Factor Productivity and Potential Output Growth in South Africa

Wolassa L. Kumo
Abstract

This study conducts an economic growth decomposition exercise to measure factor contributions to growth in post-apartheid South Africa (1996–2015). It also investigates trends in factor intensity, potential output growth and the output gap in the period. The study finds that total factor productivity (TFP) remained the dominant source of economic growth. The key driver of TFP gains was the democratic transition in 1994 that transformed the political system, ending decades of international isolation and leading to trade liberalization. Improved macroeconomic policies, reforms and strong institutions led to rapid gains in TFP and in efficiency in the following decade. Yet growth in TFP has lost momentum in recent years due to structural constraints, in particular severe skills shortages, an infrastructure deficit and weak domestic competition. Capital intensity gradually declined in the first decade of democracy, but subsequently increased rapidly, particularly after the 2008–09 global financial crisis, to reach its 1980s’ level. Given that much of the last decade has seen a gradual deterioration in factor intensity, employment gains, TFP growth and growth in actual and potential output, bold structural reforms are critical to boost TFP and resuscitate South Africa’s growth.

This paper is the product of the Vice-Presidency for Economic Governance and Knowledge Management. It is part of a larger effort by the African Development Bank to promote knowledge and learning, share ideas, provide open access to its research, and make a contribution to development policy. The papers featured in the Working Paper Series (WPS) are those considered to have a bearing on the mission of AfDB, its strategic objectives of Inclusive and Green Growth, and its High-5 priority areas—to Power Africa, Feed Africa, Industrialize Africa, Integrate Africa and Improve Living Conditions of Africans. The authors may be contacted at workingpaper@afdb.org.
Factor Productivity and Potential Output Growth in South Africa

Wolassa L. Kumo

Key words: Total factor productivity, Potential output, Output gap, Factor intensity, Hodrick-Prescott Filter, Growth accounting.

JEL classification: O11, O33, O47.

---

1 Wolassa L. Kumo is a Country Economist at the African Development Bank
1. Introduction

Factors of production—labour, capital and technology—feature prominently in endogenous and exogenous growth theories. The efficiency and intensity of their use, and their productivity levels, have varied widely before and during South Africa’s period of democracy. In the four decades before the democratic transition in 1994, South Africa’s economy was characterized by a rapidly increasing average capital intensity and a rising average capital output ratio, alongside weak and often declining total factor productivity (TFP), and thus weak and declining economic growth.

The main reason for poor productivity and efficiency gains in these four decades was apartheid. The political structure engendered prolonged political instability and international economic isolation owing to the race-based system of government. The government’s macroeconomic policy responses to the isolation resulted in higher inflation, increased uncertainty and lower investment, further eroding efficiency and productivity gains.

The democratic transition transformed the political system, ending the decades of isolation. Soon after, the new government adopted wide-ranging policy reforms, including trade liberalization. Increased import penetration led to improved price competitiveness of domestic producers. The new government also adopted prudent fiscal and macroeconomic policies, creating an enabling environment for investment and economic expansion. Consequently, efficiency of factor use improved, employment expanded and economic growth accelerated. Particularly in the first decade or so of democracy, actual and potential output growth increased, although the negative output gap remained wide.

The external economic shock induced by the global financial crisis of 2008–09 and domestic structural weaknesses brought further gains in efficiency and total factor productivity to an abrupt end. Much of the last decade has seen a gradual deterioration in factor intensity, employment gains, TFP growth and growth in actual and potential output.

This study conducts a detailed growth decomposition exercise for 1996–2015 to measure factor contributions to economic growth in post-apartheid South Africa. Trends in annual and quarterly potential output growth and the output gap were estimated using the Hodrick-Prescott (HP) singlevariate (SV) filter. Trends in factor intensity and the average capital output ratio were also investigated.
The rest of the paper is organized as follows: Section 2 provides definitions of key terms used in the analysis. Section 3 reviews the empirical and theoretical growth accounting literature. Section 4 discusses the methodological framework and results of the estimation of the performance of factor productivity and efficiency in post-Apartheid South Africa, and presents key determinants of TFP growth and trends in factor intensity. Section 5 investigates the trends in potential output growth and the output gap. Section 6 concludes the paper with key policy recommendations to resuscitate factor efficiency and economic growth in South Africa.

