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What happened to the cycle? Reflection on a perennial negative output gap

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Abstract

The SARB's published output gap estimates show that South Africa has had a negative output gap for a decade. It is unusual for a cyclical concept to have the same sign for so long. This note shows that implausibly high potential growth estimates for 2010 and 2011 are responsible, probably because positive demand shocks were mistaken for evidence of robust potential growth. A simple HP filter, by contrast, generates lower potential growth estimates for those years, with no meaningful disagreement for the subsequent period. This yields an output gap with more plausibly cyclical behaviour. More broadly, we argue that a demand-centric perspective is not very useful in understanding South Africa's economic malaise. Instead, disappointing growth should probably be attributed to negative productivity shocks, especially intensifying corruption and misgovernment. This real business cycle-style approach also helps explain why the economy was unresponsive to stimulus policies.

Introduction[1]

The economic forecasts prepared for the Monetary Policy Committee (MPC) show that South Africa has had a negative output gap for a decade, and that this gap is likely to remain negative until 2020. A gap of this duration should invite skepticism. Output gaps are a cyclical concept, reflecting deviations of actual output from an underlying potential output. Can the cycle really deviate from the trend for over a decade? This note interrogates the existing output gap estimates to explain this un-theoretical behaviour. The main takeaways are as follows:

- A simple HP filter produces an output gap with a more intuitive, cyclical pattern, relative to the published estimates. This result is not simply due to the end-point problem (in which the HP filter reverts to the final data points). Instead, the disagreement between the two measures lies almost entirely in estimates of potential output for 2010 and 2011. Unusually for an output gap estimate, the main source of uncertainty is therefore not the current conjuncture but the quite distant past.
- South Africa's potential growth rate in 2010 and 2011 has probably been overstated. This is because growth was boosted by temporary factors – the rebound from the Global Financial Crisis (GFC) and the Soccer World Cup (SWC).
- The negative output gap narrative has had powerful policy consequences, motivating expansionary

[1] The authors gratefully acknowledge Konstantin Makrelov and Pieter Pienaar for providing detailed responses to earlier versions of this note, as well as seminar participants who offered useful comments on this research.

settings for interest rates as well as large fiscal deficits. An alternative explanation is that South Africa has been suffering a large negative productivity shock, along the lines of real business cycle (RBC) theory. This diagnosis helps explain the ineffectiveness of stimulus policies. Although short-term growth benefitted from larger quantities of spending, the lower quality of spending made it harder for the economy to achieve 'take-off' velocity.

- The scale of the productivity shock is visible in a rising Incremental Capital-Output Ratio (ICOR) from 2010 onwards, which shows the marginal unit of capital became steadily less productive over the post-crisis period. This is consistent with intensifying corruption and wasteful spending. Indeed, South Africa's ICOR is now amongst the worst in the emerging market space. We would like to have richer data mapping the effects of state capture on productivity, including through economy-wide investment efficiency and skills losses (both through skilled people leaving institutions and emigrating from South Africa entirely). Because this data is not available, however, we use ICORs as a helpful summary statistic that demonstrates the scale of the underlying productivity problem.
- Skepticism about very persistent negative output gaps does not imply the gap is currently positive. In fact, all the methods we consult indicate the gap is presently negative. Instead, our study indicates the gap is less negative, at the moment, than the published forecasts suggest. More broadly, it challenges the usefulness of viewing the economy's post-crisis performance through an output gap lens. Stimulus measures were probably incapable of preventing a major growth slump over this period, a point that is becoming clearer as more information emerges about the damage caused by state capture. Existing language about structural reforms and weak demand may therefore be inadequate for describing South Africa's growth problem.

Output gaps: theory and practice

An output gap is the difference between what an economy can produce and what it actually produces. For policymakers, output gaps have important implications. Where output has deviated from potential, standard economic theory holds that policymakers can improve welfare by adjusting fiscal and monetary policies so aggregate demand re-aligns with aggregate supply. Output gaps can also affect inflation, with excess demand pushing up prices and excess supply holding them down.[2] These relationships are reflected in the Taylor rules consulted by most central banks, including the South African Reserve Bank (SARB). Faulty estimates of output gaps will therefore tend to produce misleading growth, inflation and interest rate projections.

