

Inflation Just Ain't What It Used to Be: Assessing Phillips Curves for Canada

Brian DePratto, Senior Economist | 416-944-5069

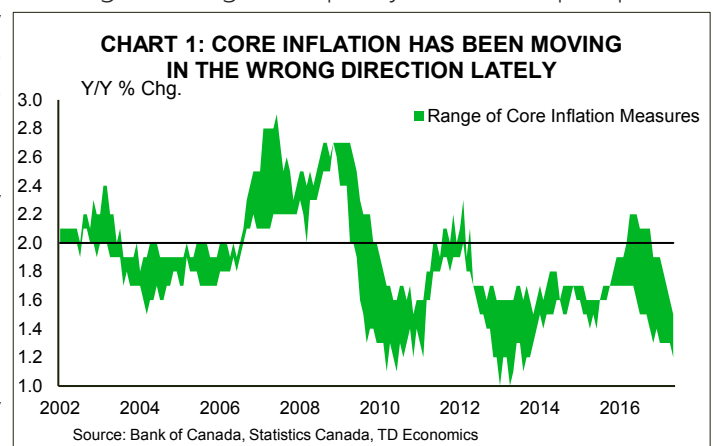
July 28, 2017

Highlights

- Consumer price and wage growth have slowed markedly in recent months despite robust economic growth. The path forward will be crucial for the path of monetary policy in Canada.
- It goes without saying that future inflation is uncertain. Policy makers must rely on models to inform how inflation is likely to evolve. The Phillips curve, or the relationship between economic slack and price pressures, is thus crucial to setting monetary policy.
- Evidence suggests that, as in other advanced economies, the relationship between economic slack and inflation has weakened markedly since the Global financial crisis. This is true both for core inflation measures (excluding the Bank of Canada's CPI-Common measure), as well as for wages.
- Precisely why this has occurred remains unclear. Weak imported goods price growth, mismeasurement, demographic trends, and other likely culprits are not able to explain the shift in the relationship.
- Regardless of the reason, a flatter Phillips curve has clear implications for the Bank of Canada, increasing the likelihood of a persistent undershooting of the inflation target, or a possible de-anchoring of inflation expectations.
- In the very near-term, the Bank of Canada has made it clear that it intends to further tighten monetary policy. For 2018 and beyond however, the flattening of Canadian Phillips curves imply only a very gradual pace of interest rate increases.

The goal of many central banks, including the Bank of Canada, is to maintain price growth around a target over the medium term. Monetary policy acts with a lag (that is to say, raising or lowering the overnight rate today will impact the economy several quarters later), creating challenges for policymakers. To paraphrase Bank of Canada Governor Stephen Poloz, relying only on current inflation to guide monetary policy is like driving using only the rear-view mirror. To help provide a sense of what might be coming around the bend, economists rely on "Phillips curves" – the estimated relationship between the current state of the economy and future price growth.¹

Globally, there is evidence to suggest that the relationships captured by Phillips curves have become weaker, or 'flattened' in economists' jargon. This can be seen in the United States, where despite generally healthy economic growth and an unemployment rate that is



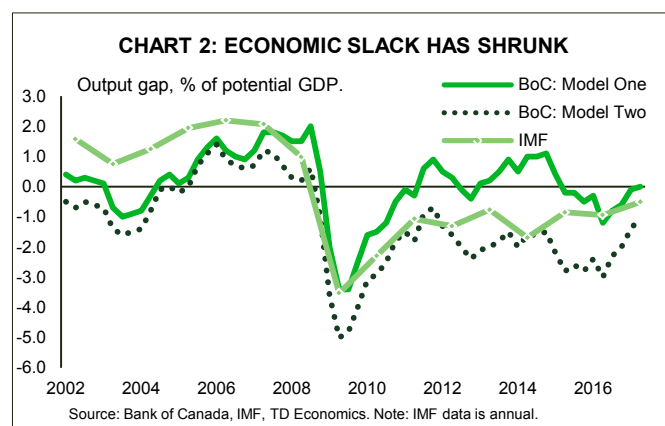
approaching historic lows, inflationary pressures remain elusive. A similar theme has emerged of late in Canada. Despite a robust string of growth that has propelled Canada to the top of the developed country growth tables, inflation has been trending lower (Chart 1).

