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South Africa Economic Update

Focus on Green Growth

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Acknowledgments

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Foreword

The World Bank Office in South Africa is pleased to present the second South Africa Economic Update, this time focusing on the challenges and opportunities for securing "Green Growth." The topic is of special significance, particularly as South Africa prepares to host the next Convention of Parties (CoP-17) of the Climate Change meetings in Durban, November 28–December 9, 2011.

In keeping with the earlier format, section 1 takes a broad canvas approach and assesses the challenges and near-term prospects facing the South African economy. The expanding sovereign debt crisis in the Eurozone countries, uniformly sluggish growth globally including the downgrading of the U.S. sovereign debt rating by Standard and Poor's, the continuing economic slump in Japan, and an overall weakened outlook for the global economy—all are hitting South Africa in ways described in the update.

Section 2 takes a fresh look at "Green Growth" issues, in the context of South Africa's efforts to attain faster, more inclusive growth while pursuing a low-carbon growth trajectory.

The report discusses two crucial questions: How do "green" and "growth" hang together in practice? How will green environmental policies affect GDP growth, employment, and international competitiveness? The update's overarching finding is that policies to increase energy efficiency have substantial potential for green growth. A successful green growth policy will require South Africa to have solid, well-thought, and distinct policy agendas if it is to better pursue its growth and environmental objectives. While green policies can have large synergies and co-benefits with the growth and employment agendas, they are no substitute for it.

As always, we offer the update to spur discussion, generate debate, catalyze solutions, and contribute to sound policymaking informed by analytical evidence and research findings.

Ruth Kagia
Country Director for South Africa
The World Bank

Executive summary

The global financial roller coaster, with the Eurozone as its lead car, has hit economic prospects across the globe. The South African economy, with its close links to the world economy, has suffered, too, resulting in weakened growth prospects, lower fiscal revenues, lower and more volatile valuation of the rand, and dampened external financing. This further compounds the policy challenges facing the authorities, on top of their preoccupation with unyielding unemployment, which requires higher and more inclusive economic growth. Policymaking is also conditioned by a growing recognition that future growth needs to be less carbon-intensive. As elsewhere, opportunities in green economies are viewed with keen interest, as a way of simultaneously targeting a cleaner environment and stimulating innovation, growth, and job creation.

Green growth—Opportunities and challenges for South Africa

"Green growth" has become a subject of great interest for policymakers, private business, and civil society. While the term has no single definition, policy debates emphasize "win-win" outcomes—not only a better environment but also more jobs and faster output growth. This idea has resonated in South Africa, as it strives to boost economic growth, reduce very high unemployment, and address air pollution, high CO_2 emissions, and water scarcity. The country's *New Growth Path Framework* looks to greening the economy as a jobs driver for the future. The *Green Economy Accord* signed by the government and social partners in November 2011 lays out an ambitious and far-reaching agenda to build and grow the green economy.

The update's special focus section aims to contribute to the South African discussion on green growth at three levels. Its first part introduces the general idea of green growth, starting with a simple definition that emphasizes natural assets in the growth process, and then developing more concrete messages about this type of growth. A comprehensive discussion of all the natural assets and environmental problems relevant for green growth in South Africa would be far beyond the scope of this focus. So, the section's second part looks in more depth at one important element of the green growth agenda in South Africa—the challenges and opportunities associated with the country's transition to a low-carbon growth path. The emphasis is on its energy use patterns—noting briefly the range of other environmental problems that are also vital for the country.

A crucial question is how these two terms—"green" and "growth"—hang together in practice. How will green environmental policies affect GDP growth, employment, and international competitiveness? The focus section's third part takes up these questions, surveying the international cross-country evidence and relating these findings to the South African context, noting that well-designed policies are crucial for reaching outcomes that take advantage of synergies and reduce potential tradeoffs between the environment and the economy.

What is green growth?

"Green growth means fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies."[1] It spotlights natural assets in economic production and well-being.

Yet the price of scarce environmental resources fails to reflect the true social cost of their depletion, due to market failures. Consider the atmosphere as a sink for greenhouse gases, the depletion of shared water resources, and the loss of biodiversity. Such overuse is especially severe when natural systems can suddenly collapse if pushed beyond critical thresholds. Fuel subsidies and other policy distortions also reduce economic efficiency and environmental quality.

Given this background, we develop four more specific points about green growth.

First, a basic feature of green growth should be that choices are made and resources allocated in ways that fully reflect the social costs and benefits of using up scarce natural capital.

In practice this means that policies and institutions correct for the overuse of natural capital caused by market failures or preexisting policy distortions. By preventing socially inefficient overconsumption of natural capital, green growth is also a key to sustainability.

Second, to increase social welfare and well-being, faster economic growth should be combined with more—and more effective—environmental protection.

The relevance of this point for South Africa is apparent. The acceleration in economic growth to 6–7 percent proposed by the government is good for reducing unemployment and poverty, but it could also heighten stresses on the environment and natural capital. With natural capital under more stress, the social benefit from better preserving it is also increasing. This suggests that, to increase social welfare, faster growth should be accompanied by more environmental protection, not less.

Third, there is generally no single "silver bullet" that by itself will deliver both growth and environmental protection: it usually makes sense to use multiple policy instruments to pursue multiple policy objectives—in this case growth and the environment—targeting each objective with the instruments most suited to it.

Increasing growth will require finding the right mix of growth instruments that have worked internationally. Environmental policies have important synergies, or co-benefits, with the growth agenda, but they are no substitute for it. Similarly, high growth will not, by itself, be enough to cure environmental ills. That requires targeted environmental policies, the most important of which is to put a price on environmental "bads"—a price that reflects the social costs they inflict. South Africa is indeed making progress on some of these dimensions, reducing energy consumption subsidies, and seriously studying introduction of a carbon tax.

Fourth, there can be important synergies or co-benefits between growth and the environment, and these are likely to be mutually enhancing and larger when policies to accomplish growth and environment objectives are well coordinated.

Consider examples of synergies from environmental protection to growth. Taxes on pollution raise fiscal revenues that can be used to cut growth- or job-inhibiting taxes on capital or labor, or to make growth-enhancing public goods investments. Less pollution and greater access to clean water improve health and labor productivity, which can improve employment if other conditions are conducive. Now consider synergies from growth to the environment. South Africa's trade policies are oriented toward protecting capital- and energy-intensive sectors, so reforms here would not only boost economic efficiency and jobs, they would also curb greenhouse gas emissions. Several constraints—notably skill shortages, current labor market institutions, crime, and poor access to electricity and finance—curb the formation of small and medium enterprises (SMEs) in South Africa, otherwise a major source of employment in other middle and high income economies. Environmental policies to promote energy efficiency would be more effective if new SMEs can form more easily in the energy-efficiency sectors (retrofitting residential buildings and so on).

"Greening" energy use in South Africa: possibilities and challenges

South Africa is the world's 11th largest emitter of CO_2 from energy consumption. It is also in the upper quartile of countries on CO_2 emissions per capita and per unit of real GDP. The level and growth of CO_2 emissions has three key drivers:

- Economic activity, measured by real GDP.
- Energy intensity of GDP (a measure of energy efficiency).
- Carbon intensity of energy consumption, driven by the proportion of fossil fuels in the country's primary energy mix, measured by the ratio of CO_2 emissions to energy consumption.

The 2000s saw an acceleration in the growth of South Africa's CO_2 emissions, primarily the result of an acceleration in GDP growth, only partly offset by reductions in the energy intensity of GDP and the carbon intensity of energy. Compared with other middle-income countries, South Africa's energy intensity and carbon intensity of energy are also higher, while rates of improvement have been relatively modest.

Nevertheless, in recent years, South Africa has stated its ambition to act responsibly to mitigate climate change. In its Copenhagen Pledge it proposes reducing CO_2 emissions 34 percent below "business as usual" emissions by 2020, depending on adequate international support in terms of financing, technology development, and technology transfer. If the economy continues to grow at around 4 percent, the target would require reductions in the energy intensity of GDP of around 30 percent, roughly tripling the pace of South Africa's energy-efficiency improvement. Ambitious, this could be feasible, since about a quarter of countries have achieved it. The target would also require a cut of around 20 percent in the carbon intensity of energy supply through a rapid shift in fuel sources from coal to some combination of renewables, nuclear, and natural gas. Few countries have achieved such a rapid cut.

Noting these challenges and the current realities of international climate mitigation policy, the *National Development Plan: Vision 2030*[3] realistically observes that: "it will be challenging to honor the commitment to reduce South Africa's emissions without compromising the overriding priorities to create jobs, address poverty, improve public health and grow an internationally competitive economy, without substantial international assistance. However, it is in the country's best interest that an absolute global emissions constraint is put into effect sooner rather than later."[2]

The current energy situation: a closer look

Does South Africa's high economywide energy intensity primarily reflect high energy intensity (low energy efficiency) in particular sectors or the overall composition of economic output? Although the broad sectoral composition of South Africa's GDP is similar to that in a number of middle- and high-income countries, the energy intensity of the broad industry, transport, and other sectors is significantly higher than most comparators. This is good news in the sense that South Africa may have the opportunity to learn more readily from the policies and technological solutions applied in other countries to reduce its own energy intensity.

Almost 70 percent of South Africa's energy supply comes from coal, either directly or through coal-fired electricity. The next section discusses the significant uncertainties, challenges, and opportunities in managing a transition to a low-carbon energy supply.

Green energy policies

The recent Integrated Resource Plan (IRP) for energy sector development over 2010–30[4] and the *National Development Plan: Vision for 2030* clearly articulate the multiple energy challenges that South Africa must address to achieve its goals for economically, environmentally, and socially sustainable development.

Among the country's key objectives are averting the risk of power shortages in the near term while increasing energy supply and efficiency to support the needs of a growing economy in the longer term; ensuring affordable energy to support inclusive development; addressing local environmental threats related to energy use, notably those related to air pollution and human health; and shouldering an appropriate share of future responsibility for the long-term global challenge of

restricting emissions of CO_2 and other greenhouse gases.

A key element in meeting these objectives is to ensure that energy prices reflect the true social costs of energy use and that opportunities for energy efficiency are being increasingly exploited. Here, South Africa is making significant progress. Ongoing electricity tariff increases are unwinding very significant de facto subsidies inherited from history. The country is also conducting an in-depth discussion on a carbon tax, a type of pollution pricing policy that both theory and experience indicate as efficient in providing broad incentives to mitigate carbon emissions from energy use. Several recent government white papers provide a careful evaluation of the economic, fiscal, environmental, and distributional implications, together with the practical challenges of implementation. While ongoing pricing reforms will provide a powerful impetus for improved energy efficiency, there are good arguments for well-targeted energy-efficiency standards to overcome institutional and informational barriers that can limit the effectiveness of price-based incentives. The country's National Energy Efficiency Strategy contains standards, aimed especially at industrial energy efficiency.

In addition, the new IRP plans to add almost 30 GW of new generation capacity by 2030 and to complete roughly 10 GW of new coal-fired capacity already in the pipeline. Longer term options include deploying substantial new nuclear capacity (almost 10 GW), more than 20 GW of renewable energy capacity, expanded regional agreements to import more hydroelectric power, and increased substitution of unconventional and imported natural gas for coal. In November 2011, South Africa and the World Bank signed an agreement for a $250 million loan to construct large on-grid wind and solar thermal power plants, each of 100 MW.

Plans as large and ambitious as the *Green Economy Accord* and IRP inherently face various uncertainties. The prospect of large, long-lived power generation investments means that there is an advantage to plans that provide flexibility on the timing and size of total investment outlays. The ambitious nearer term renewable energy investments and energy efficiency measures envisaged in the IRP and the Accord reflect strong emphasis on capturing early "learning by doing" gains that are expected to result in new opportunities for employment, skills development, and domestic business growth. These actions also can provide a hedge against fossil-fuel price increases, and they make it possible to build fewer carbon-intensive coal-fired plants to meet growing demand, thus avoiding increased longer term CO_2 emissions. At the same time, it will be important to monitor how the unit investment costs of different renewable energy technologies decline over time to optimize longer term investment budgeting. Planned investment in nuclear power post-2020 also provides a useful hedge against unexpected increases in the costs of other sources and an element of flexibility in the path by which carbon intensity is reduced. Another attractive possibility is the prospect of plentiful and inexpensive natural gas becoming available as a bridge fuel for power generation and vehicles.

Economic growth, jobs, and international competitiveness

What does greening imply for growth?

The traditional view is that a greener environment has an economic cost, but that well-designed policies can keep the cost relatively small (also taking into account the ambitiousness of the objective). This is consistent with a considerable body of work analyzing the potential impact of a carbon tax on the South African economy: emissions mitigation will have some economic costs, but these can be limited by using efficient instruments, such as a carbon tax, and by recycling revenues to reduce other distorting taxes.

More recently the traditional view of tradeoffs between environmental protection and growth has been challenged by the Porter Hypothesis.[5] A "weak" version of the Porter Hypothesis says that well-designed environmental instruments, such as pollution pricing, are likely to stimulate firms to innovate. A stronger version is that this induced innovation by firms can overcome the added costs of regulation and thus increase firm productivity and business performance. On a large enough

scale, then, this "strong" Porter effect could boost output and growth as a result of green regulation. Empirical research on the Porter hypothesis finds a good deal of evidence for the weak version—in other words, for a positive relationship between environmental regulation and firm innovation. By contrast, there is little evidence for the strong version of the Porter Hypothesis of an increase in overall output and growth, though a few recent studies find some support for it.

Given the mixed empirical evidence, it would probably be prudent not to count on environmental regulation by itself having major positive effects on economywide business performance and growth, at least in the near term. But green policies do significantly improve human well-being directly, through better environmental protection, and, as noted above, can have significant synergies with growth, especially when coordinated with a well-designed package of policies directly targeted at raising growth.

What does greening imply for jobs?

We look at three sets of questions to help evaluate the potential for green jobs and the implications for the overall employment picture in South Africa.

First, what are the main factors holding back job creation in South Africa? The Organisation for Economic Co-operation and Development's 2010 Economic Survey for South Africa estimates that much of the country's unemployment is *structural,* and that little can be attributed to cyclical factors. The main reasons are that trend growth has been too low to absorb the growing labor force; growth has become less unskilled labor intensive due to structural change and skill-biased technical change; labor market institutions have created a dualistic "insider-outsider" labor market with incomplete adjustment to fundamental shifts in demand and supply; and deficiencies in education and training contribute to skill mismatches.

Second, what does cross-country experience tell us about the job potential of green growth? This is less well researched, but we note some of the emerging issues and findings. Many studies look at the direct employment effects of expanding a given green sector. However, to the extent that energy demand is increasingly met from renewable energy sources, there will also be a contraction of output and jobs in traditional fossil-fuel related sectors. So, at a minimum, the net employment effect must be considered. There is some evidence that direct job effects of energy efficiency are higher than in fossil-fuel sectors and perhaps, to a modest extent, in some renewable sectors.

One also needs to consider broader economic effects outside the energy sector. Renewable energy sources may also have higher capital requirements per unit of output, as well as shorter plant lives and more intermittent energy production—all contributing to the higher cost of renewables today. The impact of these features on the broader macroeconomy also needs to be taken into account, including the impact on jobs—say, through the adverse impact of increases in electricity costs on output and jobs in downstream electricity-consuming sectors. These issues are less important for energy efficiency, where capital costs are lower and many options are already commercially profitable.

Third, what are the broader employment implications of green growth in South Africa, and what broader complementary reforms would help increase the jobs potential of green growth? As noted, there is little evidence so far that green policies could significantly boost growth. But there is every reason to think green job creation would be increasingly buoyant for policies that directly target fast growth, particularly if greater productivity allows South African firms to become more internationally competitive producers of green technologies and products.

For labor intensity, energy efficiency is the most promising direction for increasing unskilled labor demand, while the capital-intensive renewable sector will make bigger demands on skilled labor. Clearly, green policies are not designed and cannot be expected to address institutional issues in the labor market. A more promising approach is to ask what complementary reforms would foster more vigorous SME development, thus increasing the job impact of green policies.

Green policies are no substitute for structural reforms. Both are needed. Indeed, the

success of green policies will depend on such reforms to improve growth and employment.

Green growth and international trade

Carbon emissions. South Africa's relatively high carbon emissions are linked in part to its being a net exporter of embodied carbon emissions. Its carbon consumption is estimated to be around 40 percent lower than its production, the balance being net exports, mostly to developed countries, which tend to consume more carbon than they produce. This creates a risk for South Africa. Looking forward, when developed countries decide to adopt significant carbon pricing to curb their own emissions, they may consider taxing the carbon content of imports from countries that have not yet adopted carbon pricing—to level the playing field. South Africa could face among the largest tariff hikes as a result of these "border tax adjustments." But the country could reduce this risk if it introduces some form of carbon pricing of its own.

Environmental goods. Many developing countries are interested in stimulating domestic growth and employment by becoming net exporters of environmental goods and services. Under the broadest definition, environmental goods (EGs) are not an especially fast-growing component of world trade, their share of world trade having remained roughly constant in the 29–30 percent range since 2002, if with fast-growing segments within the total.

South Africa's EG exports have about a 0.5 percent share in the world market for EGs, a little less than a roughly 0.7 percent share in total world trade, so its revealed comparative advantage (RCA) index for EGs is much less than one. But at a more detailed level, it is greater than 1 in several categories. Of these, a significant number have to do with autos and auto components, whose exports have been promoted under the country's Motor Industry Development Program, which has provided various financial supports. Thus strong RCAs in some of these categories may be misleading about underlying competitive strengths. But South Africa also shows RCAs greater than 1 in other industrial and electrical machinery—for example, centrifuges, electrical motors, generators, furnaces, meters, surveying instruments, and similar products with dual uses. The category for photosensitive semiconductors (including those for solar panels) has an RCA of 0.97, quite close to 1.

Trade policy and the environment. South Africa's average most-favored-nation applied tariff rate on imports of EGs is 3.6 percent, less than half the 7.8 percent it levies on merchandise imports overall. This should be favorable for green growth because South African firms are, broadly speaking, able to buy environmental inputs and technologies from the most competitive international producers, with low tariff costs. Another channel for trade policy to hamper green growth is if trade barriers provide particularly strong protection for sectors that destroy natural capital, as with particularly energy-intensive sectors. Here, it is notable that, after a burst of tariff liberalization in the 1990s, the tariff structure has become more complex, and South Africa has emerged as one of the world's most prolific users of antidumping provisions. Many such provisions protect heavy upstream industries, which are also intensive energy users. So trade policy may be protecting and expanding South Africa's energy-intensive sectors.

Given South Africa's well-developed industrial base and its existing RCAs in various industrial and electrical machinery categories, the country may have the potential to expand its current relatively low share in world EG markets. Such prospects must be linked to the overall productivity and competitiveness of the South African economy, depending on broad macroeconomic factors, such as the real exchange rate, and on structural factors, such as trade policies, infrastructure, logistics, the investment climate, and labor market characteristics. South Africa clearly has significant challenges, as indicated by its declining share of world trade in the last several decades.

Conclusions

For energy consumption and carbon emissions, policies to increase energy efficiency have significant green-growth potential by their ability to improve economic efficiency and reduce the environmental impacts of energy use.

Correcting energy price subsidies and putting a price on carbon emissions is a key element in reaping the joint economic and environmental benefits from improved energy efficiency. Trade policy reforms that reduce protection for energy- and capital-intensive sectors would be good for both jobs and energy efficiency. There is some evidence that energy-efficiency improvements have a fairly high employment content, the impact of which could be increased in South Africa through improvements in the investment climate, stronger education and skills training, and labor market reforms that promote smaller enterprises.

Long-term decarbonization of South Africa's economy will require substantial changes in the composition of energy use, moving from coal to low-carbon resources. The Integrated Resource Plan lays out an ambitious agenda to increase power generating capacity by 2030—drawing on a broad array of options, including expansion of solar and wind power, nuclear, hydro (through regional cooperation) and natural gas, as well as new coal-fired capacity. The potential irreversibilities associated with long-lived power generation investments mean that there is an advantage to plans that retain flexibility for the timing and size of outlays, based on close monitoring and constant evaluation of factors such as demand trends, the evolving relative costs of different energy technologies, and the implications for domestic growth and employment.

While green policies can have large synergies and co-benefits with the growth and employment agenda, they are not a substitute for it. Indeed, such synergies are likely to be mutually enhancing and larger when the growth and environment objectives are being pursued by multiple, well-targeted and coordinated policies.