The theoretical connection between a negative output gap and its expected macroeconomic consequences is slack: this excess capacity is what exerts downward pressure on prices and permits demand stimulus to raise total output, without crowding out. In turn, the fact that negative output gaps work through slack is an important reason why they should be fairly short-term phenomena. Productive capacity does not remain

[2] For a helpful review article on the output gap concept, see F Citu and J Twaddle, 'The output gap and its role in monetary policy decision-making'. *Reserve Bank of New Zealand: Bulletin* 66(1), 2003, pp 5–14. https://www.rbnz.govt.nz/-/media/ReserveBank/Files/Publications/Bulletins/2003/2003mar66-1.pdf.

'on tap' indefinitely. Machinery depreciates. Labour force participation declines; skills erode.[3] Over long periods, supply cannot quickly mobilise to meet demand in the same way it can directly in the wake of a downturn. For this reason, old output gaps should lose potency and ultimately fade away. (At this point, growth weakness becomes a structural problem.)[4]

The SARB's methods for estimating output gaps have been revised repeatedly over the past decade.[5] The estimates themselves have also changed, sometimes by large amounts, with the revised gaps typically becoming less negative. (We are, however, aware of one paper which contends the output gap may be more negative than currently stated – although this paper assumes no decline in total factor productivity growth.)[6] These estimates have typically indicated a negative output gap throughout the post-crisis period. Furthermore, where estimates have pointed to the gap closing for short periods, those instances have been revised away in subsequent forecast rounds.

Empirically, decade-long negative gaps are rare. The best available source of output gap data is the IMF, which unfortunately only provides estimates for 27 advanced economies. For this admittedly limited sample, the average negative output gap over the past four decades (counting 2019 forecasts) has lasted 4.3 years. (Since 2008, the average is longer – in keeping with the effects of a major economic crisis – with an average duration of 5.1 years and a median duration of 5.0 years).[7] There are only five countries in the sample which have had output gaps lasting a decade or more, since 1980: Australia, Italy, Japan, the United Kingdom and Greece.

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3 For a useful discussion of hysteresis effects, see B Cœuré, 'Scars or scratches? Hysteresis in the euro area'. Speech by Benoît Cœuré, Member of the Executive Board of the ECB, at the International Center for Monetary and Banking Studies, Geneva, 19 May 2017. https://www.ecb.europa.eu/press/key/date/2017/html/ecb.sp170519.en.html (accessed 11 February 2019).

4 A similar principle applies to the monetary policy response to negative gaps. As per standard Neo-Keynesian theory, monetary policy can affect a real variable like output because prices are sticky in the short term. Monetary stimulus therefore affects quantities in the near-term. In the long-term, however, it only affects prices, which is to say that money is ultimately neutral. Monetary stimulus should therefore be effective in the short term, but over time prices will begin to adjust as the Phillips Curve steepens. This implies policy cannot stay below neutral for long periods, which is what negative output gaps lasting 10 years or more would require.

5 See N Ehlers, L Mboji and D Smal, 'The pace of potential output growth in the South African economy', *South African Reserve Bank Working Paper Series No. WP/13/01*, March 2013. https://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/5600/WP1301.pdf; V Anvari, N Ehlers and R Steinbach, 'A semi-structural approach to estimate South Africa's potential output', *South African Reserve Bank Working Paper Series No. WP14/08*, Pretoria: South African Reserve Bank, November 2014. https://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/6504/WP1408.pdf; B Botha, F Ruch and R Steinbach, 'Short-lived supply shocks to potential growth', *South African Reserve Bank Working Paper Series No. WP18/02*, Pretoria: South African Reserve Bank, June 2018. https://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/8605/WP1802a.pdf.

6 D Steenkamp, 'Productivity estimates for South Africa from CES production functions', *South African Reserve Bank Working Paper Series No. WP18/05*, Pretoria: South African Reserve Bank, November 2018. http://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/8937/WP%201805.pdf.

7 All the countries (in the sample) approached the GFC with a positive output gap; the average was +0.4% in 2004, +2.0% in 2006, and +3.7% in 2007. In 2008, with the GFC already well underway, the average gap moderated to +2.6%, and then collapsed to -2.7% in 2009.

Although this suggests decade-long negative output gaps are not entirely implausible, it demonstrates they are rare. If the current forecast is vindicated and the South African output gap closes only in early-2021, then South Africa will be in an even more exclusive club, of countries with 12-year negative output gaps.[8] There is only one country in the sample with this distinction (the UK, 1991–2002), although Italy and Greece will also qualify if their output gaps remain negative into 2020 and 2021, respectively.

