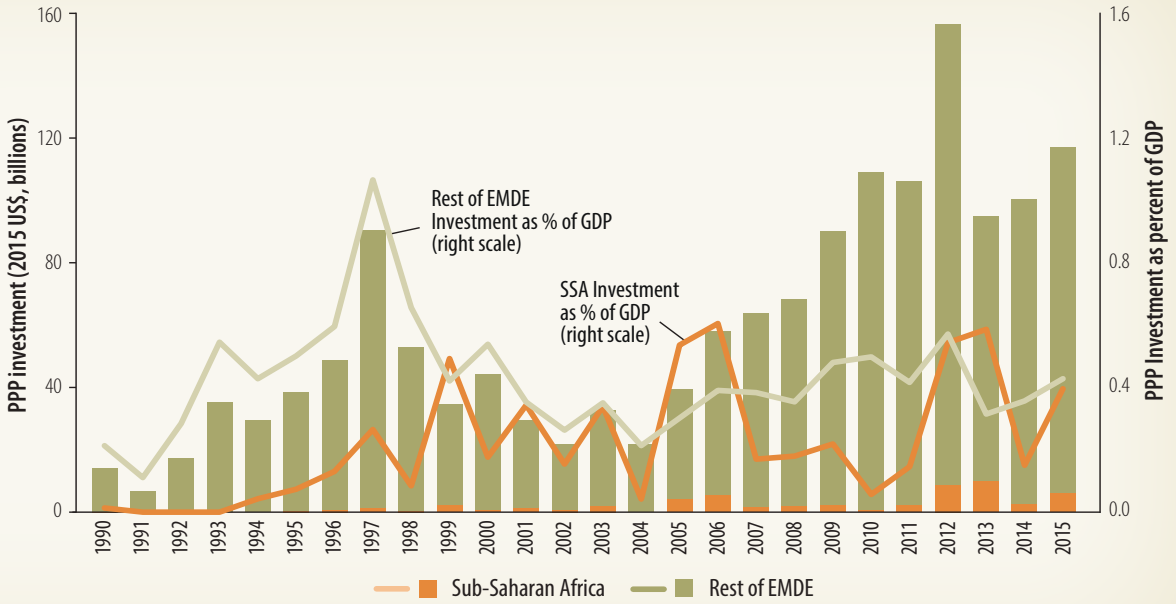
Overall, the number of PPP infrastructure projects in the region is a relatively small proportion of the total number of projects in emerging markets and developing economies (EMDEs), ranging from 2 to 12 percent.[21] Because the proportion is so small, in figure 2.42, the scale for the number of projects in Sub-Saharan Africa has been expanded; the right scale shows the fluctuations over the years. Although growth has been evident in the past 25 years, it has been somewhat less pronounced in Sub-Saharan Africa than in the rest of the EMDEs, with slightly more volatility as well.

This pattern also holds when we look at PPP investment commitments in Sub-Saharan Africa, which make up only a small portion (2–10 percent) of total EMDE investment. When adjusting the data by the size of the economy, it can be observed that before the Asian financial crisis (1997–98), PPP investment as a percentage of GDP was clearly below the average for the rest of the EMDEs, reaching a peak of 0.2 percent in 1997 compared with 1.1 percent for the rest of the EMDEs (figure 2.42). However, after the Asian financial crisis, investment as a percentage of GDP fluctuated between 0.2 and 0.6, closer to the average for the rest of the EMDEs.

21 This includes all IDA, International Bank for Reconstruction and Development (IBRD), and IDA-IBRD blend countries.

PPP investment commitments in the region are a small portion of total investment in emerging markets and developing economies.

FIGURE 2.42: PPP Investment in Sub-Saharan Africa versus the Rest of the EMDEs



Source: World Bank PPI Database, February 7, 2017.

**Note:* % of GDP for rest of EMDE uses GDP for all countries except Sub-Saharan Africa. Data exclude telecom, divestitures, merchants, and management and lease contracts.

High Concentration in the Top Four Countries in the Region

PPP projects in Sub-Saharan Africa have been concentrated in only a few countries, namely *South Africa, Nigeria, Kenya, and Uganda,* which are the top four countries in investment and number of projects. Together they account for 48 percent of the 335 total PPP projects in the region in the past 25 years.[22] This amounts to $36.7 billion of investment commitments, or 62 percent of the $59 billion of total investment commitments in the region.[23]

Looking at PPP investment over the years also demonstrates the role these four countries have played in the region's PPP market. Investment as a percentage of GDP tends to be somewhat sporadic for the top four countries, jumping during boom years, such as 2005–06, 2012–13, and 2015 (figure 2.43). In three of the past five years, the top four countries (especially South Africa and Nigeria) have played a significant role in the development of Sub-Saharan Africa's PPPs. This has been largely due to renewable energy initiatives in South Africa and port renovations in Nigeria.

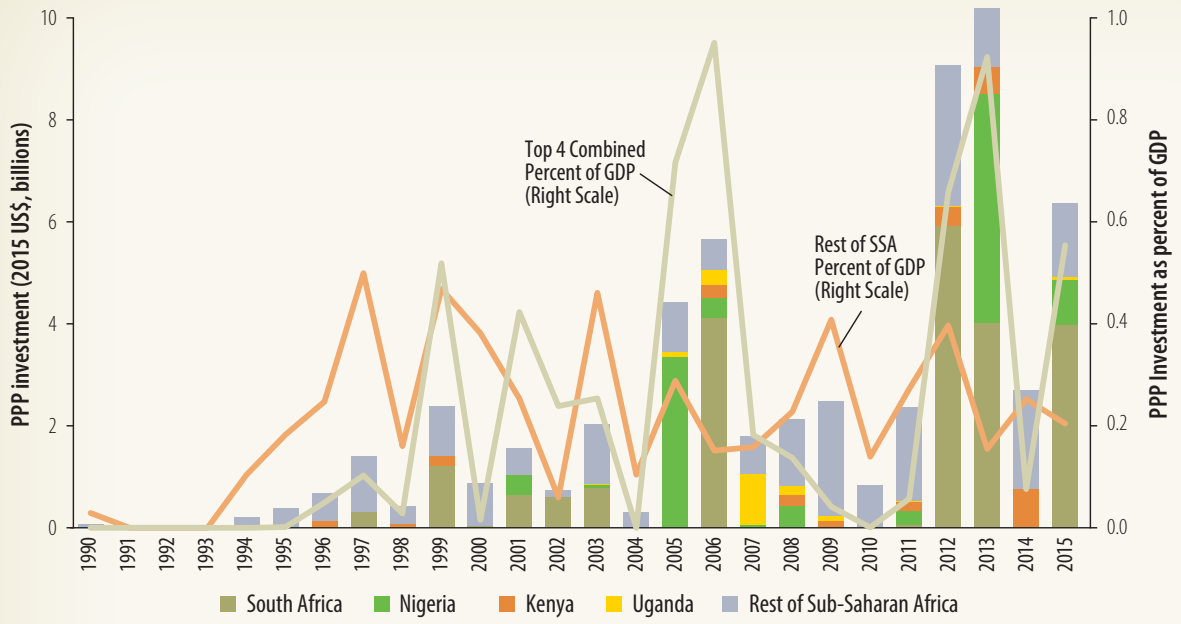
Another way to assess at the concentration of PPPs is to look at the number of countries per year that had new PPP investment commitments. The number of countries gradually increased in the 1990s and early 2000s, peaking during the latter 2000s (figure 2.44). The first half of the 2010s has subsequently seen a falloff in the number of countries with new PPP commitments. Looking at the annual number of PPPs per country (countries with at least one PPP) shows that averages have increased slightly in recent years, reflecting a surge of 19 port projects in Nigeria in 2005, and the large number of renewable energy projects in South Africa—31 in 2012, 12 in 2013, and 16 in 2015.

22 Projects that cross borders are counted only once, and this count only represents each country's portion of those projects divided evenly between the participating countries. For example, for the Belt Bridge Border Post project between South Africa and Zimbabwe, only half of the project is represented by the top four countries. Another example is the West African Gas Pipeline, which is split among Togo, Ghana, Benin, and Nigeria. The top four countries account for only one-quarter of this project.

23 The same information about cross-border projects applies to these investment sums. Total investment is divided among countries participating in cross-border projects, and then only applied to their category of aggregation. For example, only one-quarter of the total investment for the West African Gas Pipeline is attributed to Nigeria's aggregated investment.

FIGURE 2.43: PPP Investment in Top Four Countries versus the Rest of Sub-Saharan Africa

PPP projects in Sub-Saharan Africa have been concentrated mainly in Kenya, Nigeria, South Africa, and Uganda.