2. Definitions

TFP is defined as the portion of output that is not explained by the amounts of inputs, i.e. labour and capital used in the production process. The level of TFP depends on the efficiency and intensity of the use of inputs in production. In essence therefore TFP measures productivity growth, capturing technological change in the production process. It is often measured by the Solow residual in a neoclassical production function.

Following Okun (1962), we define potential output as the level of output that can be achieved without putting any upside or downside pressure on inflation. The output gap is defined as the difference between actual and potential output as a percentage of potential output. The output gap can be zero, negative or positive. When zero, there is no upward or downward pressure on inflation, as actual demand coincides with the economy’s potential. If the output gap is positive, such that actual output is greater than potential output, inflation will begin to rise in response to demand pressures. And if the output gap is negative, so that actual output falls below potential output, prices will begin to fall to reflect weak demand. Potential output can also be defined in a more colloquial sense as an equilibrium level of output achieved when an economy is in full employment of resources with constant inflation, where the output gap is the level of deviation of actual from the equilibrium level of output. Most recent literature defines potential output as the output achieved with historical rates of factor (labour and capital) utilisation and total factor productivity (Arora and Bhundia, 2003).

TFP is often referred to as technology, but it is technology in the widest possible sense. It is not just new ways of constructing buildings, new machines, or new sources of power, but changes in work organization, efficiency of government regulations, degree of monopoly, literacy and skills of the workforce, and many other factors (US President’s Council of Economic Advisers, 2001).
3. A Literature Review

Growth accounting—calculating the deviations of actual output growth from output growth implied by the growth rates of physical and human capital (under the assumptions of constant returns to scale and competitive factor markets)—was pioneered by Robert Solow (1957) and Moses Abramovitz (1956). Since then, economists have applied this tool to measure factor contributions to growth at sectoral and aggregate levels in developed and developing economies.

But why does the source of growth matter? According to the neoclassical growth model, capital accumulation cannot sustain long-term economic growth because of the law of diminishing returns to physical capital, while TFP can. A large body of the empirical literature supports this crucial assumption (Senhadji, 1999). Technology and efficiency are therefore the sole long-term drivers of growth in any nation.

According to the standard neoclassical growth model (Solow 1956), input-driven growth is not sustainable because there are limits to input mobilization and because incremental growth in inputs is subject to the law of diminishing returns. In this model, capital per worker rises over time, generating a decline in the marginal product of capital, up to the point where the economy reaches the steady state. Countries’ growth rates will level off at a growth rate equal to the sum of their labor and productivity growth rates, as capital per worker peaks at a level determined by saving behavior and the pace of productivity growth. Thus, this model implies that if there is no technical progress (and in the absence of exogenous increases such as population growth), and growth results exclusively from the accumulation of resources, then the process will stop as a result of diminishing returns to the factors. Hence the emphasis on productivity (Felipe, 1997).

A number of authors have assessed the role of TFP in economic growth. Choudhry (2009) measured TFP growth in the agricultural and manufacturing sectors and for the economy as a whole for Pakistan in 1985–2005 using the Cobb-Douglas production function and found that while growth in agriculture was driven by labour and TFP, growth in the whole economy was driven largely by factor accumulation, i.e. increases in labour and capital inputs. He found that for the economy as a whole, TFP increased at an annual average of only 1.1%, implying that three-quarters of the growth in output was driven solely by factor accumulation.

Senhadji (1999) conducted a growth accounting exercise for a panel of 88 countries, including 46 developing countries, for 1960–1994 and found that Africa had the lowest annual TFP growth (negative growth), ranging from -0.26% to -0.79%. During 1960–1994, average economic growth
for Africa was 2.83% compared with 3.80% for the whole sample; the sources of lower African output growth were lower physical and human capital accumulation, and lower TFP growth (Senhadji 1999). He also found that Asia recorded the highest performance in productivity growth, followed by advanced economies as a group.