The Real Business Cycle alternative

The output gap concept is premised on a demand-centric view of business cycles. But this is not the only account modern economists have devised for the ups and downs of modern economies. A major alternative, RBC theory, holds that cyclical variations can instead be explained by productivity shocks, which change the incentives of capital and labour.

The RBC school has been criticised for a failure to identify actual productivity shocks large enough to explain observed business cycle fluctuations[9] and for mischaracterising the lived experience of recessions. (For instance, RBC theorists have been lampooned for suggesting the Great Recession was really a Great Vacation.[10]) Both criticisms carry weight. However, this literature makes the fundamentally plausible point that large negative productivity shocks, if they happened, could produce economic consequences that look like recessions but would not respond as desired to Keynesian remedies. This analysis may be especially relevant for emerging markets: as one major paper in this literature contended, 'for emerging markets, the cycle is the trend.'[11]

Interrogating the SARB's published output gap estimate

The output gap used in the MPC's economic forecasts is estimated using a semi-structured multivariate filter. A simple HP filter[12] gives different results (see Figure 1). Usually, HP filters are problematic because the filter itself tends to align the trend with the actual data at the start and end of the sample.[13] For this reason, a disagreement between an HP filter and a more structured approach is typically just evidence of the unreliability of HP filters. However, in this case the disagreement has a different explanation, with the two measures generating markedly different potential growth estimates for 2009, 2010 and 2011; the

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8 This is based on annual data. It is possible some of these countries would have had positive gaps in some quarters, but quarterly estimates are not available.

9 See L Summers, 'Some sceptical observations on real business cycle theory', *Quarterly Review*, Federal Reserve Bank of Minneapolis, 1986. Summers cites the oil price shocks of the 1970s as too small to explain proximate recessions, and notes these are the most significant negative productivity shocks available to RBC theorists. https://www.minneapolisfed.org/research/qr/qr1043.pdf (accessed on 5 February 2019).

10 See for instance R Chernomas and I Hudson, *The Profit Doctrine: Economists of the Neoliberal Era*, 2017.

11 M Aguiar and G Gopinath, 'Emerging market business cycles: The cycle is the trend'. *Journal of Political Economy* 115(1), 2004. https://scholar.harvard.edu/files/gopinath/files/cycleisthetrend.pdf (accessed on 31 January 2019).

12 HP filter applied to quarterly data and converted to annual data. The HP filter end-point problem is (partially) overcome by providing out-of-sample forecasts which takes GDP growth back to median growth observed over 1994 to 2018.

13 J Cohen-Setton and Y Yatsynovich, 'HP filters and business cycles'. *Bruegel Blog*, 16 July 2012. http://bruegel.org/2012/07/blogs-review-hp-filters-and-business-cycles/.

cumulative difference between the two potential growth measures for this period is 0.9 percentage points.[14] The two estimates are very similar thereafter, with an average discrepancy of just 0.09 percentage points from 2012–2018 (see Figure 2).

Figure 1: Output gaps

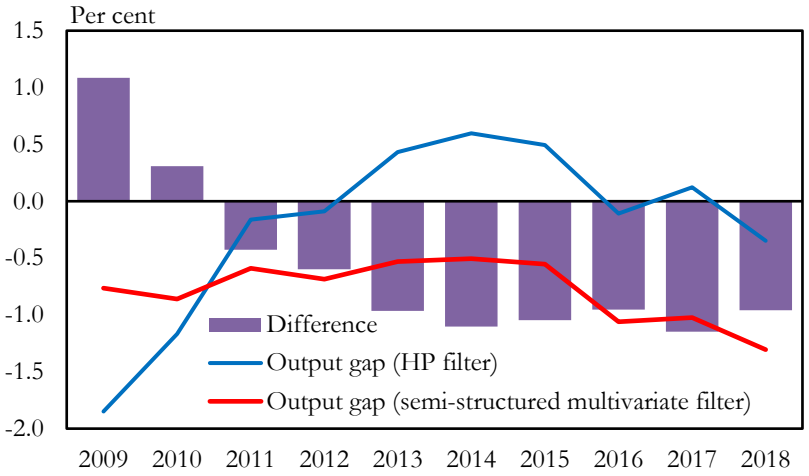
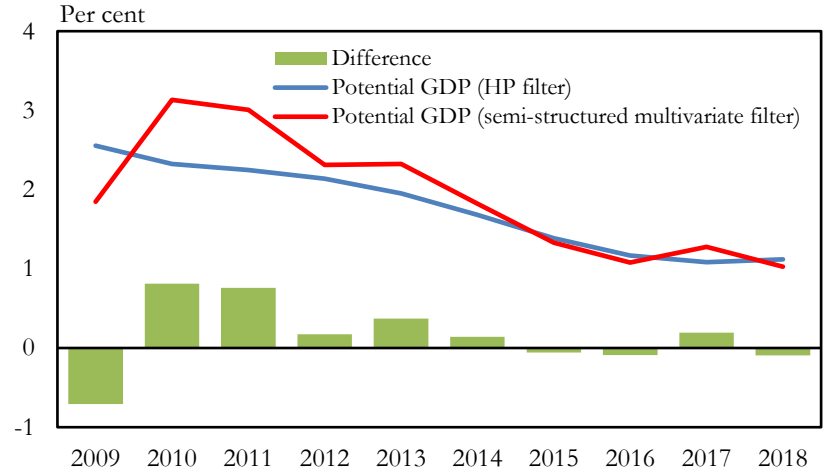