SECTION I

Recent economic developments and prospects

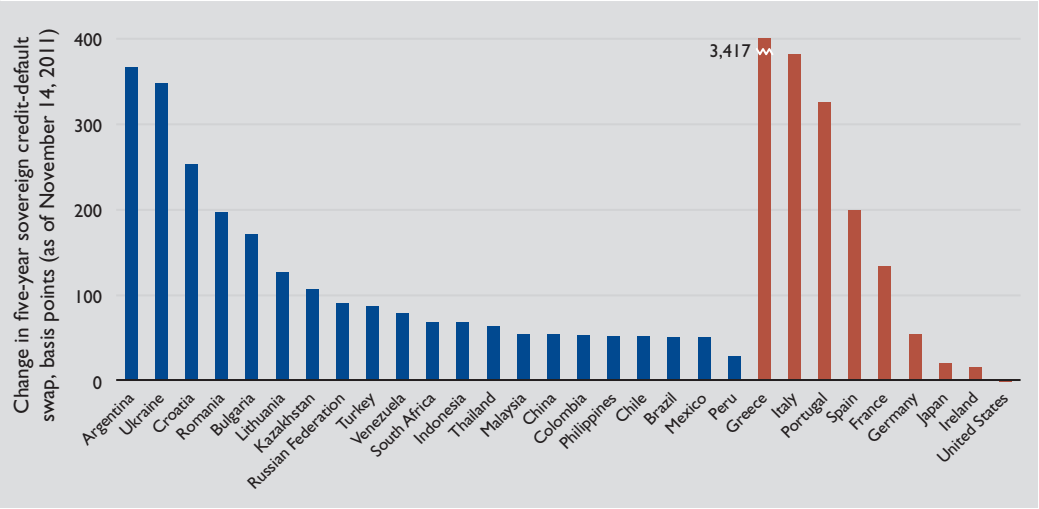
Global trends: contagion from the European debt crisis[6]

The global economic recovery, proceeding until July 2011, has once again hit a massive road bump, this time a debt crisis in Europe.[7] Exacerbated by downbeat news from the United States, the downgrading of its sovereign debt by Standard and Poor's, and the continuing economic slump in Japan, this has rattled financial markets and considerably weakened the outlook for the global economy. Worryingly, a consensus among policymakers (particularly in Europe and the United States) appears difficult to achieve, despite the worsening financial risks.

Spreading contagion

Unlike prior phases of uncertainty in the Eurozone, the current episode features substantial contagion, with risks spreading to hitherto unaffected Eurozone countries and farther afield to Japan and emerging market economies, including South Africa. An agreed reduction of Greece's private sector debt seems imminent, and pressures on debt from Italy, Portugal, and Spain remain intense. Since the beginning of July, spreads on sovereign credit default swaps (CDSs) have shot up in France (130 basis points), Germany (52), and notably Italy (381; figure 1.1). The contagion has moved to European commercial banks holding

Figure 1.1 **Contagion has increased sovereign credit default swap rates worldwide**



Note: Change since the beginning of July 2011.
Source: Bloomberg data and World Bank DEC Prospects Group.

substantial quantities of risky sovereign debt. Their CDS spreads having risen by 131 basis points since the beginning of July, prompting widespread rating downgrades for French and Italian commercial banks.

Post-July uncertainty clouds the global outlook

Large equity losses (figure 1.2), increasing doubt about policy, and plummeting consumer and business confidence cloud the near-term outlook. In August alone, the world's stock capitalization declined about $7.6 trillion (12.4 percent of global GDP), and $15 billion was withdrawn from emerging market equity mutual funds, the largest withdrawal since 2008.[8] Even in a benign scenario, investment in high-income and developing countries is now projected to be weaker, and consumer savings higher. Global GDP growth is projected to slow to 2.7 percent in 2011 from earlier forecasts of 3.2 percent (World Bank 2011b), with 0.6 percentage points shaved from the 2012 forecast and another 0.3 percentage points from the 2013 forecast. Most of the current downward revision to growth is concentrated among high-income OECD countries. Developing country growth has been marked down to 6.1 percent, from 6.3 percent in June (table 1.1).

These revised baseline projections are subject to heightened downside risk. Prospects will depend on how firms and households react to financial market volatility, wealth losses, labor markets, and uncertainty. Global purchasing manager surveys suggest weakening prospects since August. Depending on how serious the confidence effects are, growth for high-income countries in 2012 could range between 1.2 and 2.2 percent (at market exchange rates), and for developing countries, between 4.8 and 6 percent.[9]

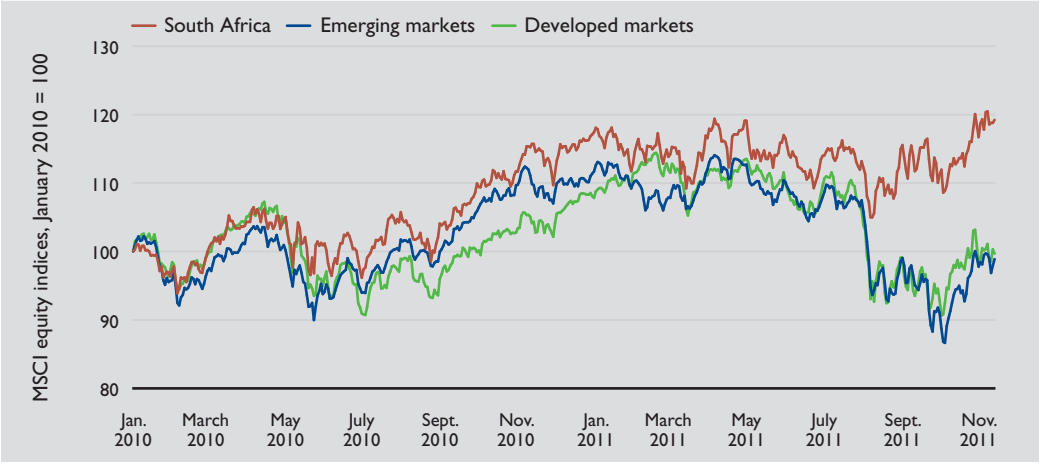
Developing countries are more vulnerable to slowdown than before

Developing countries are more vulnerable to an unfavorable outturn than they were in 2007. Although their fiscal positions are healthier than those of high-income countries, they have less fiscal space than before. Following discretionary fiscal measures and automatic stabilizers in 2008 and 2009, more than 40 percent of developing countries carried fiscal deficits above 4 percent of GDP in 2010. In a slower growth scenario, developing countries will face declining revenues and may be forced to cut spending and get squeezed out of capital markets. There may be scope for monetary easing in countries that have tightened policy sharply (Brazil), but elsewhere low (even negative) real interest rates and inflationary pressures limit the scope for further interest rate cuts.

Commodity prices have stabilized or are falling

Commodity prices, after the runup of 2010 and early 2011, have either stabilized or are falling (figure 1.3). This is mixed news for producers of internationally traded commodities, but all countries will benefit from the step-down in inflation already in evidence. Since August,

Figure 1.2 **Post-July turmoil leads to equity market declines in both developed and emerging markets**



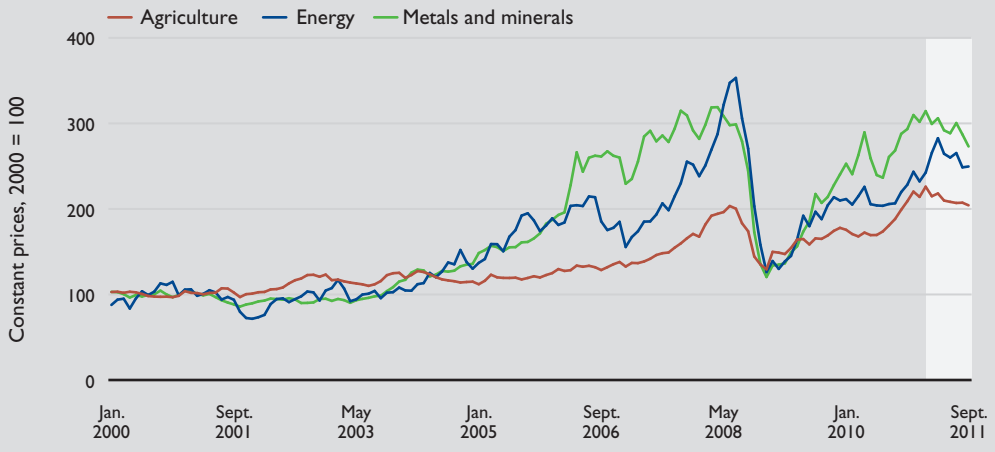
Source: Bloomberg data.

Table 1.1 The global outlook in summary

Indicator	2008	2009	2010	2011f	2012f	2013f
Global conditions						
World trade volume (GNFS)	3.0	−10.6	12.4	6.9	6.8	7.7
Consumer prices						
G-7 countries[a,b]	3.1	−0.2	1.2	2.2	1.8	1.6
Commodity prices (US$ terms)						
Nonoil commodities	18.3	−24.1	27.6	20.7	−12.0	9.4
Oil price ($ per barrel)[c]	97.0	61.8	79.0	103.0	94.7	92.5
Oil price (percent change)	36.4	−36.3	28.0	30.4	−8.1	−2.4
Manufactures unit export value[d]	7.8	−6.5	5.0	11.2	1.2	0.6
Interest rates						
$, 6-month (percent)	3.2	1.2	0.5	0.4	0.4	0.9
€, 6-month (percent)	4.8	1.5	1.0	1.5	1.4	1.6
Real GDP growth[e]						
World	1.4	−2.4	4.0	2.7	2.8	3.3
Memo item: world (PPP weights)[f]	2.6	−1.0	4.9	3.8	4.1	4.3
High income	0.1	−3.8	2.9	1.6	1.8	2.2
OECD countries	0.0	−3.8	2.8	1.5	1.7	2.1
Euro area	0.3	−4.2	1.7	1.6	0.8	1.6
Non-OECD countries	2.7	−1.5	7.2	4.5	3.3	4.3
Developing countries	5.8	1.9	7.3	6.1	5.7	6.2
South Africa	3.7	−1.8	2.8	3.2	3.1	3.7
Memorandum items						
Developing countries						
Excluding transition countries	5.9	3.2	7.8	6.3	5.9	6.4
Excluding China and India	4.3	−1.7	5.5	4.4	3.9	4.5

ppp = purchasing power parity; f = forecast
a. Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.
b. In local currency, aggregated using 2005 GDP weights.
c. Simple average of Dubai, Brent, and West Texas Intermediate.
d. Unit value index of manufactured exports from major economies, expressed in US$.
e. Aggregate growth rates calculated using constant 2005 dollars GDP weights.
f. Calculated using 2005 PPP weights.
Source: World Bank DEC Prospects Group.

Figure 1.3 Commodity prices have declined from earlier peaks in 2011



Source: Datastream and World Bank DEC Prospects Group.

the World Bank's crude oil price index has fallen 6.9 percent. Although food prices are turning down, risks of higher grain prices persist, evidenced in low maize stocks. Prices of metals and minerals, of special interest to South Africa, fell a cumulative 9.3 percent in August and September, and 13.1 percent from their 2011 peak in February. Recognize, however, that despite the recent decline, the average year-to-date metal and mineral prices are 19.6 percent higher than in 2010.

Recent trends in South Africa: economic recovery falters

Economic recovery, which showed encouraging signs of firming until 2011q1, has since been faltering. GDP growth slowed down markedly to 1.3 percent (q/q, seasonally adjusted and annualized) in 2011q2 from 4.5 percent in the first quarter (table 1.2). The main contributor to that sharp slowdown was manufacturing, whose growth slumped from 14.5 percent (q/q, s.a.a.) to –7.0 percent from the first quarter to the second. The sectoral patterns of growth were otherwise similar in the first two quarters of the year; mining and agriculture declined further while construction remained flat and each of the services subsectors grew. Manufacturing and agriculture are the only two major sectors below the precrisis peaks.

Momentum in the mining sector continued to deteriorate in 2011q3, as output fell on y/y basis in each of the three months. The manufacturing sector, on the other hand, slipped further in July but then returned to positive growth in August and September, following the cessation of widespread industrial action and resumption of more regular supply of intermediate goods from Japan. The Kagiso manufacturing purchasing managers index (PMI) rose above the threshold of 50 in September and October, indicating mild expansion. But these incipient signs of rebound are likely to be marred by the ripple effects of the global crisis. The 0.9 point decline in the SACCI business confidence index (BCI) in October and 9.0 point decline in the RMB/BER BCI in 2011q3 may be early signs of that.

On the expenditure side, the mild recovery in private investment has been concentrated in extractive activities (table 1.3), responding to favorable commodity prices in 2010 and the first half of 2011. Excess capacity in manufacturing is likely to constrain investment and hiring decisions in the short to medium run.[10] Moderation in consumption expenditure in 2011q2 is likely to continue in the short run, as reflected in a decline in the FNB/BER consumer confidence index in 2011q3.

Labor markets trends: high persistence in employment status

The most damaging aspect of the post-2008 economic slowdown has been its impact on unemployment (figure 1.4). The unemployment rate, already extremely high at 21.9 percent

Table 1.2 GDP growth by main sectors (value added), 2007–11q2 (percent)

Sector	2007	2008	2009	2010	2010q2	2010q3	2010q4	2011q1	2011q2
Primary	0.6	–0.1	–3.9	4.3	–15.0	28.3	15.8	–3.9	–5.2
Agriculture	2.7	16.1	–3.0	0.9	13.6	16.3	12.5	–4.0	–4.2
Mining	0.0	–5.6	–4.2	5.8	–24.5	33.7	17.1	–4.0	–4.2
Secondary	6.2	3.0	–7.1	4.1	4.3	–3.8	3.6	11.1	–5.2
Manufacturing	5.2	2.6	–10.4	5.0	5.7	–4.9	4.1	14.5	–7.0
Electricity	3.4	–3.1	–1.6	2.0	–1.7	–2.2	5.6	3.3	0.9
Construction	15.0	9.5	7.4	1.5	1.0	0.8	0.2	0.0	0.5
Tertiary	6.1	4.5	0.7	2.2	4.6	2.0	3.5	3.7	4.0
Wholesale and retail	5.3	0.8	–2.5	2.2	6.0	3.3	3.5	4.4	4.1
Transport	6.6	3.4	0.6	2.9	4.5	3.0	4.2	3.6	4.1
Finance	7.9	7.3	0.9	1.9	4.0	1.4	1.7	4.8	2.9
Government services	4.0	4.5	4.1	3.0	4.6	0.5	5.7	1.8	5.7
Personal services	5.6	3.9	–0.3	0.6	3.6	3.1	3.3	2.7	2.8
GDP growth	5.6	3.6	–1.7	2.8	2.8	2.7	4.5	4.5	1.3

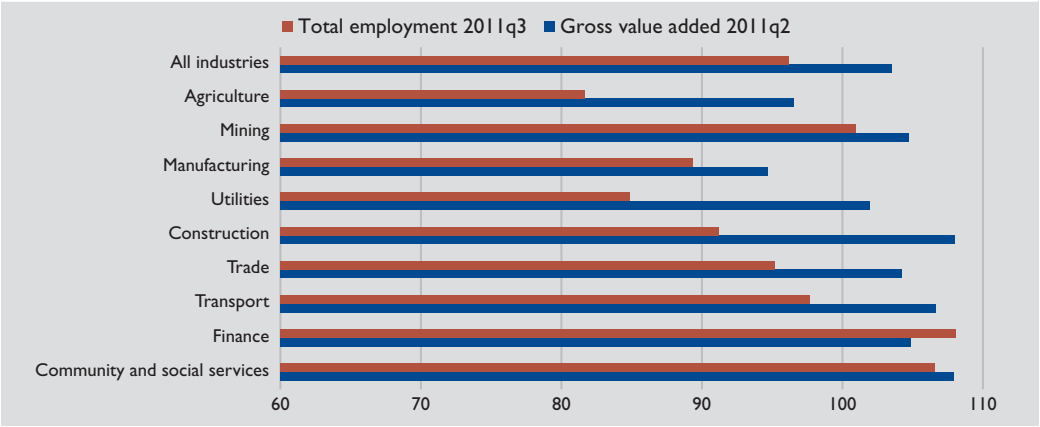
Source: Statistics South Africa.

Table 1.3 Gross domestic expenditure growth by component, 2007–11q2 (percent)

Component	2007	2008	2009	2010	2010q2	2010q3	2010q4	2011q1	2011q2
Total final consumption									
Household	5.5	2.2	–2.0	4.4	4.4	5.7	4.8	5.2	3.8
Durables	1.9	–9.4	–9.6	24.0	45.4	13.4	5.0	21.5	12.5
Semidurables	11.3	4.2	–1.8	6.5	9.8	–4.8	4.6	8.6	8.8
Nondurables	5.0	0.8	–2.7	2.1	–2.3	2.9	0.2	3.4	3.6
Government	4.1	4.7	4.8	4.6	7.1	–0.8	3.9	9.5	–0.1
Gross fixed capital formation	14.0	14.1	–2.2	–3.7	1.2	1.0	1.5	3.1	4.1
Private	8.9	9.2	–8.9	–4.4	2.2	2.0	1.6	2.7	4.0
Government	22.2	16.1	–4.0	–10.9	–5.3	–3.0	–1.9	–0.5	3.8
Public corporations	34.8	36.2	26.1	3.5	2.9	0.7	3.3	6.6	4.4
Change in inventories (R billions)	19.8	–12.4	–34.5	–3.8	–7.6	–0.9	1.1	9.3	5.6
Gross domestic expenditure	6.3	3.4	–1.7	4.2	3.2	6.6	2.4	7.9	1.3

Source: Statistics South Africa.

Figure 1.4 Output and employment, by industry (2008q3 = 100 for GVA and 2008q4 = 100 for total employment)



Source: Statistics South Africa, Quarterly Labor Force Survey 2011q3, and staff calculations.

in 2008q4, has since risen to 25 percent. This translates into a loss of more than half a million jobs since 2008, even though real GDP has exceeded its precrisis peak since 2010q2. And more than 1 million people have joined the ranks of discouraged workers since 2008. The unemployment rate broadly defined (including discouraged workers) has increased from 26.7 percent in 2008q4 to 33.3 percent latest. A confluence of structural factors, supply and demand side, has contributed to South Africa's exceptionally high unemployment (see section 2).

Results from the 2011q3 Labor Force Survey are slightly more encouraging; with the unemployment rate falling from 25.7 percent (a postcrisis peak) to 25 percent, on the back of close to 240,000 jobs added in the nonagricultural formal sector. The number of discouraged workers did not increase q/q for the second consecutive quarter. Moreover, job creation was broad-based, with significant additions in agriculture, mining, construction, domestic trade, and finance. But the manufacturing sector, one of the hardest hit since the crisis, saw no visible change. In an especially worrying sign, the employment component of Kagiso's manufacturing PMI remains well below the neutral 50 point mark, indicating dim prospects for job creation in the sector.

The aggregate unemployment figures do not reveal individual transitions in the labor market status. To elicit that, tables 1.4 and 1.5 present the six-month labor market transition matrices for the working-age population (15–64) and youths (15–24).[11] These are

computed using nationally representative panel data from the Quarterly Labor Force Surveys for 2011q2 and 2010q4. The diagonal elements in the tables indicate the probability of staying in the same employment status in 2011q2 as in 2010q4, and the nondiagonal elements, that of moving from one employment status to another one.

Highlights include:

- Young workers (15–24) are less likely to retain a job than older workers. There was a high persistence in the status of those employed: 91 percent of those employed in the formal sector and 72 percent of those in the informal sector retained that position after six months. The persistence for youths was lower, however, at 84 and 62 percent, respectively. They appear more likely to become unemployed or not economically active.
- Half the discouraged workers remained in that category after six months. They faced a 23 percent chance of transitioning into becoming not economically active, a 58 percent higher likelihood of that transition than for those unemployed and searching. Of the discouraged workers, 15 percent began actively looking for a job within six months.
- The category of not economically active was similarly highly persistent, with 87 percent retaining the status after six months. Fewer than 3 percent in this category found any kind of job.
- Of the unemployed actively searching for a job, 14 percent found employment within six months. This likelihood falls to 12 percent for discouraged workers. For the young unemployed, the likelihood was only 9 percent if they were unemployed and 8 percent if discouraged.
- Two of three actively searching unemployed continue to so after six months. Of them, 21 percent (23 percent in the case of youths) give up and become discouraged or take up activities that are not economically active.