Felipe (1997) conducted an extensive survey of literature on productivity growth in East Asia and summarized the prevailing view that productivity growth in East Asia was zero or insignificant during the previous two to three decades, and that the main source of economic growth was capital accumulation. However, results differed by author, methodology, time frame and estimated weight used for labour and capital inputs. He concludes that “the variation in the estimates of TFP growth is rather large, and the figures are very sensitive to the specific assumptions of each study. Often, one is led to contradictory results. This should be a warning sign in drawing conclusions out of this literature. If anything, this indicates a general fragility about the empirical studies on the nature and sources of growth in East Asia…. And that the theoretical problems underlying the notion of TFP are so significant that the whole concept should be discarded”. He reiterated this view a decade or so later, maintaining that the underlying theory of TFP is a series of problems that, taken together, makes TFP a dubious—even useless—concept for policy making and that the relevant variable for policy making should be labour productivity (Felipe 2008).

Contrary to Felipe’s nihilistic view, the mainstream economics profession regards TFP as a useful tool of economic analysis. For example, Hulten (2000) stresses that:

Economists have long recognized that total factor productivity is an important factor in the process of economic growth. However, just how important it is has been a matter of ongoing controversy. Part of this controversy is about methods and assumptions. Total factor productivity growth is estimated as a residual, using index number techniques. It is thus a measure of our ignorance, with ample scope for measurement error. Another source of controversy arises from sins of omission, rather than commission. A New Economy critique of productivity points to unmeasured gains in product quality, while an environmental critique points to the unmeasured costs of growth. …The ultimate objective is to demonstrate the considerable utility of the idea, as a counter-weight to the criticism, often erroneous and sometimes harsh to which it has been subjected. Despite its flaws, the residual has provided a simple and internally consistent intellectual framework for organizing data on economic growth, and has provided the theory to guide a considerable body of economic measurement.
Fedderke (2002) assessed factor accumulation and TFP growth in South Africa over 1970–1997 using the Cobb-Douglas production function and found that economic growth in the 1970s and 1980s was led by growth in accumulation of physical capital and labour, with very little contribution from technology. He also noted that the contribution of growth in TFP in aggregate output growth had been steadily rising since the 1970s, reaching 1.07 percentage points in the 1990s, due mainly to declining formal sector employment and investment.

Arora and Bhundia (2003) conducted a growth accounting exercise using a similar methodology for 1994–2001 and found that growth was driven by increases in TFP rather than increases in the accumulation of physical capital and labour, again reflecting the decline in factor accumulation. They conclude that the prominent role of TFP in South Africa’s growth performance highlights that growth can be sustained over longer periods when it is based on improvements in technology and efficiency, which are embedded in TFP, rather than on factor accumulation, which is constrained by demographics and diminishing returns.

Although a useful tool for growth analysis, a simple growth decomposition exercise has its own limitations. One is that the approach based on the Cobb-Douglas production function does not disaggregate the factor inputs by their intrinsic quality. Some authors such as Senhadji (1999) have introduced a skill-adjusted measure of labour input—though Fedderke (2002) did not pursue this line of inquiry owing to data limitations. This paper follows Fedderke’s line of inquiry. Two other limitations discussed by Fedderke (2002) relate to the assumption of constant returns to scale and the assumption that factor social marginal products coincide with observable factor prices. Some analysts attempted to address the latter by using a regression approach to estimate the elasticity of factor inputs in the production function. An argument made in the literature against the estimation of production functions to determine the share of physical capital and labour is the problem of potential endogeneity of the explanatory variables, namely capital and labour. Regression analysis also suffers from measurement error, and the choice of a specific functional form (Felipe, 1997). Senhadji (1999), however, argues that applying certain specialized econometric estimators—the “Fully Modified” estimator in this case—not only corrects for the potential problem of endogeneity but also for the likely autocorrelation of the error term.

While the debate about returns to scale—increasing, decreasing or constant—continues, economists have opted to interpret economies or diseconomies of scale using an alternative class
of functions known as homogeneous production functions. A function homogeneous of degree 1 exhibits constant returns to scale, with neither economies nor diseconomies of scale. A function homogeneous of a degree greater than 1 exhibits increasing returns (or economies) of scale. A function homogeneous of a degree less than 1 exhibits diminishing returns (or diseconomies) of scale. This study employs the Cobb-Douglas production function homogenous of degree 1.