Figure 2: Potential GDP



Sources: Stats SA and SARB

This disagreement does not reflect the structural aspects of the MPC forecast model, either the financial cycle or manufacturing capacity utilisation. When this augmented model was first introduced, it generated only small differences in potential growth for 2010 and 2011, relative to previous estimates that excluded these factors (the large differences were generally pre-crisis).[15] Instead, we suspect the forecast model is

[14] The output gap based on the semi-structured multivariate filter includes adjustment for supply shocks. The method actually yields two measures of potential, a smooth trend rate and a more volatile supply-shock adjusted potential rate. The 0.9 pp figure reflects a comparison with the latter figure. However, the result is very similar (0.8pp) if we compare the HP-filter outcome with the trend rate. See B Botha, F Ruch and R Steinbach, 'Short-lived supply shocks to potential growth', *South African Reserve Bank Working Paper Series No. WP18/02*, Pretoria: South African Reserve Bank, June 2018. http://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/8605/WP1802a.pdf.

[15] See p 14 of the Anvari et al. paper, cited above.

generating an overall higher potential growth rate for 2010 and 2011, relative to the HP filter, because it is misinterpreting demand-side shocks as evidence of supply-side strength. We see at least three such demand shocks hitting the South African economy at this time.

- First, monetary and fiscal policies both turned very expansionary. The repo rate fell from 9.5% in 2009Q1 to 5.5% by 2010Q4, while the fiscal deficit averaged over 4% of GDP in both years.
- Second, global growth was relatively strong in both years, at 4.3% for 2010 and 3.2% for 2011, versus a longer-run average of 2.8%. Relatedly, and probably more crucially, South Africa's terms of trade improved by 6% in both years.
- Third, most idiosyncratically, the SWC took place in 2010. Estimates indicated that this added about 0.5 percentage points to GDP growth[16] in 2010. Although the SWC also required new infrastructure, which would have helped potential growth, the 2010 effect should have been mostly about temporary tourist consumption effects, with the investment portion spread over prior years (and incorporated in those years' estimates). In 2010 the SWC was mostly a demand shock.

All three of these factors lent a significant, positive impulse to growth that would not be repeated in subsequent years.

If we accept that potential growth was lower for this period, then the output gap turns positive in 2012 and stays positive until 2016. This is consistent with various other measures of demand we have for the economy. In particular, we note that manufacturing capacity was slightly above its longer-run average in 2012, that the current account deficit was much larger than its longer run average from 2012 through 2015, and that the unemployment rate was below its longer-term trend[17] over 2013–2015. These supplementary measures of slack give us confidence that the HP filter is not erroneously diagnosing low potential when the economy is actually in a weak demand-weak growth trap.[18]

A supply-side downturn

When we look at **supply-**side indicators, and employ a production function approach, we find that higher potential growth is not emanating from an acceleration in the growth rate of *capital stock* (Table 1). In fact, after growing by 3.1% in 2009, the capital stock growth rate fell to 2.5% and 2.6% in 2010 and 2011 respectively. Although there was a marginal acceleration in the working age population (WAP)[19] growth rate, this was too small to have a meaningful impact on potential growth. Total factor productivity (TFP) growth[20] declined from 0.7% in 2009 to 0.5% and 0.3% in 2010 and 2011 respectively. We are therefore