The overall picture is largely static, with high persistence in employment status, where youths in particular are finding it even harder both to transition into employment and to retain their jobs. This individual-level stasis contrasts with a noticeably more dynamic labor market that

Table 1.4 Transition matrix for adults (15–64), 2010q4–11q2

Adults	Formal employed	Informal employed	Other employed	Unemployed searching	Unemployed discouraged	Not economically active	Total
Formal employed	90.6	4.1	0.4	2.5	0.6	1.8	100
Informal employed	10.8	72.0	1.9	6.1	3.0	6.2	100
Other employed	3.6	8.4	83.9	1.2	0.3	2.6	100
Unemployed searching	5.3	8.4	0.1	65.2	6.5	14.4	100
Unemployed discouraged	4.1	8.0	0.0	15.1	49.9	22.8	100
Not economically active	0.9	1.7	0.1	6.0	4.7	86.6	100

Note: The number of observations has been weighted using the sample weights to make it representative. Rows add to 100. Not economically active excludes discouraged work-seekers.
Source: QLFS 2010q4 and QLFS 2011q2, Statistics South Africa and staff calculations.

Table 1.5 Transition matrix for youths (15–24), 2010q4–11q2

Youths	Formal employed	Informal employed	Other employed	Unemployed searching	Unemployed discouraged	Not economically active	Total
Formal employed	84.0	6.4	0.0	6.0	1.0	2.6	100
Informal employed	13.7	61.9	0.5	9.9	2.2	11.7	100
Other employed	0.0	11.7	21.1	22.1	8.5	36.6	100
Unemployed searching	6.0	3.1	0.0	67.6	6.6	16.6	100
Unemployed discouraged	1.6	6.1	0.0	12.3	54.3	25.7	100
Not economically active	0.7	0.7	0.0	5.3	4.4	88.9	100

Note: The number of observations has been weighted using the sample weights to make it representative. Rows add to 100. Not economically active excludes discouraged work-seekers.
Source: QLFS 2010q4 and QLFS 2011q2, Statistics South Africa and staff calculations.

Banerjee and others (2008) found in a similar exercise covering September 2003–March 2004. More uncertain and downbeat economic conditions in the current environment may be behind the less fluid current labor market.

Fiscal policy: adjusting to economic slowdown

Turmoil in global financial markets and a slowing and increasingly risk-laden world economy set a complex and volatile backdrop for the Medium-Term Budget Policy Statement (MTBPS) of the government, released on October 25, 2011. With the global effects clearly seeping through, policymakers faced bleaker and riskier growth prospects for the domestic economy and, as a result, a marked slowdown in revenue collection. The social challenges outlined in the New Growth Path (particularly high unemployment), an elevated public sector wage bill, and remaining infrastructure gaps (especially in the power and transport sectors) further conditioned the fiscal framework set forth by the MTBPS.

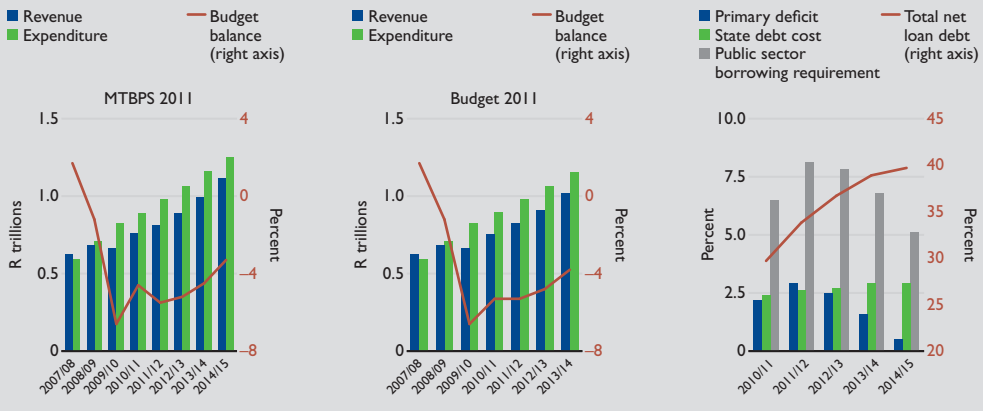
Understandably, the 2011 MTBPS retained the countercyclical fiscal stance, to be gradually rolled back over the medium term (table 1.6). But faced with more restrictive fiscal space, it also sought consolidation and reprioritization of expenditures—toward infrastructure and social investments and away from recurrent expenditures largely through moderation of the public sector wage bill. Moderation in expenditures relative to the February 2011 budget does not, however, fully counter the slowdown in revenue collection, leading to a slight worsening of the deficit over the MTEF period (less than half a percent of GDP in any given year). The net debt-to-GDP ratio is projected to increase to 38.9 percent by 2013/14 (compared with 39.3 percent in the 2011 budget) and stabilize at around 40 percent, with the debt service costs settling at 3 percent of GDP (figure 1.5).

Table 1.6 Consolidated government fiscal framework, 2008–15 (percent of GDP, unless otherwise indicated)

	Outcome			Budget	MTBPS	Forecast		
	2008/09	2009/10	2010/11	2011/12	2011/12	2012/13	2013/14	2014/15
Revenue	29.5	27.2	27.6	28.3	27.3	27.0	27.3	27.7
Expenditure	30.7	33.8	32.2	33.6	32.9	32.2	31.8	31.0
Budget balance	–1.2	–6.6	–4.6	–5.3	–5.5	–5.2	–4.5	–3.3
Interest cost	2.4	2.3	2.4	2.6	2.6	2.7	2.9	2.9
Public sector borrowing requirement	4.3	8.9	6.5	9.5	8.1	7.8	6.8	5.1
Total net government debt	22.7	27.6	29.7	34.3	33.8	36.7	38.9	39.7
Southern African Customs Union transfers (R millions)	28,921	27,915	14,991	21,763	21,763	38,983	35,997	—

— is not available
Source: National Treasury of the Republic of South Africa.

Figure 1.5 Consolidated revenue, expenditure, fiscal balances, and debt burden



Source: National Treasury of the Republic of South Africa and staff calculations.

These positions are fairly manageable, and debt sustainability does not appear to be an issue, especially given the government's ready access to the deep and liquid domestic capital markets, the primary source of funding for the budget, and to international markets, enabled by investment-grade ratings kept up by various rating agencies.

A striking feature of the MTBPS is a marked slowdown in infrastructure spending by both the government and state-owned enterprises. Shortfalls in spending in the energy and in water and sanitation are largely responsible. In the 2010/11 fiscal year, the public sector spent R67 billion (3.1 percent of GDP) less on infrastructure than envisaged in the February 2011 Budget (table 1.7). The MTBPS projects infrastructure spending to catch up over the course of the MTEF period, though this would be predicated on fixing the capacity and other implementation bottlenecks that are currently holding back spending (especially for local governments and state-owned enterprises). Inability to do so would translate into lower potential rates of GDP growth than the current estimates. A promising step is the government's new cities-support program, designed to lend capacity support to cities and introduce incentive-based mechanisms to help the cities better manage their built environment.

Banking sector developments: dual-economy divide proves hard to bridge

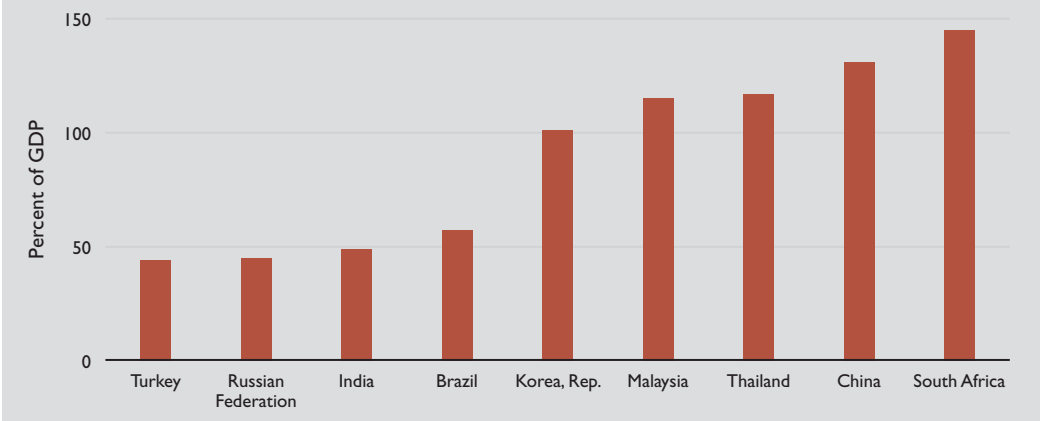
Headline figures of banking sector development put South Africa significantly ahead of its BRICS and other emerging market peers (figure 1.6). Banking sector assets have tripled in the past 10 years (figure 1.7), as the share of the South Africans with access to formal financial services grew from about 25 percent in 1994 to 63 percent in 2010. The financial industry contributes more than 10 percent to GDP,

Table 1.7 Public sector expenditure estimates by sector, 2010/11–2013/14 (R billions, unless otherwise indicated)

	2010/11		2011/12		2012/13		2013/14	
Sector	Budget	MTBPS	Budget	MTBPS	Budget	MTBPS	Budget	MTBPS
Economic services	228.7	161.9	216.2	197.3	219.4	217.8	228.5	228.2
Energy	102.8	52.5	96.5	71.7	98.1	90.4	96.8	98.8
Water and sanitation	21.0	14.4	26.8	17.8	25.4	20.6	28.2	19.9
Transport and logistics	80.5	69.1	67.5	79.5	69.1	76.3	75.6	76.9
Other	24.4	25.8	25.4	28.4	26.8	30.4	28.0	32.5
Social services	26.2	17.2	29.5	26.6	34.9	26.6	44.3	32.5
Total	260.1	185.3	252.8	232.9	269.3	257.6	286.4	269.9
Percentage of GDP	9.8	6.7	8.7	7.8	8.4	7.8	8.1	7.4

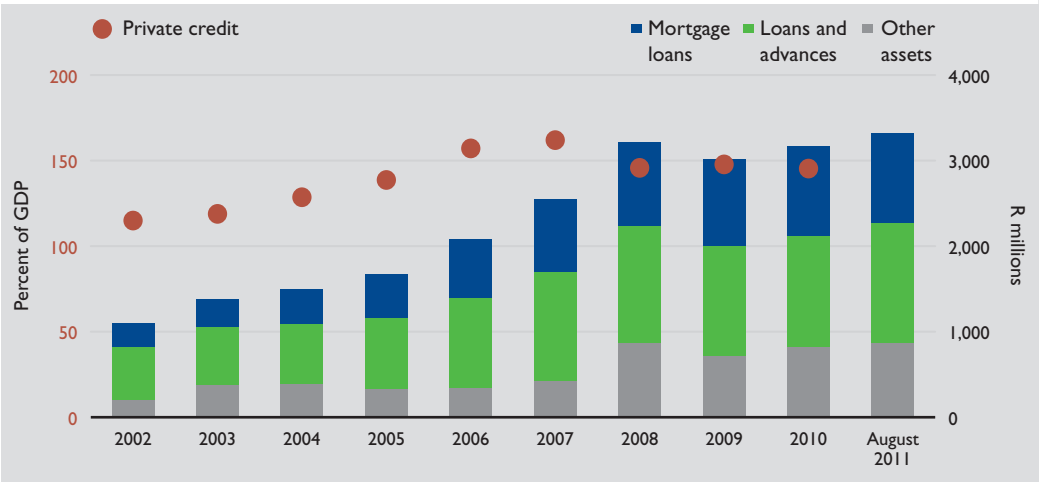
Source: National Treasury of the Republic of South Africa.

Figure 1.6 Domestic credit provided to the private sector, South Africa and its peers, 2010



Source: World Bank, Global Development Finance and World Bank, World Development Indicators.

Figure 1.7 **Banking assets and credit provision**



Source: South African Reserve Bank, World Bank, Global Development Finance, and World Bank, World Development Indicators.

and South African banks have a significant and growing footprint in the rest of Africa.

This impressive growth trajectory has been thrown off track by the economic downturn. Growth in banking assets has been flat since 2008. As reported in the last economic update, credit conditions have tightened especially for small and medium enterprises, apparently more because of cyclical than structural factors, and banks expect credit flows to resume once a broader macroeconomic recovery takes hold. The downturn has, however, highlighted the inefficacy of existing development finance instruments in providing countercyclical support to small and medium enterprises.[12]

More concerning are the structural barriers reducing access to credit finance in the underserved areas. South African banks, in most parts, still lack the business model to bridge the dual-economy divide. Outreach efforts remain focused on deposit collection and transaction services, not credit.[13] The absence of large microfinance franchises and the difficulties of African Bank and Capitec in competing with the big four commercial banks on transaction services and deposit mobilization point to industrial organization challenges for financial inclusion. In particular, new entrants lack the economies of scale to compete with the big four banks. This significantly increases their funding costs and excludes them from profitable fee business and other rents that typically accrue to new entrants targeting less-developed markets, restricting their ability to grow in the underserved segments.

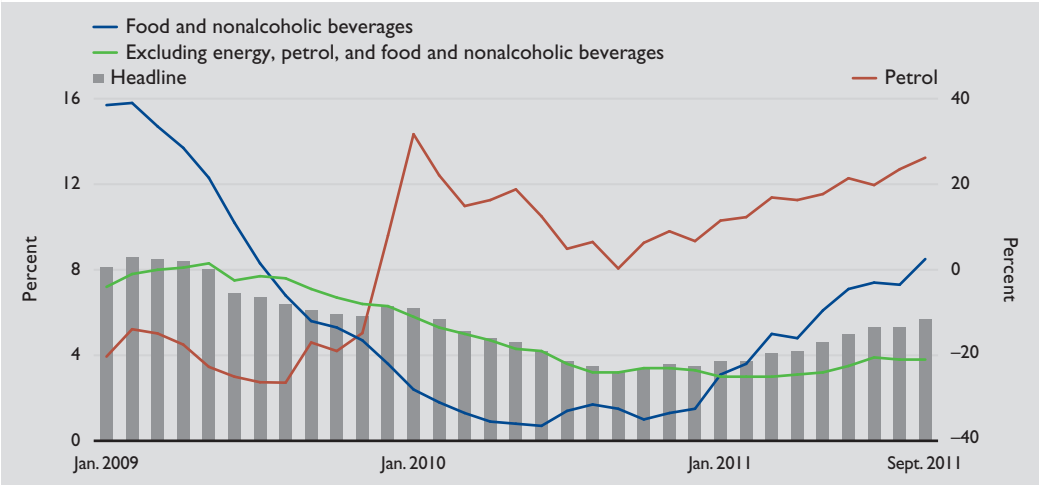
In a promising sign, the initial success of Capitec and African Bank in targeting the emerging lower middle mass market has prompted new efforts by the large commercial banks in this segment. Lower interest rates have aided fairly quick growth of salary-based lending to salaried lower income retail customers.[14] Mobile phone banking, an innovative instrument put to use in Kenya and other African countries to bring basic banking services to the poor, is beginning in South Africa. A notable example is the "bank shops," a recent initiative of Standard Bank to team up with small retail outlets in poor communities to offer low-cost banking services.[15]

Inflation trends: pressures are mostly supply side

Headline CPI inflation accelerated to 5.7 percent y/y in September, 0.3 percentage points above the previous month (figure 1.8). Food and nonalcoholic beverages, housing and utilities, and transport contributed close to 70 percent of the total annual change. Core inflation (which subtracts the effect of volatile food and energy prices) remains under 4 percent, much more subdued than headline inflation. The difference naturally is accounted for by the rapid acceleration in food and energy prices over this period.

Unlike other emerging market economies (such as China, Brazil, and India) currently facing binding capacity constraints, output in

Figure 1.8 Trends in headline and core CPI inflation



Source: Statistics South Africa.

South Africa remains below potential, keeping demand-side pressures in check. The main upside risk remains from externally determined food and energy prices and the administered electricity prices. The recent depreciation of the rand, driven by heightened risk aversion among global portfolio investors, is another upside risk to the inflation outlook, though it is not likely to emerge strongly in the near term (box 1.1). Downside risks are mostly associated

Box 1.1 Exchange rate pass-through and inflation in South Africa

Exchange rate pass-through (ERPT) refers to the transmission of exchange rate fluctuations into domestic prices. Understanding the transmission mechanism from exchange rates to domestic prices is important for anticipating inflationary developments and formulating monetary policy.

The extent of the pass-through depends on seven factors: 1) the weight of imported goods and services in domestic production and the aggregate price index; 2) the degree to which import prices are market determined; 3) the nominal anchor, the monetary policy regime, and the credibility of the central bank; 4) the availability of hedging instruments; 5) whether the changes in the exchange rate are temporary or permanent (if the change in exchange rates seems permanent, exporters would be tempted to modify local prices without fear of loss of market share); 6) the presence of menu costs in the price adjustment process, with firms absorbing the fluctuations until a threshold is crossed; and 7) the degree and form of competition in a given market and capacity constraints.

A number of studies analyze the pass-through effects for South Africa, as summarized below.

Pass-through	Authors	Period	Findings (for a 10 percent change in the rand exchange rate)
Short term	Bhundia (2002)	1980–2001 (quarterly)	For CPIX inflation (excluding interest on mortgage bonds), the ERPT is 0.83 percent after 4 quarters, 1.23 percent after 8 quarters, and 1.32 percent after 10 quarters, while for headline inflation ERPT is 1.07 percent, 1.17 percent, and 1.17 percent, respectively.
	Aron and others (2010)	1980–2009 (monthly)	The ERPT is about 3.0 percent after six months and 4.4–5.0 percent within a year. Exchange rate volatility reduces pass-through over the very short run, and the shift in monetary policy might have reduced the ERPT for import prices.
Long term	Rangasamy and Farrell (2002)	1980–2001 (monthly)	Long-run ERPT for import prices is 7.8 percent.
	Nell (2004)	1987–98 (quarterly)	Long-run ERPT for import prices is 7.7 percent.
	Karoro and others (2009)	1980–2005 (monthly)	Long-run ERPT in the range of 7.5–8.2 percent. Higher ERPT for depreciations (7.2 percent) than for appreciations (6.4 percent).

On balance, these results would suggest that the recent depreciation of the rand is unlikely to cause any immediate noticeable changes in headline inflation, with several mitigating factors at play. First, not enough time has elapsed for the more significant longer term effects to show. Furthermore, nontradable goods and services still carry a significant weight in the overall price index. Excess capacity in production would also have contained second-round effects. Finally, heightened volatility in the exchange rate would also have reduced the pass-through.

with weaker-than-projected global and domestic growth performances.

External sector: Europe poses risks to exports, as portfolio flows dry up

The trade surplus moderated in the first half of 2011 and slipped into deficit in the third quarter, as South Africa's terms of trade receded from the record highs in 2010q4. This, in combination with higher services, income, and current transfers, led to worsening of the current account deficit from 1 percent of GDP in 2008q4 and 2.8 percent for 2010 as a whole to 3.1 percent and 3.3 percent of GDP in 2011q1 and 2011q2, respectively (figure 1.9).

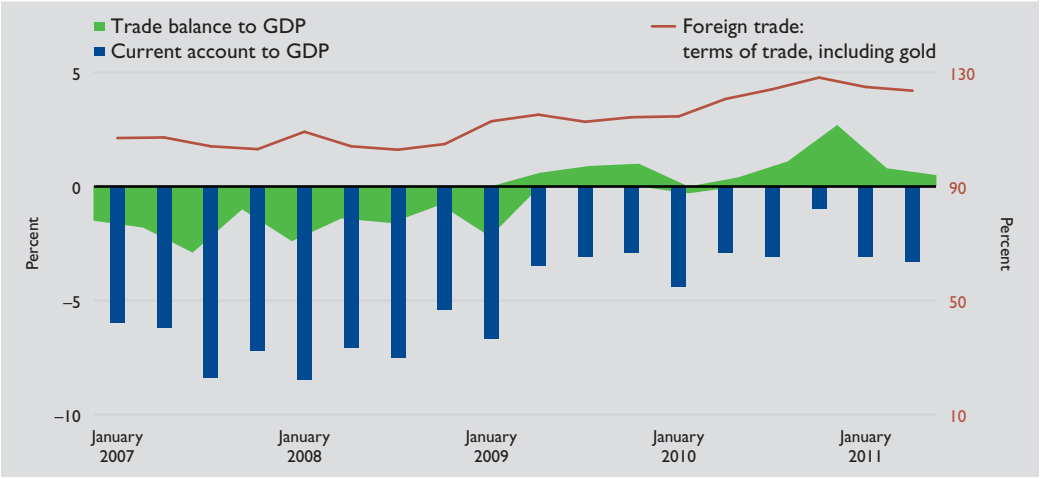
South Africa's export destinations have shifted, with China making inroads and becoming the biggest single-country destination (table 1.8). This has come mostly at the expense of the EU and, to less extent, Japan and the United States. The EU nonetheless remains the largest single-market destination for South Africa, and its deteriorating situation poses considerable risks.

