

The Canadian Energy Sector: A Natural Hedge to Supply Shock Risks

Guihai Zhao (Bank of Canada)¹ January 2020

One potential concern with a Flexible Inflation Targeting approach to monetary policy is that supply shocks (e.g., oil shocks) move output and inflation in opposite directions. Central banks adopting this rule, therefore, face a trade-off in managing the output and inflation effects of supply shocks. In this note, I provide evidence that the Canadian energy sector provides a natural hedge to supply shock risks.

1 Key Messages

- The correlation between short run real GDP growth and inflation in Canada switched from negative to positive after the *early 1980s*. This implies that the Bank of Canada has not faced a trade-off between growth and inflation since the early 1980s. In contrast, this correlation switched from negative to positive *around 2000* in the US.
- I try to reconcile this difference by examining the larger importance of the energy sector in the Canadian economy. The Canadian energy sector has been a stable 10% of total GDP since 1980, while in the US energy is about half as large on a relative basis.
- Consistent with the energy sector as a hedge against supply shocks, the correlation between Canadian real energy growth and energy inflation has been mostly positive since the 1970s.
- Energy exports from Canada have steadily increased from 20% in the 1970s to currently 80% of total energy output.

2 Background

The market-based short rate in Zhao (2020), reflecting investors' expectation of growth and inflation, is similar in spirit to a standard Taylor Rule (Taylor, 1993):

$$i_t = i_t^* + \varphi_\pi \tilde{x}_{\pi,t} + \varphi_g \tilde{x}_{g,t} \quad (1)$$

where the neutral nominal rate is the sum of the neutral real rate of interest (r_t^*) and trend inflation (π_t^*). $\tilde{x}_{\pi,t}$ is the short-run inflation expectation deviation from the long-term trend due to learning from transitory price changes (GDP deflator excluding core inflation). $\tilde{x}_{g,t}$ is the short-run growth rate expectation deviation from its long-term trend due to learning from transitory GDP growth (GDP growth excluding PCE). Zhao (2020) shows that the model implied short rate, long rate, and spread match the data well. Importantly, expectations of these variables are derived from past transitory changes. We can thus measure expectations of these variables not only at the aggregate level but also at a sectoral level.

¹ I would like to thank Jason Allen and Jonathan Witmer for their suggestions and Clara Kyung for excellent research assistant.

3 Trade off between growth and inflation – Canada compared to the USA

If supply shocks (e.g., oil shocks) move short-run output and inflation expectations ($\tilde{x}_{g,t}$ and $\tilde{x}_{\pi,t}$ in Equation 1, respectively) in the opposite direction, central banks face a trade-off between growth and inflation. For example, during the recession periods in the 1970s, central banks needed to raise interest rates because of high inflation; however, at the same time, real growth rates were very low. This operation likely increases the chance of recessions (see Figure 1 and Figure 2 for recessions in Canada and U.S during 1970s).

Figure 1 shows that the correlation between Canadian short-run output and inflation expectations switched from negative to positive after the *early 1980s*, which is about **20 years earlier** than the U.S (where the switch in correlation happened around 2000. See Figure 2).

The Bank of Canada, therefore has not faced the short run trade-off between growth and inflation since the *early 1980s*. The Flexible Inflation Targeting approach we adopt since 1992 accommodates both growth and inflation at the same time given their positive.

While for the U.S, a Flexible Inflation Targeting approach would not have been able to accommodate both growth and inflation given their negative correlation pre-2000. However, the Federal Reserve dual mandate can adjust for growth that moves opposite to inflation.

4 Canada Energy Sector

Why did the correlation between growth and inflation change earlier in Canada than in the US? The *positive* correlation between short-run growth and inflation in Canada after the *early 1980s* is most likely driven by Canada's strong energy sector (oil shocks move inflation and energy related growth in the same direction).

First, since the 1980s, the energy sector accounts for approximately 10% of total real Canadian GDP. This is double the proportion of U.S energy sector (Figure 3).

Furthermore, Figure 4 shows that energy exports in Canada have steadily increased from 20% in the 1970s to 80% currently, as a portion of total energy output. While in the U.S, pre-2008 more than 95% of energy products were consumed domestically, whereas about 20% of energy products are currently exported.²

Most importantly, energy growth and energy inflation are almost always positively correlated (Figure 5). Curiously, the correlation of the two between 1974 and 1985 was negative, when the energy sector was also a large part of the economy. An increase in energy prices during this period should also have spurred growth in the energy sector during this period. One possible explanation is that energy prices were regulated during this period.³ During the price regulation period, especially during the National

² Note that Canada is a net energy export country, and energy imports are less than 20% of energy export for most of the time. While the US is a net energy import country, energy export is negligible compared with import.