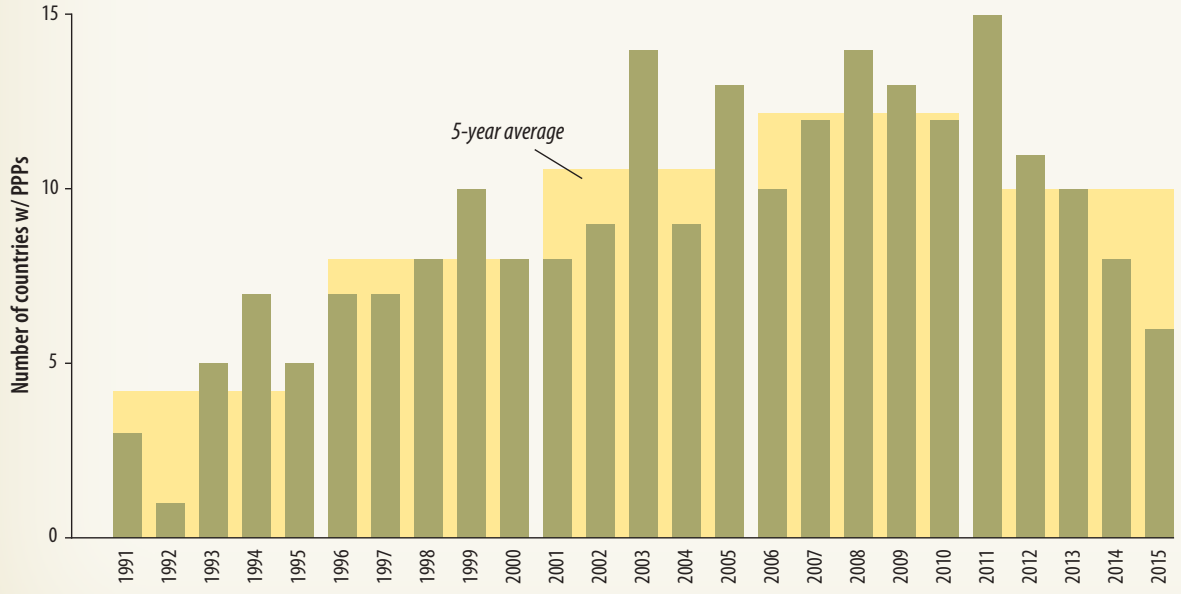


Source: World Bank PPI Database – 7 Feb 2017

**Note:* % of GDP for rest of EMDE uses GDP for all countries except Sub-Saharan Africa. Data excludes telecom, divestitures, merchants, and management and lease contracts.

FIGURE 2.44: Annual Number of Countries with PPP Projects
Sub-Saharan Africa (1991–2015)

The number of countries per year that had new PPP investment commitments has increased slightly in recent years.



Source: World Bank PPI Database, February 7, 2017.

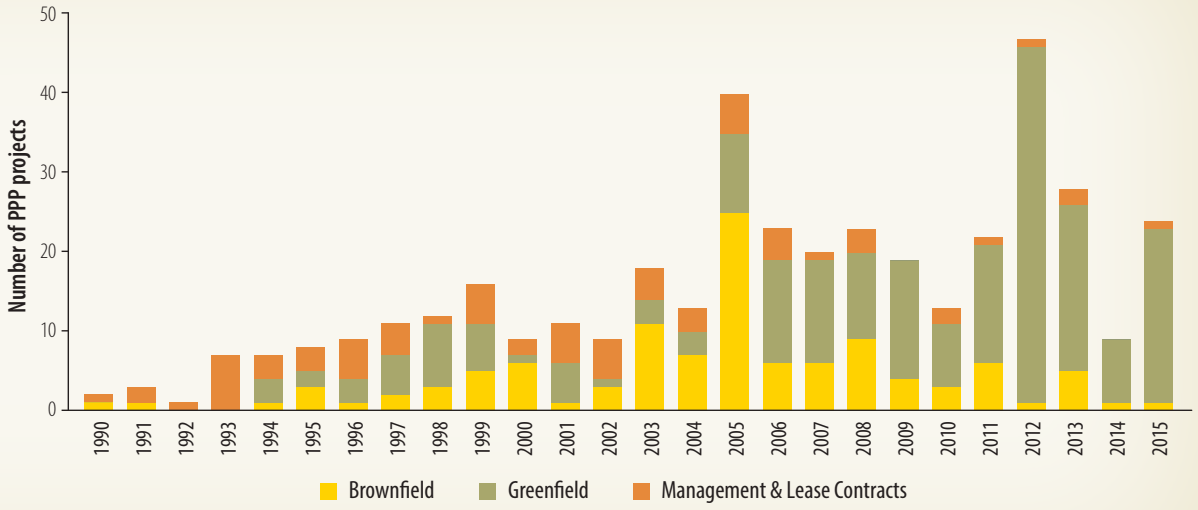
**Note:* Data exclude telecom, divestitures, and merchants.

Project Type and Sector

The PPI database identifies three types of PPP projects: management and lease contracts, greenfield projects, and brownfield projects. In the 1990s, as PPPs started to gain traction, management and lease contracts were the predominant type of PPP, likely due to their relative simplicity and ease of implementation. Brownfield projects gained popularity in the mid-1990s, peaking in 2005 and then subsequently declining, probably as existing assets that were eligible for PPPs were exhausted. Greenfield projects exhibit continued growth, as emphasis has been placed on renewable energy projects, which are largely responsible for the increase in greenfield projects in the most recent years, and particularly in 2012 (figure 2.45).

The number of greenfield projects has grown steadily, reflecting the emphasis on renewable energy.

FIGURE 2.45: Number of PPP Projects by Type of Project, Sub-Saharan Africa



Source: World Bank PPI Database, February 7, 2017.
Note: Data exclude telecom, divestitures, and merchants.

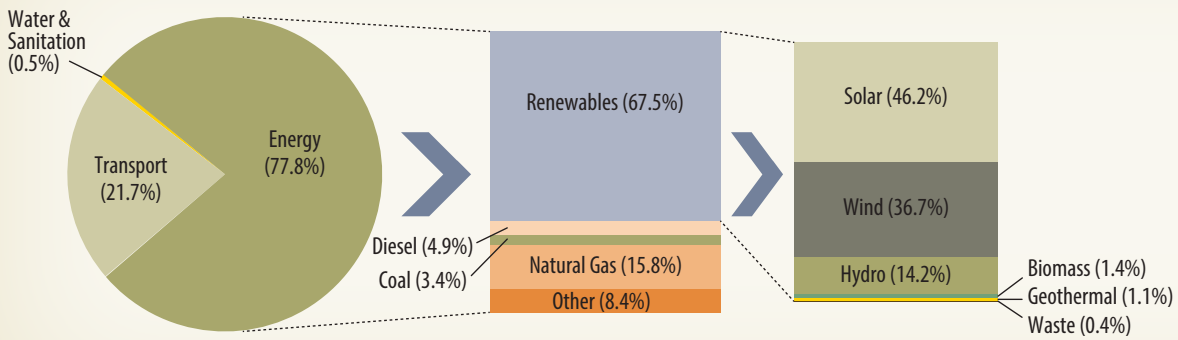
A look at the number of projects in Sub-Saharan Africa broken down by sector demonstrates the increasing dominance of energy PPP projects, which have overshadowed the transport and water and sanitation sectors in recent years. The large presence of transport projects in 2005, 23 in total, was due to a boom of 19 transport projects in Nigeria, all projects to rehabilitate and expand seven ports in four major cities. This was part of a broad Nigerian initiative to attract private participation in the port sector.

The PPP infrastructure projects in Sub-Saharan Africa in the past five years have mainly been concentrated in the energy sector (78 percent), followed by transport (22 percent) and water and sanitation (0.5 percent) (figure 2.46). Among the energy projects, the majority are renewable energy projects (68 percent), distributed across solar (46 percent), wind (37 percent), and hydro (14 percent). The solar projects are concentrated almost entirely in South Africa, which produced 35 of the 37 projects between 2012 and 2015. Total PPP investment in solar is $7.6 billion (2015 US$). Wind power is slightly less concentrated, but South Africa is still the dominant player, producing 23 of 28 total projects, worth $4.9 billion (80 percent) of the $6.1 billion total investment commitments in wind projects. The five remaining projects were undertaken by Kenya (two), Cabo Verde, Ethiopia, and Mauritius. The largest

project by investment commitment is the Aldwych Lake Turkana Wind Farm in Kenya, worth $765 million. The next largest project is worth $506 million (South Africa), and the average wind project in Sub-Saharan Africa is worth $219 million.