Arora and Bhundia (2003) estimated potential output for South Africa for the first seven years of the post-Apartheid period using two statistically detrending approaches, including the HP filter, and the production function method, all of which indicated an increase in the average annual potential output growth rate to 2.25–3% in 1994–2001 from 1–1.25% in 1980–1993. The empirical literature indicates that results obtained by the HP filter method were largely consistent with the results obtained by other methods. In choosing the estimation methodology, they noted that a major disadvantage of the HP filter was that, because it is a two-sided symmetric filter, the estimated trend output suffers from end-point biases. They also noted that the method fails to take account of structural breaks in the output series, instead of smoothing out such changes. This paper addresses the latter issue by limiting the period to post 1994, where no structural breaks were observed.

4. Factor Productivity and Efficiency in Post-Apartheid South Africa

4.1. Methodological Framework

Factors of production—capital, labour and technology—feature prominently in exogenous (or neoclassical) and endogenous models of economic growth. Both models identify accumulation of the physical and human capital as well as improvement in the production technology and sound economic policies as the most important factors in economic growth, which depends on the size and the efficiency and intensity of the use of these inputs in the production process.

To understand the role of each factor in the economic growth process, economists have developed an analytical framework known as growth accounting. This tool enables them to measure sources of economic growth and to determine how changes in each of these sources affect the growth process over time. An alternative method to growth accounting is the direct econometric estimation of the aggregate production function.
Both methods use the production function, primarily the Cobb-Douglas production function, as the starting point. “However,” (according to Felipe, 1997):

... growth accounting is an estimator of technical change that lacks a stochastic term. Therefore, the model is not estimated statistically. As a result, the usual test statistics used in econometric work cannot be applied to growth accounting. For practical purposes, the latter imposes the assumption of profit maximization that allows us to equate the elasticities to the factor shares, so that there is no need to estimate the parameters \( \alpha \) and \( \beta \). On the other hand, in the econometric estimation, the parameters are, in general, unrestricted, and do not necessarily have to add up to 1. It is hoped, however, that the estimates of \( \alpha \) and \( \beta \) will take on interpretable values, that is, coefficients that could be taken to be reasonable elasticities. Growth accounting makes it easy to calculate the change in total factor productivity growth from year to year, while the econometric estimation provides an average rate for a given period.

Therefore, to measure the sources of economic growth in South Africa for 1996–2014, and following the footsteps of the neoclassical growth theory, we use the Cobb-Douglas form of the production function expressed below, with the assumptions of constant returns to scale, competitive factor markets, diminishing marginal returns to each factor input and profit maximization:

\[
Y_t = A_t X(K_t)^\alpha (L_t)^{1-\alpha}
\]

where \( Y \) is the level of output (GDP), \( K \) the stock of capital, \( L \) the amount of labour input, \( A \) the level of technology or TFP, \( \alpha \) the share of capital in output and \( 1- \alpha \) the share of labour in output. Shares \( \alpha \) and \( 1- \alpha \) are positive and below 1; i.e. \( 0 < \alpha < 1 \), and \( 0 < (1- \alpha) < 1 \) and sum to 1, \( \alpha + (1- \alpha) = 1 \) (constant return to scale). Furthermore, by the Euler exhaustion theorem (Bhattarai, 2004), the payment to labour and capital based on their marginal productivity equals the output:

\[
\frac{rK}{Y} + \frac{wL}{Y} = 1; \ alpha = \frac{rK}{Y} = \frac{\alpha AK^{(1-\alpha)}}{Y}, \text{ or } (1-\alpha) = \frac{wL}{Y} = \frac{(1-\alpha) AK^{(1-\alpha)-1} L}{Y}
\]

where \( r \) is the interest rate and \( w \) wage rate. In the Cobb-Douglas production function (described above), if output changes it can only be due to changes in the economy’s capital stock, its labour force or its level of TFP. Therefore, taking the natural logarithm of the function and using a discrete time growth rate, the proportional growth rate of South African GDP is given by:
\[
\frac{\Delta Y}{Y_t} = \alpha \frac{\Delta K}{K_t} + (1 - \alpha) \frac{\Delta L}{L_t} + \frac{\Delta A}{A_t}
\]

with the first term \(\Delta Y/Y\) giving the size of the change in GDP, the second \(\alpha (\Delta K/K)\) giving the contribution of capital to GDP growth, the third \((1-\alpha)(\Delta L/L)\) giving the contribution of labour to GDP growth, and the fourth \((\Delta A/A)\) giving the contribution of TFP to GDP growth. The average ratio of compensation of employees to GDP \((\text{wL}/Y)\) for 1996–2014 was 0.51; therefore \((rK/Y) = \alpha = 0.49\) was used.

