Getting to the core of it – July 2017

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Abstract

There has been an unexpectedly large slowdown in core inflation from 5.9% in December 2016 to 4.8% in May 2017. This slowdown is mainly driven by core goods inflation, which has contributed more than twice as much to the decline than services. The cumulative exchange rate pass through (ERPT) to core price levels is estimated at 28%, while the peak inflation rate pass through is 10%. ERPT is strong and fast to core goods, but is much weaker and delayed for services. Unit labour costs take much longer to feed through to core inflation with the largest impact coming through services inflation. Had the rand and output gap remained at 2015q4 levels, core inflation would have respectively been 0.38% lower and 0.07% higher, compared to actual outcomes.

Introduction[1]

Core inflation slowed to 4.8% in April and May this year, from a peak of 5.9% in December 2016. Although a fall in core was widely anticipated, the extent of the decline has been a surprise. For instance, the Bloomberg consensus for March was 5.3%, whereas actual core came in at 4.9%. In January, the SARB expected core inflation of 5.7% for the first quarter, while the actual reading was 5.2%.

In this note we analyse possible reasons for the sharp decline in the core inflation rate. We begin with the recent data, which indicates that most (more than two-thirds) of the decline is attributable to core goods inflation; services inflation has not slowed as markedly. We then proceed to build an econometric model to explain the different drivers of the goods and services components of core inflation.

We find that the slowdown in core inflation primarily relates to high exchange rate pass through – where the strengthening rand has been instrumental in driving core goods inflation down. As these goods are tradeable they are highly sensitive to international competition, and therefore respond quickly to exchange rate developments. Services, on the other hand, are more responsive to changes in unit labour costs (ULC) and the output gap – but the transmission is slower.

We also considered counterfactual scenarios, one with a smaller output gap and the other based on a weaker rand. We found that without the 2016 output gap deterioration, core inflation would probably have been about 0.07% higher than the recorded figure. Had the exchange rate remained at the 2015q4 levels (R14.18/$), core inflation would have been 0.38% lower on average during 2016. This corroborates the importance of the exchange rate as the primary driver of recent core disinflation.

Investigating the slowdown in core inflation

There has been a marked slowdown in core inflation in 2017. After reaching a peak of 5.9% in December 2016, core inflation slowed to 4.8% in May 2017 (Figure 1). The last time core inflation fell as quickly and sharply as over the past five months was in 2009/10, when the appreciation in the exchange rate was similar to the appreciation seen towards the end of 2016 (Figure 2).

[1] The authors are grateful for valuable comments and editorial contributions from David Fowkes and data inputs from Reneilwe Magoane.

Figure 1: Core inflation

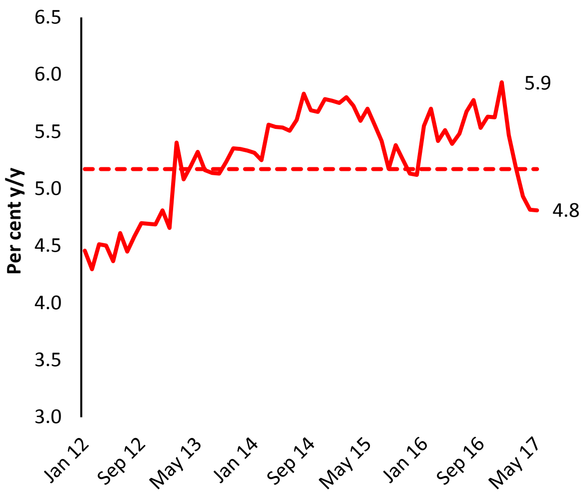
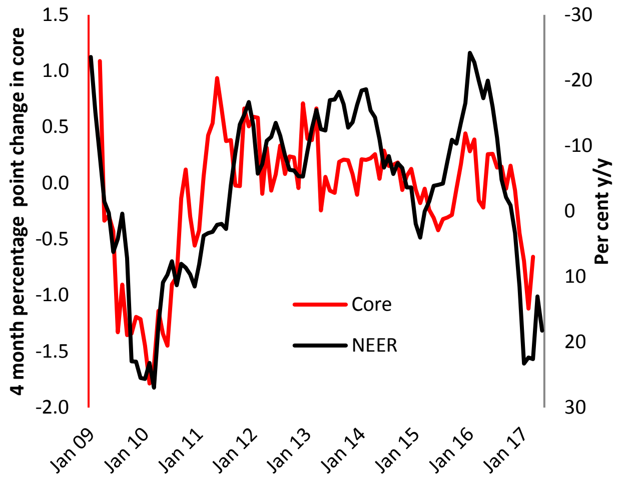