16 South Africa, National Treasury, '2010 Budget Review'.
17 HP filter trend of unemployment rate.
18 As discussed, for instance, by P Krugman, 'Filters and full employment'. *The New York Times*, 11 July 2012. https://krugman.blogs.nytimes.com/2012/07/11/filters-and-full-employment-not-wonkish-really/ (accessed on 21 January 2019).
19 Data from the World Bank. See Appendix 1 on why we prefer WAP.
20 TFP is calculated as a Solow-residual and then HP filter smoothed.

also unable to find evidence from the production side suggesting that potential growth rebounded strongly in 2010 and 2011. What we see instead is the start of a large decline in productivity.

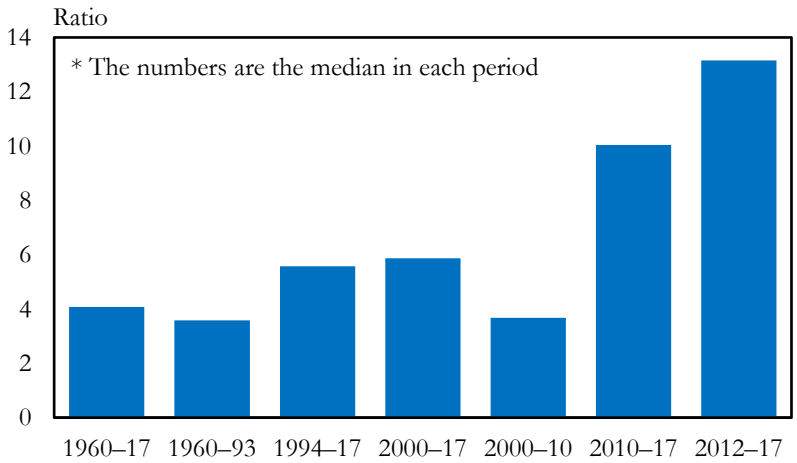
Table 1: Sources of potential growth

Year	Working age population (15-64)		Capital Stock		TFP		Potential GDP				Output gap		
							Production function		HP filter	Semi-structured multivariate filter	Production function	HP filter	Semi-structured multivariate filter
	Millions	% change	R millions	% change	Index	% change	R millions	% change	% change	% change			
2000	28.5		5 393 236		179.5		1 971 512		3.0	3.8	-0.9	0.4	0.3
2001	29.1	1.9	5 426 573	0.6	183.4	2.2	2 040 184	3.5	3.3	3.2	-1.6	-0.2	-0.2
2002	29.6	1.9	5 461 419	0.6	187.3	2.1	2 110 336	3.4	3.7	3.8	-1.4	-0.2	-0.3
2003	30.2	1.9	5 518 790	1.1	191.1	2.0	2 185 248	3.5	4.1	3.1	-1.9	-1.3	-0.4
2004	30.7	1.8	5 608 128	1.6	194.8	1.9	2 265 757	3.7	4.4	4.2	-1.1	-1.1	0.0
2005	31.2	1.7	5 725 136	2.1	198.3	1.8	2 349 729	3.7	4.6	4.2	0.4	-0.5	1.0
2006	31.7	1.4	5 880 169	2.7	201.4	1.6	2 435 474	3.6	4.4	4.4	2.3	0.7	2.2
2007	32.1	1.3	6 082 347	3.4	204.1	1.3	2 525 676	3.7	3.8	4.4	3.9	2.2	3.0
2008	32.5	1.3	6 332 912	4.1	206.1	1.0	2 619 900	3.7	3.1	3.6	3.4	2.2	2.6
2009	33.0	1.4	6 527 470	3.1	207.7	0.7	2 697 486	3.0	2.6	1.8	-1.1	-1.8	-0.8
2010	33.5	1.5	6 688 759	2.5	208.7	0.5	2 764 251	2.5	2.3	3.1	-0.6	-1.2	-0.9
2011	34.0	1.6	6 864 265	2.6	209.4	0.3	2 830 366	2.4	2.2	3.0	0.3	-0.2	-0.6
2012	34.6	1.6	7 039 971	2.6	209.6	0.1	2 893 067	2.2	2.1	2.3	0.3	-0.1	-0.7
2013	35.1	1.7	7 237 907	2.8	209.5	0.0	2 956 420	2.2	2.0	2.3	0.6	0.4	-0.5
2014	35.7	1.6	7 433 208	2.7	209.2	-0.2	3 014 972	2.0	1.7	1.8	0.4	0.6	-0.5
2015	36.3	1.6	7 637 373	2.7	208.6	-0.3	3 071 046	1.9	1.4	1.3	-0.1	0.5	-0.6
2016	36.8	1.4	7 805 695	2.2	207.9	-0.3	3 114 876	1.4	1.2	1.1	-1.0	-0.1	-1.1
2017	37.2	1.3	7 968 463	2.1	207.1	-0.4	3 155 840	1.3	1.1	1.3	-1.0	0.1	-1.0