In the bulk of the growth accounting literature that adopted the Cobb-Douglas production function, the share of the remuneration of physical capital in aggregate output is typically set to a benchmark value of one-third, as suggested by national income accounts of some industrialized countries. This benchmark is assumed to be the same across countries, which implies identical production technology for all countries (Senhadji, 1999). Nonetheless, if the data fail to support this assumption, it is reasonable to believe that production technologies differ across countries. The national income accounts data for South Africa do not support the assumption of identical production technologies across countries and hence \((rK/Y) = \alpha = 0.49\) instead of \(\alpha = 0.33\) is used, relaxing the assumption of identical technologies in this paper.

4.2. Results

The results of the computations are in Table 1. South Africa’s average real GDP growth increased from 2.7% in the 1996-2000 period to 3.7% in 2001-2005 period due to reforms political and economic reforms introduced by the new government. This led to higher growth in per capita income which increased from 0.7% to 2% in the period under consideration. Growth during this two sub periods was anchored by increase in total factor productivity and increased utilisation of labour.

Between 2001 and 2010 economic growth was driven largely by increased use of labour and capital than improvements in technology and efficiency. However, in the post 2010 period, the contribution of labour to economic growth was negative while both capital and TFP were key drivers of growth. This is consistent with rapid decline in employment and increased in capital intensity following the 2009 global economic crisis.
Table 1: Sources of Growth, 1996–2014

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP growth (%)</td>
<td>2.7</td>
<td>3.7</td>
<td>3.0</td>
<td>2.2</td>
<td>3.0</td>
</tr>
<tr>
<td>Real per capita GDP growth</td>
<td>0.7</td>
<td>2.0</td>
<td>1.8</td>
<td>1.1</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Factor growth rates (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td>0.6</td>
<td>1.0</td>
<td>3.0</td>
<td>2.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Labour</td>
<td>-4.3</td>
<td>2.2</td>
<td>1.6</td>
<td>-2.1</td>
<td>-0.5</td>
</tr>
<tr>
<td>Total factor productivity</td>
<td>4.6</td>
<td>2.1</td>
<td>0.6</td>
<td>2.0</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Growth decomposition (percentage points)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td>0.3</td>
<td>0.5</td>
<td>1.5</td>
<td>1.3</td>
<td>0.8</td>
</tr>
<tr>
<td>Labour</td>
<td>-0.1</td>
<td>0.8</td>
<td>1.1</td>
<td>-0.2</td>
<td>-0.3</td>
</tr>
<tr>
<td>Total factor productivity</td>
<td>4.6</td>
<td>2.1</td>
<td>0.6</td>
<td>2.0</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Source: Computations using South African Reserve Bank and Statistics South Africa data.

4.3. Drivers

What were the key drivers of rapid improvements in TFP and efficiency in the decade after 1994? In the previous four decades, South Africa’s economy had weak and often declining TFP in spite of rising capital-labour and average capital-output ratios (Figure 1).

Figure 1: Trends in average capital-labour and capital-output ratios, 1970–2015

Source: South African Reserve Bank

Likewise, the average capital-output ratio increased in the three decades before 1994, from R2.8 of capital needed to produce 1 rand (R) of output in 1970 to R3.5:1 in 1993, suggesting that the efficiency of capital declined by R0.7. GDP growth fluctuated from 5.2% in 1970 to a contraction of 2.1% in 1992 and back to growth of 1.2% in 1993. The economy was in recession in 1990–1992. Capital intensity gradually declined in the first decade of democracy, reaching a post-1994 low of R320,471 per worker at constant 2010 prices in 2004. Particularly after the global financial crisis, however, capital intensity increased rapidly, back to the levels of the 1980s. The average capital-output ratio, improved from an all-time high of 3.5 in 1993 to 2.7 in 2015.