³ From the 1970s to the early 1980s, Canadian consumer prices for gasoline and other fuels were subject to government price controls. A significant agreement reached in 1985 removed those controls to ensure that sufficient supplies of petroleum products were available at the most competitive price.

Energy Program (NEP) period (1980-1985), the Alberta government cut Alberta oil production by delaying developments in the oilsands. Meanwhile, American and other foreign oil companies sold off Canadian oil assets, and Alberta's energy industry was subsequently hit hard in the early 1980s with heavy job losses.

Thus, absent this regulation period, Canada's energy sector seems to provide a hedge against supply shocks that tend to drive growth and inflation in the opposite directions. This hedge seems important at the aggregate level, since the correlation between overall growth and inflation has been positive since 1985.

5 Conclusion

There is evidence that the Canadian energy sector provides a natural hedge to the supply shock risks that the Bank of Canada would otherwise face. This provides support for a Flexible Inflation Targeting approach to monetary policy, conditional on a healthy energy sector. Going forward, monetary policy should be able to manage supply shocks without a trade-off, since history suggests that the reliance of the Canadian economy on the energy sector mitigated the impact of this trade-off after the early 1980s.

There remains a risk, however, that a negative oil shock during zero lower bound regime could reduce both inflation and growth (and the Bank of Canada cannot accommodate this shock via interest rates). While for a non-energy intensive country, the same shock would stimulate the economy with a higher output growth.

6 References

Zhao, G., 2019. Learning, Equilibrium Trend, Cycle, and Spread in Bond Yields. Working paper.

Taylor, J., 1993. Discretion versus policy rules in practice. Carnegie-Rochester Conference Series on Public Policy 39.