This report finds some evidence that the relationship between economic slack and inflation has also weakened in Canada. We estimate several different Phillips curve specifications and find a flattened curve, echoing the trend across advanced economies. The precise reasons why this has been the case remains an open question, but the flattening may be related to a secular downtrend in imported goods prices, mismeasurement of economic slack in the post-crisis period, demographic trends, increased automation, or other reasons. Regardless of cause, the shifting relationship between growth and inflation has clear implications for the conduct of monetary policy, suggesting a cautious approach to normalizing interest rates will likely be necessary to achieve the Bank of Canada's inflation mandate and ensure that inflation expectations remain anchored at the 2% target.

Evidence mixed on the growth-inflation nexus

The Bank of Canada has long had difficulty fully achieving its 2% inflation mandate. Since the mandate became fully binding in 1996, headline inflation has averaged roughly 1.8% per year – a bit short of target, but comfortably within the Bank's 1% to 3% control band.² However, if we consider only the pre-crisis period of 1996 to 2008, any evaluation of the Bank of Canada has to result in a pass with flying colours: headline inflation averaged just slightly north of the 2% target over this period. However, this changed with the financial crisis. From January 2009 to date, inflation has averaged 1.5% - well short of the 2% target.³

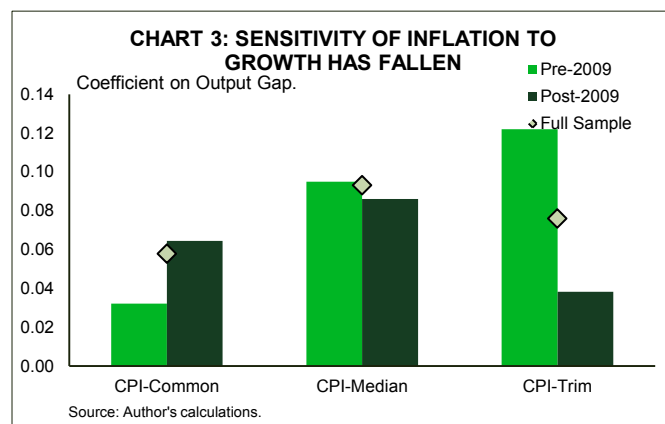
It is certainly true that economic growth has been weaker in the post-crisis period (2.2% on average, compared with 2.9% between 1996 and 2008), but this comes alongside slower potential GDP growth (the theoretical pace of economic growth assuming



full-employment of resources). Because inflationary pressures are related to how much and how long an economy has been above or below its potential growth rates – i.e. how much excess capacity it exhibits – slower economic growth on its face does not necessarily need to translate into softer inflation.

In fact, even though actual economic growth has declined in recent years, estimates of potential growth have been cut even more dramatically by economists, leading to a steady narrowing in the measured output gap, or the difference between actual output and its potential – a proxy for economic slack (Chart 2).

The results of estimating simple Phillips curves confirm that the sensitivity of inflation to economic slack has generally declined in the post crisis period (Chart 3).⁴ For CPI-Common, the relationship has strengthened somewhat, perhaps reinforcing why the Bank of Canada ranked it highest when the new inflation measures were introduced. For CPI-Median, the relationship has weakened somewhat, but the difference is not statistically significant. A