The increase in recent years in greenfield and energy projects is in part due to the increasing emphasis on renewable energy projects, which have expanded rapidly. A large boom in 2012 was mainly due to a surge in solar and wind projects in South Africa. In total, South Africa had 31 greenfield energy projects in 2012, worth a combined $5.9 billion: $4.24 billion in solar (23 projects) and $1.65 billion in wind (eight projects). These two categories made up the extent of PPP projects in South Africa for 2012. In 2013 (four solar, seven wind) and 2015 (eight solar, seven wind), the number of renewable projects in South Africa was lower but still significant.

FIGURE 2.46: Breakdown of PPP Projects in the Energy Sector, Sub-Saharan Africa (2011–15)



PPP infrastructure projects in the region have concentrated mainly in the energy sector (78%).

Source: World Bank PPI Database, February 7, 2017.
**Note:* Each category makes up 100%. Data exclude telecom, divestitures, and merchants.

Financing of PPPs

Financing structure. PPP financing may come from public, private, or development finance institution (DFI) sources. Public source financing includes (a) governments providing part of a project's upfront capital costs through grants or viability gap funding (government subsidies[24]); (b) state-owned enterprises investing equity; and (c) state-owned banks extending loans. Private source financing includes equity (including equity financed by corporate debt) through the project's developer, or project finance debt through private lenders, which can be commercial banks or institutional financiers. DFIs also provide various forms of support in the form of loans and equity.

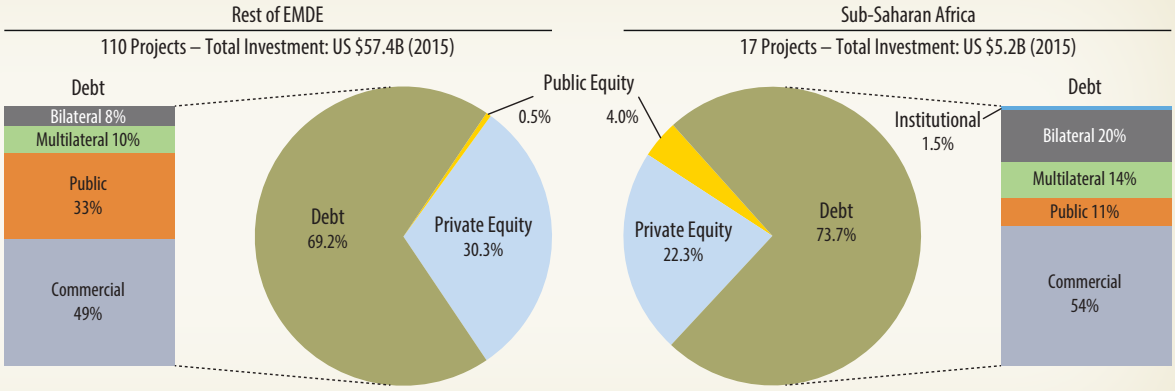
There are limited data on financing for PPP projects in Sub-Saharan Africa. In 2015, there were 334 projects for all countries in EMDEs, 24 of which were in Sub-Saharan Africa, and only 17 of those have complete financial information. The data that are available, however, show that the projects in Sub-Saharan Africa are financed in a very similar way to those in the rest of the EMDEs. In general, projects are

24 The term government subsidies here refers to all cash subsidies provided by a government for capital investments of a project to cover the costs of the physical assets during construction.

financed with about 70 percent debt and 30 percent equity, most of which is private (figure 2.47). There is a slight variation in the debt structure between EMDEs and Sub-Saharan Africa. In both cases, debt tends to be about half commercial, but in Sub-Saharan Africa international financial institutions play a larger role in financing the other half, about 34 percent as opposed to only 18 percent in the rest of the EMDEs, where public debt plays a larger role.

Most projects are financed with about 70% debt and 30% equity, most of which is private.

FIGURE 2.47: Sources of PPP Financing in Sub-Saharan Africa, 2015



Source: World Bank PPI Database, February 7, 2017.
**Note:* Each category makes up 100%. Data exclude telecom, divestitures, and merchants.

MDB support. Multilateral development banks (MDBs) have helped to facilitate, prepare, and structure complex PPPs to mobilize private sector and institutional capital, and they have helped expand the pipeline of bankable infrastructure projects. The PPI database defines MDB support as financial assistance to the project company, including loans,[25] guarantees,[26] equity, quasi-equity,[27] syndications,[28] and risk management instruments.[29] In the past five years, 31 (25 percent) of the 126 projects in Sub-Saharan Africa received some type of financial backing from MDBs, mainly in the form of loans (27 projects) and guarantees (11). This is almost twice as high as the figures for the rest of the EMDEs, for which only 12 percent (213/1,909) of projects have MDB support.[30] In the energy sector, MDBs also provide equity, syndication, and a slightly higher proportion of risk management instruments in Sub-Saharan Africa than they do in the rest of the EMDEs. In the rest of the EMDEs, MDBs contribute more equity in all sectors, some insurance in the energy sector, and syndication in the transport sector. For water and sanitation, there were only three projects between 2011 and 2015, only one of which had MDB support in the form of a debt/equity guarantee—the Befesa Desalinization Plant in Ghana (figure 2.48).

Government support. When projects are not funded through user fees, power purchase agreements (PPA), or water purchase agreements (WPA) with private entities or wholesale markets, governments must

25 Direct loans using multilateral institution funds (also referred to as A-loans).

26 Guarantees include political risk coverage and partial credit guarantees, which turn medium-term finance into a longer-term arrangement by guaranteeing longer maturity or offering liquidity guarantees in the form of put options and take-out financing.

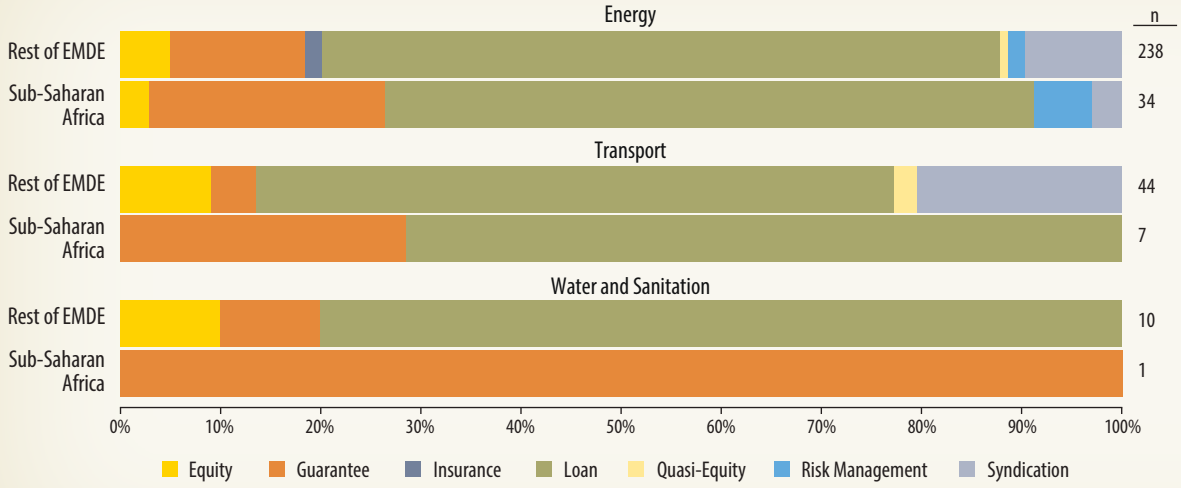
27 Quasi-equity includes both debt and equity characteristics, and some of them are convertible debt, subordinated loan investments, and preferred stock and income note investments (also referred to as C-loans).

28 A multilateral institution arranges the financing with the resources of other investors, but the institution is always the lender of record (also referred to as B-loans).

29 Risk management products, or derivatives, allow project companies to hedge currency, interest rate, or commodity price exposure. Some of them are currency and interest rate swaps, options, and forward contracts and derivatives.

30 There is limited information on projects that do not have MDB support and projects for which we have no information. For this reason, only relative comparisons should be made, on the assumption that research rigor and availability of data are the same in Sub-Saharan Africa and the rest of the EMDEs.

FIGURE 2.48: Types of Multilateral Development Bank Support for PPPs (2011-15)
Sub-Saharan Africa versus Rest of EMDE



In the past five years, 25% of the PPP projects in Sub-Saharan Africa received some financial support from MDBs.

Source: World Bank PPI Database, February 7, 2017.
**Note:* Data exclude telecoms, divestitures, and merchants, and are limited to projects with available information. n = 262 projects.
*** The number of observations for each category is greater than the sum of the projects, because it is common for a project to have multiple types of support.*

support the deals through fixed and variable payments from their budget[31] (direct support). In some cases, governments can offer indirect support through guarantees to reduce specific project risks—for example, payment, revenue, and exchange rate guarantees.