The main reason for poor productivity and efficiency gains in the four decades leading up to the mid-1990s was apartheid, which engendered international economic isolation; “sustained economic and income inequality, bedded discriminatory practices into the labour market and labour use, discriminated severely in education and skills development, aimed industrial and trade policies at the needs of an internationally isolated economy”, and polarized labour relations by denying black populations and black labour the right to vote (McCarthy, 2005). The proximate causes of slowing growth in this period were trade and financial sanctions, political instability and macroeconomic policy decisions that resulted in higher inflation, increased uncertainty and declining investment (Faulkner and Loewald, 2008). Despite being the largest and most advanced economy on the continent, South Africa remained one of the most unequal and internationally uncompetitive economy during apartheid.

The transition in 1994 transformed the political system, ended decades of international isolation and led to trade liberalization. Increased import penetration led to improved price competitiveness of domestic producers. Political transformation brought about a sharp improvement in the quality of political institutions (McCarthy, 2005). Prudent fiscal policy and sound macroeconomic management were critical factors in creating a conducive growth environment by stabilizing economic conditions, lowering the cost of capital and putting downward pressure on the real
exchange rate (Faulkner and Loewald, 2008). The improved policies and institutions resulted in rapid gains in factor productivity and efficiency in the decade after 1994.

After 1994, capital intensity declined from R356,937 per worker in 1994 to an all-time low of R320,471 in 2004 (constant 2010 prices). Real GDP growth by 2004 had climbed to 4.6% from 1.2% in 1993. The first decade of democracy also witnessed a rapid increase in employment and TFP—and consequently rapid growth in GDP. GDP growth accelerated further in 2005–2007, reaching a post-1994 high of 5.6% in 2006.

Yet after the global financial crisis, growth in employment slowed rapidly, capital intensity increased. Capital intensity climbed to R386,322 per worker by 2015 at constant 2010 prices (see Figure 1). In the past five years, the average contribution of labour to economic growth was negative, with high unemployment and thousands of jobs lost in the private sector. Policy uncertainty increased and investor and business confidences began to decline further, dampening job creation, productivity gains and growth, particularly after the 2009 great recession.

Challenges to productivity improvements became more structural and included chronic skills shortages; infrastructure deficits in power, transport and logistics; and uncompetitive domestic goods and services markets. Further productivity gains became contingent on the economy’s ability to address these structural constraints. The honeymoon of political transformation ended within the first 12 years of democratization and more bold reform measures were required. Without improved productivity gains, South Africa will not be able to achieve the 5.4% growth target set in the National Development Plan (Vision 2030) adopted in 2012.

4.4. TFP: The Key Driver of South African Growth

Because TFP was the dominant source of economic growth in South Africa for most of the period 1996–2015 (see Table 1), increasing TFP growth will remain crucial to enhance economic growth, involving different mechanisms. These include investing in human capital (via education and health), infrastructure, trade openness and imports; fostering competition; and developing the financial sector (see Isaksson, 2007, for more details). As highlighted in the endogenous growth literature, theory and empirical evidence also suggest that economic policies and institutions are key in increasing TFP. Foreign direct investment can contribute to TFP growth through technological spillovers (Arora and Bhundia, 2003).
South Africa is performing well on some of these drivers (particularly openness and financial sector development), but on skills development lagged far behind the economy’s demands. Empirical evidence indicates that human capital is an important determinant of TFP growth but that it is not the quantity of human capital but rather its quality that is statistically significant and positively associated with TFP growth in South Africa (Faulkner and Loewald, 2008).

Investment in research and development (R&D) can also spur TFP growth. An empirical study of private R&D investment in South African manufacturing by Fedderke and Bogetic (2005) concludes that R&D has a statistically significant positive impact on TFP growth.

South Africa’s TFP growth is also held back by chronic infrastructure deficits in power, transport and logistics. In power, the World Bank estimates the economic cost of load shedding in Sub-Saharan Africa to be 2.1% of GDP on average (World Bank, 2013). While the turnaround in electricity supply in 2016 when Eskom manged to produce 3000MW in surplus, will anchor the current level of subdued growth in the medium term, more generation capacity is needed in the long term for higher levels of power-intensive investments in manufacturing and mining. Higher transport and logistics costs are harming the competitiveness of businesses.

Empirical studies indicate that strong competition in goods and services markets is also an important determinant of TFP growth. South Africa’s economy is highly concentrated and competition in goods and services market remains weak with significant barriers to entry by small businesses. Policies to stimulate competition are therefore vital. One such policy is privatization, although it must be implemented with care. Policies to facilitate market entry for new firms, possibly at the expense of relatively unproductive ones, will increase TFP growth and stimulate competition (Isaksson, 2007).

