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The Impact of Oil Price Shocks on the South African Macroeconomy: History and Prospects

Jeremy Wakeford

Accelerated and Shared Growth in South Africa: Determinants, Constraints and Opportunities

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The Impact of Oil Price Shocks on the South African Macroeconomy: History and Prospects

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Abstract

A steep upward trend in the price of crude oil in recent years has led to increasing concerns about its economic implications, both abroad and in South Africa. This paper traces the history of oil shocks and their impact on the South African macroeconomy. It finds that while commodity exports – especially gold – provided an initial buffer, the economy was not immune to sustained price shocks. The paper then considers the outlook for future oil shocks and their possible impact, given South Africa's current strengths and vulnerabilities. While there are several short-run supply risks, the major threat is the inevitable peaking of world oil production, which may occur within 5 to 10 years. This will arguably result in recurrent oil shocks and greater volatility as the world struggles to adjust to a different energy regime. While previous oil shocks were precipitated largely by unforeseen political events, the oil peak is a certainty and therefore mitigating action – employing currently available technologies – can and should be taken to avoid unnecessary costs. Some implications and suggestions are offered for macroeconomic policy, including monetary policy and the Government's Accelerated and Shared Growth Initiative.

1 Introduction

A steep upward trend in the price of crude oil in recent years, reaching a record nominal high in mid-2006, has led to increasing concern about its macroeconomic implications, both abroad and in South Africa. Indeed, the South African Reserve Bank (SARB) considers oil price movements to be one of the major threats to the continued attainment of its inflation target, as evidenced by numerous recent statements by its Monetary Policy Committee. Furthermore, rising energy prices have the potential to undermine the Government's Accelerated and Shared Growth Initiative for South Africa (AsgiSA), which seeks to attain an economic growth rate of six percent by 2010 and to halve unemployment and poverty by 2014 (RSA, 2006).

There is a growing literature on the impact of oil price shocks on South Africa. In an early article, Dagut (1978) reflected on certain theoretical and practical aspects of the first oil shock and noted that gold provided only a temporary buffer against the ensuing international economic fallout. Based on the 1979/80 oil shock experience, Kantor and Barr (1986) estimated that a 10 percent increase in the price of petrol resulted in a 0.7 percentage point increase in consumer inflation (net of food prices) after seven months, although the simulated rate of inflation subsequently declined to below its starting rate. Van der Merwe and Meijer (1990) provided a detailed descriptive account of the first three oil shocks, focusing on the effects of the shocks on domestic inflation, the gold price and the terms of trade.

More recently, PROVIDE (2005) use a computable general equilibrium model to simulate the economy-wide and sectoral impacts of an oil price hike, but their model does not allow for an overall increase in the price level or a monetary policy response, which are major issues surrounding oil shocks. Swanepoel (2006) employs a vector autoregressive (VAR) model to analyse the impact of three external shocks (including oil prices) on South African rates of import, producer and consumer inflation. Swanepoel (2006: 9-12) paradoxically finds a negative response of non-oil import prices to an oil price shock. However, such a shock is found to have a (barely signficant) positive impact effect on producer prices (but insignificant and negative after one or more lags); and the effect on consumer prices is statistically insignificant no matter what the lag. Bellamy (2006) attempts to model the macroeconomic impact of oil price shocks in South Africa using a VAR framework. He finds that the economy was fairly resilient in the face of shocks, thanks mainly to the gold price. However, this work needs to be extended as the model shows signs of instability. Finally, Kohler (2006) examines the effect of rising energy prices on the South African economy and on the poor, and cautions that further rises in oil prices could jeopardise world economic growth rates.

This paper overlaps with, and draws on, relevant aspects of the foregoing studies but defines its scope somewhat differently. The aim of the paper is threefold. First, it seeks to trace the historical impact of oil price shocks on the South African macroeconomy. Second, it considers the outlook for future shocks and their possible impacts, given South Africa's current strengths and vulnerabilities. Third, it draws implications for macroeconomic policy, especially monetary policy and the Government's AsgiSA strategy, but also includes other adaptive and mitigating

measures. The paper adopts a political economy perspective relying on historical analysis, assisted by graphical representation of certain key variables.

The format of the paper is as follows. Section 2 lays the conceptual foundation by considering the role of oil in the modern industrial economy, the factors that determine the international price of oil, and the anticipated short- and long-run impact of oil price shocks. Section 3 surveys the historical record regarding oil shocks and their macroeconomic impact on South Africa. The fourth section considers the extent to which historical experience may or may not be a reliable guide to the impact of future oil shocks. Section 5 assesses the prospects for further oil shocks, highlighting several short-term supply risks as well as the more serious implications of the inevitable peak in world oil production. Section 6 offers policy recommendations, while the final section concludes.

2 Conceptual background

This section sets the scene for an empirical analysis of the impact of oil shocks in South Arica by exploring (1) the role of oil in the modern economy, (2) definitional aspects of an 'oil shock', (3) the determination of international oil prices and domestic fuel prices, and (4) both short- and long-run transmission mechanisms from oil shocks to key macroeconomic variables. A review of the extensive international empirical literature on the macroeconomic impact of oil shocks is beyond the scope of this paper.

Oil is arguably the quintessential commodity in the modern industrial economy. Although the industrial revolution was initially powered by coal, since its discovery in Pennsylvania in 1869 oil has gained increasing prominence in terms of its share of the world's primary energy supply, accounting for 37 percent (the largest share) in 2001 (IEA, 2005). As an energy source oil is used for electricity generation, and to a lesser extent for heating and cooking. However, its most important role is as a liquid fuel for transportation. Globally, ship, train, airplane and road transport depend overwhelmingly on oil. Consequently, the tourism sector in most countries is also highly reliant on oil. Industrial agriculture (or 'agri-business') depends heavily on oil for the production of fertilizers, herbicides and pesticides. The manufacturing sector uses oil both for energy and as a feedstock for a myriad of products from plastics to paints to pharmaceuticals.

A large literature exists on the theoretical and empirical linkages between energy and economic growth (for a review see Stern and Cleveland, 2004). Energy (especially oil) is a critical input in many productive processes and therefore a causal factor for economic growth; in addition, economic growth stimulates the consumption of oil by households. It is small wonder therefore that the demand, supply and price of crude oil attract so much attention.

2.1 Defining an 'oil shock'

Oil shocks are usually defined in terms of price fluctuations, but these may in turn emanate from changes in either the supply of or the demand for oil. In practice it is unlikely for demand to grow rapidly enough to cause a price shock unless it is motivated by fears of supply shortages. Historically, as we shall see in section 3, the

supply side has been primarily responsible for observed oil price shocks, at least as an initial trigger. Price shocks may of course be negative (a fall) or positive (a rise), but the latter are the concern of this paper.

There are at least two important dimensions of a price shock. The first is the magnitude of the price increase, which may be measured in absolute terms or in percentage changes. Further, one can distinguish between nominal and relative (or real) price changes. The second aspect is one of timing: the speed and durability of price increases. Three cases may be identified: (1) a rapid (e.g. occurring within a few quarters) and sustained price increase (a 'break'); (2) a rapid and temporary price hike (a 'spike'); and (3) a slower but sustained rise (a 'trend'). The speed of a shock is important as it affects the ability of economies to adjust, which is typically very restricted in the short run. Durability has obvious implications for the permanence and overall extent of the consequences.

The conventional view is that there have been three oil price shocks to date: breaks in 1973-4 and 1979-80, and a spike in 1990.[1] These instances involved at least a doubling of the oil price within a year or two. The pronounced upward oil price trend in recent years may yet be accorded 'oil shock' status once the full effects become manifest.

2.2 Determination of crude oil prices

Historically there have been three eras in the determination of international crude oil prices (Nkomo, 2006). Prices were determined chiefly by multinational oil companies until the 1970s, when the Organisation of Petroleum Exporting Countries (OPEC) asserted its capacity to influence (to varying degrees) the price via its output decisions. Since the late 1980s, however, "world oil prices have been set by a market-related pricing system which links oil prices to the 'market price' of a particular reference crude" (Farrell, Kahn & Visser, 2001: 69). Two important reference prices, Brent and West Texas Intermediate (WTI), are determined on the London and New York futures exchanges, respectively.

