

# Canada: Selected Issues



# CANADA

## SELECTED ISSUES

January 2015

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# CANADA

## SELECTED ISSUES

January 14, 2015

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**Western Hemisphere  
Department**

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# CANADA'S NON-ENERGY EXPORTS: ASSESSMENT OF POST-CRISIS GROWTH PERFORMANCE<sup>1</sup>

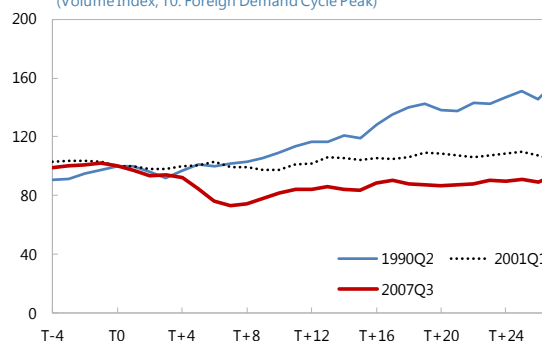
## A. Context

**1. Despite the recent pickup, the post-crisis recovery in Canada's non-energy exports<sup>2</sup> has been lackluster.** Canada's non-energy exports rebounded strongly from the collapse in 2009 over the period of 2010–11, but then failed to carry on the growth momentum. Over 2012–2014:Q1, exports recorded a disappointing -0.5 percent growth (q-o-q, annualized) in volume terms. As a result, even with the pickup in 2014:Q2, Canada's non-energy exports stood at about 8 percent below the pre-crisis peak level in volume, although in value terms they have just surpassed the pre-crisis peak.

**2. To a large extent, this subpar recovery reflects the persistent weak demand in Canada's major export destinations following the crisis.** This includes the United States that account for about three quarters of Canada's merchandise exports. Compared to past downturns in Canada's foreign demand, the level of non-energy exports in 2014:Q2 is only at about 70 percent of the historical average and 90 percent relative to the last downturn that started in 2001:Q1. The strengthening of the Canadian dollar during 2009–11 also had a dampening effect on growth, appreciating by a substantial 20 percent in real effective terms.<sup>3</sup>

Even after accounting for these already well-known factors, however, the poor performance since 2012 has been seen as puzzling in light of the ongoing recovery in the United States and the depreciation over 2012–13, and has attracted much public attention.

**Canada's Non-Energy Goods Exports During Foreign Demand Downturn 1/**  
(Volume Index, T0: Foreign Demand Cycle Peak)



Sources: Statistics Canada; IMF staff estimates.

1/ Foreign demand downturns for Canada are identified by applying the Harding and Pagan (2002) turning point algorithm to the Bank of Canada's foreign activity indicator.

<sup>1</sup> Prepared by Minsuk Kim (SPR).

<sup>2</sup> In the rest of the paper, non-energy exports refer to non-energy exports of goods only, and exclude exports of services.

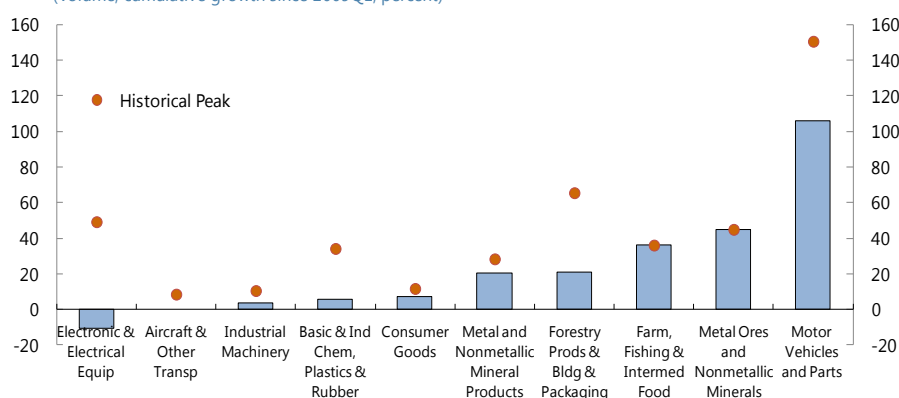
<sup>3</sup> A recent IMF study estimates that a 10 percent increase in the REER results in about 1½ percentage point decline in Canada's U.S. market share based on the sample period of 1975–2010 (Medas, P., "Canada's Loss of External Competitiveness: The Role of Commodity Prices and The Emergence of China," 2012 Article IV Consultation Staff Report, Selected Issues Paper).