Exports to the EU and the United States, and, to less extent, Japan, are more balanced with more intra-industry trade rather than endowment-based trade, as with China. More than 90 percent of South Africa's exports to China are mineral products and base metals. China accounts for almost 40 percent of South Africa's total mineral exports and less than 0.5 percent of exports of machinery and equipment or vehicles, aircraft and transport equipment. By contrast, the EU and the United States take almost half of South Africa's total machinery and equipment exports. The EU, the United States, and Japan together also take more than two-thirds of vehicles, aircraft, and transport equipment exports. A slowdown in the world's advanced economies thus has completely different first-round effects at the industry level than a deceleration of the Chinese economy.

Portfolio flows have weakened considerably in recent months. Figure 1.10 plots the end-of-period 22-day moving average of bond and equity purchases by nonresidents vis-à-vis the rand/U.S. dollar exchange rate. Since the second half of July, nonresidents have been net sellers of equities. Bonds purchases also began to decline following the credit downgrade of the United States by S&P. As uncertainty over the sovereign debt crisis in Europe started to mount, net selloffs of bonds became more pronounced, increasing the rand/U.S. dollar exchange rate to levels not seen since 2009.

While the weakening of the rand has been seen as providing welcome relief to South African exporters, business leaders and policymakers alike have expressed concern about the high volatility in the exchange rate markets. Indeed, the rand emerges as among the most volatile currencies relative to a number of other global currencies (figures 1.10 and 1.11).[16] The bars indicate the two months following the collapse of Lehman Brothers and the U.S. credit downgrade by S&P. Clearly, currency

Figure 1.9 **Current account, merchandise trade, and terms of trade, 2007q1–11q2**



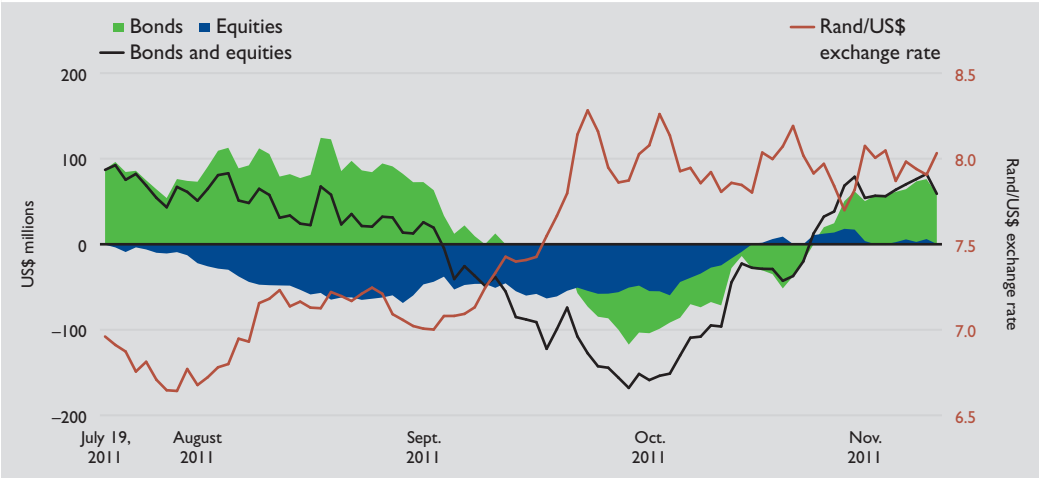
Source: South African Reserve Bank.

Table 1.8 Cumulative exports and imports with major trading partners, January–July 2011

Exports by section	EU	China	USA	Japan	Total
Total exports (R millions)	89,025	46,731	32,131	31,329	382,016
As a percentage of total South Africa exports	23.3	12.2	8.4	8.2	100.0
Memorandum					
2006 exports as percent of total South Africa exports	30.1	3.6	10.4	10.7	395,173
2007 exports as percent of total South Africa exports	30.1	6.0	10.8	10.1	491,391
2008 exports as percent of total South Africa exports	29.2	5.4	10.0	10.1	656,125
2009 exports as percent of total South Africa exports	23.7	9.3	7.4	6.7	513,874
2010 exports as percent of total South Africa exports	23.4	10.1	8.8	7.9	590,054
Top five South African exports by value					
	Share with respect to the total exports to a given country				
Mineral products	19.2	77.1	5.7	14.5	24.4
Natural/cultured pearls, precious/semiprecious stones, precious metals	18.6	1.9	29.5	57.7	25.6
Base metals and articles of base metal	13.1	14.5	16.3	14.7	14.6
Machinery and mechanical appliances, electrical equipment	14.3	0.4	6.7	0.6	8.0
Vehicles, aircraft, vessels, and associated transport equipment	12.0	0.3	25.6	4.3	7.9
	Share with respect to total exports of each section				
Mineral products	18.3	38.6	2.0	4.9	100.0
Natural/cultured pearls, precious/semiprecious stones, precious metals	16.9	0.9	9.7	18.5	100.0
Base metals and articles of base metal	20.9	12.2	9.4	8.3	100.0
Machinery and mechanical appliances, electrical equipment	41.5	0.6	7.1	0.6	100.0
Vehicles, aircraft, vessels, and associated transport equipment	35.3	0.5	27.1	4.4	100.0

Source: South African Revenue Service and staff calculations.

Figure 1.10 Bond and equity purchases by nonresidents



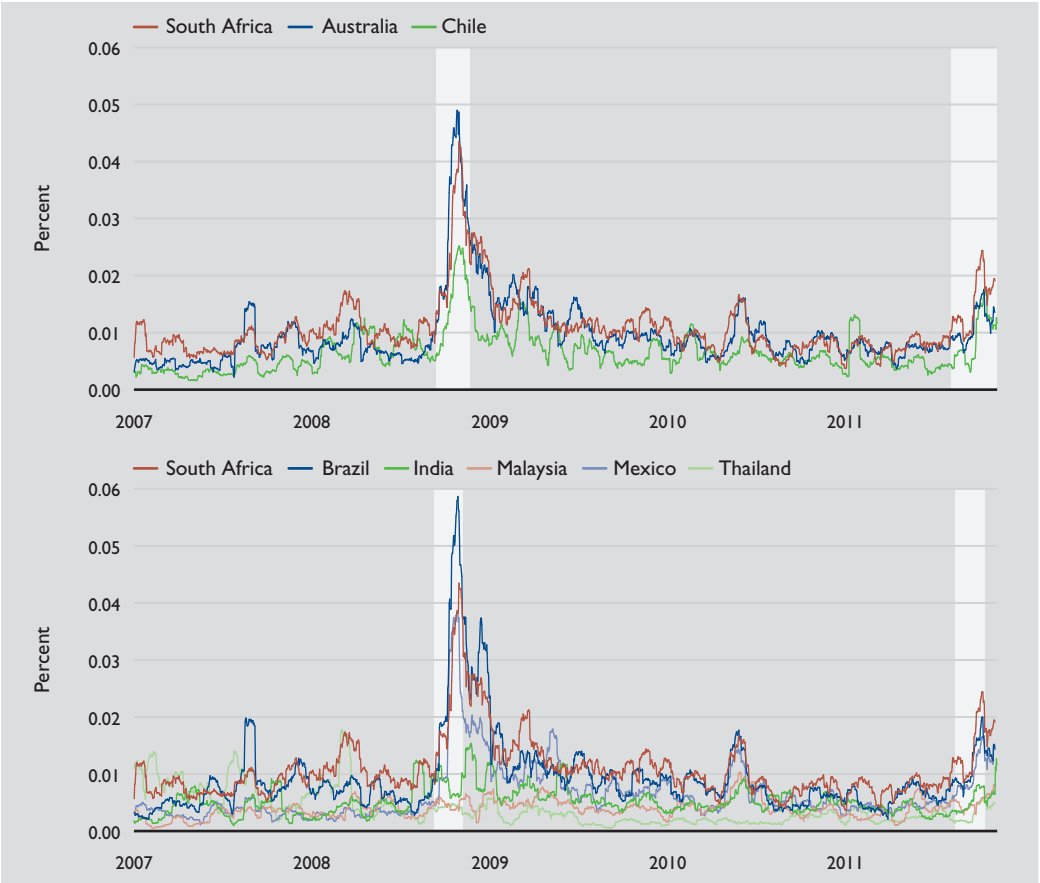
Note: Figure depicts the 22-day moving average for bonds and equities.
Source: Citibank, South African Reserve Bank, and staff calculations.

fluctuations for resource-based exporters have recorded a pronounced increase during recent episodes of risk aversion and flight to safety. The concern around heightened volatility appears to be justified by a review of the literature (box 1.2), which, on balance, finds damaging effects for developing countries.

Economic outlook for South Africa

Against the backdrop of a significantly weaker global economy than at the time of the previous forecasts (June 2011), the short-to-medium-term growth outlook for South Africa remains less optimistic than earlier projected. A marked slowdown in infrastructure spending by public

Figure 1.11 Exchange rate volatility for South Africa, selected emerging markets, and Australia



Note: Graph depicts the daily volatility of the growth rate of the nominal exchange rate over a 22-day rolling window (end-period).
Source: Federal Reserve of St. Louis and Central Bank of Chile and staff calculations.

Box 1.2 Does exchange rate volatility really matter?

Exchange rate volatility can hit the real economy through two main channels: foreign direct investment (FDI) and international trade. FDI inflows bring not only additional resources for investment but also associated benefits of transfers of technology and managerial know-how.[1] But they can be deterred by the heightened risk that more volatile exchange rates would generate, especially when currency hedging is not a viable option.

Exchange rate volatility may also affect trade flows. From a theoretical standpoint, the impact on the level of international trade is ambiguous. Greater volatility creates uncertainty around the profits derived from international trade, and thus leading to lower volume of trade. But if a firm can alter factor inputs to take account of exchange rates movements, it can in fact benefit from the increased volatility, leading to higher trade. Other factors might also mitigate the effect of exchange rate fluctuations in firms' profits, such as the use of imported inputs in the production process.[2]

Results from empirical studies are similarly mixed,[3] though there is more compelling evidence that developing countries are adversely affected.[4] One explanation behind these results could be the incomplete nature of the capital markets in developing economies, which limit the ability of firms to reduce their exposure to exchange rate risk. These options, even if present, might not be accessible to all of them, and they may entail high costs. Wei (1999) finds little empirical support showing that the availability of hedging tools would reduce the impact on trade. More recent studies have emphasized the heterogeneous impact of exchange rate risk across industries.[5]

Notes

1. See, for example, Larrain and Vergara (1993) and Kiyota and Urata (2004).
2. Clark and others 2004.
3. Clark and others 2004.
4. Calvo and Reinhart 1999; Grier and Smallwood 2007.
5. Raddatz 2011.

Table 1.9 Macroeconomic outlook, 2007–13 (percent change, unless otherwise indicated)

	2007	2008	2009	2010	2011	2012	2013
Real GDP	5.5	3.6	–1.7	2.8	3.2	3.1	3.7
Household consumption	5.5	2.2	–2.0	4.4	4.5	3.9	4.2
Government consumption	4.1	4.7	4.8	4.6	4.4	4.1	4.1
Gross fixed investment	14.0	14.1	–2.2	–3.7	2.9	3.3	4.6
Exports, GNFS	5.9	2.4	–19.5	4.5	4.0	5.0	6.2
Imports, GNFS	9.0	1.4	–17.4	9.6	7.7	6.8	7.2
Headline consumer price index	6.1	9.9	7.1	4.3	5.0	5.4	5.6
Current account balance (percent of GDP)	–7.0	–7.1	–4.1	–2.8	–3.4	–3.8	–4.0

Source: National Treasury of the Republic of South Africa and staff calculations and projections.

entities also contributes to diminished prospects for growth in the short run. Hence, we have lowered our GDP growth forecast for 2011 to 3.2 percent from the 3.5 percent in the last economic update, and for 2012 and 2013 to 3.1 percent and 3.7 percent, respectively, down from 4.1 and 4.4 percent (table 1.9).

Supported by historically low interest rates and above-inflation wage increases, South African consumers will continue to remain a dominant force for supporting GDP growth. The contribution of consumer spending to GDP growth could, however, wane over the forecast period as the recent pick-up in inflation reduces purchasing power and increases the possibility of a rate hike. Furthermore, the heightened economic uncertainty is likely to constrain job creation and accelerate the pace of the ongoing debt deleveraging by households. Indeed, the RMB/BER consumer confidence index dropped sharply in the third quarter to +4 from +11 in the previous quarter, suggesting less buoyant consumers, which could translate to lower spending.

With government fiscal policy remaining countercyclical, the boost to growth from increased government spending will remain strong in 2011 and 2012 but is likely to wane thereafter, as projected under the MTBPS. Throughout the recovery, private investment—blighted by an uncertain global recovery, low business confidence, long-running labor disputes, and a strong rand—has lagged behind other aggregate demand components in its contribution to GDP growth. It is likely to take a further hit from the heightened uncertainty in the global economy. Indeed, the FNB/BER business confidence index dropped by a sharp 9 points to 39 in the third quarter as business confidence was shaken not only by external developments but also by domestic ones including industrial action and weaker-than-expected domestic sales, as households moderated their spending.

On the export front, deterioration in global growth is likely to dampen export growth, through lower metal and mineral prices and weaker demand from high-income countries. Although a moderation in domestic consumption and lower oil prices could lower the expansion of imports, overall net exports will continue to serve as a drag on growth.

Risks to the outlook

The key risks emanate mostly from global uncertainty. First is the possibility of a much more pronounced slowdown of the global economy than is anticipated under the baseline forecasts. Two potential sources of slowdown are pertinent for South Africa. A disorderly resolution to the ongoing Eurozone sovereign debt crisis could lead to a sharper slowdown in growth in Europe than envisaged. By our estimations, a 1 percent GDP contraction in the Eurozone could cut 0.77 percentage points from GDP growth in South Africa. Second, with much of the recent increase in commodity prices driven by strong demand from Asia (particularly China), a cooling of the Chinese economy relative to baseline projections, coupled with weak demand from Europe, could dampen commodity prices and reduce South African export receipts as well as investments in minerals. Indeed, were base metals and mineral prices to fall by an average of 10 percent, South Africa's exports could see a 4.6 percent

decline, placing a significant drag on GDP growth.

South Africa's chronically low national savings rate (around 16 percent of GDP) yields a high current account deficit, which gets funded mostly through volatile and short-term portfolio (equity and bond) flows. The reliance on portfolio flows makes the economy susceptible to sudden capital stops. Manifestation of this particular risk could result in a large abrupt depreciation of the rand and a large correction in the current account deficit, which, in turn, would constrain domestic investment and lower GDP growth. Heightened risk aversion among commercial banks in a scenario of global financial turmoil would lead to curtailment of domestic credit extension, which, together with a subdued consumer confidence, could undermine the recovery in consumption of durable goods.

SECTION 2

Green growth—opportunities and challenges for South Africa

Green growth has become a subject of great interest for policymakers, private business, and civil society. While the term has no single definition, the emphasis in policy debates is on the possibility of win-win outcomes—not only a better environment but also more jobs and a faster rate of output growth. This idea has resonated in South Africa, as it strives to boost economic growth, reduce very high unemployment, and address air pollution, high CO_2 emissions, water scarcity, and other serious environmental concerns. South Africa's *New Growth Path Framework* sees greening the economy as an important jobs driver for the future. The *Green Economy Accord* signed by the government and social partners in November 2011 lays out an ambitious and far-reaching agenda to build and grow the green economy.

The update's special focus section aims to contribute to the South African discussion on green growth at three levels. Its first part introduces the general idea of green growth, starting with a simple definition that emphasizes natural assets in the growth process, and then developing more concrete messages about this type of growth. A comprehensive discussion of all the natural assets and environmental problems relevant for green growth in South Africa would be far beyond the scope of this focus. So, the section's second part looks in more depth at one important element of the green growth agenda in South Africa—the challenges and opportunities associated with the country's transition to a low carbon growth path. The emphasis is on its energy use patterns—noting briefly the range of other environmental problems that are also vital for the country, and the need for other, more extensive follow-up studies.

A crucial question is how these two terms—"green" and "growth"—hang together in practice. How will green environmental policies affect GDP growth, employment, and international competitiveness? The section's third part takes up these questions, surveying the international cross-country evidence and relating these findings where possible to the South African context, noting that well-designed policies are crucial for reaching outcomes that take advantage of synergies and reduce potential tradeoffs between the environment and the economy.

What is green growth?

A useful entry-point is provided by the Green Growth Knowledge Platform: "Green growth means fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies."[17]

This approach puts the spotlight on natural assets in economic production and in human well-being. To carry on production, firms draw on the services of a variety of capital inputs, including physical and human capital, technological knowledge, and other intangible assets such as trust social capital, and the quality of institutions. The perspective of green growth places particular emphasis on *natural capital,* which refers to natural systems that provide

services useful in economic production. These environmental services come from various spheres—the atmosphere, water resources (hydrosphere), the earth's soil and crust (pedosphere and lithosphere), and living things (the biosphere). Such environmental services are also themselves often a direct source of enjoyment or utility to people—such as clean air, natural beauty, and so on.

For the most part, people would like more of both economic and environmental goods, but often have to tradeoff one against the other. Some amount of increased air pollution from factories may need to be tolerated in return for more abundant consumer goods. Different societies and individuals will have different preferences for precisely where they make that tradeoff. Innovation and technological progress become important here, softening the tradeoffs between economic and environmental objectives. Then the relevant concern becomes how many resources ought to be invested in developing less polluting technologies versus other uses.

Yet scarce environmental resources often fail to receive a price that sufficiently reflects the true social cost of their depletion, due to a variety of market failures. Without a price that reflects social cost, such resources are almost certain to be overused. Social welfare is then less than it could be. Examples include the overuse of the atmosphere as a sink for greenhouse gases, leading to climate change, depletion of shared water resources, and loss of biodiversity. Such problems could be especially severe when natural systems are liable to sudden collapse if pushed beyond critical thresholds. Problems of "market failure" can be worsened by "policy failures." For example, energy subsidies reduce both economic efficiency and environmental quality by inducing excessive energy consumption and oversupply of greenhouse gases in the atmosphere. And poorly defined or enforced property rights over land use can induce excessive soil erosion or deforestation.

Given this background, we develop four more specific points about green growth.

First, a basic feature of green growth should be that choices are made and resources allocated in ways that fully reflect the social costs and benefits of using up scarce natural capital.

In practice this means that policies and institutions correct for the overuse of natural capital caused by market failures or preexisting policy distortions. The measurement of environmental costs and benefits may be far from simple in practice, though environmental economics has made a good deal of progress on such methods over the years.[18]

By preventing socially inefficient overconsumption of natural capital, green growth is also a key to achieving *sustainability,* defined as a development path that provides future generations with the opportunity to enjoy at least the same level of well-being as today's generation, typically by providing future generations with at least the same amount of *wealth* as today's generation. Comprehensive wealth accounting (including natural capital) is then an important informational tool to help measure and develop policies for green growth and sustainability. Box 2.1 discusses preliminary results from comprehensive wealth accounting for South Africa.

Second, to increase social welfare and well-being, faster economic growth should be combined with more—and more effective—environmental protection.

The relevance of this point for the issues confronting South Africa is apparent. The acceleration in the country's rate of economic growth to 6–7 percent proposed by the government is highly desirable for reducing unemployment and poverty, yet, on its own, would also heighten stresses on the environment and natural capital. As we document later, the modest acceleration in South Africa's growth in the 2000s has already increased the pace of carbon emissions growth, for example. However, with natural capital under more stress, the social benefit from better preserving it is also increasing. This suggests that, to increase social welfare, faster growth should be accompanied by more environmental protection, not less.

Third, there is generally no single "silver bullet" that by itself will deliver both growth and environmental protection: it usually makes sense to use multiple policy instruments to pursue multiple policy objectives—in this case growth and the

Box 2.1 South African growth in a comprehensive wealth accounting perspective

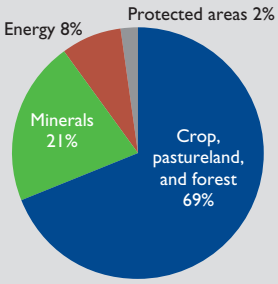
At the heart of determining whether growth in a country is green and sustainable, is the accumulation of wealth. It is wealth—broadly defined to include manufactured capital, natural capital, and intangible capital (human and social)—that underlies the generation of national income.[1] While GDP has conventionally been used to assess economic growth from one year to the next, it does not take into account depreciation and depletion of wealth, and therefore does not show whether growth is sustainable. An economy could appear to be growing in the near term but only by running down its assets.[2] Assessments of economic performance should therefore be based on both measures of annual growth (such as GDP growth) as well as measures of the country's comprehensive wealth, which indicate whether that growth is sustainable in the long term.