The fundamental determinant of oil prices is the demand/supply balance in the international market; each side of this market is in turn influenced by several factors. Over the long term, the demand for oil is determined primarily by rates of economic growth in the major regions of the world, as well as by energy-related technological developments such as efficiency gains or new-found uses for oil. Such structural determinants tend not to change rapidly and are therefore unlikely to provide the impetus for an oil price shock on their own. Having said this, China's extraordinary growth has had an increasingly significant effect on the world demand for oil, most notably in 2004. On the other hand, a negative demand shock, such as the fallout from the Asian financial crisis in 1997, can have a depressing effect on world oil prices in the short run.

The supply side of the crude oil market is comprised of output from OPEC and non-OPEC producing countries, whose production decisions hinge on geological, economic and political factors (see Farrell *et al*, 2001: 72-78). In the long term, oil supply depends on the rates of extraction, depletion and new discoveries, as well as

[1] A 'reverse' or negative oil shock (a break) occurred in 1986.

developments in extractive technologies which allow enhanced recovery of oil. In the short term changes in OPEC production quotas and temporary supply disruptions due to technical or political factors or natural disasters can have important consequences for supply and hence oil prices. The impact of such factors depends in turn on the extent of spare production capacity (most of which has resided in Saudi Arabia), as well as oil inventories – most notably the United States (US) Strategic Petroleum Reserve.

In addition to these fundamentals, expectations and speculation about future demand and (especially) supply conditions – which in turn are stimulated by economic and political conditions – play a large part in the determination of crude oil prices on the futures and spot markets, particularly when inventories are low (Nkomo, 2006: 13; Farrell *et al*, 2001: 82). These considerations also amplify oil price volatility.

Being a relatively minor net oil-importing country, South Africa is a price taker on the international oil market. However, the downstream domestic liquid fuels industry is subject to government regulation. Petrol and diesel prices are administered by the State, which imposes various levies and taxes, and sets retail and wholesale margins, over-and-above a 'basic fuel price'. The basic fuel price is an import parity pricing formula which depends on the international spot price of refined oil (SAPIA, 2006a). Sasol and PetroSA's synthetic liquid fuels (converted from coal and gas, respectively) are therefore accorded the same status as imported petroleum or locally refined oil.

2.3 Transmission of an oil shock

In the context of internationally determined oil prices, the vulnerability of a particular oil-importing country to oil shocks can be broken down into various dimensions (Nkomo, 2006: 10): oil import dependence (the proportion of oil consumption that is imported); oil resource dependence (the ratio of oil to total energy use); and the energy intensity of the economy (the ratio of energy use to real gross domestic product). Developing countries tend to have higher vulnerability than do developed economies, especially where mining and manufacturing are relatively important sectors. The specifics of these vulnerability dimensions for South Africa are taken up in section 4.

When analysing the expected economic impacts of an oil shock on the domestic economy, it is important to distinguish between the short-to-medium term and the long run. Over the shorter time horizon, both direct and indirect effects can be anticipated, the latter being the transmission of the shock through the international economy. An oil price shock will raise prices in trading partner countries, thus raising domestic import prices. To curb inflation, foreign monetary authorities may raise interest rates, resulting in decreased consumption, investment and economic growth. This in turn would result in diminished demand for many export commodities.

On the domestic scene, an oil shock will have reverberations through a number of channels and on several important macroeconomic variables. In the first instance, higher oil prices will encourage reduced wastage and greater efficiency of energy usage, as well as substitution of alternative energy sources and less oil-intensive capital equipment (Dagut, 1978: 26). However, demand for oil tends to be highly inelastic in the short run as most oil-burning capital equipment and appliances cannot be substituted for immediately (Nkomo, 2006: 14).

The most immediate, direct effect of an oil shock will be a rise in the price levels of liquid fuels for transport and other uses, and in the costs of oil-based petrochemicals. Additionally, there will be an indirect price effect via transported commodities, especially food, as well as the higher import prices mentioned earlier. Thirdly, and perhaps most importantly, are possible second round effects on inflation expectations and associated wage-price spirals, which have the potential to extend the price effect beyond the initial once-off rise.

In addition to the price effect, an oil shock may involve limitations of physical supply. The impact of this would clearly be most severe for those sectors or regions of the country that are both dependent on and starved of oil and its derived products, and may cripple those sections of the economy, at least as long as the shortage persists.

Components of the balance of payments will potentially be affected in a number of ways by an oil price shock, some positive and others negative. The immediate negative effect on the current account of a higher oil import bill may be compounded by lower export revenue (for oil-intensive goods and services such as manufactures and tourism in particular) if the shock induces an international economic slow-down or recession. However, rising world inflation may boost demand for gold exports, and exports of coal and uranium (energy substitutes for oil) may also increase. The capital account may also be adversely affected if international economic malaise and increased uncertainty result in reduced foreign portfolio and direct investment – or even capital flight – from countries perceived as especially risky, such as emerging markets.

The impact of an oil shock on the terms of trade depends on the magnitude of the oil price change relative to the change in the price of the home country's exports. In South Africa's case, gold and other minerals are an important consideration, and it is not possible to determine *a priori* what the net effect will be. Similarly, the ultimate impact of an oil shock on the external value of the currency will depend on the net effect of the shock on the balance of payments. A depreciation of the currency would of course exacerbate the inflationary impact of the original oil shock by further raising the rand price of oil and other imports.

National income, for instance measured by GDP, will suffer a negative income effect as the oil bill rises and to the extent that general exports are depressed. However, this may theoretically be offset partially, wholly or even to a greater extent by rising revenue for exports of gold and coal, at least temporarily (Dagut, 1978: 26-27). GDP will also suffer if interest rates are hiked to curb inflation. Furthermore, oil shocks can be expected to generate increased uncertainty about inflation, interest rates, exports, and the exchange rate, and therefore have a general dampening effect on consumption and investment. As a result of these factors as well as rising production costs, labour demand is likely to fall and unemployment to rise.

A transitory oil price spike would not generally be expected to have major long-term consequences, other than perhaps stimulating measures to cope with transitory shocks such as strategic oil reserve facilities. However, a sustained oil price shock would set in motion a series of long run adjustments on both the supply side and the demand side. In oil producing countries, the shock will act as a stimulus for further oil

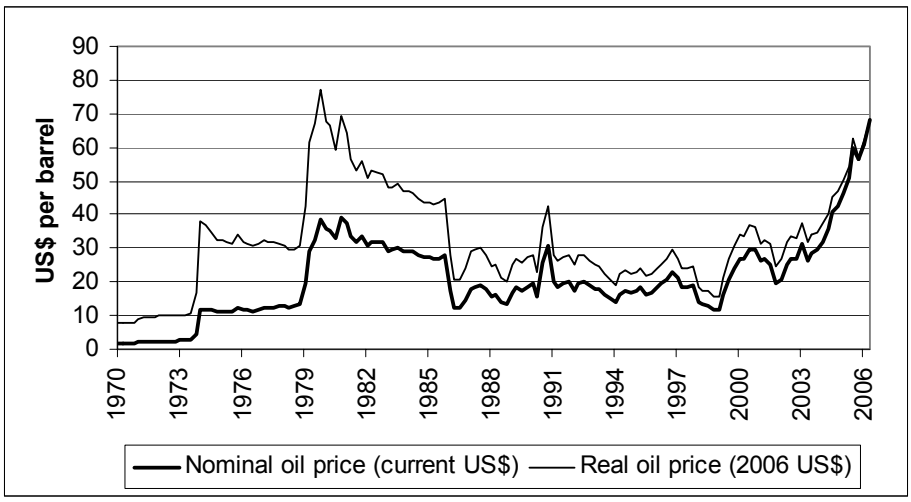
exploration and technological innovations that enhance recovery from existing oil fields. Furthermore, there will be substitution of alternative energy sources such as coal- and gas-to-liquid fuel conversion and biofuels. Finally, one can expect structural changes in the economy away from energy-intensive sectors and towards higher labour intensity of production (Dagut, 1978: 31).

On the demand side, a lasting oil price shock will induce greater energy efficiency and conservation by both producers and consumers. This may involve the construction and use of non-oil consuming transport infrastructure (e.g. electric trains and vehicles, partially powered by renewable energy sources such as solar and wind) and even a new approach to spatial development. As Nkomo (2006: 14) notes, "[t]he flexibility in the use of oil or energy in the long run depends on a myriad of other macroeconomic variables such as employment, economic growth and so forth." The way that South Africa has been affected by oil shocks in the past is dealt with next.