Figure 2: Core inflation and the NEER



Core inflation consists of two main components, core goods and services, which account for 31% and 69% of the core basket respectively. Services inflation has trended slightly lower over the past year, and is now at 5.4%, versus a long-term average fractionally above 6.0%. By contrast, core goods inflation has slowed sharply from 5.9% in December 2016 to 3.4% in May 2017 (Figure 3). This slowdown has in turn been driven mostly by an abrupt downturn in durable and semi-durable goods inflation (Figure 4).

Figure 3: Services and core goods inflation

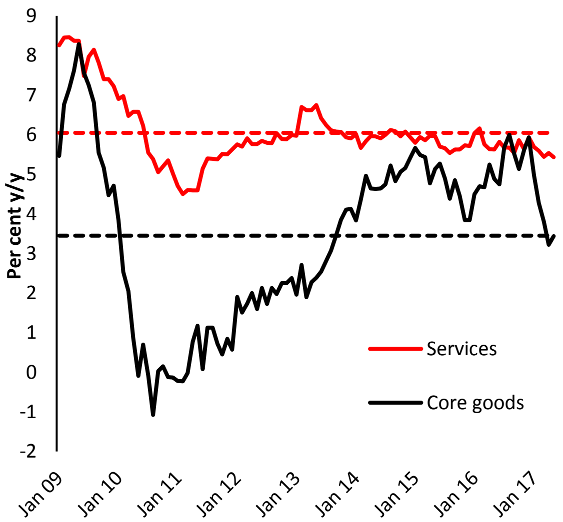
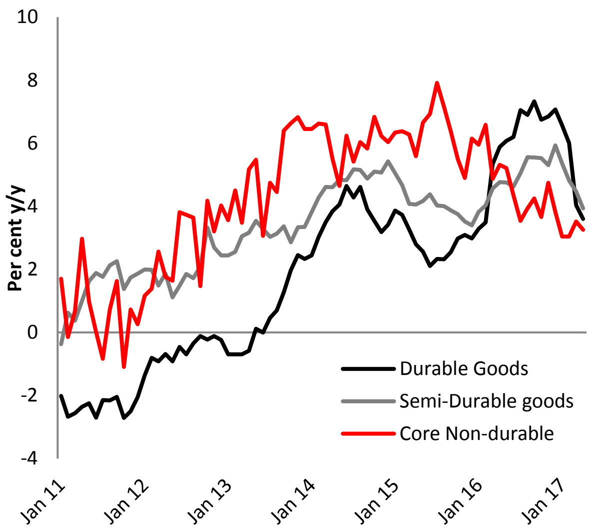


Figure 4: Movements in the components of core goods inflation



Although services inflation has made the largest contribution to core inflation (Figure 5), since the beginning of 2017, core goods inflation has been the main source of change (Figure 6). In fact, the year-to-date decline in core goods inflation has contributed more than twice as much as services did to the overall slowdown in core. This divergence suggests the goods and services components are responding to different drivers. In the next section we econometrically estimate these drivers, and the extent to which they explain the movement in the two components of core inflation.