Thus to achieve the higher growth target in the National Development Plan, the government should implement reforms to stimulate TFP growth, but should not neglect the other two factors. South Africa has one of the highest unemployment rates on the continent, officially hovering around 25% in the past two decades and even reaching 27% in the second quarter of 2016. The labour absorption rate was one of the lowest among the emerging economies at 42.5% in the second quarter of 2016, and the labour force participation rate was only 57.9% at that time, pointing to great potential for higher growth through more labour-intensive production. Investment in critical infrastructure, will boost labour productivity as well as TFP.
5. Declining Potential Output Growth in South Africa

Potential output is the level of output achieved when an economy is in full employment of resources and has a constant inflation rate (Okun 1962; Grech 2014). In essence, therefore, potential output is an equilibrium level of output. Nonetheless, Grech (2014) argues that the full use of all the factors of production is not economically feasible, as marginal costs rise steeply (and exceed marginal revenues) at high levels of factor utilization. He argues further that potential output implies the optimal use of resources in the light of prevailing economic constraints in factor markets, such as the natural rate of unemployment. In effect therefore, as De Masi (1997) (quoted in Grech, 2014) succinctly summarizes, “potential GDP is the maximum output an economy can sustain without generating a rise in inflation.” For the purpose of this paper and following Arora and Bhundia (2003) we define potential output as that achieved with historical rates of factor (labour and capital) utilisation and total factor productivity.

The output gap is the difference between actual and potential output, and therefore measures the size of the disequilibrium. Unlike actual output, potential output is unobservable, and so has to be estimated using various methods. The simplest is the SV filter methodology, which filters actual GDP data into two components: a cyclical component that exhibits stationary, mean-reverting, characteristics; and a permanent (or trend) component. The most common SV filter is the HP filter (Hodrick and Prescott 1997):

\[
\min \left( \sum_{t=1}^{T} (y_t - z_t)^2 + \lambda \sum_{t=2}^{T-1} \left[ (z_{t+1} - z_t) - (z_t - z_{t-1}) \right]^2 \right)
\]

In this HP filter model, the first term minimizes the distance between the actual \( (y_t) \) and the potential \( (z_t) \) value, while the second component minimizes the change in the trend value. The weight \( \lambda \) is used to control for the smoothness of the trend; \( \lambda = 100 \times (n^2) \), where \( n \) = number of periods in a year. Thus for annual data, \( \lambda \) is typically set at 100 and at 1600 for quarterly data in E-views and other econometric software packages. The HP filter is commonly used for its simplicity, but also has other useful properties, such as producing a stationary output gap even when the original series is integrated (Grech, 2014).
The biggest weakness of the HP filter is the end-of-sample problem, with estimates towards the end of a given sample period subject to significant revisions as more data become available and the sample is extended (Alichi, 2015). Nonetheless, the potential output estimated using the HP filter is largely consistent with results obtained using other methods. For South Africa, the Article IV Report 2014 of the International Monetary Fund obtained consistent potential output growth rates using the HP filter, multivariate filter and production function methods with the potential growth rates of 2.1%, 2.0% and 2.4% respectively for 2014 (IMF 2014).

We employ the HP filter technique to estimate South Africa’s potential GDP in the post-Apartheid period. We use annual real GDP data for 1995–2015 and quarterly real GDP data from 1995Q1 to 2015Q3. The output gap is measured as the difference between actual and potential output as a percentage of potential output.

Our estimates suggest that South Africa’s annual potential output growth increased marginally between 1996 and 2004, edging up from 3.5% to 3.7%, but declined persistently from 3.5% in 2006 to 2.1% in 2015 (Figure 2). Our HP filter method estimated potential output growth rate of 2.2% in 2014, a result consistent not only with the IMF HP filter method for South Africa but also results obtained by IMF using other methods, in particular the production function and multivariate filter for 2014 (IMF Article IV Report for South Africa 2014). The main cause of falling potential output growth is the decline in total factor productivity growth and efficiency.