### 3. The picture at the product level reveals significant differences in terms of the strength of the export recovery.

Among the major export product categories, motor vehicle and parts, metal ores and non-metallic minerals, and farm and fishing products have posted the highest cumulative growth since 2009Q1 in volume terms, whereas traditional industrial inputs such as machinery and equipment have either declined or stagnated (Chart). With the exception of motor vehicle exports, most of the products leading the non-energy export growth so far have come from non-manufacturing sectors such as mining and agriculture. The relative weakness of manufacturing export growth is not new: the sector has been on decline since the early 2000's owing to tougher competition from

emerging markets<sup>4</sup> and Canada's low productivity growth, among other factors. Sectors based on raw materials (other than energy), on the other hand, enjoyed robust growth over the same period, accounting for an increasingly larger share of Canada's non-energy exports. It is

**Recovery from Global Financial Crisis**  
(Volume, cumulative growth since 2009Q1, percent)



Sources: Statistics Canada; IMF staff estimates.

therefore important to take into account these long-term trends across different types of industries when making an assessment of Canada's recent export performance. Another important aspect to consider is the possibility that these long-term dynamics from the pre-crisis period have structurally changed since the crisis, especially given the unprecedented magnitude of the global financial crisis and the exceptionally persistent weakness in the global economy.

### 4. In this paper, we assess Canada's post-crisis export performance of non-energy products using model-based benchmarks.

Specifically, the analysis explores whether the pre-crisis relationship between Canada's non-energy exports and their determinants still holds in the post-crisis period. The analysis covers 23 product categories that comprise about 77–84 percent of Canada's non-energy exports over the sample period of 1986:Q1–13:Q4, of which 21 products belong to the manufacturing sector. We then make assessments of their actual export performance using the respective model-estimated benchmarks obtained from the export demand equations. In the second part of the paper, we check whether the observed post-crisis performance of individual products is substantial by historical standards, by testing for possible structural breaks around the crisis period. For this, we adopt the multiple structural change identification method proposed by Bai and Perron (1998, 2003), which allows estimation of an unknown number of multiple breaks at

<sup>4</sup> See, for example, Medas (2012).

*a priori* unknown points in time. Finally, we focus on the products with a structural break around the crisis period and examine the relative importance of contributing factors to their post-crisis growth.

## B. Framework

**5. To obtain our model benchmarks, we estimate export equations for 23 individual non-energy products with respect to foreign demand and relative prices.** Specifically, we consider the following standard form export demand equation:

$$Y_{i,t} = \beta_0^i + \beta_1^i C_t + \beta_2^i I_t + \beta_3^i G_t + \beta_4^i FDD_t^i + \beta_5^i (exr * p_{CAN,t}^i / p_{FOR,t}^i) + \varepsilon_t^i, \quad \varepsilon_t^i \sim N(0, \sigma_{\varepsilon,i}^2)$$

The dependent variable,  $Y_{i,t}$ , denotes the level of Canada's exports of product  $i$  in quarter  $t$  in volume terms, and the independent variables  $C_t$ ,  $I_t$ , and  $G_t$  refer to the level of real private consumption, business investment, and government gross investment (federal, state, and local), respectively in the United States—Canada's dominant trading partner. In addition, we have a term capturing the demand from the rest of the world ( $FDD_t^i$ ) defined as the export destination-share weighted average of final domestic demand<sup>5</sup> for product  $i$ . The variables are all expressed in log-level terms and therefore the coefficients correspond to the usual long-run elasticity of product  $i$  with respect to each of these demand components. The relative export price variable ( $exr * p_{CAN,t}^i / p_{FOR,t}^i$ ) is the ratio of Canada's export price for product  $i$  denominated in U.S. dollars to the export destination-share weighted price of this product in major export destinations (U.S. dollar denominated), including the United States (see Data Appendix for details). The standard unit root and the Johansen test results indicate that the series in each export equation are first-order integrated and that there exists at least one cointegration relationship among these series. Based on these results, we take as the model benchmarks the fitted values of  $Y$  obtained from the regression over the entire sample period.<sup>6</sup>