The table presents estimates of wealth for South Africa for 2008. The country's overall capital stock was estimated at $84,829 per capita in 2008, lower than the average for upper middle-income countries ($105,000 per capita). As in most upper middle-income countries, intangible capital (human and social) is by far the largest component of South Africa's total capital stock, while a partial estimate of natural capital represents about 10 percent of the total. Natural capital is dominated by agricultural land, with smaller shares for minerals (gold and platinum), energy (coal), and protected areas (see figure). (The wealth accounting methodology does not fully account for all forms of natural capital, such as water resources, fisheries, and the use of the atmosphere as a sink for greenhouse gases.)

Where is South Africa's wealth? (2008 US$)

	Total (billion)	Per capita	Annual growth, 1995–2008
Total wealth	4,139	84,829	1.4
Produced capital	603	12,348	–0.3
Natural capital	420	8,617	5.9
Intangible capital	3,183	65,233	1.5
Net foreign assets	–67	–1,369	6.3

Natural capital composition



Source: World Bank data and staff estimates. Statistics South Africa data for coal, gold, and platinum group metals.

In real terms, estimated wealth per capita increased by 1.4 percent a year between 1995 and 2008, in line with the average for upper middle-income countries. This estimate could provide some evidence that South Africa's growth is broadly sustainable, in the sense that overall wealth per capita is rising over time, though at a modest pace.[3] However, South Africa's adjusted net savings rate—a concept appropriate for comprehensive wealth accounting since it includes not only gross savings and depreciation of produced capital but also estimates of savings and depreciation in the form of changes in human and natural capital—has been declining since 1996, from around 8 percent of gross national income to 2 percent in 2008. This is cause for concern about the future sustainability of growth.

Comprehensive wealth accounting is a crucial analytical tool to support green growth policies, which will be expanded and developed over coming years in terms of both country and conceptual coverage and depth. It will ultimately be a key element in an expanded set of national accounts that can support comprehensive monitoring, analysis, and policy formulation for both the economy and the environment.

Notes

1. World Bank 2011d. See also Arrow and others (2010).
2. Net domestic product and net national income account for depreciation of manufactured capital, but not depletion or degradation of natural capital.
3. This compares favorably with many other Sub-Saharan economies, where an upturn in GDP growth over the last decade could be unsustainable because it is accompanied by an accelerated depletion of minerals and other natural capital, resulting in a decline in the total capital stock per capita.

environment—targeting each objective with the instruments best suited to it.

Increasing growth, no simple matter, will require the sustained attention of policymakers on finding the mix that is right for South Africa among the set of growth policy instruments that have worked internationally—macroeconomic policies; structural reforms to strengthen trade, competition, labor markets, and the investment climate; solid public investments in infrastructure, education, health, and other public goods; and so on. Green or environmental policies can have important synergies with the growth agenda, as we show. But it is unlikely that green policies can largely *substitute* for the hard work

of finding and implementing a good growth policy package.

Similarly, it would be idle to think that high growth, once achieved, will be enough by itself to cure environmental ills. As noted, environmental goods are subject to market failures and typically need public action to protect. Here, international experience offers lessons on the most economically efficient and growth-friendly environmental policy instruments to use. In the first instance, this entails removing distortions that actually subsidize environmental "bads," and then putting a price on environmental "bads," which reflects the social costs they inflict. South Africa is indeed making progress on some of these dimensions, reducing energy consumption subsidies and seriously studying introduction of a carbon tax.

Fourth, there can be important synergies or co-benefits between growth and the environment, and these are likely to be mutually enhancing and larger when policies to accomplish growth and environment objectives are well coordinated.

Consider examples of synergies from environmental protection to growth. Taxes on pollution raise fiscal revenues that can be used to cut growth- or job-inhibiting taxes on capital or labor, or to make growth-enhancing public goods investments. Less pollution and greater access to clean water improve health and labor productivity, which can improve employment if other conditions are conducive. Now consider examples of synergies from growth to the environment. South Africa's trade policies are oriented toward protecting capital- and energy-intensive sectors, so reforms here would not only boost economic efficiency and jobs, they would also curb greenhouse gas emissions. Several constraints—notably skill shortages, current labor market institutions, crime, and poor access to electricity and finance—curb the formation of small and medium enterprises (SMEs) in South Africa, otherwise a major source of employment in other middle- and high-income economies.[19] Environmental policies to promote energy efficiency would be more effective if new SMEs can form more easily in the energy-efficiency sectors (retrofitting residential buildings and so on).

A comprehensive discussion of all the natural assets and environmental problems relevant for green growth in South Africa is beyond the scope of this special focus. Instead, we look in more depth at one important element of the green growth agenda in South Africa—energy use and the challenges and opportunities of transition to a low-carbon growth path. This attention is warranted by the generally close

Box 2.2 Key environmental challenges in South Africa

Limited water supply is "a matter of central importance in national planning."[1] While less than 20 percent of South African land is seen as arable, irrigation currently is responsible for 62 percent of water uptake, while large industry, mining, and power generation account for only 8 percent.[2] Improved energy efficiency will reduce demand for water use in power generation and refining; conversely, changes in the country's water infrastructure and allocation system will be needed to accommodate anticipated growth in water demand from industry and power generation.

Water degradation is a particularly serious concern for human health and river/estuary ecosystems. Inadequate and poorly maintained sewage systems, together with growth in the number and size of informal settlements along stream banks, contribute to high bacterial levels in some of South Africa's rivers,[3] posing a significant threat of illness and, especially for young children, death. Ameliorating this problem is important for improved employment, growth, and quality of life.

Loss of natural habitat, in particular due to urban sprawl and past agricultural expansion, is a concern for protecting South Africa's valuable nature tourism and safeguarding biodiversity. Since the agricultural sector was deregulated in the 1980s and agricultural subsidies have been largely abandoned, one could anticipate some decline in the area under cultivation. More importantly for our purposes, policies to limit urban sprawl would promote energy efficiency as well as supporting continued efforts to establish and maintain conservation areas, including on privately held land.

Notes

This box draws on a background paper for this report prepared by Anthony Leiman.

1. NPC 2011a.
2. DWAF 2004.
3. Oberholster 2010.

links in all economies between energy use and both economic growth and the environment—and by unusually high energy and carbon intensity of the South African economy. The salience of these issues is reflected in the attention given to them in recent years by South African policymakers, embodied in studies, policy papers, and planning documents, culminating in the recent *National Development Plan: Vision for 2030*.[20] This by no means underestimates other environmental issues for the green growth agenda in South Africa—for example, water scarcity and air and water quality. These issues are briefly outlined in box 2.2 and need to be addressed in more extensive follow-up studies.

"Greening" energy use in South Africa: possibilities and challenges

Among the issues South Africa will need to address for green growth, energy efficiency and the environmental impacts of the types of energy it uses are a key part of the story. South Africa's historical patterns of industrial and energy resource development have resulted in high reliance on coal reserves, reflecting the impact of energy and industrial development policies as well as the availability and cost of energy resources. Direct coal combustion by industry and others—and an overwhelming proportion of electricity produced from coal—have provided relatively inexpensive energy. But these patterns of energy production and use also give rise to concerns about local air pollution and relatively high CO_2. Moreover, the efficiency of energy use in South Africa appears to be notably lower than in other comparison countries. Current patterns have been motivated by a history of pricing energy below its cost of supply, though the government has made significant strides in recent years to address that situation.

This part begins with a quantitative overview and analysis of economywide trends in South Africa's carbon emissions and the broad features of energy use that drive those trends. The discussion provides a useful framework for the later parts of this section, which take a more detailed look at patterns of energy use and at the policies needed to put the economy on a low-carbon path.

Overview of economywide trends

South Africa is the world's 11th largest emitter of CO_2 from consumption of energy. It is also in the upper quartile of countries on CO_2 emissions per capita and per unit of real GDP.[21] In the wake of international climate change negotiations at Copenhagen in December 2009, South Africa proposed an ambitious Nationally Appropriate Mitigation Action plan, aiming to reduce CO_2 emissions 34 percent below an estimate of business-as-usual emissions by 2020, and a 42 percent reduction by 2025.[22]

Arithmetically, one can calculate a country's CO_2 emissions from energy consumption according to the following simple identity:

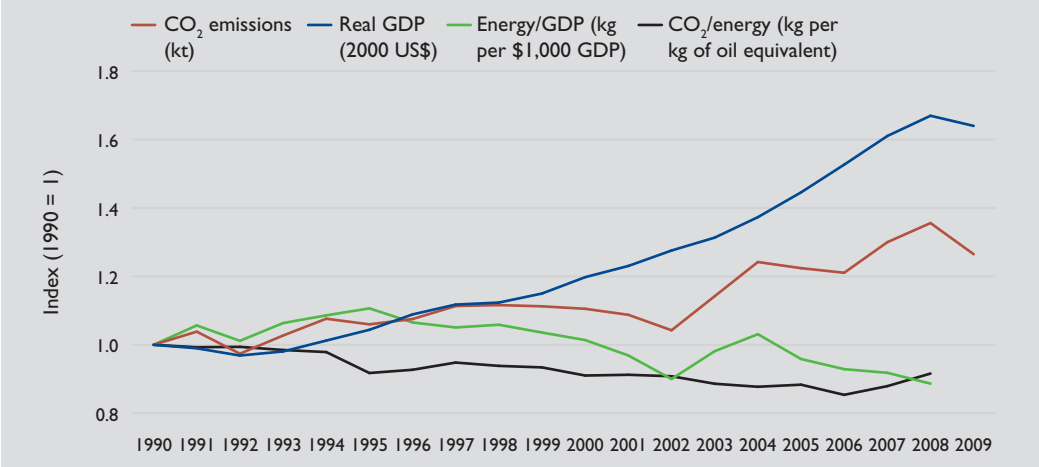
$$CO_2 \text{ Emissions} = \text{GDP} \times (\text{Energy Consumption/GDP}) \times (CO_2 \text{ Emissions/Energy Consumption}).$$

So, the level and growth of CO_2 emissions can be decomposed into three key drivers:

- Economic activity, measured by real GDP.
- Energy intensity of GDP (a measure of energy efficiency).
- Carbon intensity of energy consumption, driven by the proportion of fossil fuels in the country's primary energy mix, measured by the ratio of CO_2 emissions to energy consumption.

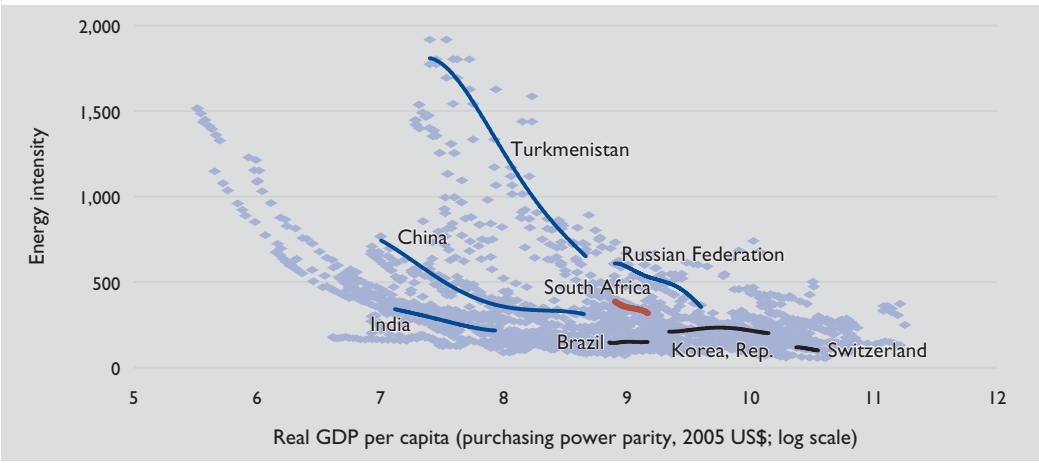
We use this framework to analyze recent trends in South Africa's CO_2 emissions. Figure 2.1 indicates that, although the country's CO_2 emissions from energy use grew only modestly in the 1990s, the pace accelerated in the 2000s. Trend CO_2 emission growth doubled from the 1990s to around 2.5 percent a year in the 2000s.[23] This was primarily the result of an acceleration in trend GDP growth in the 2000s, only partly offset by reductions in energy intensity (improvements in energy efficiency) of a little over 1 percent a year. This pace of energy efficiency improvement in South Africa is a significant improvement over the 1990s, which saw little increase in energy efficiency but was still below the average of 1.7 percent a year in high-income economies and over 2 percent a year in developing economies. For the third variable of the identity, there was a modest decline in the carbon intensity of the energy mix in South Africa during the 2000s, at about 0.5 percent a year.

Figure 2.1 CO_2 emissions and its drivers



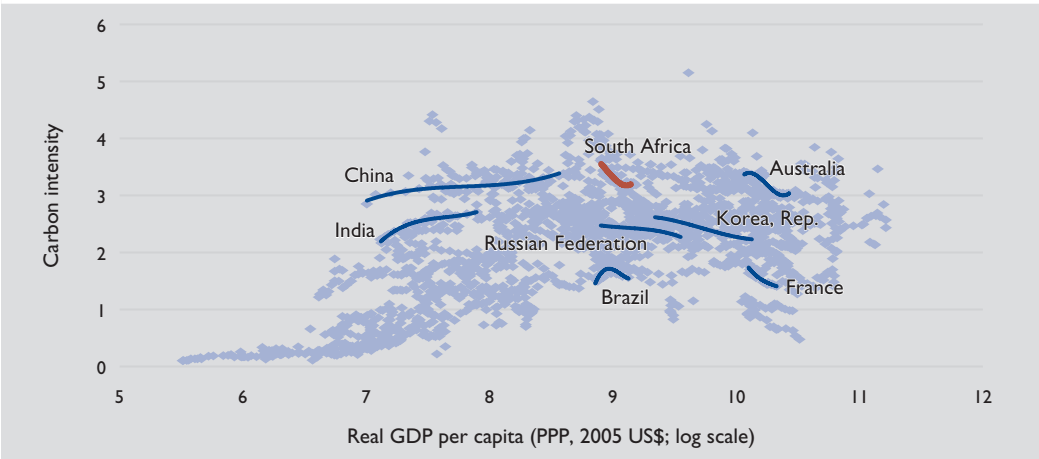
Source: World Bank, World Development Indicators and U.S. Energy Information Administration.

Figure 2.2 Evolution of energy intensity, 1990–2008



Note: Energy to GDP ratio: kilogram of oil equivalent per $1,000 GDP (power purchasing parity, 2005 US$).
Source: World Bank, World Development Indicators.

Figure 2.3 Evolution of carbon intensity, 1990–2007



Note: Carbon emissions to energy ratio: kilogram of carbon to kilogram of oil equivalent energy use.
Source: World Bank, World Development Indicators.

Figures 2.2 and 2.3 take a closer look at the evolution of energy efficiency and carbon intensity in an international context. Figure 2.2 shows the energy consumption to GDP ratios for 125 countries over 1990–2008, plotted against the logarithm of real GDP per capita (in purchasing power parity terms). The evolution of energy intensity of several comparator countries is picked out with individual trend lines. Broadly speaking, energy intensity appears to fall with per capita GDP, but there is considerable variation in intensity among countries at any given level of income. The figure indicates that South Africa's energy intensity, while declining over the last two decades, remains higher than in other middle-income countries. True, some middle-income countries have even higher energy intensity, but they are largely transition economies of the Former Soviet Union, with a special history of wasteful energy use under the planned economy. Most other large emerging economies have lower energy intensity than South Africa, including China and India, which have both seen marked declines in energy intensity over the last two decades.

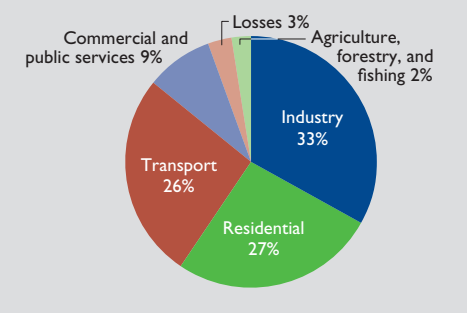
Figure 2.3 provides a similar international comparison for the evolution of carbon intensity—the ratio of carbon emissions to energy consumption. Again, there is a wide range of outcomes at every income level, depending in part on the type of domestic energy resources available to countries, with coal or other fossil-fuel-abundant countries like South Africa, Australia, and China typically at the upper end of the range for their per capita incomes. Countries that started the period (1990–2007) at higher per capita incomes (Republic of Korea, Russian Federation, and Australia as well as South Africa) tend to show a decline in carbon intensity over time. Countries that started at lower per capita incomes (China and India) tend to show rising intensities over time.

The decomposition framework used here also facilitates the discussion of scenarios for a transition to low-carbon growth. In recent years, South Africa has increasingly stated its ambition to act responsibly to mitigate climate change. In its Copenhagen Pledge, South Africa proposed to reduce carbon emissions in 2020 by one-third relative to a business-as-usual scenario, depending on adequate international support in financing, technology development, and technology transfer. Assuming a 4 percent GDP growth rate for illustration, we estimate that the target reduction in emissions could be accomplished by a reduction by 2020 of around 25–30 percent from current levels in both the energy intensity of GDP and in the CO_2 intensity of the energy mix. Greater reduction in the energy intensity of GDP would allow the goal to be met with a smaller reduction in CO_2 intensity, and vice versa. Both intensities would have to decline by a greater amount to meet a given emissions reduction target if there is a higher GDP growth rate.

As noted, the energy to GDP ratio in South Africa has been trending lower at a little over 1 percent a year in the 2000s. To achieve a 30 percent decline by 2020 would imply accelerating the pace of energy efficiency improvement to about 3 percent a year. While ambitious, such a goal is feasible since about a quarter of the world's countries achieved this or faster energy rates in 2000–07. The prospect for a rapid reduction in the carbon intensity of energy consumption is more challenging, however. To reduce carbon intensity by 20 percent by 2020 would require the pace of decline to increase from around 0.5 percent a year to around 2.5 percent. Given South Africa's current pattern of energy consumption, this would necessitate a rapid shift from coal to renewable sources or nuclear, as well as a significant shift to natural gas.[24] However, the number of countries that achieved decarbonization at an annual pace of 2 percent or more during 2000–07 is quite small.

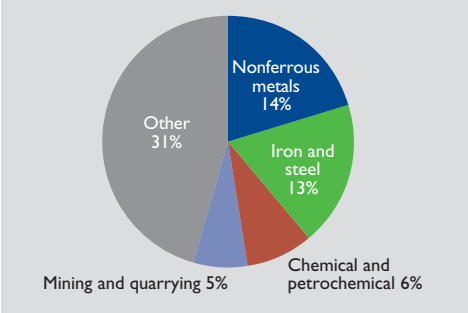
Noting these challenges and the current realities of international climate mitigation policy, the *National Development Plan: Vision 2030* realistically observes that: "it will be challenging to honor the commitment to reduce South Africa's emissions without compromising the overriding priorities to create jobs, address poverty, improve public health and grow an internationally competitive economy, without substantial international assistance. However, it is in the country's best interest that an absolute global emissions constraint is put into effect sooner rather than later."[25]

Figure 2.4 Energy use by sector, 2009 (percent of total energy use)



Source: International Energy Agency.

Figure 2.5 Energy use by subsectors, 2009 (percent of industry energy use)



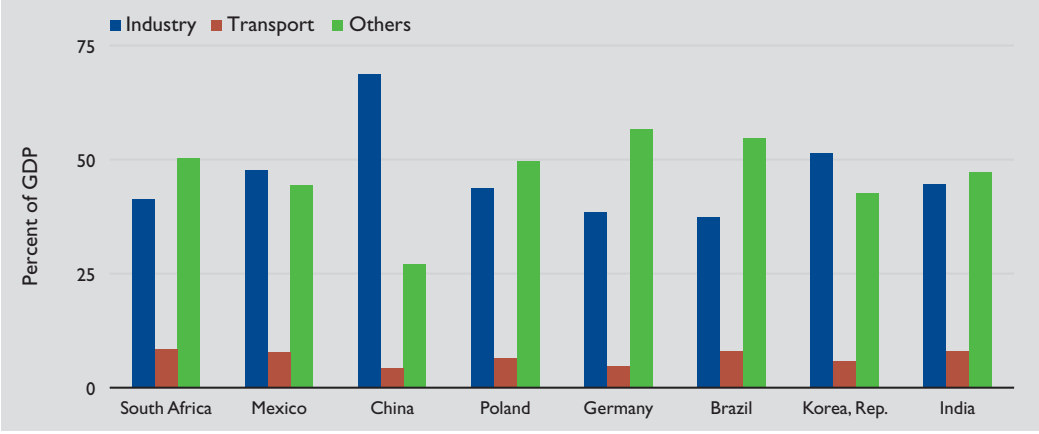
Source: International Energy Agency.