Figure 5: Percentage point contribution to core inflation

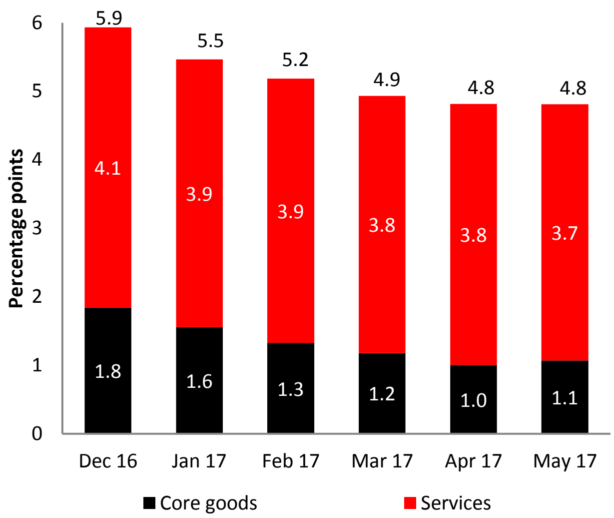
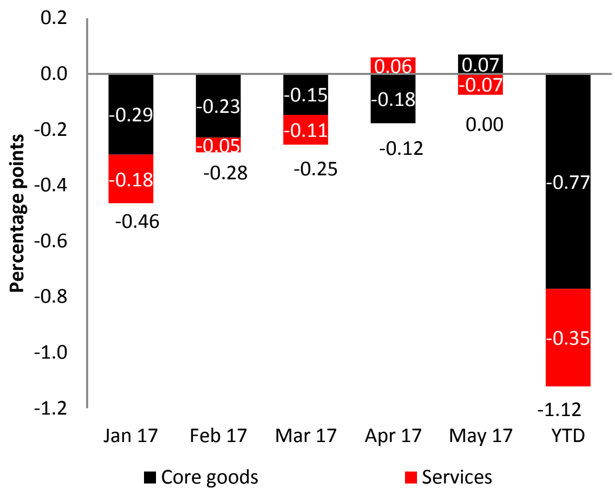


Figure 6: Percentage point contribution to the y/y change in core inflation from the previous month



Modelling core inflation

We econometrically estimate separate equations for the two main components of core inflation, namely services and core goods (See Appendix A, Diagram 1 for a schematic overview of the model and its drivers).

With regard to *services*, we find that over the long run the primary drivers are PPI for final manufactured goods (73.9%), ULCs (26.1%) and the output gap[2], while over the short(er) term changes in electricity prices also play a role. (See Appendices B and C for the mnemonics and equations respectively). From the estimated equation, it follows that when ULCs change by 1%, it will have a direct impact of 0.261% on services; further indirect impacts of 0.41% will come via changes in PPI, bringing the total core services impact to 0.67%. In contrast, a 1% depreciation in the rand will only increase services prices by 0.23%. Put differently, over the long term, a 1% change in ULCs will have almost three times the impact on services of a 1% depreciation of the rand.

With regard to *core goods*, we find that the primary equilibrium drivers are global PPI (36.7%) (in rand terms), PPI for final manufactured goods (8.5%) and openness[3] (54.8%). Over the short(er) term, changes in petrol prices also affect the prices of core goods. In contrast to services, a 1% change in ULCs has an (almost) negligible indirect impact of just 0.05% on core goods. However, the combined direct and indirect impacts of a 1% rand depreciation is 0.39%, which reflects the tradability of core goods. This cumulative 39% exchange rate pass through (ERPT) coefficient for core goods is substantially larger than the 23% ERPT to services – with overall ERPT for core inflation estimated at 28%.[4, 5]

PPI for final manufactured goods is driven by import prices (44.7%) and ULCs (55.3%), while changes in the output gap also play an important role in explaining disequilibria. Over the short(er) term, petrol prices also have some role in price adjustment(s). *Import prices* reflect changes in global PPI (69.0%) and oil prices (31.0%) – both converted to rand. The output gap also has an impact.

[2] Output gap data is from the Macro Models Unit (as per the May-2017 MPC forecasts).
[3] Openness is defined as: (exports + imports)/GDP; all variables in volumes.
[4] This ERPT is slightly lower than the estimated ERPT of 31.4% for Core Inflation estimated over the 2002-2014 period. However, in the August 2015 version, Core inflation was not split into its two subcomponents. See: Janse van Rensburg and Visser (2015), *"Right for the wrong reasons? How falling unit labour cost inflation masked persistent exchange rate pass-through"*, SARB Economic Note EN/15/20.
[5] The 28% ERPT refers to the *cumulative change in prices*. In the next section, we also report the *peak ERPT inflation rate impacts*.

In the next section we will run impulse responses, where we observe model predictions for core inflation when the primary drivers change.