Sources: Stats SA, World Bank, SARB and own calculations

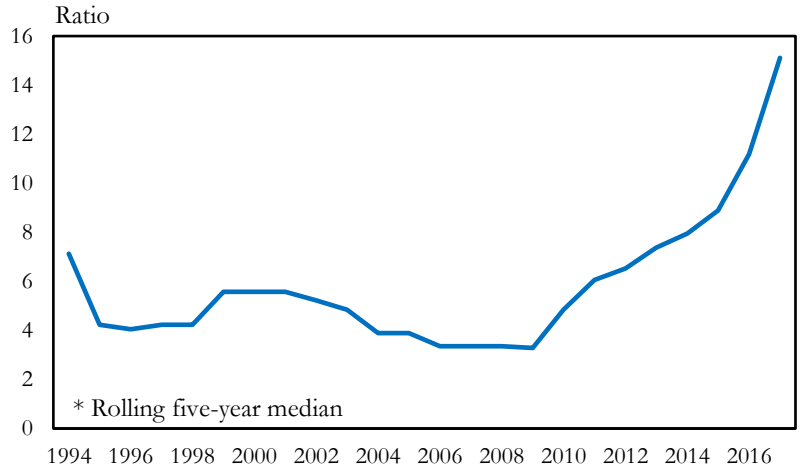
This trend is also visible in the efficiency of investment. Over South Africa's modern economic history, it has historically taken around 3½ to 6 units of investment to generate a unit of output. Over the past decade, however, the ICOR[21] has worsened steadily (Figures 3 and 4). Over the last six years, it has climbed to more than triple its long-term average, and it is now almost four times higher than in the 2000s.

Figure 3: Incremental capital-output ratios*



[21] ICORs are calculated from the formula $I_{t-1}/(Y_t - Y_{t-1})$, where I and Y are gross fixed capital formation and GDP. See World Bank, 'Global development horizons: Capital for the futures', Technical Annexure 1.1, p 1), 15 May 2013.

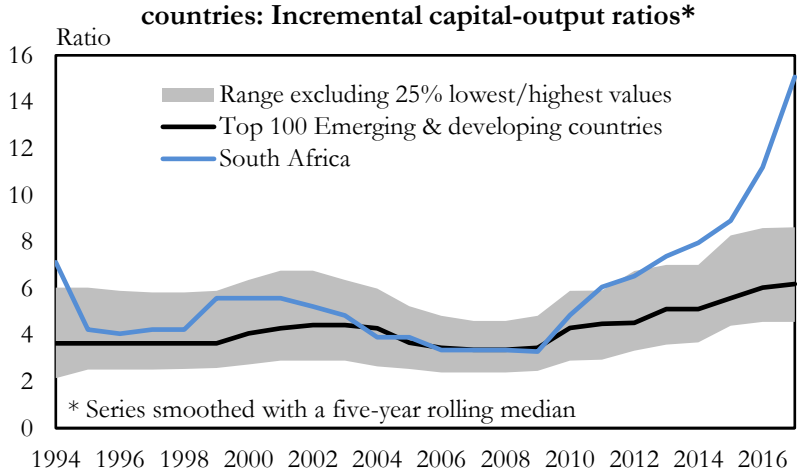
Figure 4: SA's incremental capital-output ratio



Sources: United Nations National Accounts Main Aggregates Database, IMF World Economic Outlook Database and own calculations.

Compared with other emerging markets (Figure 5), South Africa's ICOR has gone from being slightly worse than average (behind 58% of emerging markets, for the period 1994–2008) to being clearly inferior (behind 82% of peers). This shows the quality of capital spending has become much worse over the post-crisis period.