3 South Africa's historical experience with oil shocks

In line with the definitions provided earlier, four oil shocks can be identified in the post-war era, having occurred in 1973-74, 1979-80, 1990 and the period from roughly 2003 to 2006 (see Figure 1). The origins, nature and impact of each episode are discussed briefly below, in conjunction with a graphical overview of the movements in some key variables.

Figure 1: Nominal and real average crude oil prices, 1970-2006



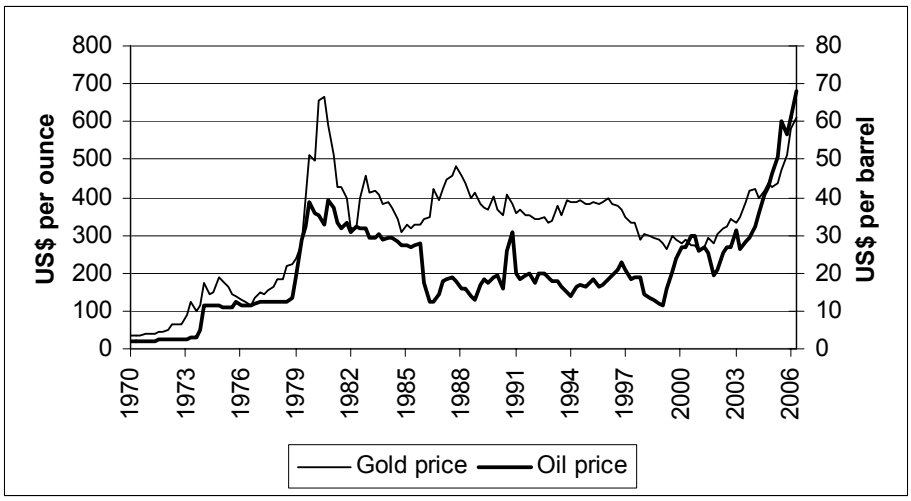
Source: International Monetary Fund (IMF, 2006)
Note: The real oil price is the nominal price deflated by the US producer price index.

3.1 The first oil shock, 1973-4

The first oil shock was catalysed by the Arab-Israeli war, which resulted in various Arab oil-producing nations placing an embargo on oil exports to the Unites States and the Netherlands, which were seen as strongly pro-Israel. In addition, the Organisation of Petroleum Exporting Countries (OPEC) asserted its oligopolistic power in the oil market by colluding on reduced production volumes and collectively setting the price (van der Merwe & Meijer, 1990: 6). The oil price rose by a factor of nearly four, from about $3 per barrel prior to the war to around $11.50 per barrel in 1974 (see Figure 1).

This shock had severe repercussions for many of the advanced industrial economies, including sharply rising prices – which induced a wage-price spiral – and a recession; hence the term 'stagflation' entered the lexicon. Subsequently, developing countries suffered from the decline in world trade and as primary commodity prices fell (Dagut, 1978: 29). In response to inflation and international monetary instability, the average gold price rose 66 percent from 1973 to 1974 (see Figure 2). However, the following year the gold price stagnated and by 1977 it had made a partial retreat. Dagut (1978: 30) claims that governments forced down the price of gold to bolster faith in the value of currencies and to restore stability to the financial markets.

Figure 2: Gold and average crude oil prices, 1970-2006



Source: IMF (2006)
Note: The gold price series is end of quarter values, while the oil price is quarterly averages (based on data availability).

From 1974 to 1976, South Africa's merchandise import bill rose on average by 13.82 percent per annum. The overall terms of trade received an initial boost from the rise in the gold price, but this was followed by a marked deterioration, especially in 1975. The rand/dollar exchange rate also weakened, and the inflation rate climbed from mostly single digits in 1972 to an annualised high of 17.8 percent in the final quarter of 1974, before easing again somewhat. More seriously, the GDP growth path altered, with the rate of growth in the three years following the oil shock averaging 1.73 percent, compared to an average of 5.32 percent in the preceding 19 years. According to Dagut (1978: 32), the "main lesson of the [first] energy crisis is that the adjustment process is a slow one", which is an important point to bear in mind for the present situation.

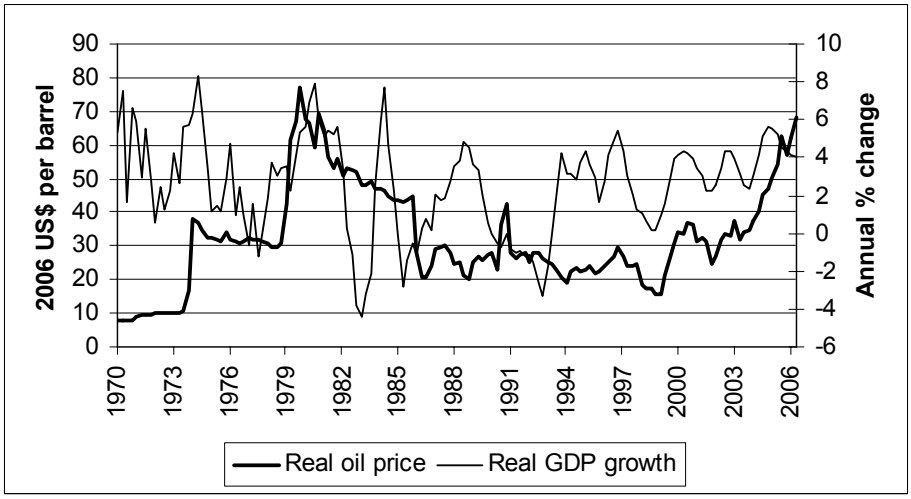
3.2 The second oil shock, 1979-80

The second oil shock occurred in the wake of the Iranian Revolution in 1978-79 and the subsequent war between Iraq and Iran in 1980, which caused Iranian oil exports to dry up altogether. As in the previous oil crisis, the magnitude of the price hike (almost a three-fold increase) was driven to a large extent by panic reactions and hoarding behaviour; on this occasion OPEC did not play a primary role (van der Merwe & Meijer, 1990: 6).

This oil shock gave rise to another bout of serious inflation internationally, and many central banks – notably the US Federal Reserve Bank – raised interest rates sharply in response. This action contributed to a severe international recession. Worsening inflation and uncertainty gave rise to a massive increase in the gold price; however, as in the previous case, this proved unsustainable. Van der Merwe and Meijer (1990: 12) note that the "gold price increases effectively cushioned the adverse effects of the first two oil price shocks on the balance of payments and the 'real' economy", but that "these gold price surges inspired unduly optimistic views of the long-term prospects for the price of gold". Similarly, the average world prices of coal and uranium, two important energy-export commodities for South Africa, initially rose in response to the first two oil shocks, but soon retreated as a result of the induced supply response as well as falling demand from stagnating industrialised economies (Van der Merwe & Meijer, 1990: 15).

South Africa's terms of trade – with or without gold exports – worsened considerably in the wake of the second oil crisis (Van der Merwe and Meijer, 1990: 15). The rate of consumer price inflation ratcheted up to double figures and became much more volatile between 1979 and 1981. Boosted by gold, real GDP grew robustly in 1980 (6.6%) and 1981 (5.4%), but declined precipitously thereafter, culminating in a severe recession in 1983 (see Figure 3). Once again, therefore, the lesson is that the South African economy is not immune to oil shocks once the adjustment process takes its course.

Figure 3: Real oil price and South African real GDP growth rate, 1970-2006



Source: IMF (2006) and SARB (2006)

3.3 The third oil shock, 1990

The third oil price shock was triggered by the Iraqi invasion of Kuwait in August 1990. As a consequence of fear-driven stockpiling, and the elimination of Iraq and Kuwait's approximately 7 percent share of daily world oil production following the imposition of United Nations sanctions, the price of oil climbed by a factor of about two from $17 per barrel in July 1990 to an average of $35 per barrel in October (van der Merwe & Meijer, 1990: 4). However, the shock proved to be short-lived, with the price dropping to below $20 per barrel by February 1991. This was thanks mainly to

the rapid deployment of US and allied military forces and their subsequent victory in the Gulf War in early 1991, which prevented the crisis from spreading and calmed sentiments in the oil market. Again, this price spike demonstrated the importance of expectations in determining the level of the price in the oil market.

Some major industrialised nations suffered a fairly severe recession around this time, which was exacerbated by – but not entirely due to – the oil spike. In contrast to the two previous shocks, the gold price did not react sharply to the oil price spike in 1990, rising less than 10 percent and subsequently retracting partially. Van der Merwe and Meijer (1990: 14) attribute this to gold's diminished status as a safe-haven during the 1980s, and consequently cautioned against reliance on gold to offset the higher oil import bill.