Impulse responses

Figure 7 depicts the impact of a 10% one-off permanent rand depreciation on the inflation rates for goods, services and core. As discussed previously, core goods price levels will in the long run rise by 3.9% – which is the long run cumulative ERPT of 39% (i.e. 3.9%/10%). However, according to the model, peak pass-through to the inflation rate will be 1.8% for core goods, which occurs some four quarters after the shock. The equivalent numbers for services and total core are 0.8% and 1.0% respectively, and are reached some five to six quarters after the shock. In the case of core goods, 75% of the adjustment to equilibrium levels is completed in around nine quarters, whereas in the case of services only about 60% of the adjustment is completed by that point. To summarise, ERPT is strong and fast to core goods, but much weaker and delayed for services.

Figure 7: Impact of a 10% depreciation in the rand on core inflation

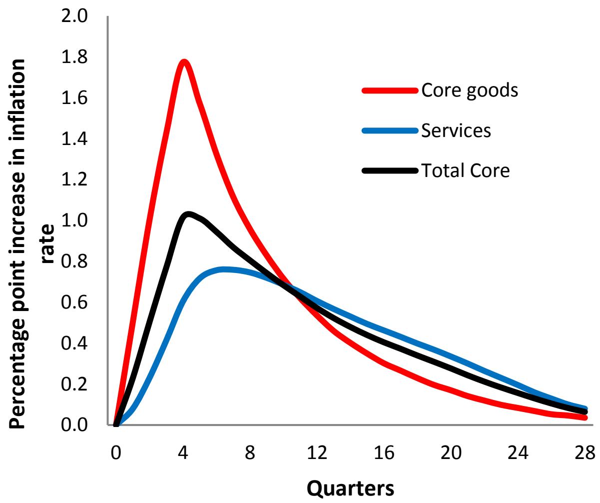
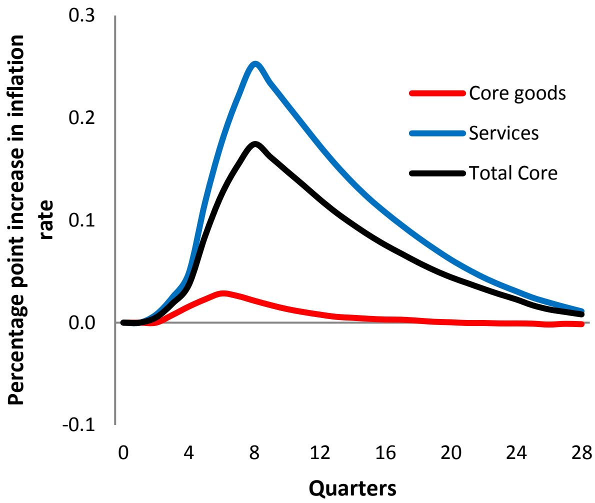


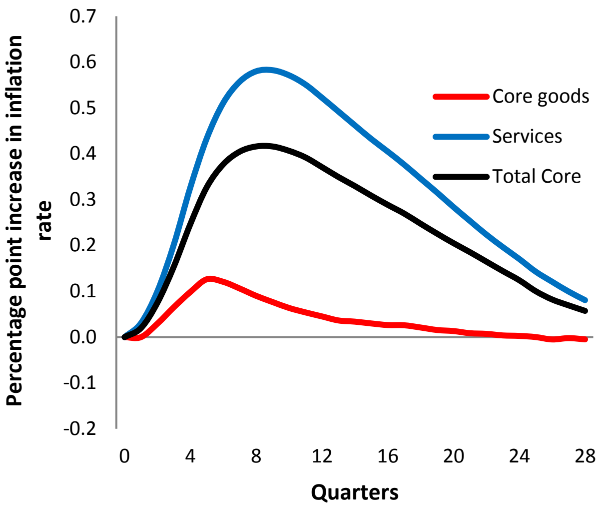
Figure 8: Impact of a 1% increase in unit labour costs on core inflation



ULC shocks transmit more slowly than exchange rate shocks, with the peak core inflation rate impact occurring some seven to ten quarters after the initial shock (Figure 8). The bulk of the shock works through services with just a minor impact on core goods. Overall, goods, services and core prices levels will rise by a cumulative 0.05%, 0.67% and 0.48% respectively over the long run when the level of ULCs permanently increases by 1%. In terms of the peak inflation rate impact, the services inflation rate would rise by 0.3%, and the total core rate by 0.2%, some eight quarters after the initial shock.