Figure 5: SA and other emerging and developing countries: Incremental capital-output ratios*



Sources: United Nations National Accounts Main Aggregates Database, IMF World Economic Outlook Database and own calculations.

During this period, South Africa's investment rate has actually remained above its longer-term average. The share of investment from the (broad) public sector has risen sharply, however, mainly because of state-owned enterprises. It is becoming clearer that these investment projects were increasingly coopted for patronage spending and self-enrichment, a misallocation of capital that has curtailed the efficiency of investment and therefore the country's longer-term growth potential. To cite two prominent examples,

Eskom's Medupi plant is likely to cost R145.0 billion[22] at completion, versus R69.1 billion[23] initially projected. Similarly, the Kusile plant is expected to cost R161.4 billion[24] instead of R80.6 billion.[25] Despite massive expenditure, neither of these plants is functioning properly – and South Africa is once again suffering electricity shortages, more than 10 years since 'load shedding' first entered the lexicon.

Figure 6: South Africa's investment ratio

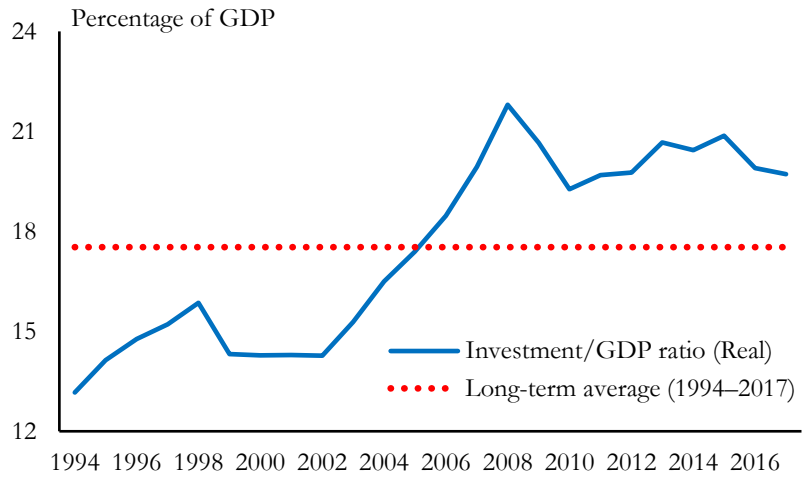
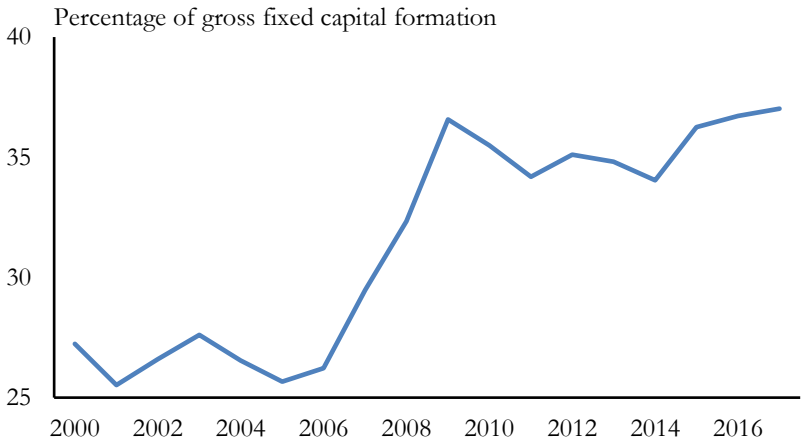


Figure 7: Share of general government and public corporations investment



Sources: Stats SA, SARB and own calculations

Had South Africa maintained its longer term (2000–2017) ICOR of 5.9, growth over the past six years (up to end-2017) would have been 3.4% annually, versus an actual average rate of 1.6%. On this measure, falling investment efficiency may have more than halved potential growth in recent years. Although we

22 L Tyabashe, 'Lessons learnt from megaprojects – Eskom new build project'. Speech by Loyiso Tyabashe, Eskom's Acting General Manager: New Nuclear Build, at the Nuclear Regulatory Information Conference, 16 May 2018. http://www.eskom.co.za/news/Documents/Proposed%20Speech%20-%20National%20Nuclear%20Regulator%20Conference%20%2816%20May%202018%29.pdf (accessed on 6 February 2019).