At the time of this third oil shock, South Africa was already in the early stages of a downturn in economic activity as a result of several factors. These included, *inter alia*, weak international demand for our exports coupled with sanctions, the early stages of an intensive domestic drought, a tightening monetary policy stance, and political jitters following the unbanning of the African National Congress early in 1990. Thus it is difficult to determine precisely the separate impact of the oil spike, although its transitory nature seems to have resulted in muted effects on the South African economy relative to the earlier shocks.

3.4 A fourth oil shock, 2003-6?

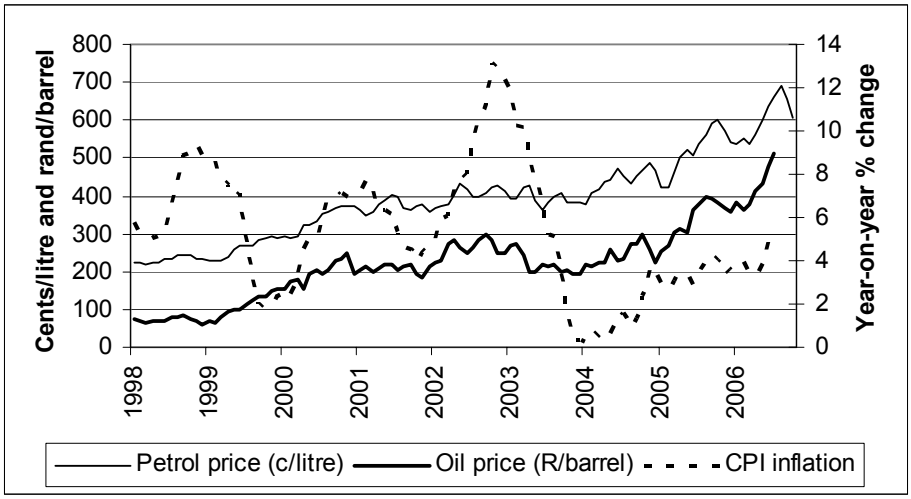
The balance between supply and demand in the oil market has been gradually tightening over the past few years. This is partly attributable to steeply rising demand on the back of robust economic growth, especially in major emerging economies such as China, but also in the US. On the other hand, supply has expanded less rapidly than demand. Moreover, there have been temporary or recurrent disruptions to the flow of oil in some areas as a result of various factors, such as: the ongoing conflict in Iraq; sporadic conflict and sabotage in Nigeria; the devastation wrought by Hurricanes Katrina and Rita in the Gulf of Mexico; and a leaking pipeline leading to a temporary closure of the Prudhoe Bay field in Alaska in August 2006. Speculation in the oil market has amplified the price effects of these relatively minor supply disruptions. In addition, fears amongst oil traders were exacerbated by the conflict between Israel and Hezbollah in July/August 2006.

As a consequence, the price of crude oil rose from around US$25 per barrel in 2003 to a high point of US$78 per barrel in July 2006. This represents roughly a trebling of oil prices over three years, which – according to the earlier definition – may be defined as a 'trend' oil price shock. Since this shock has been drawn out over a number of years, its effects have been slow to manifest. In addition, the impact has to some extent been masked or offset by other factors such as declining prices of (particularly Asian) manufactured goods, low interest rates and cost-reducing technological innovations. South Africa has been buffered from the oil price trend by these factors as well as by a relatively strong currency from 2003 till around the middle of 2006 (on the back of robust commodity prices). As a result of all these conditions, domestic consumers have been engaged in a credit-driven consumption boom.

However, the cumulative effect of the oil price increases appears in recent months to have fuelled inflation in many of the world's economies, including South Africa's

(headline CPI inflation rose from an average 3.6% last year to 5.1% in the second quarter 2006). This has prompted central banks (including the SARB) to initiate an interest rate tightening cycle. Already the real GDP growth rate has fallen from an average of 4.9 percent in 2005 to just above 4 percent thus far in 2006 (Figure 3). The lags in the transmission of oil prices, especially for the domestic economy, could mean that the worst effects are yet to be felt.

Figure 4: Rand oil price, petrol price and consumer price inflation, 1998-2006



Source: SARB (2006) and SAPIA (2006b)
Note: The petrol price is that of 93 octane lead replacement petrol (leaded until December 2005) in Gauteng Province.

4 Is the past a reliable guide to the future?

History provides valuable lessons of experience, but it does not repeat itself exactly. Thus it is pertinent to compare current global and South African macroeconomic and geopolitical conditions with those prevailing when the earlier oil shocks occurred. This will also help us to gauge our vulnerability to further oil shocks.

4.1 The world economy then and now

The first oil shock in 1973 came soon after the abandonment of the gold standard and the Bretton Woods system of fixed exchange rates. This had been prompted largely by the growing US trade deficit as a result of the Vietnam War and rising oil imports (US oil production peaked in 1970). The financial fallout from the oil shock was considerable as the market was flooded with 'petrodollars' and exchange rates fluctuated wildly (Dagut, 1978).

By 1979, the world economy had not fully recovered from the first oil shock, with inflation expectations still a problem and growth rates below those achieved in the 'golden age' of the 1950s and 1960s. Furthermore, the world geopolitical situation in 1979-80, as described by van der Merwe and Meijer (1990: 6), was "unusually tense and restless" with "potential for large-scale international friction, conflict and war", mainly as a result of the Soviet Union's invasion of Afghanistan and the death of the communist leader of Yugoslavia.

The world economy has progressed a great deal since the 1970s, especially in terms of technological development. This has contributed to a decline in energy intensity in most industrialised countries, although developing nations tend to be relatively more oil-intensive. On balance, oil is still a critical commodity for the global economy, especially for transportation. Furthermore, the globalisation of trade and finance mean that national economies are more interdependent now than ever before. Therefore, economic (and indeed political) afflictions in one region often spill over to other nations, as witnessed for example in the 1997 emerging market crisis. Moreover, as a result of financial deepening and integration the expectations aspect of oil price determination is more important now than ever before.

Although global growth has been very robust over the past three to four years, there are several signs of serious vulnerability, some of which hark back to the 1970s. These include persistent global monetary imbalances, driven largely by the US's massive twin (budget and trade) deficits, and worries about a housing-led slowdown or recession in the US, which could drag the world economy down with it. Rising energy prices have been fuelling inflation, which in turn has led to an interest rate tightening cycle in most major economies. On the plus side from the South African perspective, the gold price has continued in recent years to track the oil price, and may once again prove to be a safe-haven – at least in the short term – if the dollar suffers a sharp depreciation or inflation rates continue to rise.

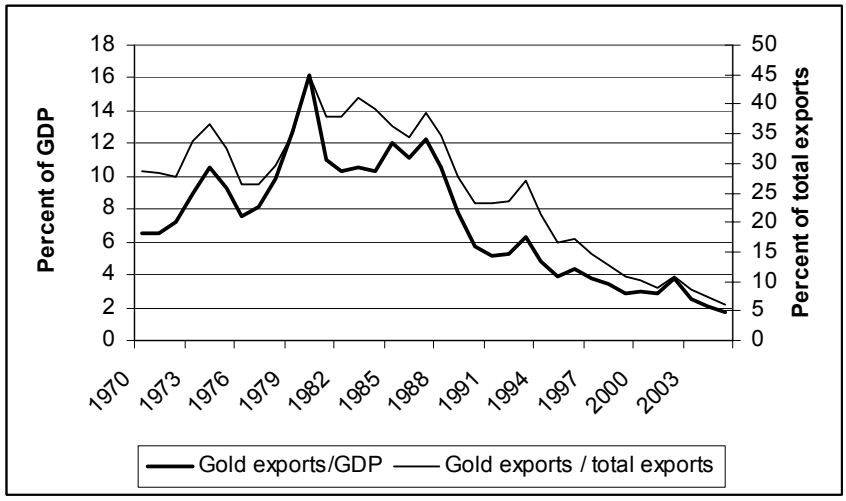
The current geopolitical climate is not too dissimilar to that prevailing in the 1970s. The Middle East continues to be a hotbed, with Iran, Iraq and Israel again at the epicentre. While the Cold War is long past, global terrorism has in a sense replaced it as a source of risk. Moreover, Russia – boosted by its oil and gas wealth – is enjoying a resurgence of influence, aligning itself to some extent with its 'emerging giant' neighbour, China.