**6. Examining potential structural breaks then helps identify if export performance has structurally changed after the crisis.** From the benchmark model, we then test for structural breaks in each equation using the sequential " $l$  vs.  $l+1$ " breakpoint method developed by Bai and Perron (1998, 2003), allowing shifts both in the intercept and the coefficients.<sup>7</sup> In addition to the

<sup>5</sup> Final domestic demand is defined as the sum of consumption, gross fixed investment, and government expenditure. For China, we use the gross domestic product instead due to the lack of available data. We exclude the foreign demand term for "passenger cars and light trucks", "medium and heavy trucks, buses, and other motor vehicles," and "aircraft, aircraft engines and part" as the U.S. share accounts for very close to 100 percent.

<sup>6</sup> We use OLS estimates throughout this paper, which have non-standard limiting distributions when the series are cointegrated I(1)s as in this case. However, other more suitable estimation methods (including Dynamic OLS, fully-modified OLS, VECM) also produced point estimates very close to those of the OLS. It should be noted, however, that the OLS appears to underestimate the size of the coefficients for the real effective exchange rate and the U.S. consumption relative to these other methods.

<sup>7</sup> The strategy involves first estimating  $l$  break points ( $\hat{T}_1, \hat{T}_2, \dots, \hat{T}_l$ ) that minimizes the global sum of squared residuals and then testing for the presence of an additional break against the null hypothesis of  $l$  breaks. If the global sum of

(continued)

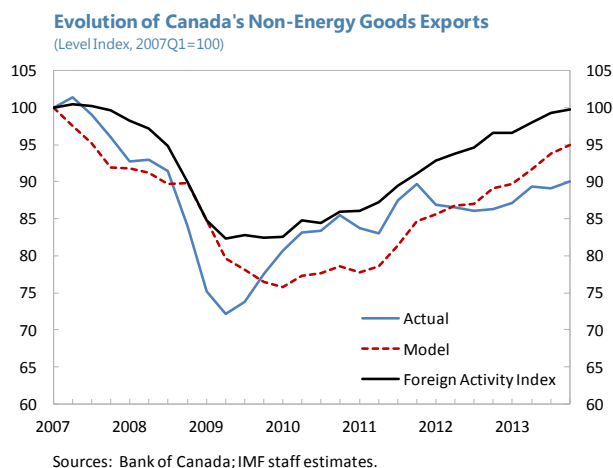
product-specific equations, we also estimate a similar equation for Canada's total non-energy exports, using the real effective exchange rate (REER) instead of the individual relative export price and similarly test for the presence of structural breaks.

## 7. The approach in this paper has several advantages, but also comes with a few caveats.

The product-level analysis enables a granular assessment of Canada's non-energy export performance, helping us better understand the forces underlying recent developments—taking into account past trends and breaks in individual export sectors. The non-U.S. foreign demand term is an important addition given Canada's export destination diversification in recent years. On the downside, the analysis ignores the supply side and the coverage of sample products is rather limited due to lack of available data. Given Canada's size in the world economy and with respect to the United States, however, the implicit assumption of Canada being a small open economy does not seem very unreasonable.