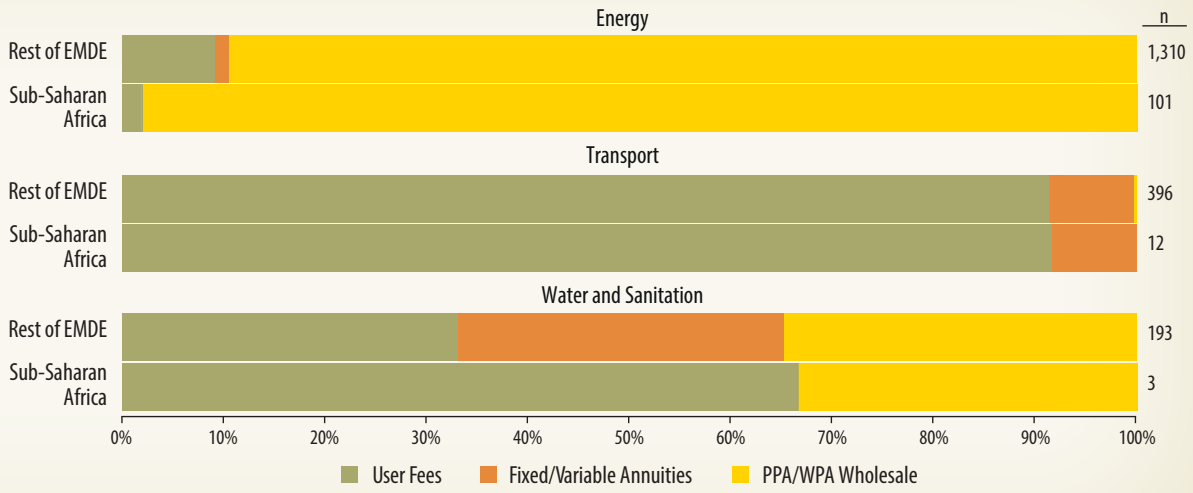
In Sub-Saharan Africa, 91 of the 334 projects have information on government support. Of these projects, 46, or 50.5 percent, have some form of government support: four of those received direct government support and the rest, 42, received only indirect support. Of the projects receiving direct support, three received a capital subsidy, and only one received a revenue subsidy. Of the 42 projects receiving indirect support, for 38 it was in the form of a payment guarantee (37 were energy projects); three received a debt guarantee; and only one received a revenue guarantee. Projects in Sub-Saharan Africa tend to receive less government support than those in the rest of the EMDEs, with most of the support in Sub-Saharan Africa going toward payment guarantees, which are most typical for energy projects.

Revenue sources. The sources of revenue for a project can be grouped into three categories: (a) user fees,[32] (b) power or water purchase agreements (PPA or WPA)[33] and sales to wholesale markets,[34] and (c) annuity/availability payments from the government. In the last category, the government makes direct transfers in the form of fixed or variable payments.[35] Very few projects in Sub-Saharan Africa require fixed or variable annuities as a source of revenue (figure 2.49). This is not surprising, since the PPPs in the region are concentrated in the energy sector, which demands PPAs, but it is surprising in the water sector, because there were only three water projects with available information (see *n* to right in the figure).

31 In some cases, the government may collect user fees but pay availability payments to the private entities bearing the demand risk.
32 When the PPI project relies exclusively or mainly on user fees to cover its cost.
33 In some cases, the government may collect user fees, but the government still bears the demand risk.
34 This includes power/water plants or transmission lines that sell or transport electricity/water to private off-takers. Wholesale markets include cases when outputs are sold to a single buyer or a group of buyers at market prices.
35 This is when the government agreed to make payments to the project company in exchange for the provision of infrastructure.

Very few projects in Sub-Saharan Africa require fixed or variable annuities as a source of revenue.

FIGURE 2.49: PPP Main Revenue Sources by Sector (2011-15)
Sub-Saharan Africa versus Rest of EMDE



Source: World Bank PPI Database, February 7, 2017.
**Note:* Data exclude telecoms, divestitures, and merchants, and are limited to projects with available information. n = 2,015.

Cancelled projects. Cancellations have taken place. Although cancelling a project is a last resort, it can still have a meaningful impact on the PPP market. From 1990 to 2015, relatively few infrastructure projects witnessed the exit of a private investor before the contract ended. Although rare, such cancellations can have a sustained impact on a country's PPP program, reducing the private sector's confidence in the government's commitment, as well as the government's confidence in the robustness and "value for money" of these arrangements.

Of the 5,456 infrastructure projects reaching financial closure in EMDE countries during 1990–2015, 204 were cancelled,[36] accounting for 3.7 percent of all projects and 5.7 percent of investment commitments. Sub-Saharan Africa shows only a slightly higher PPP cancellation rate (4.2 percent) compared with the rest of the EMDEs, which is mostly due to a higher cancellation rate of 10 percent in the water and sanitation sector (three of 29 projects). The three cancelled projects were all management and lease contracts.

Quality of the Institutional and Regulatory Framework for PPPs

A robust institutional and regulatory framework is critical in attracting private investment for infrastructure projects. Given the high costs and risks investors face, many criteria must be met, especially in Sub-Saharan Africa, where economic and financial conditions are often more tenuous. For example, there must be peace and stability, rule of law, good governance with accountability and transparency, clear property rights, and enforceable contracts, just to name a few. Yet another key element for attracting private investment is instilling confidence in investors. One way to do this is by maintaining a stable environment in which domestic and foreign investors can operate with limited risk in unpredictable circumstances.

Empirical evidence suggests that a favorable regulatory and institutional framework corresponds with a successful PPP investment environment, despite limited data on the subject. One such gauge is the Benchmarking PPP Procurement (BPPP) report,[37] which measures governments' capability to prepare,

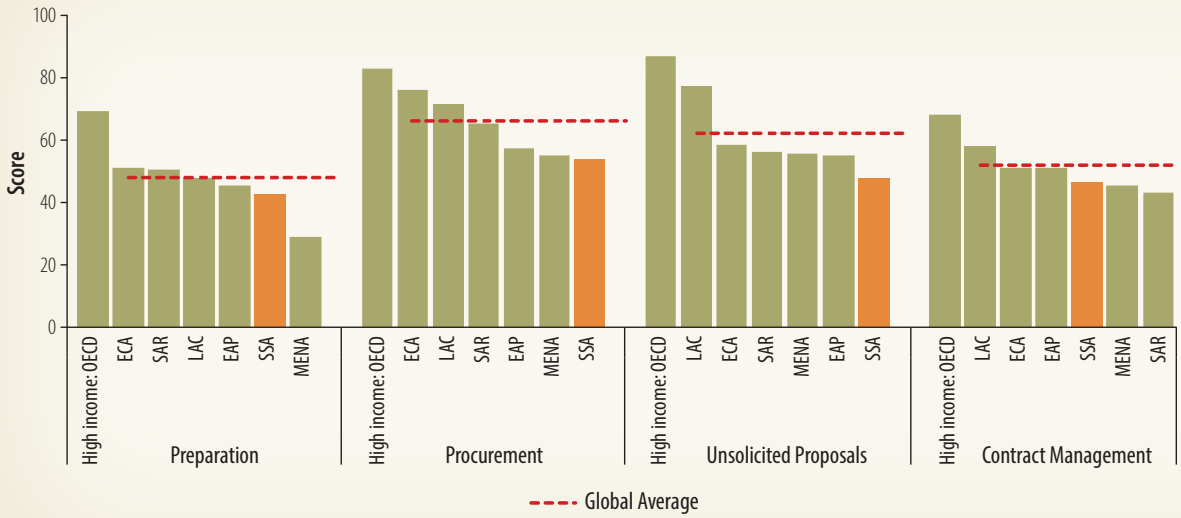
36 A project was deemed to have been cancelled if, before the end of the contract period, the private company sold or transferred its economic interest in the project to the public sector; the private company physically abandoned the project (such as withdrawing all staff); or the private company ceased operation or halted construction for 15 percent or more of the license or concession period, following the revocation of the license or repudiation of the contract. A project is also considered cancelled if the host government issued a decree cancelling the project.

37 For more detailed information, visit http://bpp.worldbank.org/data/exploreindicators/PPP-procurement.

procure, and manage PPPs globally. The report also looks at the procedures for evaluating unsolicited proposals. The 2017 edition of the BPPP includes 20 of the 48 countries in Sub-Saharan Africa.[38]

According to the BPPP, the region performs below average in each of the four thematic coverage areas: project preparation, procurement, unsolicited proposals, and contract management. Moreover, when compared with other regions, Sub-Saharan Africa places in the bottom two, except for contract management, where it places above the Middle East and North Africa and South Asia, but still below the global average. Sub-Saharan Africa's lowest performance is for the PPP preparation indicators (figure 2.50).