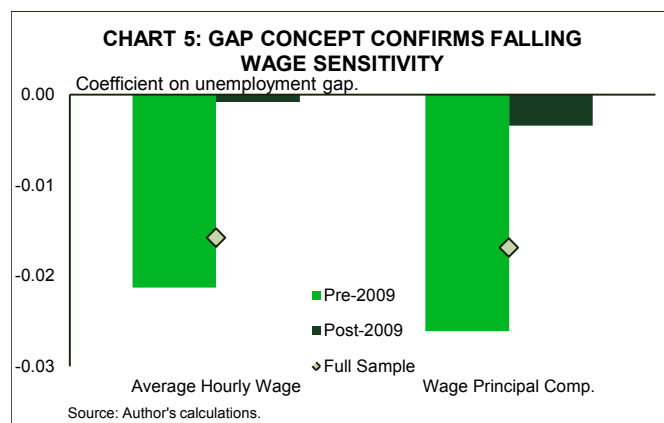
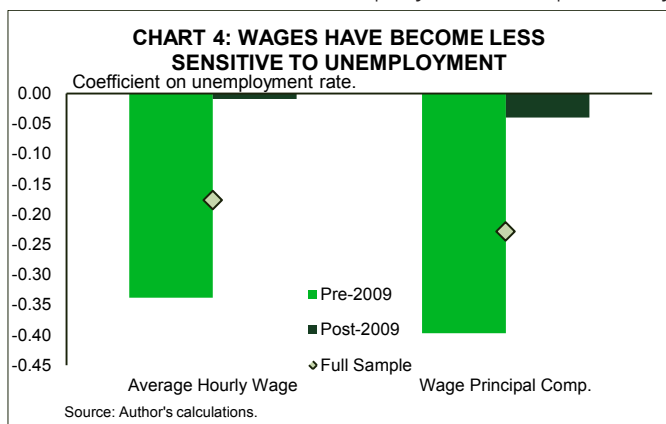
dramatic flattening of the Phillips curve was found for CPI-Trim, where the post crisis relationship is not meaningfully different from zero.

Jobs have been coming, but wage growth hasn't

Wage growth may not be part of the Bank of Canada's mandate, but the evolution of wages still matters for the conduct of monetary policy as they can send early signals regarding future price pressures, as employers eventually pass along rising labour costs in the form of higher prices.

Indeed, evidence of a recent flattening in the wage Phillips curve is even more compelling than for the output gap (Chart 4).⁵ The relationship between average hourly earnings and the unemployment rate has become dramatically weaker in the post-crisis period, whether measured by the 'headline' measure of average hourly wages or a broader measure of wages (similar to the Bank of Canada's CPI-Common) that captures the common signals sent across various wage measures.⁶ To put the results in context, our findings suggest that, had the pre-2009 relationship held, wage growth would be around 3% to 3.5% year-on-year, rather than the 1% to 1.5% recorded recently.

While traditional measurement of the wage Phillips curve relies on the level of unemployment, there are reasons to believe that a gap based measure may better capture wage pressures. Like the output gap discussed previously, the unemployment gap attempts to tease out the difference between current unemployment rate and a rate consistent with maximum (or full) employment. Importantly,



because it relies on trend concepts, the unemployment rate gap removes the impacts of factors such as demographic shifts.⁷

This alternative specification yields a similar result (Chart 5). Although coefficients are not comparable across the two models, a similar pattern nevertheless emerges: Canadian wage growth has become much less sensitive to changes in unemployment post-crisis, regardless of how the unemployment measure used.