5 Figures

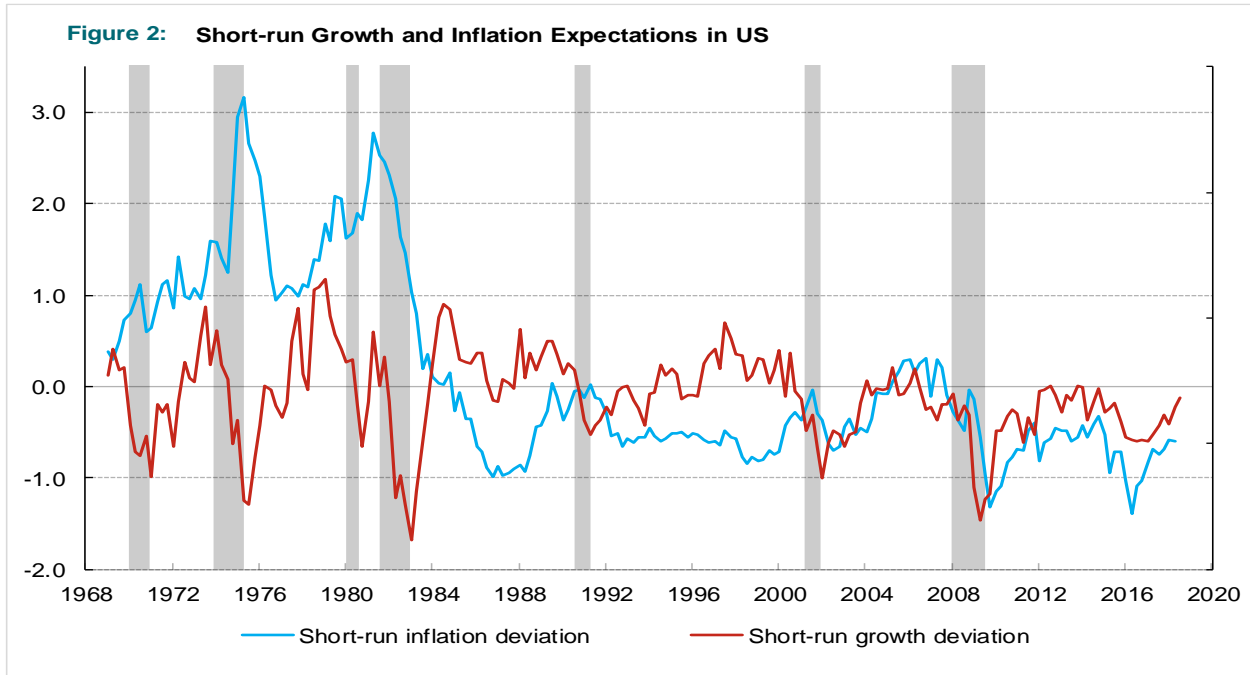
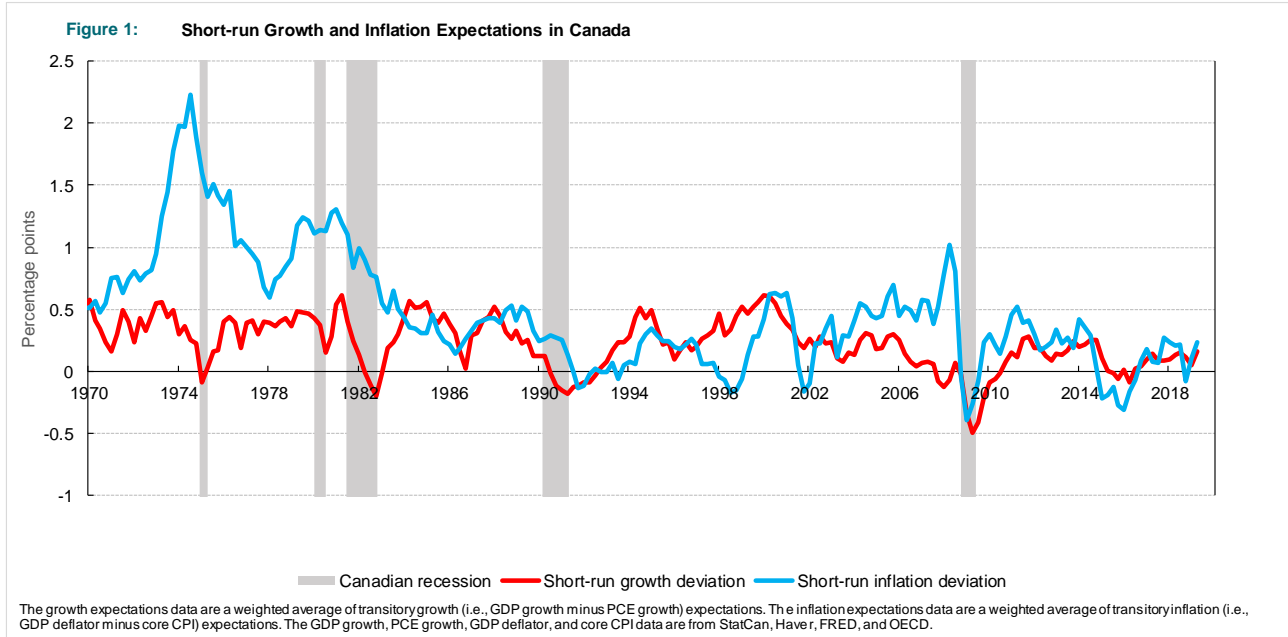
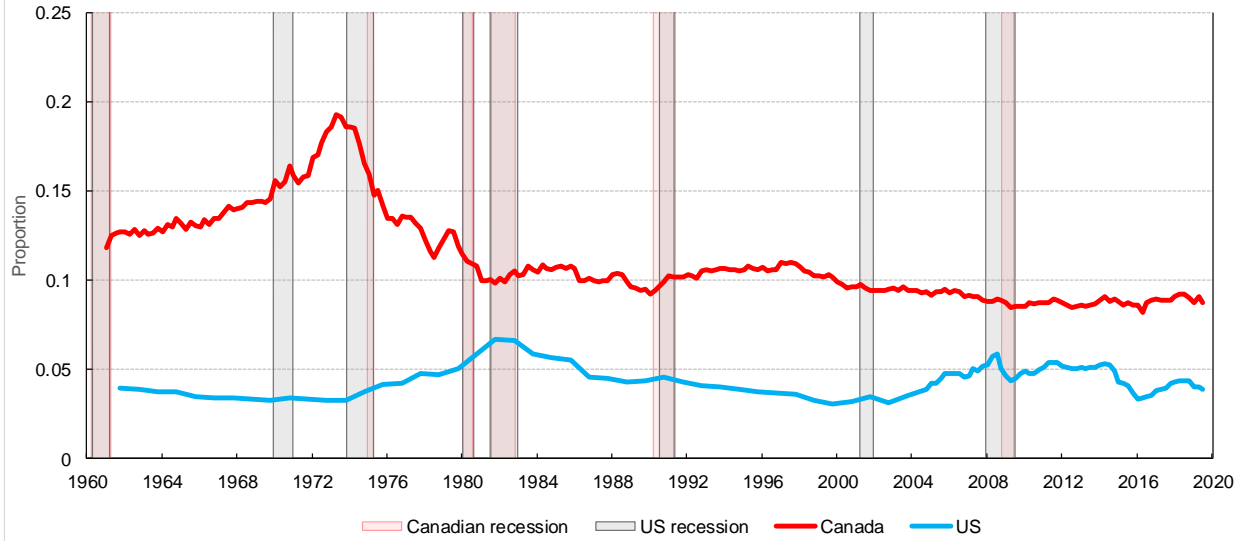
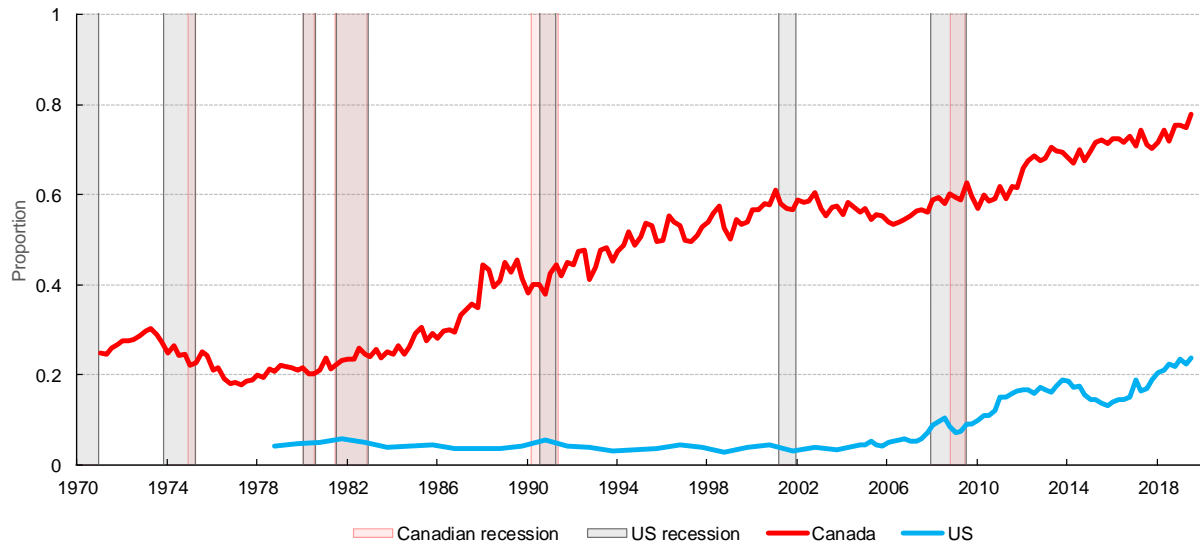