## C. Results

**8. At the aggregate level, Canada's non-energy exports do not seem to have performed particularly poorly relative to the benchmark.** As of 2013:Q4, Canada's non-energy exports were at about 5 percent below the model benchmark, although compared to the Bank of Canada's foreign activity indicator—which includes the U.S. demand—the gap was larger at about 10 percent (Chart). Interestingly, while Canada's non-energy export growth lagged the benchmark over 2012–13 on a cumulative basis (3.7 vs. 10.9 percent), it actually outperformed both our model benchmark and the foreign activity indicator over the entire post-crisis period of 2009:Q1 to 2013:Q4 (19.8 percent) by about 8 and 2 percentage points, respectively. This relatively higher growth could be in part ascribed to the steeper-than-expected decline in 2009, which led to sizeable gaps with respect to these measures. This could be explained, among other factors, Canada's unfavorable



squared residuals is sufficiently small, we then reject the null in favor of the  $l+1$  break points. In applying this method, we allow a maximum of 3 breakpoints over the sample period of 1986:Q1–13:Q4. See Kejriwal and Perron (2010) for structural break analysis with cointegrated series. The choice of maximum 3 possible breaks is motivated by three historical events that are considered as potentially key turning points to Canada's exports: the launch of NAFTA agreement in 1994, China's entrance to the United States in the early 2000s, and the global financial crisis in 2007–08. The break dates identified are based on the ones obtained from the repartition procedure. Finally, we allow error variances to vary across break points.



export product mix at the time of the crisis, which was particularly vulnerable to the U.S. housing busts and the sharp fall in consumption on durable consumer goods such as passenger motor vehicles.

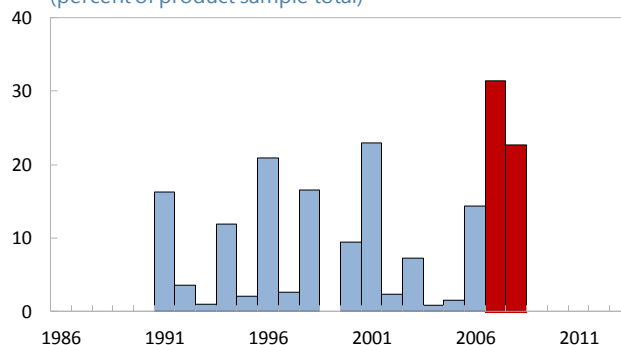
**9. Of the 23 non-energy products, 5 products outperformed their respective benchmarks both in growth and level terms, while 7 products underperformed by the same measures.<sup>8</sup>**

On a cumulative basis, a total of 14 products grew faster than their respective benchmarks over the period of 2009:Q1–13:Q4 (“outperformers”), which together constitute more than half of Canada’s non-energy exports in 2013 on a nominal basis. And while the fast growth could be in part ascribed to the relatively steeper fall at the peak of the crisis, 5 products managed to surpass their respective benchmarks even in level terms, mostly led by final consumption goods such as passenger cars and food, beverage, and tobacco products. The performance of passenger cars and light trucks is particularly notable considering other transportation products (e.g. medium/heavy trucks/buses/other transportation equipment) are among the worst performers. Meanwhile, 9 products lagged the model benchmark over the same period in terms of the cumulative growth (“underperformers”), of which 7 fell behind also in level terms. In terms of the product categories, most of these underperformers consisted of sophisticated industrial goods, including industrial machinery and communications/audio/video equipment.

**10. For some out-/underperforming products, a casual inspection of the data seems to suggest a potential trend shift around the time of the crisis.** For some products, the pre-crisis trend largely extended beyond the crisis, as shown in Figure 1 (e.g. basic and industrial chemical products, cleaning products, appliances, and miscellaneous goods and supplies). For many others, however, the relative growth performance does not seem conform to their long-term trend. For example, pharmaceutical and medicinal product exports were enjoying robust growth for most of the pre-crisis period, but the post-crisis growth proved relatively much weaker. Other products, including computers and computer peripheral equipment, also exhibited a similar pattern. This leads to our next question of whether the post-crisis dynamics between Canada’s non-energy exports and their foreign demand and prices has become structurally different from the pre-crisis period.

**11. The statistical tests show that a total of 13 products had a structural break during**

**Frequency of Product-Level Structural Breaks 1/**  
(percent of product sample total)



1/ Weighted by each product's nominal share in non-energy goods exports  
Sources: Bank of Canada; Statistics Canada; IMF staff estimates.