Is the case overstated? Assessing potential explanatory factors

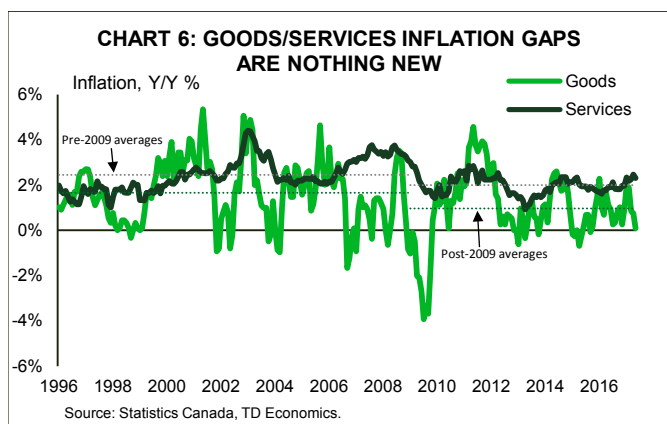
The preceding analysis suggests that Canada, like other advanced economies (notably the United States, as well as Europe and Japan), has seen a marked flattening of its Phillips curves. It is important to stress that we still see the Phillips curve as being relevant. Rather the traditional relationship where growth and tight labour markets ultimately drive inflation appears more muted and lagged than in the past.

If the impact of growth-driven price pressures has declined, there must be a reason why. And, perhaps, abstracting further, could this be much ado about nothing? Surely there are a number of temporary factors that are working to constrain wage and price growth. Beyond potential temporary factors, there is also the question of whether economists and central bankers are measuring economic slack appropriately.

A common explanation for soft inflation is that imported goods, particularly from China, are holding back price pressures. Does this explanation hold up to scrutiny? Unfortunately, the answer appears to be no. It is certainly the case the goods inflation has underperformed price growth in services, but this has been the case throughout the Bank of Canada's inflation targeting regime (Chart 6).

Two additional facts argue against the "China effect" as an explanation for flatter Phillips curves. To begin with, there is evidence of a China effect, but its timing (starting after China's WTO accession in late 2001) does not correspond to the identified flattening of Phillips curves, which has been a post-crisis phenomena. In fact, the China effect, as measured by import prices appears to have largely run its course by 2010. Second, re-running the Phillips curve analysis using only service price inflation yields similar results as for core inflation, reinforcing that the shift in inflationary relationships is not limited only to goods prices. While the China effect is certainly real, and can be seen clearly in trade and price data, it does not appear to be a factor in flatter post-crisis Phillips curves.

Perhaps more convincing may be the transition to e-commerce, a global phenomenon that appears to have intensified in recent years. However, in the Canadian context, e-commerce is likely having only a marginal impact. Online retail sales, for instance, accounted for just over 2% of total retail spending in the most recent data.⁸ That said, online-sales growth is significantly outpacing traditional channels, suggesting that any impact the sector may be having on price growth is likely to increase with time.



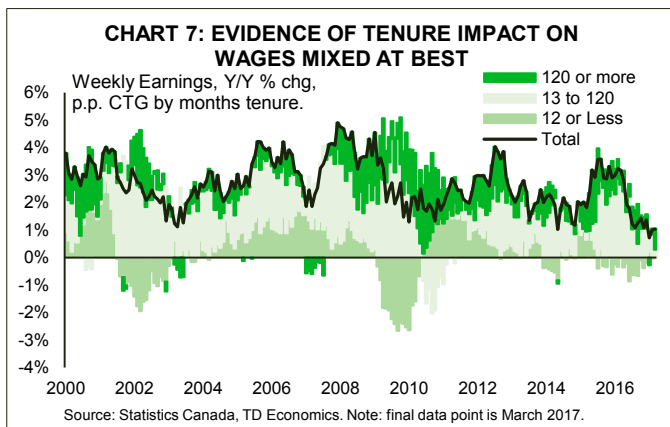
For the unemployment-wage relationship, many theories have been advanced to help explain the weakened relationship but to date, a satisfying explanation remains elusive. Bank of Canada staff research indicates that workers aged 25 to 44, particularly those in energy intensive regions such as Alberta, have played a large role in recent wage softness.⁹ The same research also suggests that a persistent labour market gap has been depressing wages in the post-crisis period, although there remains a large unexplained component, particularly in the last two years.

It is also possible that softer aggregate wage growth reflects a decline in the 'quality' of jobs, given relatively lower-paying service sector employment has driven the lion's share of job gains in the post-crisis period. However, average wage growth in both sectors have been slower in the post crisis period, and not meaningfully different from one another.