The current energy situation: a closer look

Like many countries with a relatively established industrial sector, most of South Africa's energy use is distributed across industry (33 percent), residential (27 percent), and transport (26 percent)—see figure 2.4. Within industry, the top four energy-using subsectors are nonferrous metals (mainly electricity-intensive aluminum production), iron and steel, chemicals, and mining/quarrying (figure 2.5). However, roughly 30 percent of total industrial energy use is outside these subsectors, scattered across a substantial number of other subsectors each with relatively small energy use. Close to 85 percent of the country's total carbon emissions come from industry, transport, and residential, with industry alone roughly half that (over 40 percent of total national emissions). Within industry, however, emissions outside the top four subsectors are closer to 40 percent of the industry total, indicating the high carbon intensity of some smaller sectors.

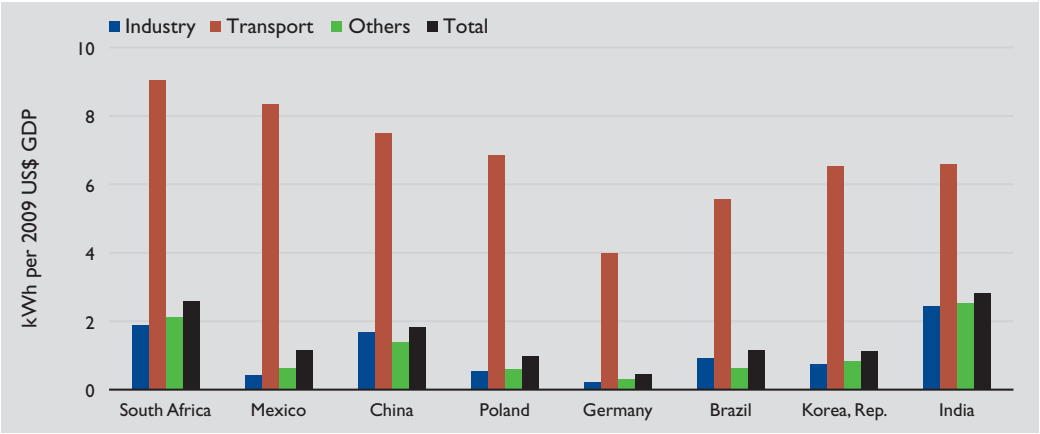
We now look more closely at the broad drivers of carbon emissions noted earlier. Does South Africa's high economywide energy intensity primarily reflect high energy intensity within particular sectors, or the overall composition of economic output? Figures 2.6 and 2.7 provide a crude but useful initial cut at answering that question. Figure 2.6 shows that shares of GDP from industry, transport, and "other" for South Africa are broadly comparable to those in several other relatively industrialized middle- and high-income countries—notably Brazil, Germany, India, and Poland. Among the other comparator countries in the figure, Mexico and Republic of Korea have higher industry shares and smaller transport shares, while there is a bigger difference between these shares for China. Looking forward, it will be important to carry out this kind of analysis of sectoral structure at the level of individual industries, transport modes, residential and commercial buildings, agriculture, and so on.

Figure 2.6 Economic structure across economies, 2009



Source: United Nations Industrial Development Organization.

Figure 2.7 **Energy intensity by sector, select countries, 2009**



Source: International Energy Agency and United Nations Industrial Development Organization.

Figure 2.7 shows that the energy intensity of industry in South Africa is substantially larger than in most of the other countries shown, including China. Only India has a higher industrial energy intensity. South Africa's energy intensity for transport is also substantially above the intensity in other countries. While those differences could reflect a variety of influences—including age of vehicle stock, population density, and availability of mass transit—they likely also reflect continued use of highly carbon-intensive synthetic oil from coal liquefaction. These observations suggest that there are likely to be significant opportunities for South Africa to improve energy efficiency, many of which can be undertaken at relatively low cost.

On South Africa's high intensity of carbon emissions per unit of energy used, almost 70 percent of South Africa's total energy supply comes from coal, either directly or through coal-fired electricity, compared with almost trivial amounts of hydro, solar, and wind. About 10 percent of total energy supply comes from biomass, in contrast to many other relatively industrialized economies and likely reflecting continued small-scale and traditional uses of biomass in rural and lower income areas. These patterns of energy use have also given rise to serious air quality concerns.[26]

Green energy policies

Context and objectives. South Africa's challenges in achieving green growth cannot be separated from its economic and political history, which have led to a dualized economy with high unemployment and poor quality public services for the historically disenfranchised. As a consequence, South Africa faces interconnected challenges of environmental sustainability and poverty alleviation that in some ways are similar to other countries at a similar stage of development, and unique in others.[27]

The recent Integrated Resource Plan (IRP) for energy sector development over 2010–30,[28] and the *National Development Plan: Vision for 2030* clearly articulate the multiple and complicated energy-related challenges that South Africa must address to achieve its goals for economically, environmentally, and socially sustainable development. The needs for change echo those first articulated in the important 1998 *White Paper on Energy Policy*. They include:[29]

- Responding to the risk of near-term electricity capacity shortages, while also increasing energy supply and improving energy efficiency over the longer term to respond to the needs of a growing economy and help keep South Africa competitive in the global economy.
- Making energy affordable to meet the basic needs of all South African households and realize the fundamental goals of inclusive development.
- Addressing local environmental threats from energy use, notably those to air pollution and human health. This in turn requires addressing primary fuel quality for lower income households and rural areas, and ambient air pollution from energy

combustion in power production, industry, and transport.
- Shouldering an appropriate share of future responsibility for the long-term global challenge of sharply restricting emissions of CO_2 and other greenhouse gases.

The current state of the electricity sector derives in part from circumstances dating to the 1970s, when Eskom, finding itself with excess generating capacity, embarked on a strategy to stimulate electricity demand with low rates, while lining up long-term coal supply contracts at favorable prices. As economic growth restarted after 1994, demand for electricity rose, but tariffs (and contract coal prices) were slow to adjust. These de facto subsidies, plus delays in expanding capacity and insufficient investment in maintenance, led to a crisis including blackouts and other curtailments starting in 2008.

Getting the prices right and improving energy efficiency. South Africa is now unwinding the distortions in its electricity pricing, with substantial tariff increases beginning in 2008 and planned to continue every year through 2012/13. Eskom has also negotiated new interruptible service agreements with large customers to increase short-term flexibility in load management. The higher prices provide a powerful incentive for improving energy efficiency over the medium and longer term, as well as curbing nearer term demand in the face of capacity shortages.

South Africa has also undertaken an in-depth and well advanced discussion on a carbon tax, a way of putting a price on this environmental "bad." Both theory and experience indicate that pricing emissions is the most efficient way to provide broad incentives to mitigate carbon emissions from energy use. The National Treasury (2010) lays out clearly how a carbon tax would work in South Africa, and the potential impacts on economic efficiency, fiscal balance, and distributional considerations.

Implementing a carbon tax will have challenges, however, particularly for coal-based emissions. NPC (2011b) points out that Eskom is a regulated monopoly, and since its costs (including fuel expenses) are covered by regulated electricity rates, the tax may do little in practice to reduce carbon intensity in power generation. Substantially increased competitiveness in the wholesale power market could have the desired effect, but this would take some time to accomplish. Until that time, authorities may need to consider either a modified form of carbon tax that changes relative fuel-cost recovery for different energy sources based on carbon content without compromising Eskom's financial sustainability—or some systemwide performance standards on the carbon intensity of electricity supply as a second-best alternative.

Enhancing energy efficiency is an important element of green growth in South Africa. Better energy efficiency can lower energy costs, reduce environmental impact from lower energy use per unit of output, offer flexibility in how it is developed and delivered (limited sunk costs), and contribute to employment growth because of its relatively high labor intensity. Along with the ongoing reforms of energy pricing that provide a powerful impetus for improved energy efficiency, there are good arguments for well-targeted energy-efficiency standards to overcome institutional and informational barriers that can limit the effectiveness of price-based incentives. The National Energy Efficiency Strategy, first promulgated in 2005 and reviewed in 2008, contains standards and implementation measures toward that end, particularly for energy efficiency improvements in industry.[30]

Integrated Resource Plan options. South Africa's challenges in balancing multiple objectives are laid out in the Department of Energy's discussion of revisions to the IRP.[31] The long-term goal is to add almost 30 GW of new generation capacity by 2030 and to complete roughly 10 GW of new coal-fired capacity already in the pipeline. That would replace retiring capacity and satisfy anticipated growth in electricity demand; ameliorate risks of supply insecurity; create new domestic business and employment opportunities; stabilize national emissions of CO_2 at 275MT per year from 2025 onward (significantly below business as usual projections); while also holding down electricity price increases. The means to accomplish these objectives include additional (high-efficiency,

lower emissions) coal fired generation capacity; deployment of substantial new nuclear capacity (almost 10 GW); investment in more than 20 GW of renewable energy capacity, including early-start investment that can help build up domestic capacities and employment opportunities; improved energy efficiency through demand side management programs; expanded regional agreements and corresponding transmission investment to import more hydroelectric power; and increased substitution of unconventional and imported natural gas for coal.[32] The IRP target for renewable energy investment through 2016 (already committed and new build) is in line with the 3,725 MW announced as part of the November 2011 *Green Economy Accord*.

In response to comments on an initial consultation draft, the IRP has subsequently been adjusted in several ways, notably far faster construction of coal plants to increase nearer term supply security combined with a larger and faster investment in renewables capacity. The new investment in renewable by 2020 is anticipated to include 2.4 GW each of solar photovoltaic (PV) and wind capacity, and 400 MW of solar thermal capacity.[33] South Africa and the World Bank signed an agreement in November 2011 for a $250 million loan for constructing large on-grid wind and solar thermal power plants, each of 100 MW.

Uncertainties, challenges, opportunities. As noted, the *Green Economy Accord* lays out an ambitious and far-reaching agenda for new initiatives in energy efficiency and renewable energy, involving both major investments as well as commitments to skills development for thousands of workers. Any plan on this scale faces various uncertainties. In particular, economic and technological uncertainties arise in the context of large, long-lived investments in power generation capacity that once built are costly to change. This point, in turn, underscores the importance accorded in the IRP to undertaking a range of initiatives that provide greater overall flexibility in the nation's portfolio of power sector investments.

The ambitious nearer term renewable energy investments and energy efficiency measures envisaged in the IRP and the Accord reflect strong emphasis on capturing early "learning by doing" gains that are expected to result in new opportunities for employment, skills development, and domestic business growth. These actions also can provide a hedge against fossil-fuel price increases, and they make it possible to build fewer carbon-intensive coal-fired plants to meet growing demand, thus avoiding increased longer term CO_2 emissions. At the same time, it will be important to monitor how the unit investment costs of different renewable energy technologies are declining over time so as to optimize longer term investment budgeting. The larger are these declines, the greater are the prospective gains from longer term renewable investment and the lower will be the start-up costs.[34]

The planned investment in nuclear post-2020 can also provide a useful hedge against uncertainties in fuel prices and renewable energy investment costs, in addition to displacing new coal-fired generation capacity that otherwise would have been built.[35] The other side of the choice is uncertainty about the capital costs of new-generation nuclear plants. Another uncertainty involves the prospects for more plentiful and low-cost natural gas becoming available, acting as a bridge fuel for power generation and vehicles.

Economic growth, jobs, and international competitiveness

A crucial question in developing countries is how green environmental policies will affect the growth in output of economic goods and services (measured approximately by real GDP) and employment.

Green policies could have such effects in two ways. The first is the impact on growth and employment of structural changes in the country's economy as a result of green policies—for example, as a result of changes in demand patterns, the emergence of new sectors and the decline of others, and the adoption of new technologies. The first two parts of this section look at these kinds of effects on growth and jobs, respectively. The second channel is through a country's participation in the international market for environmental goods and services, likely to grow as more countries adopt green policies. Many countries hope to boost

growth and employment by becoming globally competitive net exporters in the world market for green goods and services, though not all can succeed. The last part of this section looks at the global trends in world trade of environmental goods and services and South Africa's potential participation in this market.

What does greening imply for growth?

Developing countries are usually extremely concerned about the impact of green policies on short-term economic growth, a major driver of employment. In some cases, the choice should be rather straightforward, as when green policies eliminate economic distortions like energy subsidies, thus increasing economic efficiency and the prospects for growth. In other cases like climate change, the choice may be more difficult, since green policies could require some economic costs today in return for environmental and economic benefits in the longer term.

The traditional viewpoint. The traditional view is that a greener environment usually does have some economic cost, but that with well-designed policies the cost can be kept fairly small if implemented using market-based policy instruments, like a pollution emission tax, that create incentives for people to seek out the least-cost ways of protecting the environment.[36] There is also evidence for the so-called "double dividend" hypothesis: economic costs can be further minimized when pollution tax revenues are used to reduce other distorting taxes, for example on capital or labor, or to reduce fiscal large deficits.[37] But much will depend on the ambitiousness of environmental targets, the availability of substitute technologies, the level of distortions in the existing tax system, and the particular country circumstances.

In South Africa, a significant amount of work has been undertaken in recent years to evaluate the economic impacts of environmental regulation to limit greenhouse gas emissions.[38] The results of these studies broadly confirm the results found internationally—emission mitigation will have some economic costs, but they can be limited by the use of efficient instruments, such as a carbon tax, and by recycling revenues to reduce other distorting taxes. Devarajan and others (2011) find that a carbon tax designed to reduce emissions by 15 percent reduces household welfare by 0.33 percent. This cost is slightly reduced with revenue recycling to reduce other indirect taxes. The study also finds that the welfare cost is significantly lower when distortions in the labor market are reduced.

South Africa is also in the midst of gaining valuable experience on these matters as a result of the major increases in electricity tariffs implemented in the wake of the local energy crisis in 2007/08. Prices began to be increased in 2008, with significant annual increases planned through 2012/13. It is perhaps still too soon for rigorous analysis of the impact on the economy. But a survey of large firms commissioned by the National Treasury finds that companies are making significant changes in their operations in response to the tariff increases.[39] Most firms are implementing options to increase energy efficiency. Energy savings are expected to rise to around 3.5 million MWh a year in 2011–15, compared with less than 2 million a year in 2008–10. Firms are also anticipating an increase in the number of renewable energy projects that they undertake. While the survey does not look at the impact on firm output, it is a hopeful sign that firms are making these adjustments in response to higher prices, a precondition for minimizing adverse impacts on business performance.

The Porter Hypothesis—Do green policies accelerate growth? More recently the traditional view that there some tradeoffs between environmental protection and growth has been challenged by the Porter Hypothesis.[40] What has often been called the "weak" version of the Porter Hypothesis says that the use of well-designed environmental instruments like pollution pricing is likely to stimulate innovation by firms. A stronger version is that this induced innovation by firms can overcome the added costs of regulation and, in that case, will lead to an increase in firms' productivity and business performance.

On a sufficient scale, then, a strong Porter effect could boost output and growth as a result of green regulation. While this is an attractive idea, there is, however, relatively little overall evidence for the strong version as yet. A recent

survey paper by Ambec and others (2011) surveys the empirical research on the Porter Hypothesis. It notes a good deal of evidence for the weak version: that is, for a positive relationship between environmental regulation and firm innovation, as measured by R&D spending or patents.

But the evidence for the strong Porter effect is much more mixed, with an earlier generation of studies generally finding that environmental regulation had a negative impact on firm productivity, while some more recent studies have found a positive impact. A recent study by Lanoie and others (2011) studies the Porter causality chain in more than 4,000 firms in seven industrial countries. They again confirm the existence of a significant positive link between regulation and firm innovation. They further find that such innovation does have a significant positive effect on business performance. But they also note that the environmental regulation itself has a direct negative effect on business performance. On balance, they find the net effect of regulation on business performance is negative. An earlier study by Lanoie and others (2008) accounts for the point that it would probably take some time for Porter-type effects to become apparent. For a sample of firms in Quebec, they find that the impact of regulation on business performance is initially negative but then becomes modestly positive after a number of years.

What lessons should policymakers draw from the evidence on connections between green policies and growth? Given the mixed cross-country evidence, it would probably be prudent not to count on environmental regulation by itself having major positive effects on economywide business performance and growth, at least in the near term. However, green policies do significantly improve human well-being directly, through better environmental protection, and, as noted earlier, can have significant synergies with growth, especially when coordinated with a well-designed package of policies directly targeted at raising growth.

What does greening imply for jobs?

Reducing unemployment is one of the overriding policy concerns in South Africa today. And green growth to generate green jobs is now a part of the country's plans to tackle unemployment.

The *New Growth Path* targets greening to generate 300,000 direct jobs by 2020—6 percent of the 5 million additional jobs needed to cut the unemployment rate from its current 25 percent to 15 percent by 2020. These jobs are expected to arise from "expanding the existing public employment schemes to protect the environment," biofuels production, and "major new opportunities for investment, and employment in manufacturing new energy technologies as well as construction" related to expanded renewable energy targets. These plans were further fleshed out in the November 2011 *Green Economy Accord*.

The *Industrial Policy Action Plan* (IPAP) for 2010/11–2012/13 also highlights green and energy-saving industries as one of 13 key sectors to promote. It emphasizes solar water heating, concentrated solar thermal, industrial energy and water efficiency, wind, biomass, waste management, and energy-efficient vehicles, using subsidies, subsidized finance, standards, regulations, and public demonstration investments. The IPAP does not discuss the employment implications of these initiatives, however.

To be sure, there is no entirely agreed definition of the term "green jobs." One approach equates it with employment in the specific set of industries that produce goods and services deemed of environmental benefit—currently about 1 percent of total employment in advanced economies. A broader approach focuses on the *overall* employment consequences of introducing green policies, taking into account direct and indirect channels, and jobs created and jobs destroyed.[41]

We look at three sets of questions to help evaluate the potential for green jobs and the implications for the overall employment picture in South Africa.

- First, what are the main factors holding back job creation in South Africa? There is a considerable research literature on this question, and we can just touch on the highlights.[42]
- Second, what does cross-country experience tell us about the job potential of

green growth processes? This is less well researched, but we note some of the emerging issues and findings.

- Third, given results for the first two questions, what are the broader employment implications of green growth in South Africa and what are the kinds of broader complementary reforms would help increase the jobs potential of green growth?

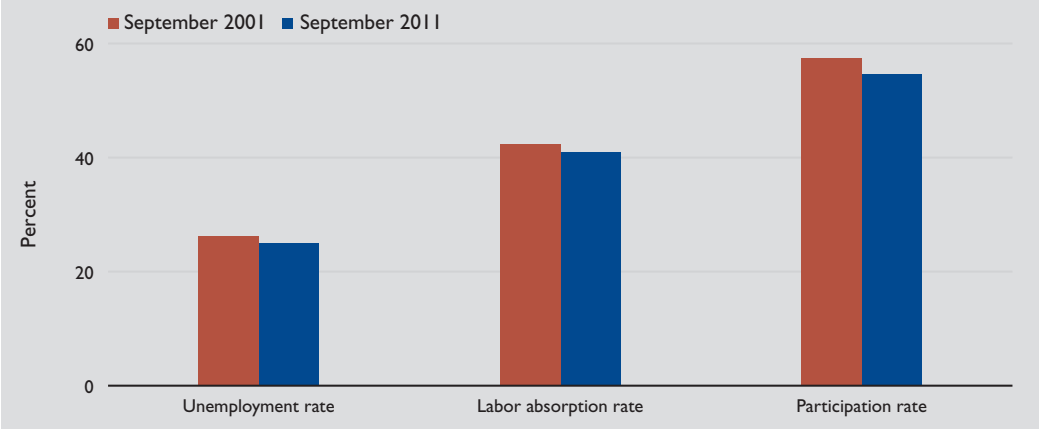
Features and causes of high unemployment in South Africa. Some 25 percent of South Africa's labor force was unemployed in September 2011, down only slightly from a decade earlier (figure 2.8). Such sustained high unemployment is unusual. One can get a better idea of what is driving the unemployment rate by decomposing it into two further ratios. The unemployment rate will be higher, the lower is the *labor absorption rate* (the ratio of employment to the working-age population). Other things equal, the unemployment rate will also be higher, the higher is the labor force participation rate (the ratio of the labor force to the working-age population).[43]

Between the absorption rate and the participation rate, the former explains South Africa's high unemployment relative to other countries. Only slightly more than 40 percent of the working-age population was employed in September 2011, compared with 60–75 percent in the OECD and many middle-income economies. The labor absorption rate was lower than 10 years before. Employment grew only at 1.3 percent a year over the decade, compared with 1.7 percent annual growth in the working-age population. Employment growth was particularly weak in the informal sector, agriculture and personal households.[44] Informal and self-employment is much lower than in other middle-income countries, as is employment in small firms.[45]

The OECD's 2010 Economic Survey for South Africa estimates that much unemployment is *structural,* and that very little can be attributed to cyclical factors.[46] Reasons for the high structural unemployment?