<sup>8</sup> The list of winners and losers identified in our analysis overlaps on many accounts with a recent study by Binette, de Munnik, and Gouin-Bonenfant (2014) from the Bank of Canada, but there also exist some notable differences (e.g. pharmaceutical). This could reflect among others the different time horizons considered and the choice of benchmarks.

**the global financial crisis of 2007–2008.** In terms of the nominal share, these 13 products accounted for about 57 percent of total non-energy exports (Chart). In terms of the relative performance, 9 products out of the 14 outperformers and 4 out of the 9 underperformers were identified as having a break during the crisis, respectively. The tests also provide evidence for Canada's two other potentially important breaks in the past: the launch of the NAFTA in 1994 and the China's entrance to the U.S. market in the early 2000s. The test using the aggregate non-energy exports series also confirm these breaks, which identifies 4 distinct sub-periods ending in 1994Q2, 2000:Q4, and 2007:Q4.<sup>9</sup>

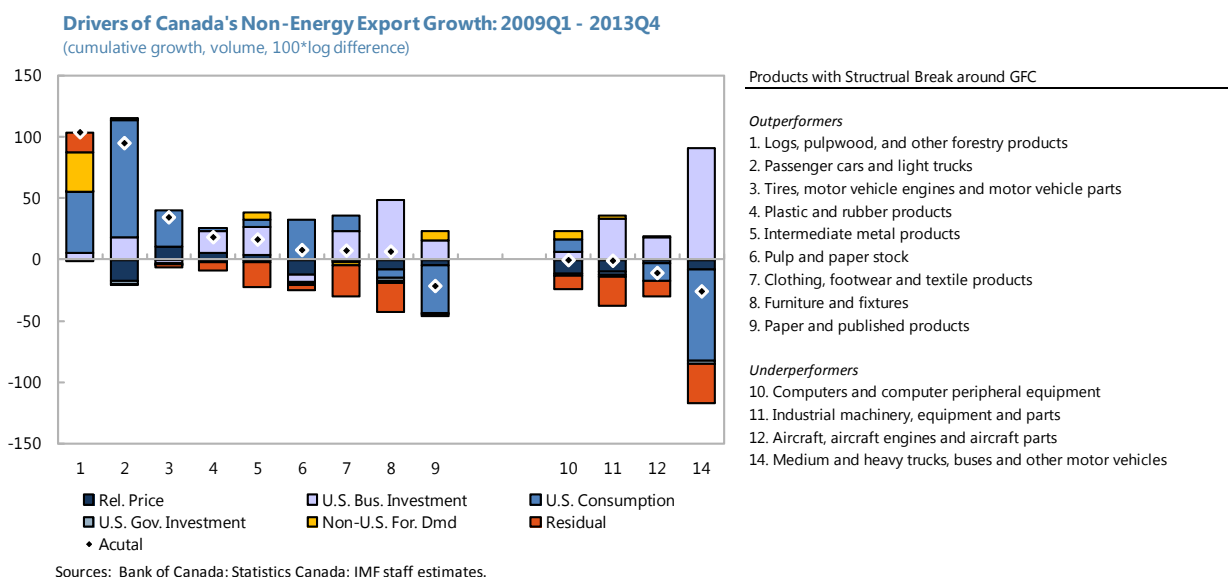
**12. At the aggregate level, the time paths of non-energy exports' elasticities confirm the increasing importance of U.S. business investment.** The estimated coefficients for each sub-period show a number of well-recognized patterns of the historical relationship between Canada's non-energy exports and their determinants. First, Canada's non-energy exports were becoming increasingly sensitive with respect to the REER in the run-up to the crisis. Together with the REER appreciation of about 70 percent (cumulative) over 2001:Q1–07:Q4, driven in large part by the commodity price boom over the same period, this finding confirms earlier studies that found a significant detrimental effect of the REER appreciation on Canada's non-energy exports. Second, the non-energy exports' elasticity with respect to the U.S. business investment steadily rose since 2001, while the elasticity with respect to the U.S. consumption had been declining in the run-up to the crisis before picking up after the crisis. This could be in part due to the changing mix of Canada's non-energy exports over this period, which shifted more toward raw-material based products than sophisticated manufacturing products such as industrial machinery and electrical equipment. Finally, domestic demand in the rest of the world trading partners started contributing positively to Canada's non-energy exports since 2001, consistent with Canada's export market diversification starting around this period.