**Figure 2: Annual actual and potential GDP growth, 1996-2015**

In the immediate post-apartheid years, the economy overheated and grew above potential, generating a positive output gap, but as potential growth increased marginally in the first decade
after 1994, the output gap remained largely negative, and the economy continued to grow below potential. In the second decade of democracy, in particular after the global financial crisis, actual and potential growth continued to decline and the negative output gap continued to narrow. For instance, the annual negative output gap declined from about 2% of potential output in 2004 to 0.4% in 2014 (Figure 3).

South Africa’s potential growth has also declined persistently quarter on quarter since 2008. Potential GDP growth fell to 1.8% in the third quarter of 2015 from 4.0% in the first quarter of 2007. Again, the decline in factor productivity and efficiency has resulted in lower growth in potential output and a narrower negative output gap.

Figure 3: Annual Output Gap as a Percentage of Potential Output (HP Filter)

Source: Computations using South African Reserve Bank data.

Figure 4: Quarterly Output Gap (HP Filter)

Source: Computations using South African Reserve Bank data.
Therefore, the output gap not only remained predominantly negative after 2009, it also continued to shrink. The quarterly negative output gap ranged from a high of 3.5% in the first quarter of 2009 to 0.4% in the second quarter of 2015 (Figure 4). The declining negative output gap is the result of falling potential output and declining potential output growth. The main driver of lower potential growth is declining total factor productivity growth. As indicated earlier, the contribution of labour to potential growth has been limited and capital intensity has risen, particularly after 2009. Consumer and business confidence has declined since 2009 both on global economic weakness and domestic policy and structural headwinds.

6. Conclusions and Policy Recommendations

Total factor productivity growth remained the dominant source of economic growth in South Africa in the period 1996-2015. Therefore, increasing TFP growth will remain crucial to enhance and sustain economic growth in the country. South Africa has strong institutions, open economy, and a well-developed financial sector, which are some of the key factors that spur total factor productivity growth.

Nonetheless, the country has a critical deficit in three key areas that are holding back total factor productivity growth and efficiency gains. These are, (1) Skills shortages, (2) Infrastructure deficit, and (3) Weak domestic competition. Skills development has lagged far behind the demand of the economy. Empirical evidence indicates that high quality human capital (skilled labour force) is an important determinant of TFP growth. In addition to investment in skills, investment in Research and Development (R&D) is found to spur TFP growth.

A study by government indicated that electricity shortages in the past two years deducted economic growth by one percentage point. While the turnaround in electricity supply since 2016 will anchor the current level of subdued growth in the medium term, more generation capacity should come on board in the long term to accommodate a higher levels of electricity intensive investments in the manufacturing and mining sectors. Higher transport and logistics costs are also harming the competitiveness of businesses. Investments to increase supply of transport and logistics services will go a long way in anchoring productivity growth.

Strong competition in goods and services market is an important determinant of TFP growth. South Africa’s economy is highly concentrated and competition in goods and services market remains weak with significant barriers to entry by small businesses. Policies to stimulate competition are
vital in order to increase TFP growth. One such policy is privatization of SOEs, although it must be implemented with care. Policies to facilitate market entry for new firms, possibly at the expense of relatively unproductive ones, will increase TFP growth and stimulate competition. The Industrial Policy Action Plan as well as the SOE rationalization strategy may consider designing policies to phase out inefficient public firms and encourage takeover or entry by small and more efficient businesses.

As outlined in the NDP, South Africa needs to achieve 5.4 percent GDP growth rate or above in the coming decade and a half in order to significantly reduce unemployment, poverty and inequality. This is unlikely to be achieved without significant improvements in intensity of factor use, both labour and capital, and in total factor productivity growth.

As an economy with abundant unskilled labour and high level of unemployment, South Africa has also a great potential to achieve higher growth through more labour intensive technique of production. Higher labour force participation and absorption rates will improve household income, narrow income inequality and spur the aggregate demand and economic growth. Nonetheless, South Africa’s economy is highly sophisticated and has higher demand for skilled labour than unskilled labour. That is why 27 percent of mostly unskilled workers could not be absorbed by the labour market. In addition to building the skills of the labour force, radical reforms to improve competition in domestic goods and services market will remain crucial to create an enabling environment for small businesses to enter these markets and create jobs for unskilled labour. Nonetheless, in sum, reform measures to boost TFP growth should remain central to South Africa’s growth strategy to achieve higher, sustainable and inclusive growth.
References