In sum, the world political economy at present is arguably more susceptible to an (additional) oil shock than it was in 1973, and perhaps to a similar extent as it was in 1979 (which marked the start of the worst recession in the post-war era). To make matters worse, the seriousness of the looming oil crisis that will result from the peaking of world oil production is likely to far exceed that of the 1970s oil shocks (see section 5.2).

4.2 South Africa's strengths and vulnerabilities

South Africa, for its part, has also undergone important political and economic changes since the 1970s, although again there are several notable parallels. In the first place, the structure of the economy has diversified away from mining towards manufacturing and services. Specifically, gold now contributes much less to GDP and exports than it did previously, although platinum has increased in relative importance. Figure 5 clearly shows the positive impact of the first two oil shocks on the ratios of net gold exports to GDP and to total exports, as well as the long-term decline in the ratios as gold ores have been depleted. Thus while gold and other minerals can still be expected to provide some level of shock absorption, it may be less than in the 1970s.

Figure 5: Ratios of net gold exports to GDP and total exports, 1970-2005



Source: SARB (2006) and own calculations.

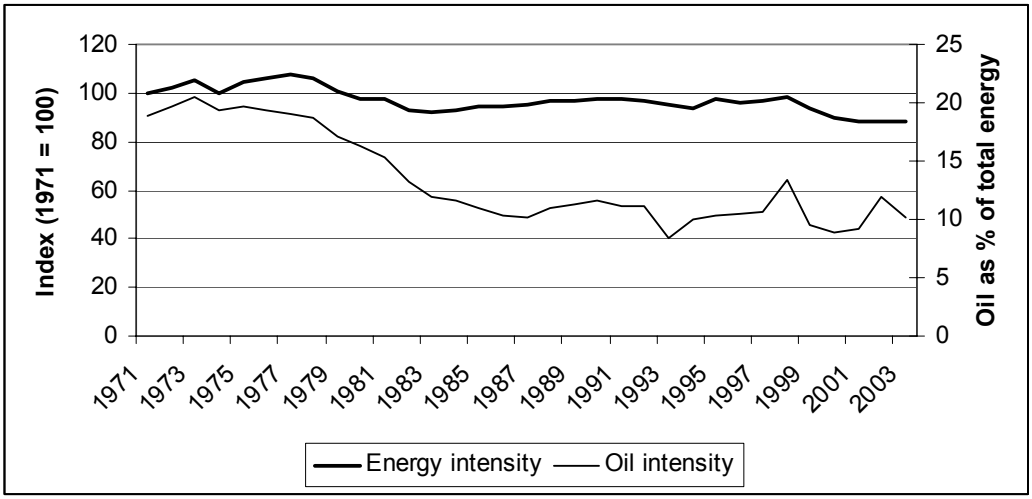
Secondly, since 1994 South Africa has strengthened its trade and financial ties with the global economy and has joined the ranks of emerging market economies. While in much of the 1970s the rand was pegged to the British pound or the US dollar, it is now a floating currency, rendering it vulnerable to periodic crises (as in 1996, 1998 and 2001). Furthermore, the rand is in real terms weaker relative to the dollar and the currencies of South Africa's other major trading partners than it was three decades ago, which enhances the potential for imported inflation. However, taking into account the inauspicious political conditions in the Apartheid era, it would be difficult to argue that the financial side of the balance of payments is more vulnerable now.

Thirdly, political instability in the Southern African region, while perhaps less serious than conditions in Angola and Mozambique from the mid 1970s, are still evident. This includes an immediate neighbour with an imploding economy (Zimbabwe). Furthermore, we are arguably experiencing the most serious domestic political uncertainty since 1994 as a result of tensions in the ANC tripartite alliance, with the presidential succession race as a focal point. These tensions, and the latent risk of social instability, are amplified by the high incidences of poverty, inequality and HIV/AIDS in the sub-region.

In addition to the broad political-economic context, a country's vulnerability to oil shocks obviously depends on the extent of its oil imports. South Africa's oil vulnerability – measured as the value of oil imports divided by GDP – was 3.4 percent in 2003, higher than most other Southern African countries (Nkomo, 2006: 16). This figure is based on the latest available data from the IEA, and will certainly have increased since then as a result of the rising crude oil price. Since oil import information was classified by the Apartheid State, it is not possible to say exactly how the ratio of oil imports to GDP has changed since the 1970s. However, as mentioned in section 2, oil vulnerability may be decomposed into three components: oil import dependence; oil resource dependence; and the economy's energy intensity. This delineation affords a more nuanced perspective.

The South African economy is characterised by high *energy intensity*, especially in its mining and manufacturing sectors (see Kohler, 2006). This is mainly attributable to the country's abundant coal reserves and the cheap electricity derived there from. Coal comprises almost three quarters of the nation's primary energy supply (IEA, 2005). As can be seen in Figure 6, South Africa's energy intensity has declined only slightly since the 1970s.

Figure 6: South Africa's energy intensity and oil resource intensity, 1971-2003



Source: IEA (2005), SARB (2006) and author's calculations
Note: The energy intensity index is derived from the ratio of total final energy consumption (kilotons of oil equivalent) to real GDP; oil intensity is the share of oil in total primary energy supply.

Partly as a result of the abundant coal reserves, South Africa's *oil resource dependence* is low relative to many other developing countries. Oil in 2003 constituted approximately 10 percent of South Africa's primary energy supply (which includes energy used to produce final, usable energy), down from around 20 percent in the 1970s. In 2003, petroleum products (including petrochemical feedstock and liquid fuels) accounted for 31 percent of final energy consumption, and imported oil just less than 20 percent (IEA, 2005). Some 80 percent of all (i.e. local and imported) liquid fuels are used by the transport sector. In 1976, by comparison, 20 percent of South Africa's energy consumption was met by (imported) oil, two-thirds of which was used for transport (Dagut, 1978: 32). The area of the economy most directly susceptible to oil shocks is therefore the transport sector (including both freight and passenger transport), as it is highly reliant on liquid fuels.

Because South Africa's domestic oil reserves are very limited, the country has a very high degree of *oil import dependence*; 95 percent of our crude oil requirements are imported. Even before the recent surge in the oil price, oil imports constituted approximately 6 percent of total imports and were the single largest import item (ABSA, 2004: 5). However, thanks to a strong domestic liquid fuels industry (Sasol's coal-to-liquids and PetroSA's gas-to-liquids facilities), only 60 percent of the country's liquid fuel requirements are met by oil, and therefore about 57 percent of our liquid fuels are imported (Energy Information Administration, 2005). On the other hand, the synthetic liquid fuels produced by Sasol and PetroSA are currently priced on an import parity basis; if this does not change, then consumers and most producers are

just as vulnerable to oil *price* shocks, even though there is a partial buffer for oil *supply* shocks. Moreover, in the event of a liquid fuels crisis, a relevant question is how quickly the capacity for coal- and gas-to-liquids production can be expanded; such facilities typically take several years to be constructed. The use of coal also comes at great cost to the environment and citizens' health.

In sum, South Africa's oil dependency has risen on the demand side (chiefly for transport), but lessened on the supply side (owing to the development of the synthetic fuels industry). On balance, our oil import requirement appears not to have changed substantially since the 1970s.

In addition to the above energy-related factors, prevailing macroeconomic conditions are also important when considering the potential impact of future oil shocks. On this score, the signs are not particularly encouraging. First, the current account has recorded historically large deficits of 6.4 and 6.1 percent of GDP in the first and second quarters of 2006, respectively (SARB, 2006). Although these have largely been supported by portfolio capital inflows up till now, this 'hot' money may exit suddenly. Other emerging economies running large trade deficits have already been punished by the financial markets this year, including Iceland and New Zealand. Second, although consumer price inflation is still within the SARB's target range, it has been rising for several months, driven largely by fuel and food prices (which often move together). This upswing in inflation (see Figure 4) has already led to tightening of the Bank's monetary policy stance (50 basis point increases in the repo rate in June and August 2006), and further increases seem highly likely. Third, following rampant credit growth (up to 25 percent year-on-year recently), consumer indebtedness is at an all-time high, with debt as a proportion to disposable income at around 70 percent. Thus further interest rate hikes could lead to a substantial slowdown in consumer expenditure, which has been the main driver of recent growth. Fourth, the rand/dollar exchange rate has weakened by approximately 20 percent over the first nine months of 2006, which means that another oil shock will be more intensely felt in rand terms. Finally, while still a fairly healthy four percent, the rate of GDP growth has declined since 2005.