FIGURE 2.50: Benchmarking PPP Procurement Scores, by Areas and Regional Average (score 1–100)



The region performs below average in all the four indicators of the Benchmarking PPP Procurement report. The lowest performance is in PPP preparation.

Source: Benchmarking PPP Procurement 2017.

The average performance masks wide variation across countries. Procurement is the area where the economies obtained more similar and higher scores, indicating a more consistent and overall adequate performance (figure 2.51). However, even in this area there are outliers, such as the Democratic Republic of Congo, Gabon, and Togo (PPPs), which score significantly lower than the other economies in the region.

There are wide variations around unsolicited proposals, for which some countries have enacted comprehensive regulations (Tanzania, Nigeria, and South Africa), and others have regulations that are far from recognized good practice (Cameroon). Similarly, wide variations in scores appear around PPP project preparation, with some economies performing relatively well (South Africa and Mauritius), and others lagging (Togo and the Democratic Republic of Congo). South Africa has adopted comprehensive regulations on contract management, and scores very well in that area.

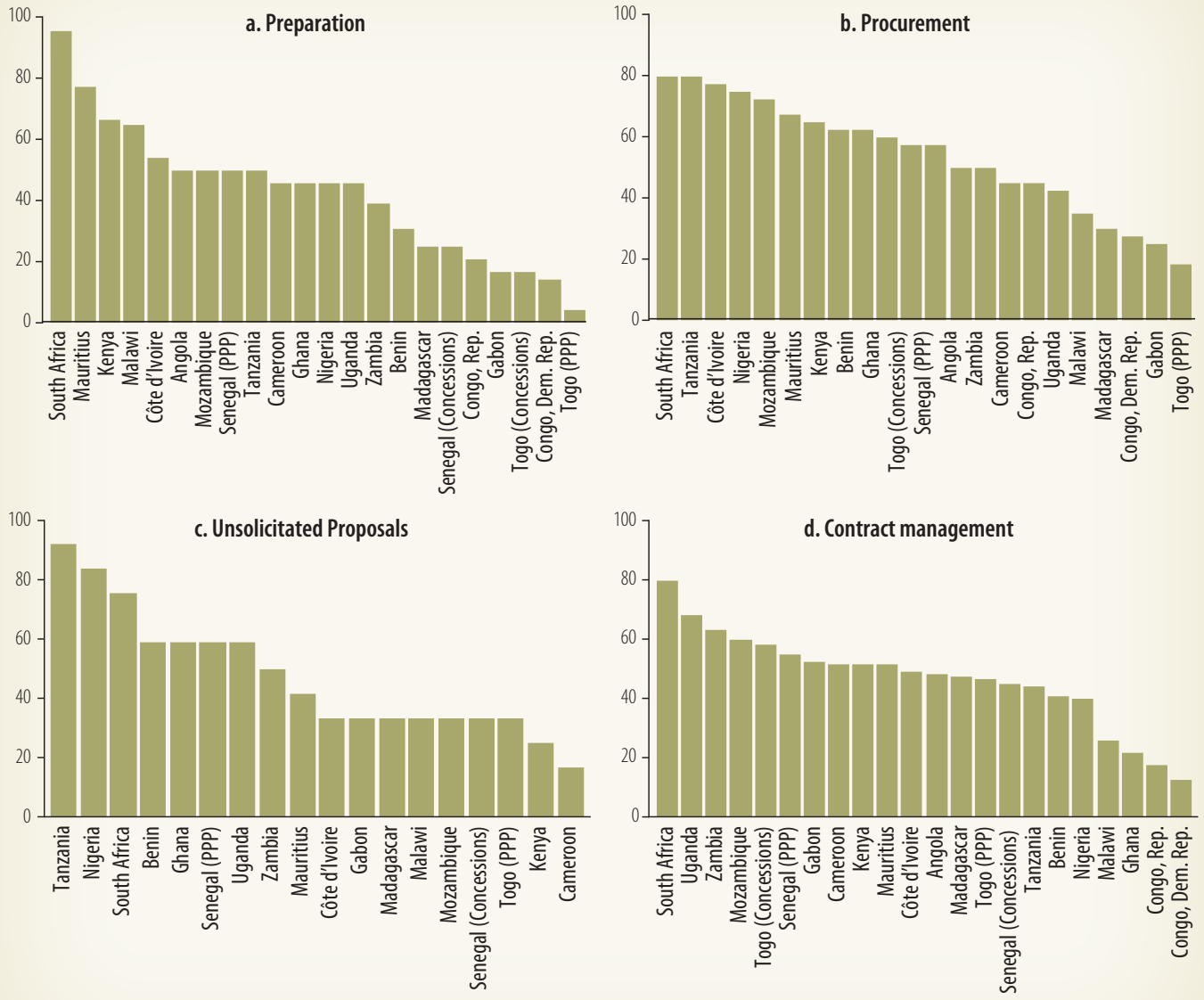
The area where there is more room for improvement is project preparation. The Benchmarking PPP Procurement 2017 data measure whether economies conduct six assessments: socioeconomic analysis, affordability assessment, risk identification, financial viability or bankability assessment, comparative assessment, and market assessment. Some economies conduct all these assessments (such as South Africa and Mauritius), while others conduct only one of them (Togo (PPP) and the Democratic Republic

38 Angola, Benin, Cameroon, the Democratic Republic of Congo, the Republic of Congo, Côte d'Ivoire, Gabon, Ghana, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Nigeria, Senegal, South Africa, Tanzania, Togo, Uganda, and Zambia.

of Congo), or none at all (Togo (Concessions)). And in the Republic of Congo, Senegal (Concessions), Togo (PPP), and Zambia, the government is not required to integrate the prioritization of PPP projects with other public investment projects. The Benchmarking PPP Procurement report also examines whether the ministry of finance, or a central budgetary authority, needs to approve the PPP project before a procurement process is launched. The available information suggests that such an approval is not required in three of the 20 economies measured (Angola, Gabon, and Togo (PPP and Concessions)).

Overall, the regulatory frameworks governing the procurement of PPPs in the region have room for improvement in all areas, to increase the quality of the regulatory framework to match those in advanced economies. Preparation of PPPs appears to be the area where the region could focus its efforts to the improve regulatory frameworks for PPPs.

FIGURE 2.51: Benchmarking PPP Procurement Scores for Sub-Saharan African Countries, by Thematic Area



Source: Benchmarking PPP Procurement 2017.

Note: The following economies do not have a regulatory framework that explicitly mentions unsolicited proposals (unsolicited proposals are not regulated, and therefore not scored: Angola, the Democratic Republic of Congo, the Republic of Congo, and Togo (Concessions).

2.4 QUALITY OF INFRASTRUCTURE SPENDING

Introduction

Public investment (in infrastructure and services) is capable of crowding in private efforts and boosting inclusive growth. However, public investment also attracts political interest—often the kind that lowers efficiency. Inadequately designed, underfunded, long-delayed, or poorly implemented public projects have a negligible impact on real economic activity. This is a challenge for many developing countries, especially countries in Sub-Saharan Africa. Some countries lack the absorptive capacity to execute their limited investment budget; others fail to have a portfolio of "shovel-ready" projects to stimulate the economy (Rajaram et al. 2014).

In this context, the productivity of public capital is a hot issue of debate.[39] So far, the literature has argued that infrastructure contributes positively to real economic activity, but there is no consensus on the magnitude of this effect (Agénor 2011). Recent literature, by contrast, focuses on the quality of the spending. It suggests that economic production is the outcome of an effective stock of infrastructure at work—or what is called *economic public capital*.[40]

A recent study evaluates the long-run growth effects of surges in public investment (Warner 2014), and finds that the impact is limited due to poor institutions governing the lifecycle of infrastructure projects. In this context, enhancing the institutions and procedures associated with project appraisal, selection, and monitoring plays a key role in raising the quality of infrastructure spending. More efficient public investment can foster growth through several channels (IMF 2015): (a) reducing transaction costs for the private sector; (b) increasing the marginal productivity of private physical and human capital; (c) generating fiscal space through the provision of low-cost, better infrastructure services; and (d) releasing resources for growth-enhancing recurrent expenditure.

Closing efficiency gaps in public investment could significantly raise the public investment multiplier. For instance, a one-off increase in public investment of 1 percent of GDP will boost output by about 0.3 percent among countries in the lowest quartile of public investment efficiency. An analogous increase in public investment will raise output by 0.6 percent among countries in the highest quartile (IMF 2015). In other words, closing the efficiency gap between the top and bottom quartiles could double the impact of public investment on growth.