Can the rise of part-time work be to blame? The first problem with this notion is that there has been no rise in part-time work, on a relative basis. Full-time employment has added nearly 4 times more net positions 2010 to date. Moreover, the most recent experience, which helped spur the discussion, saw relatively healthy wage growth over 2016 despite a preponderance of part-time job growth. This year's solid jobs growth to date has been driven entirely by full-time work, and yet wage growth has slowed markedly, suggesting the full-time/part-time mix is not the culprit.

That wage growth has decelerated recently despite strong employment gains may suggest that wages are suffering from a compositional effect: as new employees are likely to start further down the wage ladder, they weigh down overall wage growth. The data does not bear this theory out however. The contribution to wage growth by tenure of employment has fallen for across all tenures in the post-crisis period (Chart 7).¹⁰

Perhaps more abstract factors are to blame. It may be that as firms in many industries become more concentrated, the bargaining power of labour has declined, consistent with the declining share of income accruing to workers in advanced economies.



Relatedly, it is possible increased automation may also be suppressing wage growth. Both explanations have the benefit of being both global phenomena and likely to impact wages in a broad way, consistent with what has been observed. Unfortunately, unlike compositional effects, teasing out the impact of these factors in the data is a significant challenge. As such, while automation and labour bargaining power are likely influences, the precise reasons for softer wage growth post-2009, and in particular over the last few years remains an open question.

It may be the case that we are simply having the wrong conversation, and should instead be focused more on measurement. The argument in favour of mismeasurement appears strong on its face. Potential GDP is a theoretical concept, and one analyst's model will not necessarily line up with another's – indeed, as shown in Chart 3, the Bank of Canada provides two different estimates of the output gap, based on two different methodologies.¹¹ To take things further, perhaps the relationship could be reversed, and soft price pressures are telling us that the economy is further away from its potential than models might suggest (the implications for monetary policy, discussed in the next section, would be similar in either case).

The notion of mismeasurement of economic potential becomes less compelling once the flattening of wage Phillips curves are taken into account.¹² Unemployment rates may have some caveats attached to them, but are well defined, and although the unemployment gap is an unobserved variable,

it could be argued that its basis in demographic data reduces its relative uncertainty, although this is somewhat debateable.¹³ Indeed, shifting demographics help explain the longer-term downtrend in economic growth, but have a matching impact on potential growth. It thus isn't the pace of growth that matters for price pressures, but its pace relative to its trend, which is also slowing. The reduced responsiveness of wages to changes in labour markets thus reinforces the softness observed in inflation relationship.

A characteristic common to other advanced economies is that as measures of economic slack have fallen in importance, the role of inflation expectations has increased, suggesting that soft inflation 'begets' soft inflation as individuals embed current price trends in their expectations. This is not the case in Canada. Generally speaking, at the year-ahead horizon, inflation expectations have remained anchored at the Bank of Canada's 2% target, and at longer horizons almost no deviation from 2% is observed, despite, as noted earlier, a significant undershooting of the 2% target over the last 8 years. A de-anchoring of inflation expectations can thus be ruled out as an explanation for flattened Canadian Phillips curves.

Ultimately, with a number of potential drivers ruled out, just what has caused Phillips curves to weaken remains, for the time being, a mystery. Perhaps as time goes on and the global financial crisis fades further into history, the Phillips curve will reassert itself, but in the meantime, the reality is that policy-makers must contend with much weaker growth-inflation relationships than seen in the past.

What does this mean for monetary policy?

Exactly why Phillips curves have flattened may remain an open question, but central banks must, at least for now, take the softer growth-inflation relationship into account when setting monetary policy. For the Bank of Canada, this increases the risk that inflation continues to undershoot the 2% target. With this comes the broader risk that Canadian inflation expectations may become unanchored. For the time being, this possibility appears remote, and

surveys of professional forecasters, including Consensus Economics, Focus Economics, and Blue Chip, all suggest that expectations remain anchored at 2%.