- Trend economic growth of around 3.5 percent in the 2000s has been too weak to absorb the growing labor force.
- Such growth also appears to have become less labor-intensive, particularly in unskilled labor, due to structural changes (contractions of mining, agriculture, and manufacturing employment and shifts to services, some of them are less labor-intensive, like financial services), as well as skill-biased technical change.
- Downward rigidity in real wages in the formal sector has prevented market-clearing in the face of shifts in labor supply and demand. Kingdon and Knight (2007) document the dualistic "insider-outsider" labor market. Insider formal sector workers have strong collective bargaining and regulatory protections. Outsider informal sector workers and the unemployed have few protections and suffer from weak development of SME employment in South Africa.[47]
- On the supply side of the labor market, deficiencies in education and training

Figure 2.8 **Labor market indicators, 2001 and 2011**



Source: South Africa Labor Force Survey, various.

contribute to skill mismatches. Many workers, particularly Africans, live far from where jobs are located, raising reservation wages and the costs of job search.

Green growth and green jobs: what do we know? We still know relatively little about the employment effects of green growth. The reason is that few countries, if any, have implemented extensive green policies, particularly for reducing carbon emissions. Thus there has been little scope for careful empirical evaluations of economywide job impacts. Instead, many studies are more in the nature of model-based scenarios of what the job effects could be, based on partial information, and are quite sensitive to the modeling assumptions. This suggests the need for caution in interpreting and using these results.

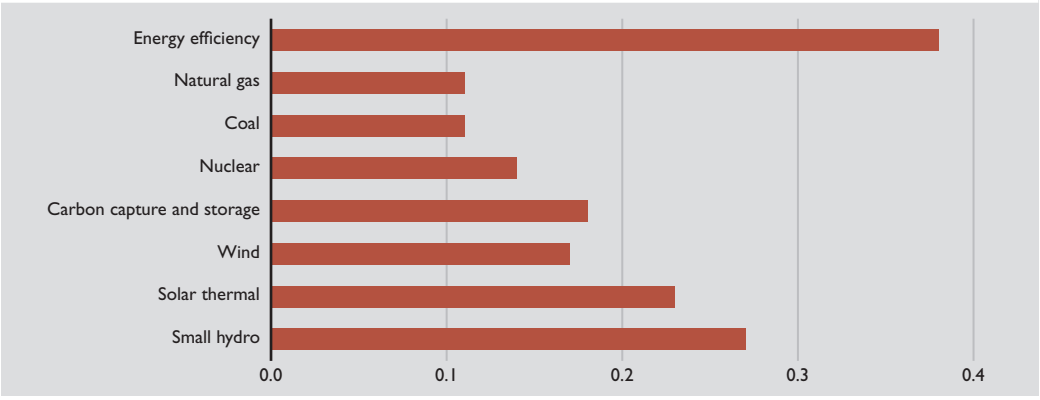
The simplest approach to measuring the employment effects of green growth is to measure *direct employment effects*—the extra employment created by the expansion of a given green sector, with the focus of most studies being on renewable energy technologies such as solar, wind, and energy-efficiency improvements. Sometimes these direct effects are bulked out by looking at *indirect effects*—the additional jobs created in the industries that supply inputs to the expanding green sector—and *induced effects,* when workers in the jobs created by direct and indirect effects spend their wages on goods and services, thereby creating additional jobs.

However, to get a complete picture of the employment impact of expanding a given green sector such as renewable energy, one has to look at the job impact not just in that sector but in the economy as a whole. Thus, to the extent that energy demand is increasingly met from renewable energy sources, there will also be a contraction of output and jobs in traditional fossil-fuel related sectors (with its own direct, indirect, and induced effects). In this case, it is the *net* change in overall energy sector jobs that needs to be considered.

A recent study by Wei, Patadia, and Kammen (2010) provides some information that can help assess such net effects. Figure 2.9 shows their estimates of direct job-years per GWh of electricity produced in the United States by different technologies, including both fossil-fuel and clean technologies. The study generally finds that clean energy technologies do have higher direct employment coefficients than, say, coal or natural gas. Energy efficiency improvement, in particular, appears to be a relatively labor intensive sector, especially when it draws on unskilled labor in the construction sector.[48] Wind, carbon capture and storage, and solar thermal are also estimated to have direct job coefficients that are on the order of 0.07–0.1 job years per GWh greater than coal.[49] (There is also some evidence for the relative high labor intensity of biofuels and low-carbon land use in a developing country.)

One also needs to consider broader economic effects outside the energy sector. Renewable energy sources may have higher capital requirements per unit of output as well as shorter plant lives and more intermittent energy production, each contributing to the current higher cost of renewables over

Figure 2.9 **Direct job years per GWh, United States**



Source: Wei, Patadia, and Kammen 2010.

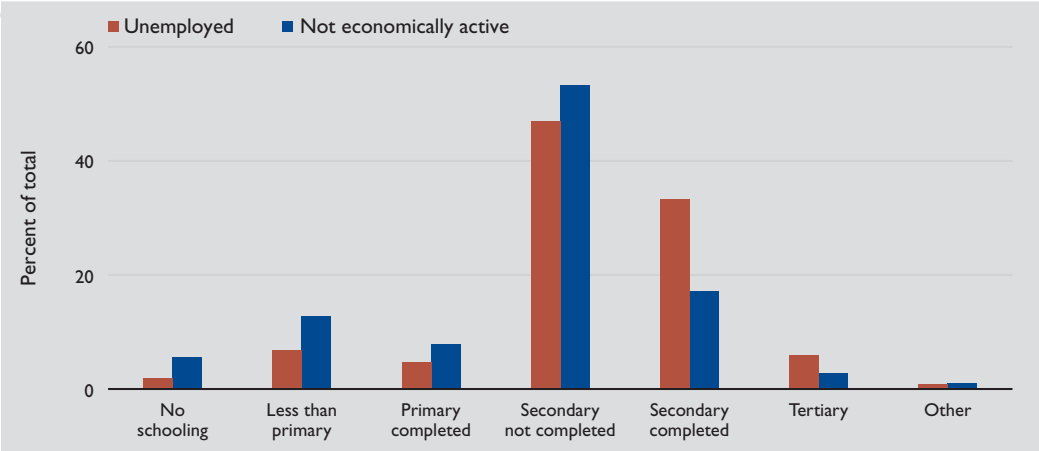
conventional energy sources. These features also need to be taken into account, including the impact on jobs. To the extent that a switch to renewables increases electricity costs, there would also be an adverse impact on output and jobs in downstream electricity-consuming sectors. If the government subsidizes electricity prices to mitigate this effect, there would be a question about the opportunity cost of the fiscal resources used for the subsidy—resources that could have been devoted to alternative purposes, including job creation.

By contrast, capital requirements in the energy-efficiency sector are likely to be much lower than in renewable energy. There is considerable evidence on the relatively low cost of energy savings through efficiency improvements, which are thus likely to be the most promising way to promote employment cost-effectively.

Strengthening the employment implications of green growth. The foregoing discussion has stressed the need to take an economywide approach in assessing the job implications of green policies. This section adds a few comments on the potential for green jobs in light of the reasons for high structural unemployment on South Africa, noting in particular the need for complementary reforms that would increase the job impact of green policies.

- *A low trend rate of economic growth.* As noted in the earlier discussion of growth, we have little evidence as yet that, while generating substantial direct benefits for the environment and for human well-being, green policies alone would significantly boost overall GDP growth. However, there is every reason to think green job creation would be increasingly buoyant in the context of a policy package directly targeted at fast growth, particularly if greater productivity allows South African firms to become more internationally competitive producers of green technologies and products.
- *Less labor-intensive growth, particularly for unskilled labor.* Here, the most promising direction for jobs growth is energy efficiency, which tends to be more labor-intensive then either fossil-fuel or renewable-based power generation, and which also has a larger demand for less skilled labor—for example, in construction, weatherization, and retrofitting.[50] Other segments, like solar PV or smart-grid technology, will make bigger demands on technically skilled labor. Keep in mind the sheer scale of unskilled unemployment in South Africa (figure 2.10). About 60 percent of the unemployed—almost 2.7 million people—have not completed secondary school, and among the economically inactive, almost 80 percent.
- *Labor market institutions and a dual insider-outsider labor market.* Clearly, green policies are not designed and cannot be expected to address institutional issues in the labor market. A more promising line of approach

Figure 2.10 **Highest level of education, July–September 2011**



Source: South Africa Quarterly Labor Force Survey (2011q3).

is to ask what complementary reforms would foster more vigorous SME development in the country, thus increasing the job impact of green policies. In many countries, energy efficiency, in particular, provides considerable scope for SMEs and for SME employment.

A recent study helps illustrate these issues and throws valuable light on some of the challenges ahead.[51] It looks at the job impact in the South African power sector of an energy revolution that would entail a major increase in renewable (non-nuclear) energy supply and energy efficiency. Strikingly, such a revolution would have little impact on employment, compared with a reference or baseline scenario (figure 2.11). The reason is that job gains in energy efficiency and renewables are offset by job losses in coal and nuclear, a possibility discussed earlier.

An advanced energy revolution scenario yields larger job gains, based on the assumption that a much larger proportion of the equipment and technologies used in renewable energy start to be manufactured in South Africa, efficiently substituting for imports and also allowing rising exports. However, such a strong improvement in South Africa's manufacturing competitiveness would presumably need to be based on structural reforms to improve the private investment climate, education and labor force skills, labor market institutions, and so on, since it would not automatically follow from the shift to renewables itself.

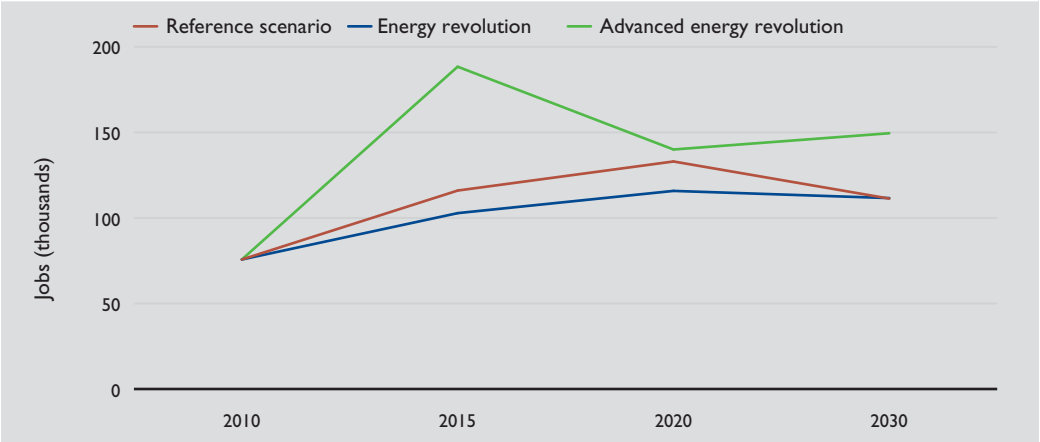
The government's National Climate Change Response White Paper gives the following realistic appraisal: "In terms of job creation, the short- to medium-term objective of the National Climate Change Response Policy is to limit employment contraction to those areas of the economy where excessive carbon intensity is considered unsustainable, whilst promoting and expanding the green economy sectors. Growth in new sectors alone will be no guarantee of net job creation and the government will promote conditions that will increase the mobility of labor and capital out of carbon intensive sectors to greener productive sectors."[52]

Green policies are no substitute for structural reforms. Both are needed. Indeed, the success of green policies will depend on such reforms to improve growth and employment prospects.

Green growth and international trade

International trade and South Africa's "carbon footprint." Worldwide, nearly a quarter of all carbon from fossil fuel burning is emitted in the course of producing goods destined to be consumed elsewhere.[53] And there is a strong pattern for many developed countries to be large net importers of embodied carbon and for their carbon consumption footprint to be larger than their production emissions. Conversely, many developing countries are significant net carbon exporters, with carbon consumption footprints significantly smaller than their

Figure 2.11 **Electricity sector jobs in three scenarios**



Source: Greenpeace International and EREC 2011.

production emissions. The carbon consumption footprint in the four biggest EU countries exceeded production emissions in 2001 by an estimated 15–17 percent, for example.[54] Conversely, China's carbon consumption footprint was about 18 percent smaller than its production emissions. And South Africa was the largest relative net exporter of embodied carbon, with carbon consumption nearly 40 percent lower than production emissions and the vast majority of embodied carbon net exports going to developed economies (figure 2.12).

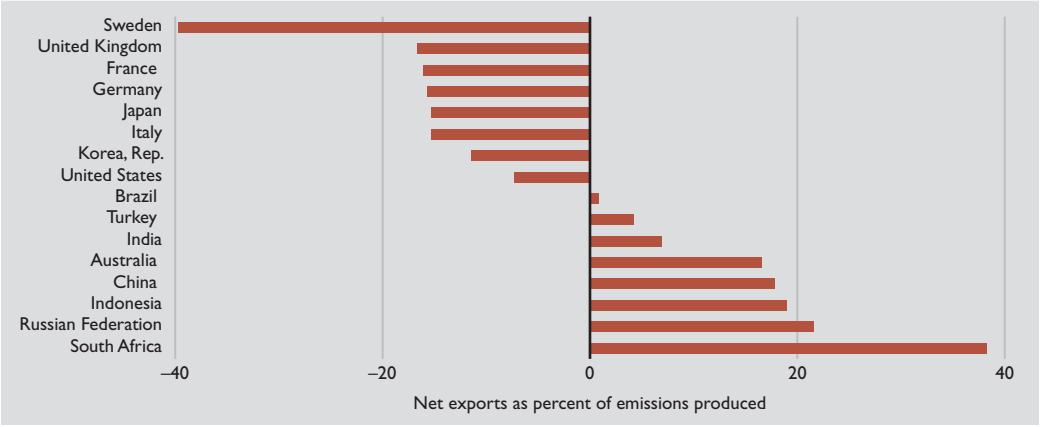
When countries decide to adopt significant carbon pricing to curb their own emissions, they may consider taxing the carbon content of imports from countries that have not yet adopted carbon pricing (most developing countries), to level the playing field. Such border tax adjustments could result in a significant effective tariff rate on the exports of developing countries, including South Africa. A $50 a ton carbon price in importing countries could result in an estimated 11.5 percent average tariff on South African exports, the highest of all the estimates made.[55] Ferrous metals, mineral products, and other mining could face effective tariffs ranging from 19 to 28 percent. Any attempt to guess whether or when a border tax adjustment regime might come about can only be speculative. But it seems likely that South Africa could reduce the risk of being subject to such adjustments if it introduces some carbon pricing, an important point as South Africa debates introducing its own carbon tax.

Opportunities for South Africa in the world market for environmental goods. Many developing countries are interested in the potential to stimulate domestic growth and employment by becoming competitive net exporters of environmental goods and services. Here, we focus on the potential for trade in environmental goods (EGs) rather than services, mainly because of greater data availability.[56] Box 2.3 comments on one type of environmental service trade, ecotourism, drawing on experience from African countries and from Costa Rica.

There is no common agreed definition of EGs, though bodies such as APEC, the OECD, and UNCTAD have developed detailed if differing definitions and lists of EGs in world trade.

Broadly speaking, EGs are classified in two groups. A narrower conventional view of EGs—referred to as *established environmental technologies* (EETs)—focuses on goods used directly in the treatment of environmental problems—for example, goods used in wastewater treatment or equipment used to produce renewable energy. These goods generally have multiple end-uses, only one of which is to provide environmental benefits, the dual use problem. A second broader view of EGs—referred to as *environmentally preferable products* (EPPs)—focuses on goods that are not mainly used to remedy an environmental problem but whose production or end-use generates environmental benefits relative to substitutes. Examples cover a wide range of products including CFC-free refrigerants, chlorine-free paper,

Figure 2.12 **Carbon emissions embodied in trade**



Source: Peters and Hertwich 2008.

Box 2.3 Ecotourism—Conserving the environment and improving welfare

Ecotourism is commonly defined as "Responsible travel to natural areas which conserves the environment and improves the welfare of local people." It is a niche tourism product, estimated by the UN World Tourism Organization to capture about 7 percent of world tourism receipts in 2007, but growing at 20–34 percent a year, about three times faster than tourism overall. Compared with resort-based or tour ship-based tourism, ecotourism is a premium product which attracts a significantly higher expenditure per tourist, a larger proportion of which is also retained in the local economy.[1]

Costa Rica is widely acknowledged as an early developer and market-leader in ecotourism. Tourism has long since become its largest export sector, with nearly half of tourist visits engaged in activities related to ecotourism. Underlying this success is Costa Rica's wealth of biodiversity and its well-established system of 29 national parks and protected areas covering more than a quarter of the country, one of the highest protection rates in the world.

Costa Rica also provides useful lessons on establishing good quality legal, policy, regulatory, monitoring, and impact-evaluation frameworks for a successful ecotourism strategy. The Certification for Sustainable Tourism program provided by the Costa Rican Tourism Board, for example, evaluates and rates tourism companies. The innovative Forest Law of 1996 provides for the government to contract with private landowners for the provision of a range of environmental services, including provision of scenic beauty for recreation and ecotourism, the financing for the program coming from a tax on fossil fuel use.

With exceptionally rich natural attractions and biodiversity, Sub-Saharan Africa—and South Africa specifically—is well positioned to take advantage of the boom in ecotourism. The subtropical thicket restoration program in the Eastern Cape of South Africa would contribute to healthier functioning of the local ecosystem and support ecosystem-based job creation. A healthy thicket is expected to increase carrying capacities for species such as black rhino, elephant, and kudu, which have significant tourism potential, while adding to carbon storage within the region's semi-arid system. Namibia's wildlife conservancy program strengths on land tenure rights and responsibility for wildlife as a means of improving local livelihoods, developing tourism enterprises within conservancies. The Great Limpopo Transfrontier Park, established in 2002, provides for joint management of adjoining national parks in Mozambique, South Africa, and Zimbabwe. The current 2006 to 2013 Transfrontier Conservation Area and Tourism Development Program focuses on policy, legal, and institutional reforms to rehabilitate the various parks and is expected to achieve substantial outcomes for biodiversity conservation, management system capacity, and community welfare.

Note

1. TIES 2006; Honey 2008.

biodegradable natural fibers such as jute and sisal, and energy-efficient light bulbs. There is often overlap between the two categories of EGs. For example, solar panels are classified as EETs when used in a renewable energy power plant but EPPs when incorporated in a solar powered consumer good.

The value of total world exports of EGs was $3.03 trillion in 2010, a little over 29 percent of total world trade.[57] At this broad level, it appears that EGs are not an especially fast-growing component of world trade, their share of world trade having remained roughly constant in the 29–30 percent range since 2002.

The five largest categories of EGs in world trade at the six-digit level are lubricating oils, motor vehicles with cylinder capacity greater than 1,500 cc but less than 3,000 cc, natural gas, light oils, and motor vehicles with cylinder capacity exceeding 3,000 cc. These five make up almost 25 percent of total world trade in EGs, but clearly they are not commonly thought of as green or environmental goods. They are included in the EG definition either because they are considered an EPP (as in the case of natural gas), or because of the dual use problem, or because the six-digit classification level is not disaggregated enough to pick out fuel-efficient vehicles (as in the case of motor cars). The next 15 largest categories of EGs do, however, contain some more conventionally recognized EGs, such as photosensitive semiconductor devices (including PV cells and light emitting diodes that are used as components of solar panels) and gas turbines.

Table 2.1 shows the five fastest growing six-digit categories with an export value greater than $5 billion in 2010. Interestingly, these include categories like photosensitive semiconductors (including those used for solar panels) and wind-powered electric generators, both of which have been growing 3–4 times faster than the value of world trade as a whole.

The largest exporter of EGs is the EU (accounting for 38 percent of world exports) followed by China (12 percent), the United

States (9 percent), and Japan (8 percent). South Africa ranks thirtieth. These rankings are broadly similar to those of a decade ago, except China, which has increased its ranking from fourth at the start of the decade. The United States is the largest market (accounting for 27 percent of world imports) followed by the EU (24 percent) and Japan (8 percent). South Africa is the fifteenth largest importer of EGs. In terms of dynamics, the 15 fastest growing import markets for EGs are nearly all emerging market and developing economies.