This section looks first at the quality of institutions governing public investment management systems (PIMs) as well as the transparency of procedures associated with the procurement cycles of public and PPP projects. Next, the section looks at the correlation of the soundness of public investment management and economic performance. Countries with sound PIMs tend to have greater growth and efficiency, higher private investment, and lower public investment. Finally, the section considers the relationship between PIMs and governance. Again, countries with sound PIMs tend to display strong levels of governance—that is, improved control of corruption, rule of law, and regulatory quality.

39 See Sturm, Kuper, and De Hann (1998) and Romp and De Hann (2007) for extensive surveys of the literature.

40 Efficiency can be constrained by political issues (Drazen 2000; Grossman and Helpman 2001; Persson and Tabellini 2000).

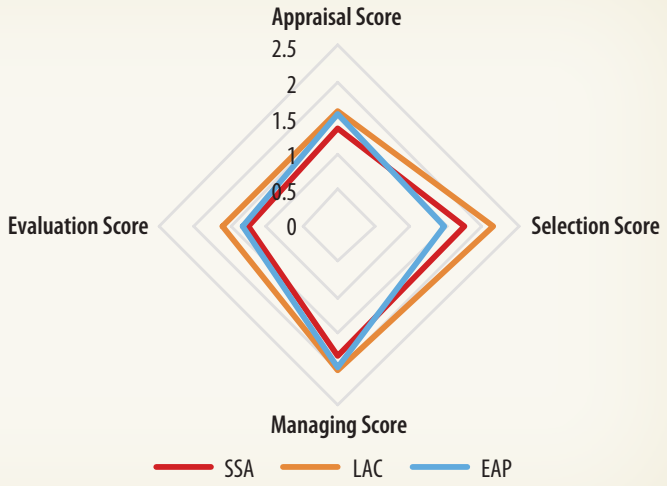
Public Investment Management

The efficiency of public investment is closely tied to the quality of institutions at the country and project levels. Rajaram et al. (2014) identify several institutional features that countries need to adopt to deliver growth-enhancing public investment. Their findings imply the need for the following: (a) implementation of a transparent and accountable system for guiding, appraising, reviewing, and selecting projects that will enhance inclusive growth; and (b) design mechanisms and procedures to implement, adjust, operate, and evaluate projects to optimize public service delivery. Weaknesses in any of these areas may lead to poor investment and lower growth.

Fostering development through public investment requires strengthening institutions for public investment management.[41] Dabla-Norris and associates (2012) constructed an index that evaluates the underlying institutional features of the Public Investment Management Index (PIMI), for 71 developing countries from 2007 to 2010 across four stages: project appraisal, selection, implementation, and evaluation. Scores for this index range from 1 to 4, with higher scores denoting better performance—that is, best (worst) performing PIMs are described by a score of 4 (1).

The region's overall score (1.53) lags behind that of East Asia (1.59) and Latin America (1.84).

FIGURE 2.52: Public Investment Management Index, by Region



Source: Dabla-Norris, Brumby, Kyobe, Mills, and Papageorgiou (2012)
Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; SSA = Sub-Saharan Africa.

Figure 2.52 displays the averages for the categories that comprise the overall PIMI score in three regions (Sub-Saharan Africa, Latin America and the Caribbean, and East Asia and the Pacific). The score for Sub-Saharan Africa (1.53) is behind those of East Asia and the Pacific (1.59) and Latin America and the Caribbean (1.84).[42] The score on project selection for Sub-Saharan Africa outperforms East Asia and the Pacific, but not Latin America and the Caribbean. Sub-Saharan Africa trails in the other three subcategories (project appraisal, managing, and evaluation). The performance of public investment management within the region varies by income level.[43] The highest average PIMI index is achieved by UMCs (2.07), followed by low-income countries (LICs) (1.45) and LMCs (1.33). Although LICs and UMCs have comparable scores in project managing, LICs are outperformed by the two other country groups in the areas of project appraisal and evaluation.

41 This implies enhanced practices of project appraisal, dealing with uncertainty, integration of procurement practices into project design and implementation, and managing the decision on PPPs.

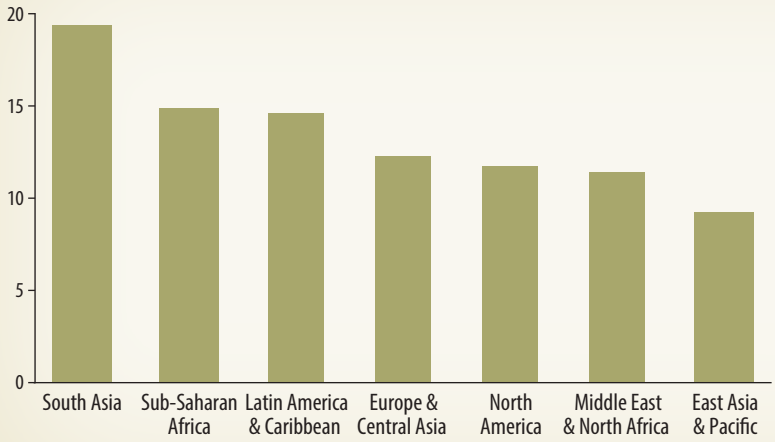
42 The Sub-Saharan Africa sample comprises 32 countries: Benin, Botswana, Burkina Faso, Burundi, Chad, the Republic Congo, Côte d'Ivoire, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Nigeria, São Tomé and Príncipe, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, and Zambia. This figure also includes 10 countries in Latin America and the Caribbean (Barbados, Belize, Bolivia, Brazil, Colombia, El Salvador, Haiti, Jamaica, Peru, and Trinidad and Tobago) and seven countries in East Asia and the Pacific (Cambodia, Indonesia, the Lao People's Democratic Republic, Mongolia, the Philippines, Solomon Islands, and Thailand).

43 Classifying countries in the region by income renders the following: 21 LICs (Benin, Burkina Faso, Burundi, Chad, the Republic of Congo, Ethiopia, The Gambia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mozambique, Rwanda, Senegal, Sierra Leone, Tanzania, Togo, Uganda, and Zambia), six LMCs (Côte d'Ivoire, Lesotho, Nigeria, São Tomé and Príncipe, Sudan, and Swaziland), and five UMCs (Botswana, Gabon, Mauritania, Namibia, and South Africa).

Public Procurement Practices

Delivering infrastructure may require that governments acquire goods, services, or works from the private sector. This process of acquisition is called *public procurement*, and involves a wide array of economic sectors. For instance, governments may rely on the private sector to supply goods and services to construct schools and hospitals, build a dam, or expand the road network Djankov, Saliola, and Islam 2016. Governments in developing countries are important players in the markets for goods and services. Figure 2.53 depicts the size of public procurement across world regions. South Asia has the highest share of public procurement in GDP (19.3 percent), followed by Sub-Saharan Africa (14.9 percent). For some countries in the region (for example, Eritrea and Angola), a considerable amount of development assistance goes through public procurement. Hence, the share of public procurement in Eritrea and Angola is 33 and 26 percent of GDP, respectively.

FIGURE 2.53: Public Procurement (% of GDP)



Source: Djankov, Saliola and Islam (2016).

South Asia has the highest share of public procurement in GDP, followed by Sub- Saharan Africa, reflecting in some cases the amount of development assistance that goes through public procurement.

In addition to the institutions governing public management systems, the efficiency of investment also relies on sound procurement practices and sound institutions governing the public and PPP project cycles (see PPPs in Sub-Saharan Africa, in section 2.3). Broadly, the enhancement of public procurement practices (such as transparency, equal treatment, open competition, and sound procedural management) may boost competition in the markets for government goods and services, and render benefits for consumers in the form of greater quality and lower prices. Furthermore, transparent procurement processes will help reduce corruption (World Bank 2016a).

This subsection benchmarks aspects of public procurement. The procurement lifecycle of infrastructure projects covers the following dimensions: (a) needs assessment, call for tender, and bid preparation; (b) bid submission phase; (c) bid opening, evaluation, and awarding phase; (d) content and management of the procurement contract; (e) performance guarantee; and (f) payment of suppliers. The rationale and areas covered in these six stages of the procurement process are described in World Bank (2016a).

Figure 2.54, panel a, benchmarks the stages of the procurement lifecycle of infrastructure projects by the public sector in Sub-Saharan Africa vis-à-vis other developing regions, namely, East Asia and the Pacific and Latin America and the Caribbean. Sub-Saharan Africa is outperformed by the other two regions in the initial stages of the procurement cycle—that is, needs assessment, call for tender, and bid preparation, as well as bid submission. Sub-Saharan Africa's score on performance guarantee is

comparable to that of Latin America and the Caribbean and outperforms that of East Asia and the Pacific. Looking at the income groups within Sub-Saharan Africa, LICs and LMCs have comparable scores in the stages of the procurement cycle, and tend to outperform UMCs in two areas: bid opening, evaluation, and award, and performance guarantee (figure 2.54, panel b).