The estimated model suggests that demand pressures, as captured by the output gap, will be most visible in services inflation, with a peak inflation rate impact of about 0.6% after nine quarters following a permanent once-off output gap change of 1 percentage point (Figure 9). The peak inflation rate impact on core goods is quicker (after around five quarters), but the impact is very small at 0.13%. The maximum total core inflation rate impact is therefore around 0.42 percentage points – occurring some eight to nine quarters after the shock.

Figure 9: Impact of a 1 percentage point closing of the output gap on core inflation



Output gap and rand contributions to core inflation in 2016

In this section we use our estimated model to calculate what inflation outcomes during 2016 would have been, had the output gap and the exchange rate remained unchanged at 2015q4 levels.

With the rand stable at R14.18/US$ (the average in 2015q4)[6], core inflation would have been on average 0.38% lower in 2016 than the actual outcome (Figure 10). Core goods and services inflation would have been lower than actual outcomes by 0.71% and 0.23%, respectively. These model outcomes are in line with our earlier argument that the bulk of the decline in core inflation was due to falling core goods inflation, in turn driven by exchange rate developments.

When we compare the core inflation outcomes under a scenario where the output gap remained at 2015q4 levels, we find that the deteriorating output gap (vis-à-vis the 2015q4 output gap) has played a very small role (Figure 11). In fact, according to the estimated model, inflation outcomes would have been only 0.07% worse. As per the earlier impulse response discussion, the maximum impact of an output gap shock takes some two years to work through to inflation – and this shock was run only over four quarters.

[6] The R/$ exchange rate averaged R15.86/$; R15.01/$; R14.07/$ and R13.90/$ respectively over the four quarters of 2016. It follows that the rand averaged R14.71/$ in calendar 2016, while in this scenario it averaged R14.18/$.

Figure 10: Impact on core inflation if R/US$ was constant at 2015q4 levels

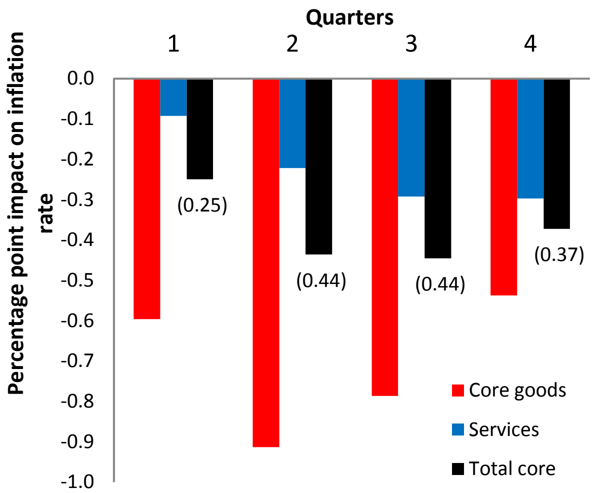
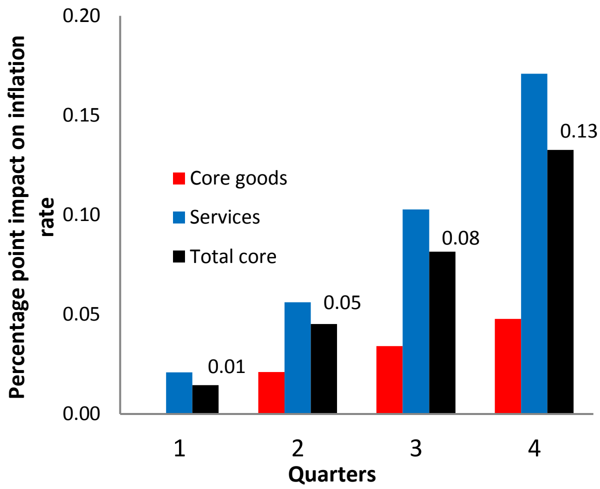


Figure 11: Impact on core inflation if output gap was constant at 2015q4 levels



Implications for monetary policy

The recent decline in core inflation constitutes an opportunity, but not a victory. Had this disinflation been the result of a wider output gap, or softening ULC inflation, then it would have indicated a sustained moderation in core inflation. This may still be coming: as we have shown, these 'weak demand' factors have a slow but meaningful effect on prices. However, the recent disinflation is mostly due to the exchange rate. Unfortunately, it is unlikely that the exchange rate will appreciate further in the current environment, and it could easily begin depreciating again. This suggests inflation is not yet stabilising at permanently lower levels, which limits monetary policy space.