In the light of these indicators, we would do well to recall the wise words offered by Dagut (1978: 34-5) following the first oil shock:

> "With hindsight it seems that only the most stubborn of optimists could not have had some inkling that there was a searing stagflation, a social polarisation, and a foreign investment withdrawal to come. Yet because the price of gold had risen and commodity markets had boomed we were governed by a wave of excessive optimism. … South Africa was forced… to suffer the pain of adjustment; the adjustment became a recession."

Yet forecasting South Africa's possible oil-related misfortunes on the basis of past and current political-economic conditions is only part of the story. It is also necessary to examine the probable sources and nature of future oil shocks, which is the subject of the following section.

5 Prospects for further oil shocks

As mentioned in Section 3, there is currently little spare production capacity in the world oil market. Saudi Arabia, long considered the 'swing producer' in OPEC, appears unable to fulfil its promise of being able to increase production by an amount up to 1 million barrels per day. This tightness in the oil market raises its vulnerability to supply disruptions, especially in the face of growing (and highly inelastic) demand. This section considers several short-term threats to oil supply, followed by the more fundamental implications of the world oil depletion profile.

5.1 Short term supply risks

On a short term basis, three significant supply risks can be identified, namely OPEC production cuts, extreme weather conditions, and geopolitical tensions or conflict. The latter two factors in particular are exacerbated by speculative activity in the oil market.

All OPEC nations are highly dependent on oil revenues as a source of both government revenue and foreign exchange. In October 2006 OPEC decided to curb production as a result of the fall in the oil price by some 23 percent from its record high in July (Ghantous and Ashby, 2006). This shows how quickly OPEC nations become attached to higher oil prices. However, ever since the 1979 oil shock, OPEC members have been wary of raising prices to such an extent that they destroy demand by triggering an international recession and substitution away from oil. Thus it seems unlikely that OPEC will cut production sufficiently to cause a major price shock at a time when prices are already near historical highs. Moreover, cheating on agreed quotas has been a perennial problem for the cartel.

Extreme weather events related to climate change, especially hurricanes in the Gulf of Mexico, may in future cause temporary supply disruptions as happened in August 2005 (see Wakeford, 2006). On the other hand, both heat waves and severe winters in the Northern Hemisphere – both of which appear to be increasing in prevalence, possibly related to global warming – can push up the demand for energy (including oil) in the short term and thereby exert upward pressure on prices.

Geopolitical tensions in several areas continue to be a significant threat to oil supplies. First, the conflict-ridden Middle East has vast strategic importance since it is variously estimated to contain somewhere between half (ASPO, 2006) and two-thirds (BP, 2006) of 'proven' reserves of regular oil. Thus any conflict in the region causes uncertainty amongst oil traders and raises the risk premium on oil. Second, recent tension between Western countries (principally the US) and Iran over the latter's nuclear programme has been an important factor contributing upward pressure on oil prices. Should military conflict break out, it could jeopardise the flow of nearly one-fifth of the world's exported oil, which passes through the Straights of Hormuz in the Persian Gulf (bordered on one side by Iran). These concerns are particularly relevant to South Africa, which imports the bulk of its oil from Iran and other Middle Eastern producers. Third, there is an ongoing risk of terrorist attacks on oil facilities, especially in Iraq but also in Saudi Arabia, the world's largest producer. Fourth, there are varying degrees of civil conflict in many oil-producing countries, including Nigeria, Sudan, Chad, Columbia and Georgia. Some of these flashpoints could potentially draw in new or further US military intervention to secure supply (see

Klare, 2004, on the history of US oil-related military action). Such action could fuel tensions with a resurgent Russia or emerging Chinese powerhouse and conceivably lead to conflict on a wider scale.

There are at least two factors which may mitigate these near-term risks. First, inventories of oil provide a limited, short-term buffer against supply disruptions. In July 2006, oil inventories in OECD countries represented forward cover of 54 days, which is in line with the recent trend (IEA, 2006). An important additional source of inventories is the US Strategic Petroleum Reserve, which stood at 687.7 million barrels at the end of September 2006 (US Department of Energy, 2006). This stock was last accessed to alleviate the interruption to supply caused by Hurricane Katrina in August 2005.

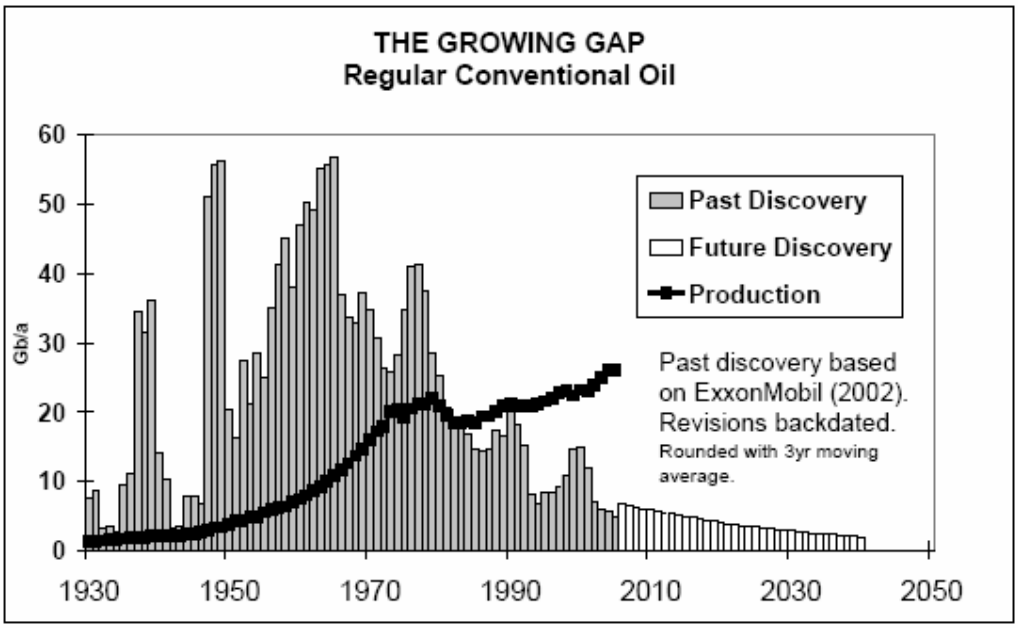
Second, there are increasing fears amongst investors of a possible US recession in 2007, triggered by a slump in an over-inflated housing market and extensive consumer indebtedness (see Wakeford, 2006 for background). This – in combination with a disorderly adjustment of global monetary imbalances – could in turn spark a global slowdown or even recession via its depressing impact on international trade. Such fears – in addition to easing of tensions in the Middle East as the Israeli-Hezbollah conflict subsided – contributed to the recent drop in oil prices from highs of some $78 per barrel in July to under $60 in late September 2006 as investors and traders anticipated reduced global demand for oil (Conway, 2006). However, if indeed the US does lead the world into a slow-down or recession, OPEC may cut production in order to halt the downward slide in the oil price.

5.2 The peak in world oil production

In the medium to long term there is a far more fundamental and serious risk of an oil crisis: the looming peak in world oil production. Wakeford (2006) reviews the evidence and arguments surrounding the so-called 'Hubbert peak' theory, according to which global oil production is expected to follow a roughly bell-shaped curve, rising to a peak when about half of all oil reserves have been exhausted, after which point output will decline year by year. This has in fact been the pattern in many individual oil producing countries, the majority of which have already passed their production peaks, including the US, UK, Norway and Venezuela (Hirsch, 2005: 5).

At a global level, the uncertainty is not about whether oil production will at some point reach a peak, but rather about when it will do so. Some official sources such as the International Energy Agency and the US Department of Energy forecast that oil production will continue to expand for at least two decades, stimulated by rising demand. However, their optimistic estimates depend on significant new discoveries being made along with an immense amount of new capital investment in productive capacity. Peak oil specialists point out that oil discoveries peaked in the 1960s (when the last 'mega-fields' were found) and have been on a declining trend since then (see Figure 7). This is despite the incentive provided by subsequent price hikes (in the 1970s) and significant progress in oil exploration and extraction technologies (in the 1980s and 1990s).

Figure 7: Conventional oil discovery and production



Source: ASPO (2006)

A significant number of independent experts expect oil to peak within the next decade (see Hirsch, 2005, for a summary). For example, the latest projection by veteran oil geologist Colin Campbell of the Association for the Study of Peak Oil and Gas (ASPO, 2006) is that 'regular' oil production peaked in 2005, and that all petroleum liquids (including heavy, deep-water and polar oil, and natural gas liquids) will peak around 2010 (see Figure 8).