East Asia and Latin America do better at the initial stages of the procurement cycle than Sub-Saharan Africa.

FIGURE 2.54: Benchmarking Public Procurement, and the Procurement Lifecycle

Source: World Bank (2016b).
Note: EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; SSA = Sub-Saharan Africa.

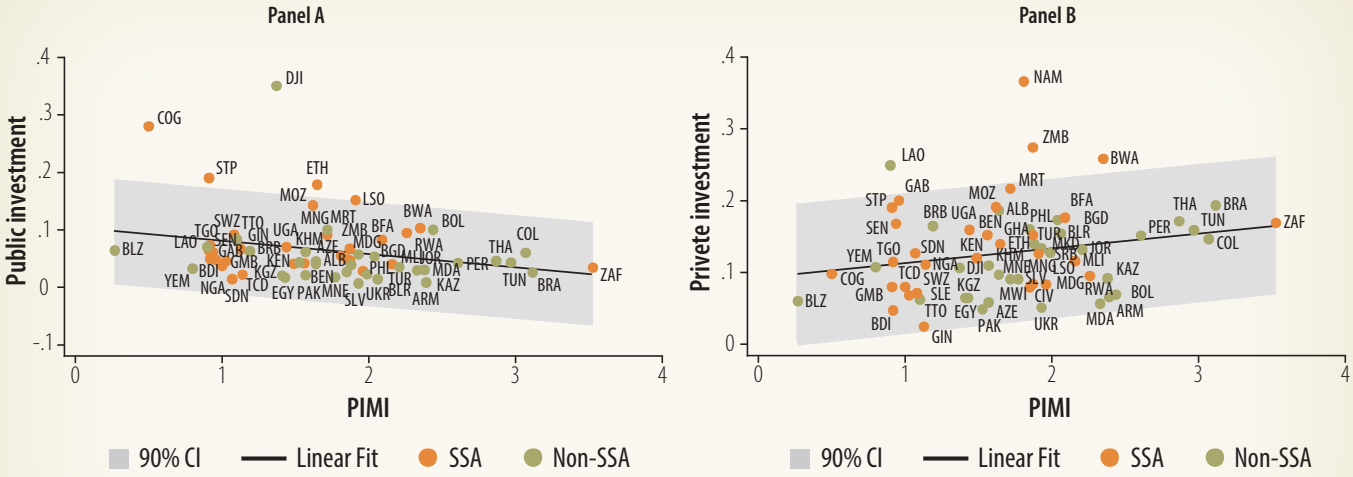
Public Investment Management and Economic Performance

Weak institutions tend to distort the effectiveness of public investment, thus limiting its impact on growth (Cavallo and Daude 2011). In other words, one dollar invested by the public sector in an economy with high levels of rent-seeking and corruption renders a smaller amount of public services compared with an economy with good institutions. This subsection looks at the association between the institutions governing public investment management (as proxied by the PIMI index) and economic performance, namely, growth per capita, investment (public and private), and efficiency of investment.

Plotting the overall PIMI index vis-à-vis growth per capita for a sample of countries across the world shows that there is a positive relationship between these two variables. That is, countries with stronger public investment management tend to have higher per capita growth rates. Some interesting findings emerge from investigating the relationship between the PIMI and public and private investment (figure 2.55). First, countries with stronger PIMs (higher values of the PIMI index) tend to have lower ratios of public investment to GDP (panel a) and higher ratios of private investment to GDP. Second, the lower public investment in countries with high PIMI values can be attributed to the improved efficiency of these investments. In this context, lower public investment may imply an improvement in public procurement and lower red tape and corruption, among others. For the PIMI level, several countries in the region have a ratio of public investment to GDP that is above the international norm (the Republic of Congo, Ethiopia, and Mozambique, among others). Third, having sound PIMs appears to attract private investment—as suggested by the positive association. Having transparent procurement rules and best practices in project appraisal, selection, implementation, and evaluation may help de-risk the country (as well as its

investment procedures). Finally, for the PIMI level, some countries in the region have a ratio of private investment to GDP that is above the international norm (Botswana, Namibia, and Zambia). The large countries in the region (South Africa and Nigeria) have ratios that are close to the international norm.

FIGURE 2.55: PIMI and Investment



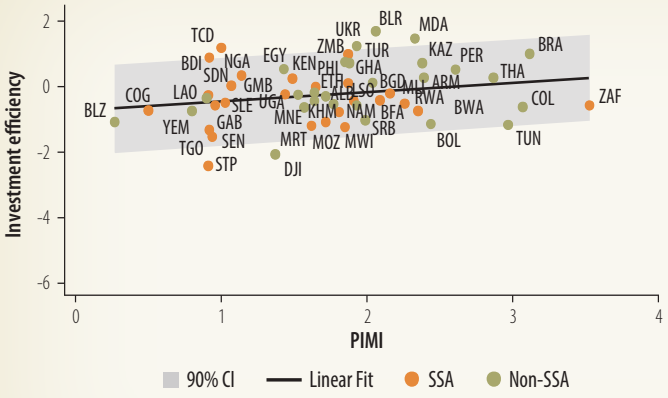
NOTE: PIMI corresponds to average of 2007–10 and public investment (I/Y) to 2014.
Regression line = 0.10 - 0.02x + ε, R-square (%): 6.06

NOTE: PIMI corresponds to average of 2007–10 and private investment (I/Y) to 2014.
Regression line = 0.09 + 0.02x + ε, R-square (%): 4.62

Source: World Bank (2016b).

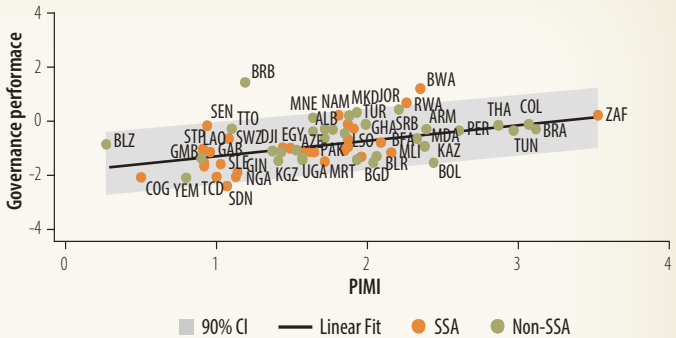
Figure 2.56 displays the relationship between the PIMI and what we call the efficiency of public investment.[44] There is a positive and significant relationship between public investment management and the efficiency of public investment. Interestingly, figures 2.55 and 2.56 show that countries with better PIMs tend to have lower but more efficient levels of public investment, and they tend to

FIGURE 2.56: PIMI and Efficiency of Public Investment



NOTE: PIMI corresponds to average of 2007–2010 and efficiency to average of 2010–13.
Efficiency variable: growth per capita/rate of investment.
Regression line = -0.74 + 0.28x + ε, R-square (%): 5.18

FIGURE 2.57: PIMI and Governance



NOTE: PIMI corresponds to average of 2007–10 and governance performance to regulatory quality, rule of law, and control of corruption, Governance indicator from the Worldwide Governance Indicators for 2014. Estimates range from approximately -2.5 (weak) to 2.5 (strong) governance performance.
Regression line = -1.70 + 0.52x + ε, R-square (%): 18.13

Source: World Bank (2016b).

44 This is a very broad measure computed as the ratio of growth per capita to the investment-GDP ratio —as suggested by King and Levine (1993).

crowd in private investment. However, relative to the international norm, some countries are clearly underperforming—which is the case of São Tomé and Príncipe, Senegal, Mozambique, and Malawi, among others.

Public Investment Management and Country Governance

The effectiveness of public investment requires not only having sound PIMs, but also having strong institutions at the country level. The latter will also have a positive impact on the cost of doing business and the ability of the government to crowd in private investment. The relationship between the PIMI index and selected governance indicators from Kaufmann, Kraay, and Mastruzzi 2010—regulatory quality, rule of law, control of corruption, and a synthetic indicator obtained from the first principal component of the three variables—is examined. An important message that emerges is that countries with sound PIMs tend to have strong institutions, as captured by our synthetic indicators of governance (figure 2.57). This finding also holds for the various components of the synthetic governance indicators. That is, countries with sound PIMs tend to have greater regulatory quality, improved rule of law, and better control of corruption. Another key message is that some countries in the region exhibit not only high PIMIs, but also high levels of country governance—for example, South Africa, Rwanda, and Botswana. Others show the opposite—for example, Sudan and the Republic of Congo are among the countries with low PIMIs and low levels of governance. This finding holds for all the components of the synthetic index.