Achieving its 2% inflation target suggests that the blueprint for the Bank of Canada going forward may be the Federal Reserve. U.S. policymakers have continually revised down their expectations for future interest rate increases as inflation continued to disappoint. Moreover, unlike the Fed, which has a dual mandate that includes both inflation and employment (which has remained robust) the Bank of Canada’s focus is only on inflation, further constraining their room for manoeuvre.

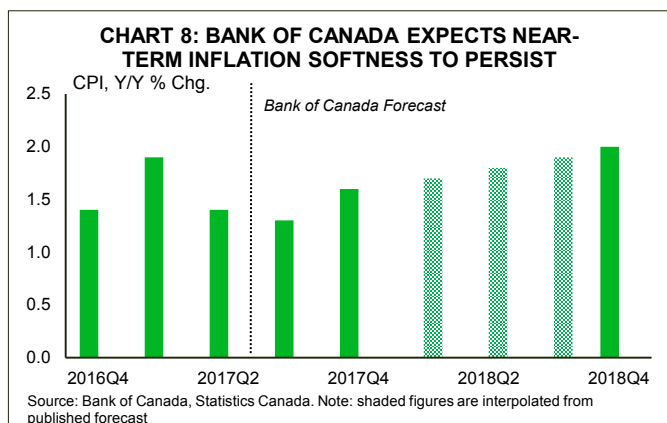
That said, in the near term the Bank of Canada appears poised to continue increasing its policy rate given a sudden and strong shift in the tone of communications in June of this year, and recent discussions of inflation that suggest that the Bank is unlikely to put much weight on soft inflation in the coming quarters, barring a significant weakening (Chart 8). Indeed, the Bank has shifted away somewhat from its measures of core inflation, emphasizing instead idiosyncratic factors, such as changes to electricity prices in Ontario, that it has identified as temporarily holding back inflation. When the current healthy economic backdrop is also taken into account, Governor Poloz is likely to want to remove the remaining 25 basis points of ‘insurance’ introduced after the 2014/2015 oil price shock, despite the lack of underlying inflationary pressures.

It is the lack of inflationary pressures that makes the picture thereafter murkier. The analysis presented in

this report suggests that a structural shift has occurred in the inflation process, meaning that even as temporary factors fade, meaningful price pressures are less likely to emerge.¹⁴ At the same time, economic growth is expected to fall more in line with its potential, with the result being still less inflationary pressure. Consistent with this, the Bank of Canada will likely take a very gradual approach to hiking interest rates in 2018 and beyond, cognizant of the risks associated with a persistent undershooting of its inflation target.¹⁵ TD Economics’ outlook for the Bank of Canada policy rate, as well as the impact of flatter Phillips curves on other central banks is discussed further in our latest [report](#).

Bottom Line

Growth – whether in GDP or jobs – just isn’t as inflationary as it used to be. Estimates of the Phillips curve, or the relationship between economic slack and prices, capture this fact, with a less ro-bust though still positive relationship found across a swathe of price measures, with the notable exception of CPI-Common. The reason(s) that this should be the case are unclear. Some obvious culprits, such as a downtrend in goods prices attributable to China, or compositional effects in labour markets, do not appear to hold up to scrutiny. Mismeasurement of economic slack is possible, although a flatter wage and ‘traditional’ Phillips curves suggest that this may not be the case. The source of weakness may remain an open question, but the implications for monetary policy are clear. The Bank of Canada’s change in tone and focus on temporary inflation factors point to another policy increase in the near term, but the path thereafter is less certain. An expected moderation of growth together with the weaker growth-inflation relationship points to a much more cautious path forward, absent a re-assertion of Canadian Phillips curves.