23 Eskom press release. *Eskom celebrates start of Medupi power station construction*. 14 August 2007.

24 South Africa, National Treasury. *Budget Review 2018*, 21 February, Pretoria: Government Printer, 2018.

25 Business Day. *Breaking up Eskom can benefit the economy and the taxpayers*. 18 August 2017.

acknowledge that potential growth is complex and investment efficiency is just one of the drivers, it has clearly played a major role in the potential growth slowdown of recent years.

Conclusion

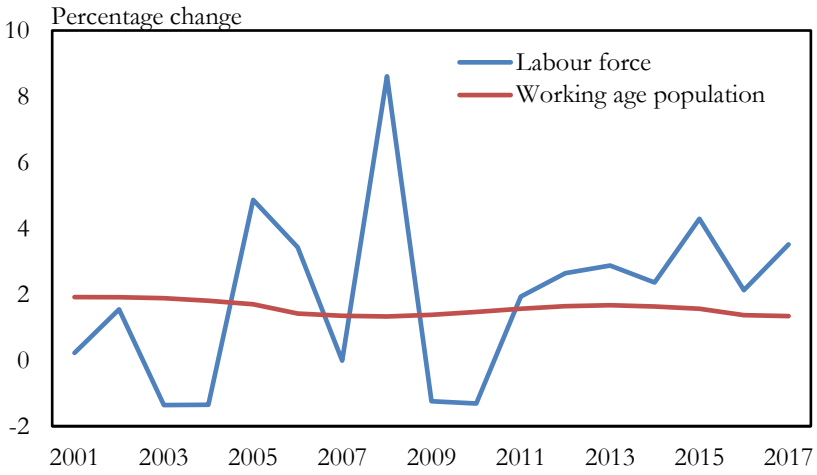
Output gaps are notoriously hard to estimate. Their uncertainty poses a dilemma for policymakers: understating potential growth can produce needless unemployment and loss of wealth, but overstating it can contribute to misguided stimulus policies and destabilising macroeconomic imbalances. The risks go both ways.

Our analysis suggests South Africa's potential growth rate has been exaggerated, for the narrow reason that reasonably strong growth rates in 2010 and 2011 were actually due to positive demand shocks. By overstating potential growth for this period, the economy's subsequent growth slowdown was mistaken, in part, for demand weakness. The legacy of this overestimation is still with us, explaining 1.0 percentage points of the alleged 1.3 percentage points negative output gap (as of calendar 2018). This note cautions against taking this number too literally, or giving it much weight in policy decisions. The real story of South Africa's post-crisis economic experience is a huge, negative productivity shock, which left us with nine wasted years. The output gap, whatever its sign, is a footnote to these events.

Appendix 1: Using WAP instead of Labour Force Participation in potential output calculations

South African labour data is notoriously unreliable, characterized by several structural breaks, rendering if difficult to use for analytical purposes. For example, the growth in the labour force should by nature be relatively smooth as population dynamics changes slowly. This is not the case for South African data (Figure A1).

Figure A1: Working age population and labour force



Similar to the World Bank (2014), we therefore opted to use Working Age Population (WAP) instead of Labour Force Participation for our potential GDP calculations. However, by using the working age population as the labour measure, we are in effect assuming that the labour force participation rate is one and the unemployment rate is zero. As a consequence we are over-estimating the amount of labour supply (proportionally to the product of the equilibrium levels of the participation and unemployment rates). Effectively this reduces the level of estimated TFP from the smoothed Solow residuals.

Note that if the natural rate of unemployment or equilibrium participation rates change over time then this will bias our measure of the contribution of TFP to potential output growth. However, as Burns *et al* argues, 'if the meaning we ascribe to TFP is broadened to incorporate social productivity, this bias may not be too serious as it effectively ascribes to TFP, changes in the efficiency with which labour is allocated. Thus a policy measure that improves labour force allocation by reducing the natural rate of unemployment would in this model show up as increased TFP, while in a model with an explicit natural rate of unemployment it would enter there'.[26]

It is important to note that this treatment has no implications for the estimates of potential GDP – it simply allocates the contribution to potential output of improved labour market conditions towards TFP instead of having it more directly measured in the labour input.

[26] See A Burns, T Janse van Rensburg, K Dybczak and T Bui, 'Estimating potential output in developing countries, *Journal of Policy Modeling* 36, 2014, p 704.