Concluding remarks

Although core goods only has a 31% weighting in core inflation, it contributed more than twice as much as services did to the decline in core inflation since the beginning of 2017. Our econometrically estimated model suggests that the appreciating exchange rate has underpinned the sharp decline in core goods, and by implication core inflation. In contrast, weak domestic demand, as proxied by the output gap, has played a relatively minor role in pushing inflation lower.

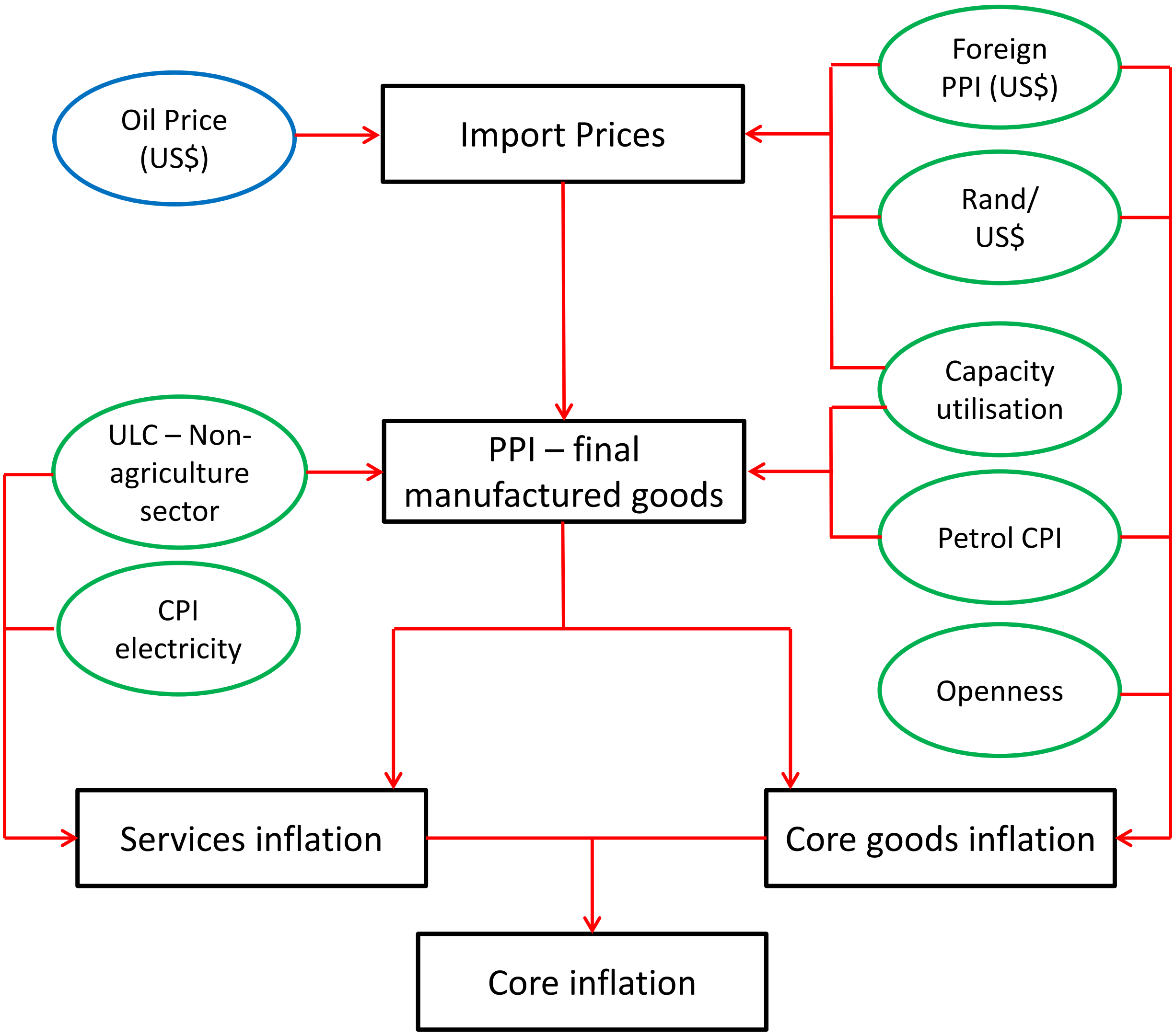
We also found that whereas core goods are largely driven by international prices (in rand terms), services are more responsive to changes in ULCs, albeit with a slow transmission mechanism. In the absence of a quick exchange rate adjustment when monetary policy settings change, the impact on core inflation is likely to be small and slow.