Figure 3: Energy Sector GDP as a Proportion of Total GDP



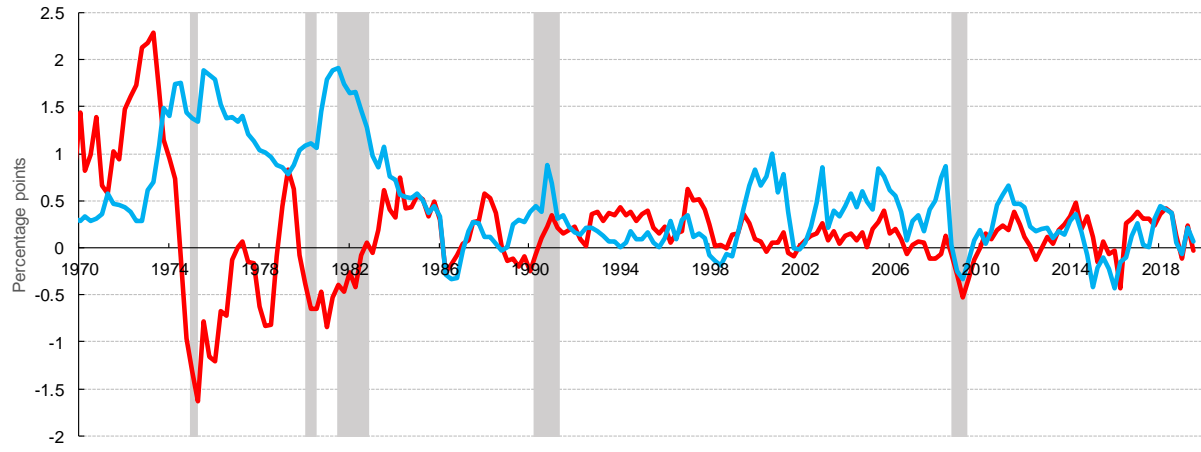
The energy sector GDP and total GDP data for Canada are in real terms from Haver and StatCan. The energy sector GDP and total GDP data for the US are in nominal terms from Haver and BEA. Energy sector GDP for both countries was approximated by summing the GDP of select industries.

Figure 4: Energy Product Exports as a Proportion of Energy Sector GDP



The energy product export and energy sector GDP data for Canada are in real terms from Haver and StatCan. The energy product export and energy sector GDP data for the US are in nominal terms from Haver, BEA, and the Census Bureau. US mineral fuel and lubricant exports are used as a proxy for US energy product exports. Energy sector GDP for both countries was approximated by summing the GDP of select industries.

Figure 5: Short-run Energy Sector Growth and Energy Sector Inflation Expectations in Canada



— Canadian recession — Energy sector growth expectations — Energy sector inflation expectations

The energy sector growth expectations data are a weighted average of realized energy sector growth. The energy sector inflation expectations data are a weighted average of realized energy sector inflation. The energy sector growth and energy sector CPI data are from StatCan and Haver.