South Africa's performance in the world market for EGs. Over the last 25 years, South Africa has generally been losing market share in world trade, dipping from around 1 percent in 1975 to 0.5 percent in 2010. South Africa's world trade share in constant price terms has declined fairly steadily (figure 2.13). The share measured in current prices has been more volatile, however, tending to rise when world primary commodity prices are high, reflecting the significant proportion of commodities in South Africa's exports. Thus the 2000s, a period of generally rising primary commodity prices, also saw a mild increase in South Africa's world trade share measured in current prices, even as the constant price share continued to fall.

South Africa exported $14.9 billion of EGs (Combined List definition) in 2010, about 21 percent of its total goods exports, while importing $22.3 billion, about 28 percent of its total goods imports. EGs have, if anything, trended somewhat lower as a share of South Africa's own export basket since 2002, while imports of EGs have trended modestly higher (figure 2.14).

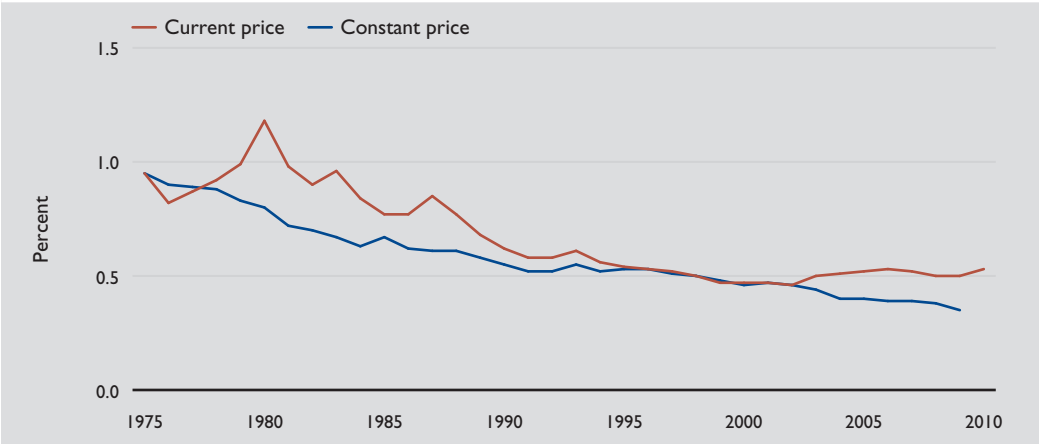
South Africa's share in world exports of EGs is consistently lower than its share in total world exports, though also trending modestly higher (figure 2.15). Its revealed comparative advantage (RCA) in EGs, defined as its share in world EG exports divided by its share in total world exports, for all EGs has been consistently less than 1, suggesting a lack of comparative

Table 2.1 Fastest growing environmental goods in world trade

Six-digit code	Product description	Export value (US$ billions), 2010	Average percentage growth, 2002–10
854140	Photosensitive semiconductors (including for solar panels)	54.8	34.7
740400	Scrap copper	22.2	29.1
850231	Wind-powered electric generators	5.6	29.0
400122	Natural rubber	11.9	27.1
870331	Motor cars, cylinder capacity < 1,500 cc	15.2	25.4

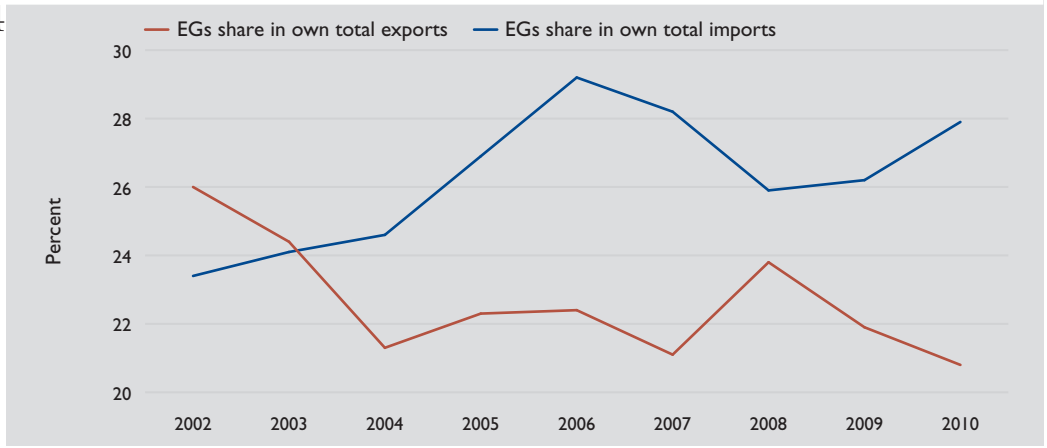
Note: With a 2010 value greater than $5 billion.
Source: Balineau and Gillson 2011.

Figure 2.13 Share of total world trade, 1970–2010 (exports of goods and services)



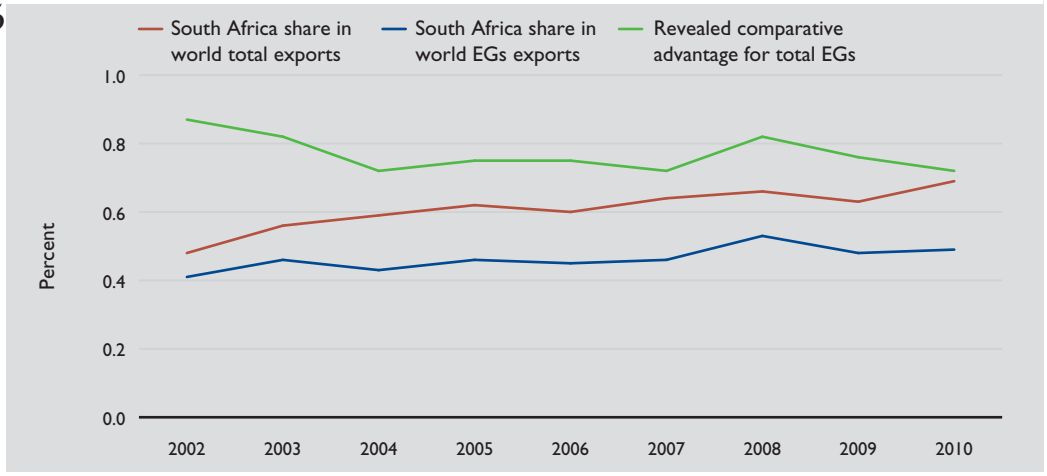
Source: World Bank data and staff estimates.

Figure 2.14 EGs share in own trade, 2002–10



Source: World Bank data and staff estimates.

Figure 2.15 Export competitiveness for EGs (Combined List), 2002–10 (current prices)



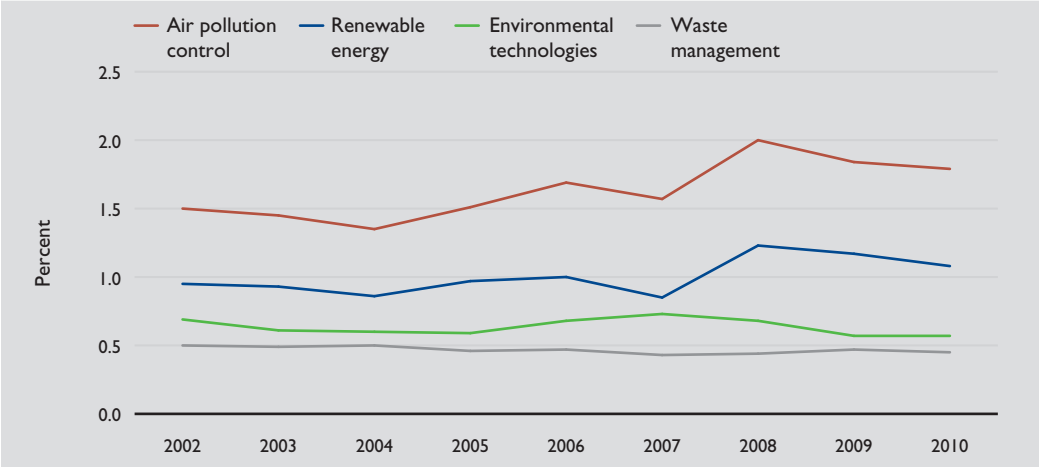
Source: World Bank data and staff estimates.

advantage in EGs as whole (see figure 2.15). But there is a considerable diversity in South Africa's subcategories of EGs. It has RCAs greater than 1 in at least a couple of the broad categories on the WTO list, notably air pollution control and renewable energy, but much less than 1 in waste management and environmental technologies (figure 2.16).

These are very broad and heterogeneous categories, though, and it is necessary to dig deeper to find the specific areas where South Africa has a comparative advantage. Of the 911 six-digit codes on the Combined List, South Africa has an RCA greater than 1 in 97 of them.[58] Of these, a significant number have to do with autos and auto components, whose exports have been promoted under the country's Motor Industry Development Program, which has provided the sector with various financial support. Thus strong RCAs in some of these categories may be misleading about underlying competitive strengths. These products are also important elements of the air pollution control and renewable energy categories, even though they do not fit most conventional notions of EGs.

South Africa also shows RCAs greater than 1 in a fairly broad array of other industrial and electrical machinery—for example, centrifuges, various kinds of electrical motors, generators and furnaces, meters, surveying instruments, and similar products with dual uses. Photosensitive semiconductors (including those for solar panels) have an RCA of 0.97,

Figure 2.16 Revealed comparative advantage for EG categories (from WTO list), 2002–10



Source: World Bank data and staff estimates.

and so are quite close to 1. EPPs based on biodegradable natural fibers are another group where South Africa shows revealed comparative advantage, as are various recyclable metals.

South Africa's trade policies and environmental goods. South Africa's average most-favored-nation applied tariff rate on imports of EGs is 3.6 percent, less than half the 7.8 percent rate on merchandise imports overall. This should be favorable for green growth because South African firms can, broadly speaking, buy environmental inputs and technologies from the most competitive international producers, with relatively low tariff costs. But some sectors are more protected than others: EGs related to iron and steel and vehicles and motor cars have average tariff rates of 7.7 and 10.3 percent, respectively.

Another channel through which trade policy could hamper green growth is if trade barriers provide particularly strong protection for sectors that destroy natural capital, such as heavily energy-intensive sectors. South Africa undertook a strong burst of trade liberalization in the 1990s, but there has been little progress on the trade front since then. Instead, the tariff structure has become more complex, and South Africa has emerged as one of the world's most prolific users of antidumping provisions. Flatters and Stern (2007) comment that the primary beneficiaries of antidumping investigations have been "upstream heavy industries such as steel, chemicals and plastics—that is, they are a form of disguised protection for 'strategic' industries, and the interests of downstream users and final consumers play an insignificant role in antidumping decisions." As of May 2011, 28 out of 68 antidumping provisions were for the energy-intensive iron and steel, aluminum, and chemicals. This is a provocative finding, suggesting that trade policy may protect and expand the energy-intensive sectors of the South African economy—clearly a topic for further study.

This brief survey suggests that, given South Africa's well-developed industrial base and its existing RCAs in various industrial and electrical machinery categories, the country may have the potential to expand its current relatively low share in world EGs markets. Such prospects must be linked to the overall productivity and competitiveness of the South African economy, depending on broad macroeconomic factors, such as the real exchange rate, and on structural factors, such as trade policies, infrastructure, logistics, the investment climate, and labor market characteristics. South Africa clearly has significant challenges, as indicated, by its declining share of overall world trade in the last several decades.

Conclusions

The idea of green growth stresses the need to ensure that natural assets continue to provide the resources and environmental services on which our well-being relies.

In this discussion we have focused on one key element of the green growth agenda in

South Africa, the challenges associated with energy use and country's transition to a low-carbon growth path. Here, policies to increase energy efficiency have a particularly significant green growth potential, by their ability to both improve economic efficiency and reduce the environmental impacts of energy use. This is especially the case in economies like South Africa's with a history of economic distortions due to underpricing energy and overinvesting in energy-intensive sectors. Correcting energy price subsidies is a key element in reaping joint economic and environmental benefits from improved energy efficiency. A good case also can be made for complementing energy-pricing reforms with well-targeted energy-efficiency standards, and reducing regulatory barriers to adoption of more energy-efficient technologies and practices. Trade policy reforms that reduce protection for energy and capital intensive sectors would be favorable for both jobs and energy efficiency. There is some evidence that energy-efficiency improvements have a relatively high employment content, the impact of which in the South African context could be increased through improvements in the investment climate, stronger education and skills training, and reforms that promote SMEs.

Long-term decarbonization of South Africa's economy will require substantial changes in the composition of energy use, moving from a dominant reliance on coal toward low-carbon renewable resources. The recent Integrated Resource Plan and the *Green Economy Accord* lay out an ambitious agenda to substantially increase power generating capacity by 2030—drawing on a broad array of options, including expansion of solar and wind power, nuclear, hydro (through regional cooperation), and natural gas, as well as new coal-fired capacity. The potential irreversibilities associated with long-lived power generation investments mean that there is an advantage to plans that retain flexibility for the timing and size of outlays, based on close monitoring and constant evaluation of factors such as demand trends, the evolving relative costs of different energy technologies, and the implications for domestic growth and employment.

While green policies can have large synergies and co-benefits with the growth and employment agenda, they are not a substitute for it. Indeed such synergies are likely to be mutually enhancing and larger when the growth and environment objectives are being pursued by multiple, well-targeted and coordinated policies.

Notes

1. GGKP 2011. The Green Growth Knowledge Platform is a partnership between the Global Green Growth Institute, the Organisation for Economic Co-operation and Development, the United Nations Environment Programme, and the World Bank.
2. NPC 2011b: 183.
3. NPC 2011b.
4. DOE 2011.
5. Porter and Van der Linde 1995.
6. This section draws on parts of the September 2011 brief prepared by the World Bank's Short-Term Risk Monitoring Group.
7. After turning negative in the wake of the Tohoku earthquake, world industrial production was growing strongly, expanding at an 8.8 percent annualized rate in the two months ending June 2011; commodity prices were stabilizing, and as a result, inflationary pressures were easing and real disposable income growth picking up—setting the scene for an acceleration of output into the second half of the year.
8. Since the end of July, global stock market capitalization has lost $5.5 trillion (as of November 14), or 9 percent of global GDP.
9. The lower bound estimates assume a 1 percentage point increase in precautionary saving worldwide and a 2.5 percentage point reduction in investment growth rates.
10. Capacity utilization in manufacturing stood at 79.8 percent in August, slightly higher than the levels recorded a year ago, but below its previous reading of 81.1 in May 2011.
11. The transition matrices were constructed matching the observations from 2010q4 and 2011q2. One quarter of the sampled dwellings rotate out of the sample each quarter and are replaced by new dwellings in the new dwellings. This means that about half the observations of each QLFS are available to construct the transition matrices.
12. World Bank 2011a.
13. The 2010 Finscope Small Business Survey found that only 9 percent of small businesses had access to credit, while the 2008 Investment Climate Assessment showed the "access gap" between large and small enterprises to be larger in South Africa than in most of its emerging market peers. Furthermore, while 65 percent of households had access to savings and transaction services in 2010, only 34 percent accessed bank credits.
14. Debt distress appears to be on the rise in South Africa. In the case of a more protracted economic downturn, a more adverse scenario for this segment of the financial services industry can clearly not be ruled out.
15. England 2011.
16. Volatility is measured here as the standard deviation of the nominal bilateral exchange rate against the dollar over a 22-day moving window.

17. GGKP 2011. The GGKP is a partnership between the Global Green Growth Institute, the Organisation for Economic Co-operation and Development, the United Nations Environment Program, and the World Bank.
18. See for example OECD (2006).
19. World Bank 2010; NPC 2011a. According to World Bank (2011a), SMEs' access to finance has become more restricted since the onset of the global financial crisis.
20. NPC 2011b.
21. U.S. Energy Information Administration. Comparisons are for 2009 from a set of 217 countries and territories.
22. Department of Environmental Affairs 2010.
23. Trend growth is estimated by linear regression against a time trend.
24. Another alternative would entail massive expansion in geological carbon sequestration, still a pioneer technology that remains unproven at large scale.
25. NPC 2011b: 183.
26. Witi's (2005) analysis of particulate data from monitoring stations in several urban areas, while now dated, shows how a variety of sources contribute to excess concentrations of this pollutant, which is very harmful to health and longevity.
27. NPC 2011a.
28. DOE 2011.
29. Reforms after 1998 addressed governance in the electricity sector, including corporatizing the national utility Eskom, establishing a stronger independent electricity sector regulator, formulating policies with quantitative targets for renewable electricity supply and energy efficiency, and taking further measures in 2010 to cope with the electricity supply crisis. The country's position on climate change policies was laid out in a "Long-Term Mitigation Scenarios" document in 2008. See Greenpeace International and EREC (2011) and OECD (2010).
30. Department of Minerals and Energy 2008. Subsidies for improving energy efficiency are harder to target and may end up benefiting those who would have chosen the more energy-efficient option anyway. The Strategy emphasizes potential for the self-financing of many efficiency measures given the reduction in future energy costs.
31. DOE 2011.
32. See Mukheibir (2007) for information on regional hydro potential. NPC (2011b: 143) provides information on potential natural gas sources including coal bed methane, imports of liquefied natural gas, and natural gas trapped in shale rock formations (the latter appears to be extremely abundant in South Africa).
33. The previous version of the plan had called for 3.6 GW of wind before 2020, but only 400 MW of solar PV and thermal capacity over that period. Over the period to 2030, the revised plan includes more new coal capacity than the previous version (6.3 versus 5.0 GW), less imported hydro (2.6 GW versus 3.3 GW), and somewhat more new gas combined-cycle capacity (2.4 GW versus 1.9 GW).
34. Lower start-up costs also allow for a lower "feed-in tariff" to cover the costs of new renewable supplies. This kind of tariff allows a supplier of higher cost energy to recover the full costs of supply, while the cost premium is spread across the rates paid for all other electricity use. South Africa's "REFIT," promulgated in 2009, has subsequently been undergoing reconfiguration.
35. The IRP's technology cost-investment experience curves are drawn from analysis carried out by the International Agency (IEA 2008) on how these technologies might develop on a global scale. The report by Greenpeace International and EREC (2011) appears to have more ambitious technology learning rates.
36. Aldy and others 2010.
37. Huberty and others 2011.
38. Department of Environmental Affairs 2007; National Treasury 2010; Devarajan and others 2011; Van Heerden and others 2006; Winkler and Marquard 2009.
39. DNA Economics 2011.
40. Porter and Van der Linde 1995.
41. See Bowen (2011) and World Bank (2011c) for a fuller discussion of green jobs concepts, methods of estimating green jobs effects, and surveys of the existing empirical literature in this area.

42. For example OECD (2010), Kingdon and Knight (2007), and Banerjee and others (2008).
43. The formula is UR = 1 – (AR/PR), where UR is the unemployment rate, AR is the labor absorption rate, and PR is the participation rate.
44. South Africa's labor force participation rate—a little below 55 percent—is also lower than in the OECD and other middle-income countries. In other words, a little more than 45 percent of the working-age population is not economically active. This tends to hold down the measured unemployment rate. Yet the economically inactive population contains a large component—well more than 2 million people—of discouraged work seekers. Adding these discouraged workers back in, a broad measure of unemployment was 33.3 percent in September 2011.
45. Magruder 2009.
46. OECD 2010.
47. Magruder (2009) argues that the weak development of SMEs is related to the system of Bargaining Councils and Wage Boards, which set sectoral minimum wages and extend these to all firms in the sector regardless of size. He finds the presence of Bargaining Councils in a sector reduces sector employment by 6–11 percent, with especially large shortfalls in SME employment.
48. Huberty and others (2011) summarize studies that generally find significant employment effects from energy efficiency programs in the United States.
49. The study finds a significantly higher estimate for solar photo voltaic (PV) but the authors note that it is likely to be unreliable and requires further study, because of various difficulties with underlying data sources.
50. Pollin and others 2009.
51. Greenpeace International and EREC 2011.
52. Department of Environmental Affairs 2011: 33.
53. Davis and Caldeira 2010.
54. Peters and Hertwich 2008.
55. Atkinson and others 2011.
56. This section draws on Balineau and Gillson (2011), a World Bank background paper prepared for this report.
57. This number refers to the Combined List of EGs, which is a comprehensive concordance of various overlapping lists developed by bodies like APEC, the OECD, UNCTAD, and the WTO. Balineau and Gillson (2011) provide details.
58. See Balineau and Gillson (2011) for the complete list.

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