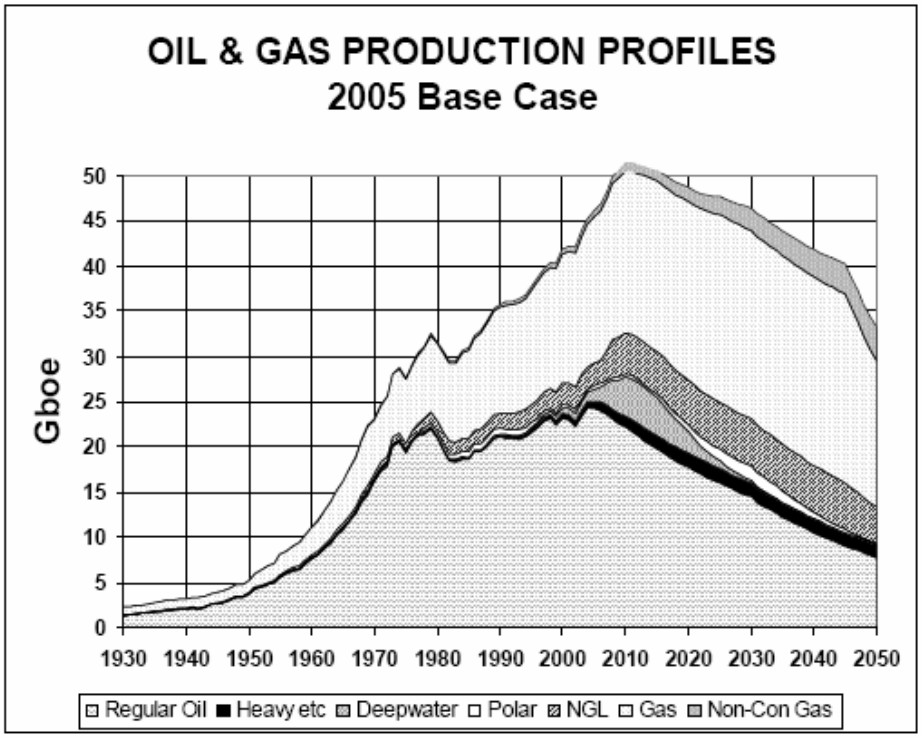
Exactly what economic and social effects the peaking of world oil production will have cannot be foreseen with certainty; it will be terrain never before experienced at a global scale. However, based on past experience certain consequences seem inevitable or at least highly likely. Viewed simply, the down-slope of the oil production curve implies a series of supply-side oil shocks spanning decades. Conservative estimates of the post-peak depletion rate are around three percent per annum. Considering that prices trebled in 1979/80 after a mere five percent reduction in output (from Iran), the potential for runaway oil prices becomes evident. Thus we can reasonably expect a rising oil price trend (due to cumulative shocks) along with greater volatility (as a result of economic adjustments and demand destruction).

Hirsch (2005: 7) points out that in many individual countries "it was not obvious that production was about to peak a year ahead of the event", and that "in some cases post-peak production declines were quite rapid." Thus there may well be a sharp price shock as a gap between demand and supply suddenly opens, taking the markets by surprise. Alternatively, now that awareness of the 'peak oil' phenomenon is growing fairly rapidly, [2] a tipping point may be reached when a sufficient number of investors realise that the peak is unavoidable and imminent, leading the market pre-emptively

[2] Examples of recent media reports about 'peak oil' are too numerous to cite here, but may be readily accessed on the Internet via a search engine.

to price in the looming supply decline. Given the history of investor panic and hoarding behaviour, this could cause an even more dramatic price hike.

Figure 8: Oil and gas production profiles – history and projections



Source: ASPO (2006)

Peak oil is thus likely to entail the worst combination of oil shock types: sharp, sustained, repeated and cumulative. The probable effect of this on the global economy will be a severe bout of stagflation, particularly as central banks are primed to raise interest rates in an attempt to curb inflation and inflationary expectations. However, it must be reiterated that this shock will be unlike any of the previous shocks, which all occurred in the context of a long-run rising trend in oil production. Peal oil represents a structural break of the highest order.

Some time after the peak, the oil price may fall somewhat – at least temporarily – as a result of demand destruction, conservation and efficiency initiatives, and whatever short-term substitutions of energy and capital are possible. On the supply side, oil producing countries quickly become used to – and even dependent upon – the revenues they receive when prices are high. Thus, they are likely to keep producing at or near their maximum rates in attempts to cash in on windfall revenues and also to avert economic collapse. However, no matter how much they try to produce individually, in aggregate the amount of oil produced will continue to decline year after year.

Wakeford (2006) argues that in combination with other risks to the world economy, notably climate change and global monetary imbalances, peaking oil production could have even more severe consequences. As we saw in the previous section, South Africa will not be inured to the impact of future oil shocks, and given the foregoing discussion the impact of peak oil seems likely to dwarf that of previous oil shocks. An

additional concern is the impact of rising energy and food prices on the poor and the resultant probability of growing social (and perhaps political) instability. Important in its own right, this would also feed back negatively onto macroeconomic stability.

In the long term, other energy sources will be substituted for oil, and non-oil consuming capital and transport infrastructure will be built. However, considering the massive scale and lifespan of present oil-based infrastructure (which applies to South Africa as well as to the world), Hirsch *et al* (2005) warn that its replacement could take decades. Moreover, there can be little doubt that investment conditions will be far less favourable in an era of declining oil production, since less (and more costly) energy will be available to underpin economic activity, interest rates may be much higher, and levels of uncertainty and risk will be far more acute. This raises the vital question of what can or should be done by the authorities to mitigate and adapt to such circumstances.

6 Policy implications

The potential impact of future oil shocks, and in particular the peaking of world oil production, carries far-reaching implications for the South African economy and policy (for an overview see Wakeford, 2006). This section focuses mainly on macroeconomic policy implications, especially monetary policy and the Government's AsgiSA strategy. However, it is argued that other mitigating and adaptive measures will also be required to avert the worst effects.

The monetary policy authorities face a daunting challenge from rising cost-push inflation, driven by oil prices but diffusing more widely across producer and consumer prices. In a post-peak oil environment, inflation targeting (especially with a 3 to 6 percent target range) may prove to be an overly restrictive framework. The only way for relative prices to adjust to reflect the increasing scarcity of oil (and its derived products) is for the general price level to rise. Attempts to adhere to the current inflation target would likely require much higher interest rates and consequent demand destruction, but would not address the fundamental cause of inflation (rising costs). On top of the effects of rising energy and food costs, highly restrictive monetary policy may prove devastating to the economy, and especially its poorer members. Therefore, it may be wise to broaden the explicit goals of monetary policy to include the levels of economic activity and employment, and to allow greater flexibility in the inflation target range.

In addition, the repo rate will most likely prove to be too blunt an instrument to cope with the extent and depth of oil shock impacts; a wider array of instruments may be called for. For instance, it may be that the SARB will come to rue its decision not to use more direct controls to stem the recent ballooning of private credit extension. Some form of intervention to rescue over-indebted consumers (and possibly even banks) may yet be warranted. The repo rate has also been used in the past to stabilise the rand exchange rate. While currently South Africa officially has a market-determined, floating exchange rate, the external value of the currency is still of concern to the SARB in that it influences the degree of import price inflation. To protect the capital account (and the rand) against the possibility of rapid portfolio disinvestment (e.g. from emerging markets generally), the National Treasury may be

advised to reconsider its relaxation of exchange controls. The introduction of a Tobin tax on foreign currency transactions could also help to stabilise the value of the currency in the face of international financial market turmoil.

Fiscal policy will also be challenged by future oil shocks, both on the revenue side (as tax collection weakens) and the expenditure side (as demands for poverty alleviation and social spending rise). In addition, government debt repayments will rise along with interest rates. It is therefore imperative that the National Treasury take whatever steps it can – while economic conditions are still reasonably favourable – to invest in mitigation options.

The AsgiSA framework recently launched by the Presidency of South Africa appears to be predicated on the maintenance and even growth of energy inputs, including liquid fuels, and the absence of further oil shocks. Several of AsgiSA's goals may therefore be jeopardised by future oil shocks, especially peak oil. In particular, if world oil production peaks before 2014, the targets of raising economic growth rates and reducing unemployment, poverty and inequality will be seriously compromised if not impossible given the current policy framework. Fortunately, it is not too late to redirect some of the initiatives outlined in AsgiSA to help mitigate peak oil; and indeed some of the existing proposals will help to do so.