APPENDIX A

Diagrammatic overview of Core inflation model

The small econometric model used to measure the drivers of Core inflation has the following set of endogenous equations (see Diagram 1 and Appendix B for mnemonics and model outline and Appendix C for the equations):

Diagram 1: Model outline



APPENDIX B

Mnemonics

CPI	=	CPI - headline
CPI_CGOOD	=	CPI - core goods
CPI_CSERV	=	CPI - services
CPI_CTOT	=	CPI - core total
CPI_ELEC	=	CPI - electricity
CPI_FNAB	=	CPI - food and non-alcoholic beverages
CPI_PET	=	CPI - petrol
DUM08	=	Dummy = 1 during 2008, 0 otherwise
DUM08Q1	=	Dummy = 1 in 2008q1, 0 otherwise
DUMQ4	=	Dummy = 1 in q4, 0 otherwise
PM	=	Import deflator
POIL	=	Oil price (US$)
PPI_FM	=	PPI for final manufactured goods
REXD	=	R/US$ exchange rate
RPOIL	=	Oil price (rand)
RWLTPPI	=	Global PPI (rand)
ULC_NA	=	Unit labour costs
WLTPPI	=	Global PPI (US$)
YCU	=	Output gap (data from MMU)
YOPEN1	=	Openness defined as total export and import volumes as a ratio of GDP

APPENDIX C

Equation 1: Import prices

Dependent Variable: DLOG(PM)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 26/06/17 Time: 10:45
Sample: 2005Q1 2016Q4
Included observations: 48
Convergence achieved after 9 iterations
Coefficient covariance computed using outer product of gradients
DLOG(PM) = C(1)*(LOG(PM(-1)) -(C(2)*LOG(RWLTPPI(-1)) +(1-C(2))
*LOG(RPOIL(-1)) +C(3)*YCU(-1)/100)) +C(4) +C(5)*DLOG(RWLTPPI)
+C(6)*DLOG(RPOIL) +C(7)*DLOG(RPOIL(-1)) +C(8)*DUM08(-4)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.087975	0.025708	-3.422090	0.0014
C(2)	0.690030	0.081394	8.477677	0.0000
C(3)	2.729406	1.422169	1.919185	0.0621
C(4)	-0.177379	0.051970	-3.413100	0.0015
C(5)	0.357162	0.035300	10.11778	0.0000
C(6)	0.130491	0.014846	8.789579	0.0000
C(7)	0.131373	0.017647	7.444656	0.0000
C(8)	0.057067	0.016581	3.441680	0.0014

R-squared	0.877361	Mean dependent var	0.014534
Adjusted R-squared	0.855900	S.D. dependent var	0.034461
S.E. of regression	0.013082	Akaike info criterion	-5.684216
Sum squared resid	0.006845	Schwarz criterion	-5.372349
Log likelihood	144.4212	Hannan-Quinn criter.	-5.566361
F-statistic	40.88018	Durbin-Watson stat	1.763874
Prob(F-statistic)	0.000000		