ANNEX 2A: DATA CHALLENGES AND THE METHODOLOGICAL APPROACH FOR TAGGING EXPENDITURE ON INFRASTRUCTURE

Issues of data quality complicate the task of properly tagging capital expenditure on infrastructure, and constrain the range and quality of analytics. Some general considerations include the following:

(1) Only general government expenditures were included; that is, capital spending by state-owned enterprises (SOEs) was rarely captured. This has minimal impact on the overall amounts, given the limited role played by SOEs in the African context.

(2) Off-budget spending was also excluded from total amounts. In some countries, off-budget spending accounts for a significant share of total expenditure—although to a lesser degree for capital expenditures. Hence, total amounts are likely to be underestimated.

(3) Only information captured in treasury systems was included in the analysis. Foreign funded infrastructure spending kept off-budget is not included and might affect total spending—especially for high-aid countries.

(4) In some Francophone countries, budget classifications are not fully integrated with the chart of account. This makes it difficult to ensure seamless tracking of transactions covering a typical Engagement/Liquidation/Ordonnancement/Paiement (ELOP) expenditure chain.[45]

Additional country-specific caveats include the following:

- Actual data for 2015 were not available for a few countries at the time of writing this report; data for 2014 were used as proxy. This includes Burkina Faso, São Tomé and Príncipe, and Ethiopia.
- The fiscal year rarely coincides with the calendar year in several African countries. Therefore, 2015 refers to the fiscal year 2014/15.
- Several countries do not properly report sources of funding, especially distinguishing capital investments funded through foreign aid. Hence, they are excluded from the analysis of foreign versus domestic funding sources.
- Equatorial Guinea and Zimbabwe provided minimal information at the administrative and economic levels, which did not allow for proper identification of infrastructure spending. Hence, they were excluded from the analysis.
- Guinea-Bissau's treasury systems fail to capture execution amounts of capital expenditures; hence, only approved amounts were used in the analysis.
- Several Francophone African countries often accumulate spending by multiple ministries into one administrative unit (*"depense communes"*), which does not allow for proper functional identification. This was the case in Guinea and Mali. It potentially leads to underestimation of spending.
- Foreign funded capital expenditure was only available at the budget level for Togo, Benin, and Guinea. Other countries such as Uganda and Mauritania among others also presented some gaps. Hence, deviation analysis was only conducted for domestic funded levels.

45 For instance, Mali uses bridge tables to link accounting data with budgetary operations, effectively retrieving execution data from their systems that are fully consistent with budget nomenclature. Others, like Togo, Mauritania, and Niger, only present data at the committed and payment order stages but not actual payments.

ANNEX 2B: SUMMARY DESCRIPTION OF BOOST COUNTRIES

Country	Data availability	Project information	Functional/ program	% spending tagged at subnational level	Availability of foreign funded execution	Economic disaggregation	Additional comments
Angola	2009-2015	Yes	Three levels	18%	Execution data for on-budget aid reported in full	Highly disaggregated	
Benin	2009-2015	Not available	Two levels of functional	0%	Execution data for on-budget aid mostly not reported	Sufficient disaggregation	5% of total spending classified as "common charges"
Burkina Faso	2009-2013	Not available	Three levels	0%	Execution data largely under-reported	Sufficient disaggregation	Misclassification likely for electricity (execution reporting domestic and foreign together)
Burundi	2013-2015	Not available	Only basic administrative	Less than 1%	All source of funding classified as internal so unclear whether execution of foreign funds is included	Basic disaggregation	BOOST database is still incomplete, pending further data quality checks
Cameroon	2009-2015	Not available	Three levels of functional and program	17%	Execution data mostly reported	Sufficient disaggregation	Classification break in 2012
Equatorial Guinea	2009-2015	Not available	Not available	0%	No source of funding available to distinguish between domestic vs. foreign-funded execution	Basic disaggregation	Insufficient disaggregation for analysis
Ethiopia	2009-2014	Not available	Three levels	33%	Execution data reported in full	Highly disaggregated	
Guinea	2009-2014	Not available	One level	0%	All sources of funding classified as internal so unclear whether execution of foreign funds is included	Basic disaggregation	29% of total spending classified as "common charges"
Guinea-Bissau	2010-2015	Not available	Two levels of functional	0%	No identification of source of funding so unclear whether execution of foreign funds is included	Sufficient disaggregation	Amounts on capital expenditures mostly missing
Kenya	2009-2015	Yes	Three levels of programmatic	29%	Execution data reported in full from 2013 onward	Highly disaggregated	Classification break in 2012 following decentralziation
Lesotho	2010-2015	Yes	Two levels of program	0%	Execution data mostly reported with gaps	Highly disaggregated	Capital spending in water in 2015 could not be found
Liberia	2009-2012	Yes, but incomplete	Three levels of functional	0%	All source of funding classified as internal so unclear whether execution of foreign funds is included	Sufficient disaggregation	BOOST database is still incomplete, pending further data quality checks

Annex 2B continued

Country	Data availability	Project information	Functional/ program	% spending tagged at subnational level	Availability of foreign funded execution	Economic disaggregation	Additional comments
Mali	2009-2015	Yes	One level of functional	25%	Execution data mostly reported with exceptions in electricity	Sufficient disaggregation	11% of total spending classified as "common charges"
Mauritania	2009-2014	Yes	Only basic administrative	0%	Execution data for on-budget aid reported with gaps	Sufficient disaggregation	
Mozambique	2009-2015	Yes, but incomplete	Two levels of fucntional and program	33%	Execution data for on-budget aid reported in full	Highly disaggregated	Individual projects grouped together
Namibia	2009-2015	Not available	Two levels of functional	0%	No foreign assistance	Highly disaggregated	Only country to properly classify operational expenditure within capital budget
Niger	2009-2015	Yes	No functional	10%	Execution data mostly reported with exceptions in electricity	Highly disaggregated	
São Tomé and Príncipe	2009-2014	Yes	Two levels of program and functional	0%	Execution data reported in full	Highly disaggregated	
Senegal	2010-2015	Yes	Two levels of functional	0%	All sources of funding classified as internal so unclear whether execution of foreign funds is included	Sufficient disaggregation	
Sierra Leone	2011-2015	Not available	Three levels of functional	0%	No execution data reported	Sufficient disaggregation	BOOST database is still incomplete, pending further data quality checks
Tanzania	2009-2015	Yes	Three levels of functional	16%	Execution data for on-budget aid reported in full	Highly disaggregated	
Togo	2009-2015	Yes	Only basic administrative and sector	0%	Execution data mostly not reported	Sufficient disaggregation	
Uganda	2009-2015	Yes	Three levels of functional	15%	Execution data mostly captured with few exceptions (i.e., electricity)	Highly disaggregated	
Zimbabwe	2011-2015	Yes, but incomplete	One level of functional	0%	No identification of source of funding so unclear whether execution of foreign funds is included	Sufficient disaggregation	Insufficient disaggregation for analysis

Appendix

I. Country Classification by Resource Abundance in Sub-Saharan Africa

Resource-rich countries		Non-resource-rich countries	
Oil	Metals & minerals		
Angola	Botswana	Benin	Malawi
Chad	Congo, Democratic Republic	Burkina Faso	Mali
Congo, Republic	Guinea	Burundi	Mauritius
Equatorial Guinea	Liberia	Cabo Verde	Mozambique
Gabon	Mauritania	Cameroon	Rwanda
Nigeria	Namibia	Central African Republic	São Tomé and Príncipe
South Sudan	Niger	Comoros	Senegal
	Sierra Leone	Côte d'Ivoire	Seychelles
	Zambia	Eritrea	Somalia
		Ethiopia	South Africa
		Gambia, The	Sudan
		Ghana	Swaziland
		Guinea-Bissau	Tanzania
		Kenya	Togo
		Lesotho	Uganda
		Madagascar	Zimbabwe

Note: Resource-rich countries are those with rents from natural resources (excluding forests) that exceed 10 percent of GDP.

II. Country Classification by Income in Sub-Saharan Africa

Low-income countries (LICs)		Lower-middle-income countries (LMCs)	Upper-middle-income countries (UMCs)
Benin	Malawi	Cabo Verde	Angola
Burkina Faso	Mali	Cameroon	Botswana
Burundi	Mozambique	Congo, Republic	Equatorial Guinea
Central African Republic	Niger	Côte d'Ivoire	Gabon
Chad	Rwanda	Kenya	Mauritius
Comoros	Senegal	Ghana	Namibia
Congo, Democratic Republic	Sierra Leone	Lesotho	South Africa
Eritrea	Somalia	Mauritania	
Ethiopia	South Sudan	Nigeria	
Gambia, The	Tanzania	São Tomé and Príncipe	
Guinea	Togo	Sudan	
Guinea-Bissau	Uganda	Swaziland	
Liberia	Zimbabwe	Zambia	
Madagascar			

Note: The list is from the World Bank list of economies, March 2017.

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