Endnotes

1. The 'classic' Phillips curve related the level of unemployment to the inflation rate. Over time, the usage of the term 'Phillips curve' has been expanded to include different measures of unemployment rates, and output gap measures are commonly used in place of unemployment. ([return to text](#))
2. Although inflation targeting was introduced in 1991, the initial goal was to bring inflation from the then pace of 5% to 2% by the end of 1995. The 2% target has been in place since then, most recently renewed in the fall of 2016. ([return to text](#))
3. If the unusually weak inflation of 2009 is excluded, the average rises to 1.7%. ([return to text](#))
4. Specifically, a simple augmented autoregressive model is fitted. The lag relationship between the output gap and inflation is allowed to vary over the full sample, with optimal lag chosen via the Akaike information criteria. The lag structure is maintained for the sub-period analyses. Results are robust to the inclusion of additional explanatory variables, such as exchange rates and commodity prices. It is worth noting that in contrast to the Bank of Canada's findings, we find that CPI-Common does not appear to have the strongest relationship with the output gap, but this may be the result of differing specifications. ([return to text](#))
5. Wage data from the Labour Force Survey is used. Due to its limited sample, Survey of Employment Payrolls and Hours data was not analyzed. ([return to text](#))
6. Principal component analysis is a statistical technique used to capture common movements across multiple series. In this instance, a principal component was estimated across all wage measures included in the Labour Force Survey. ([return to text](#))
7. This is important in the current context as population aging implies a falling unemployment rate, all else equal, as older workers leave the labour force. This would not necessarily imply rising wages, particularly if employment is stable, or even falling, assuming employment is declining more slowly than the labour force shrinks. ([return to text](#))
8. See <http://www.statcan.gc.ca/daily-quotidien/170721/dq170721b-eng.htm?HPA=1> ([return to text](#))
9. See <http://www.bankofcanada.ca/2017/07/staff-analytical-note-2017-8/> ([return to text](#))
10. Note that tenure is defined as an employer-based concept. Changing roles within the same company would not reset the tenure calculation, for example. ([return to text](#))
11. A recent post on FT Alphaville provides an accessible, though U.S.-oriented, discussion of the challenges of measuring and projecting potential GDP: <https://ftalphaville.ft.com/2017/07/21/2191673/potential-output-forecasts-are-actually-worthless/>. ([return to text](#))
12. This is further confirmed by estimates of the 'traditional' Phillips curve, relating inflation to unemployment rates. ([return to text](#))
13. The U.S. experience suggests that there may still be unobserved slack not captured by the unemployment gap. ([return to text](#))
14. While the relationship between CPI-Common and economic slack appears to have tightened somewhat, this is the 'odd duck out' of the analysis, and the evidence across other inflation and price measures suggest that overall, Phillips curves have weakened. ([return to text](#))
15. This would be the case even if flatter Phillips curves are resulting from measurement issues around trend GDP or unemployment. Should weakness in inflation be attributable to greater than expected economic slack, the monetary policy solution would still be to keep rates lower for longer. ([return to text](#))

Disclaimer

This report is provided by TD Economics. It is for informational and educational purposes only as of the date of writing, and may not be appropriate for other purposes. The views and opinions expressed may change at any time based on market or other conditions and may not come to pass. This material is not intended to be relied upon as investment advice or recommendations, does not constitute a solicitation to buy or sell securities and should not be considered specific legal, investment or tax advice. The report does not provide material information about the business and affairs of TD Bank Group and the members of TD Economics are not spokespersons for TD Bank Group with respect to its business and affairs. The information contained in this report has been drawn from sources believed to be reliable, but is not guaranteed to be accurate or complete. This report contains economic analysis and views, including about future economic and financial markets performance. These are based on certain assumptions and other factors, and are subject to inherent risks and uncertainties. The actual outcome may be materially different. The Toronto-Dominion Bank and its affiliates and related entities that comprise the TD Bank Group are not liable for any errors or omissions in the information, analysis or views contained in this report, or for any loss or damage suffered.