Equation 2: PPI – PPI for final manufactured goods

Dependent Variable: DLOG(PPI_FM)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 26/06/17 Time: 10:45
Sample: 2005Q1 2016Q4
Included observations: 48
Convergence achieved after 8 iterations
Coefficient covariance computed using outer product of gradients
DLOG(PPI_FM) = C(1)*(LOG(PPI_FM(-1)) -(C(2)*LOG(PM) +(1-C(2))
*LOG(ULC_NA(-1)) +C(3)*YCU/100)) +C(4) +C(5)*DLOG(PPI_FM(-1))
+C(6)*DLOG(PM) +C(7)*DLOG(CPI_PET)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.142213	0.050019	-2.843162	0.0069
C(2)	0.447297	0.148768	3.006671	0.0045
C(3)	2.134437	0.747104	2.856946	0.0067
C(4)	-0.045031	0.018029	-2.497631	0.0166
C(5)	0.268090	0.104264	2.571252	0.0139
C(6)	0.107822	0.053286	2.023453	0.0496
C(7)	0.042549	0.015609	2.725934	0.0094

R-squared	0.746003	Mean dependent var	0.014947
Adjusted R-squared	0.708832	S.D. dependent var	0.014946
S.E. of regression	0.008065	Akaike info criterion	-6.668565
Sum squared resid	0.002667	Schwarz criterion	-6.395682
Log likelihood	167.0456	Hannan-Quinn criter.	-6.565442
F-statistic	20.06984	Durbin-Watson stat	1.968692
Prob(F-statistic)	0.000000		

Equation 3: CPI-Services

Dependent Variable: DLOG(CPI_CSERV)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 26/06/17 Time: 10:45
Sample: 2005Q1 2016Q4
Included observations: 48
Convergence achieved after 9 iterations
Coefficient covariance computed using outer product of gradients
DLOG(CPI_CSERV) = C(1)*(LOG(CPI_CSERV(-1)) -(C(2)*LOG(PPI_FM(-1)) +(1-C(2))*LOG(ULC_NA(-4)))) +C(3) +C(4)*DLOG(PPI_FM) +C(5) *DLOG(CPI_ELEC(-2)) +C(6)*DUMQ4

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.151867	0.034069	-4.457621	0.0001
C(2)	0.739236	0.069748	10.59865	0.0000
C(3)	0.002406	0.004704	0.511444	0.6117
C(4)	0.094835	0.043995	2.155593	0.0369
C(5)	0.022034	0.012341	1.785405	0.0814
C(6)	-0.006614	0.001545	-4.280436	0.0001

R-squared	0.579357	Mean dependent var	0.014297
Adjusted R-squared	0.529281	S.D. dependent var	0.006427
S.E. of regression	0.004409	Akaike info criterion	-7.893644
Sum squared resid	0.000817	Schwarz criterion	-7.659744
Log likelihood	195.4475	Hannan-Quinn criter.	-7.805253
F-statistic	11.56944	Durbin-Watson stat	1.490798
Prob(F-statistic)	0.000000		

Equation 4: CPI-Core goods

Dependent Variable: DLOG(CPI_CGOOD)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 26/06/17 Time: 10:45
Sample: 2005Q1 2016Q4
Included observations: 48
Convergence achieved after 22 iterations
Coefficient covariance computed using outer product of gradients
DLOG(CPI_CGOOD) =C(1)*(LOG(CPI_CGOOD(-1)) -(C(2)*LOG(RWLTPPI) +C(3)*LOG(1/YOPEN1)+(1-(C(2)+C(3)))*LOG(PPI_FM(-1)))) +C(4) +C(5)*DLOG(CPI_PET) +C(6)*DLOG(PPI_FM(-1))+C(7)*DUM08Q1

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.138783	0.020307	-6.834073	0.0000
C(2)	0.367220	0.058147	6.315371	0.0000
C(3)	0.548132	0.032095	17.07851	0.0000
C(4)	0.179729	0.041458	4.335221	0.0001
C(5)	0.018025	0.007277	2.476814	0.0175
C(6)	0.083073	0.043648	1.903256	0.0640
C(7)	0.014358	0.004461	3.218933	0.0025

R-squared	0.743464	Mean dependent var	0.006769
Adjusted R-squared	0.705923	S.D. dependent var	0.007932
S.E. of regression	0.004302	Akaike info criterion	-7.925599
Sum squared resid	0.000759	Schwarz criterion	-7.652715
Log likelihood	197.2144	Hannan-Quinn criter.	-7.822476
F-statistic	19.80364	Durbin-Watson stat	1.933672
Prob(F-statistic)	0.000000		