One of AsgiSA's key elements is infrastructure investment, especially in energy, transport and electronic communications. Expanding the generation and distribution of energy will take on even greater significance in the face of future oil shocks and peak oil, and therefore such investment is critical. However, it should be done with long-term sustainability in mind, including the key factors of fossil fuel depletion and climate change due to global warming. These considerations imply that renewable energy sources like solar and wind require much more attention and support.

Perhaps the most fundamental implication of peak oil for transport infrastructure is that in the long term, economic activity should – or will by necessity – be much more localised than it is now (see Wakeford, 2006). The underlying principle of sustainability should therefore inform South Africa's transport infrastructure investment patterns. AsgiSA's plan to increase freight and passenger rail transport – as long as they are powered by electricity rather than liquid fuels – makes much sense in the in the light of oil depletion. An additional focus should be light electric rail systems for major urban areas to replace automobile dependency. On the other hand, a strong implication of peak oil is not to expand investment in the airline industry or airports (see Kuhlman, 2006, on the dismal short-, medium- and long-term prospects for the commercial aviation industry in the context of peak oil). Shipping is currently the least expensive mode of bulk freight transport, but these costs will too, and therefore the medium-term expectation is arguably reduced international trade, especially given the likelihood of stagflation. Therefore the wisdom of expanding port infrastructure to cope with a continued commodity boom is highly questionable.

On the other hand, the third area of infrastructure, namely electronic communications, will be even more important in a future of declining oil supplies. Increasingly, this form of communication will substitute for physical transport as much more economic activity is conducted via the Internet.

AsgiSA identifies three sectors for special support and development. The first, business process outsourcing (BPO), could be a significant beneficiary of higher oil prices, to the extent that it relies on telecommunications rather than physical transport, and hence makes sense for a post-peak oil environment. However, the second sector, namely tourism – which depends overwhelmingly on liquid fuels for transportation – will be an early and severe casualty of peak oil. This applies to both international and domestic tourism, given South Africa's considerable distance from wealthier countries and our large internal distances. AsgiSA's third priority sector, biofuels, seems at first glance to have particular merit in mitigating future oil shocks. Given South Africa's current surpluses of maize and sugar, the biofuels industry would seem to show great promise to partially offset declines in oil-based fuels. However, the use of agricultural products for fuel will increasingly compete with food production at global and national levels, and contribute to spiralling food costs. This will place an especially heavy additional burden on the poor and thus militate against the achievement of AsgiSA's poverty reduction targets.

A range of additional mitigation strategies may be identified. First, it would seem prudent for the Government to make use of the large existing strategic petroleum reserve capacity to provide some forward cover. While the oil price might appear high now, it has been argued strongly that the price will rise much higher once global oil production peaks. However, strategic reserves will merely be a partial, stop-gap solution to the impending liquid fuels shortage.

Second, and more important, will be the implementation of various incentives or regulations to enhance fuel efficiency and conservation among both producers and consumers. For example, legislation could be enacted prescribing higher fuel efficiency standards in automobiles. More fundamentally, production and consumption of electric powered vehicles should be incentivised by appropriate taxes and subsidies.

Third, the pricing of South Africa's domestically produced liquid fuels will have great significance. As mentioned earlier, if these synthetic fuels continue to follow an import parity pricing formula, domestic consumers will not be shielded from oil price shocks. In the context of peak oil, therefore, the National Treasury's current consideration of a windfall tax on the liquid fuels industry is even more relevant; it may need to consider an even stronger form of price regulation for this sector in the future.

In addition to biofuels, expanding coal- and gas-to-liquid capacity will undoubtedly be an attractive prospect to some, especially given South Africa's lead in this industry. However, in the face of climate change and its threatened socio-economic impacts, the continued or expanded use of coal (and even gas) is arguably not a wise long term solution. In any event, expanding investment in the synthetic fuels sector will take time and be increasingly costly. Furthermore, gas imports will also become more expensive as world demand for (and hence the price of) gas rises along with the price of oil.

Given these concerns, substitution of alternative liquid fuels for declining oil will have definite limits. Therefore, a substantial amount of electricity-based transport infrastructure will be required to alleviate the effects of future oil shortages. For long

term sustainability – including limiting environmental damage – such electricity should be generated via by massive expansion of renewable energy investments, such as solar and wind power. Mass production of solar panels, wind turbines and electric-powered vehicles will help to reduce their costs substantially. There is a real opportunity for South Africa to stake an early claim in these industries, but they need initial support (just as the fossil fuel industry received State support previously).

Despite these possibilities, if world oil production peaks in less than 10 years' time – which according to many experts is very likely – a liquid fuels crisis will almost certainly be unavoidable even if a crash programme of mitigation strategies is initiated now (Hirsch *et al*, 2005; Hirsch, 2005). Therefore, various short term adaptation measures may also be required to ameliorate the effects of physical oil shortages.

For instance, Government will need to consider liquid fuel prioritisation and a consumer rationing system. The danger of allowing the price to be the sole rationing mechanism is that the wealthy minority will continue to consume petroleum products while the majority poor and lower-income sections of the population will find the costs prohibitively expensive and will be unduly affected (since energy costs comprise a greater portion of their expenditure). In addition, essential government services (such as security and emergency services) will need a guaranteed supply of fuel in order to function.

Measures that can make an immediate difference to fuel consumption include: reducing national road speed limits; mandating the use of car pools; alternating between allowing only odd- or even-numbered vehicle registrations into city centres; and banning certain fuel-intensive leisure or sporting activities, such as motor racing. While interventions such as these may seem draconian, they may prove essential in order to preserve the social fabric and economic integrity of the country.

In short, a macroeconomic strategy that is predicated on the continued growth in oil supply is destined to be derailed, sooner or later. The earlier that sustainable, mitigating interventions are made, the lower the costs will ultimately be.

7 Conclusions

Historical oil price shocks have several noteworthy features. First, in each of the four shocks to date, political or geopolitical events have played a major role, as least as initial triggers. Second, the actual supply constraints have been on a relatively minor scale, underscoring the highly inelastic nature of oil demand. Third, speculation and fear-driven hoarding behaviour by oil traders and investors have contributed significantly (and increasingly) to the magnitude of oil price shocks.

The impact of the oil shocks on South Africa has depended – not unexpectedly – on both their magnitude and timing. In the case of the 1970s oil shocks, an initial rise in the price of gold (and to a lesser extent coal and uranium) helped to offset the negative impact on the balance of payments, although this buffer proved to be relatively short-lived as international demand soon declined. After a year or two, exports shrank, inflation rates rose, and the economy slipped into recession. As one

might suppose, the transitory oil price spike in 1990 had considerably less impact on macroeconomic variables than did the sustained price shocks of the 1970s, although its effects were clouded by a multitude of other factors. Finally, it appears as though the effects of the most recent shock are only now beginning to manifest both internationally and in South Africa; inflation and interest rates are rising, and economic growth is slowing.

The global economy at present seems at least as susceptible to another oil shock as it was in the 1970s, if not more so. Despite its relatively low oil import and oil resource dependence, South Africa is nonetheless a net oil importer and has a transportation system highly dependent on liquid fuels, and is therefore vulnerable to oil price shocks. The balance of payments and exchange rate are especially vulnerable considering the extent of the current account deficit and the economy's exposure to capital flight.

The outlook for future oil shocks is bleak. Firstly, there are significant geopolitical (and perhaps to a lesser extent environmental) risks to oil production in the short run. More seriously, peaking world oil production – which may well occur within 5 to 10 years – will inevitably result in recurrent oil shocks (diminishing supply and hence rising price) and probably much greater volatility as the world struggles to adjust to a different energy regime. While previous oil shocks were precipitated largely by unforeseen political events, peak oil is a certainty and therefore mitigating action – employing currently available technologies – can and should be taken.

The longer that mitigating interventions are postponed, the more costly they will be in the long run, both in direct terms (as a result of rising energy and energy-related prices) and indirectly in terms of the economic and social dislocation that could have been avoided. Let us hope that the fiscal and monetary authorities have the resolve to use whatever time is still available to alleviate the risks described above. Otherwise, their hard-fought efforts to achieve macroeconomic stability since 1994, and their aspirations to attain the Millennium Development Goals, may be laid to waste.

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