**13. The findings at the product level reinforce those at the aggregate level, but also reveal some interesting differences between across products.** Table 2 compares each product's estimated elasticities before and after the crisis. Recognizing the short sample periods involved, these findings should be taken as indicative. Consistent with Figure 2, Table 2 shows that the elasticities of individual products with respect to the U.S. investment and consumption have increased overall after the crisis, while the elasticity with respect to the REER turned positive (i.e. *depreciation associated with lower exports and vice versa*) for many. One possible explanation for the latter could be a delayed export reaction to the relatively large REER fluctuations over the relatively short post-crisis period (the "J-curve effect"), which stands in contrast to the steady appreciation and

<sup>9</sup> Given the parsimonious specification used in this paper, we cannot rule out the possibility that the identified structural breaks were in fact due to the influences of other potentially important but omitted variables (e.g. those capturing non-price export competitiveness). To check the robustness of the timing of breaks against this possibility, we have run the same break test on our baseline equation augmented by the polynomial terms of the estimated Y's as proposed in the Ramsey RESET test. Even with the additional terms, however, the Bai and Perron test still indicates a structural break in 2007 for total non-energy exports, providing an indication that the break point is robust to the potential omitted variable problem.

the gradual decline in non-energy exports prior to the crisis. Furthermore, we find that the outperformers and the underperformers identified in our analysis responded differently to changes in demand and relative prices. Most strikingly, of the 6 outperformers that had a negative relationship with the U.S. consumption prior to the crisis, the demand elasticity for 4 of them (passenger cars and light trucks, tires and motor vehicle parts, pulp and paper stock, logs, pulp wood and other forestry products) turned positive in the post-crisis period, allowing these products to benefit from the robust consumption growth in the United States. Albeit to a lesser extent, a similar pattern emerges with the rest of the world demand, in which 3 out of 5 products with negative elasticity before the crisis turned positive thereafter. This in part may reflect exporting firms' strategic entries into non-U.S. markets in order to compensate for the loss of demand in the United States (notably, for example, forestry exports to People's Republic of China). The underperformers, on the other hand, all had positive relationship with the U.S. consumption before the crisis, but this turned negative in the post-crisis period in 3 out of 4 products. Particularly in the case of the medium/heavy truck, bus, and other motor vehicle industry, this shift is due to the supply-side developments, including a series of plant closures following the crisis.

**14. A decomposition of Canada's non-energy export growth based on the post-crisis elasticities confirms the significant contributions from U.S. consumption and non-U.S. demand** (Chart). While the U.S. business investment remains an important driver of growth for most of the out-/underperforming non-energy products, the U.S. consumption has led the growth for passenger cars and the related motor vehicle parts, as well as pulp and paper stock. Non-U.S. demand has also provided a substantial boost to forestry products and contributed significantly for intermediate metal products, paper and published products, and computers and peripheral equipment. Changes in the relative product prices, on the other hand, appear to have been a drag for a number of products, most of which saw their prices rise over the post-crisis period. Finally, the residuals for the most of the products are non-trivial and on the negative side, providing an indication that there could be other factors also responsible for the disappointing export performance. We leave it as a subject for future research.



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## Appendix 1. Data Appendix

This section provides more detailed description of the data sources used for the analysis in the paper:

- *Canada's non-energy exports*—The volume data for individual non-energy export products are obtained from national accounts statistics on a quarterly basis (s.a.a.r., chained, 2007 C\$). The export price indices are calculated by dividing the nominal export value series by the volume series.
- *Foreign demand components*—Real private consumption, business investment, and government gross investment (federal, state, local) series for the United States all come from the U.S. national accounts statistics (s.a.a.r., chained, 2009 US\$). Real domestic demand series, defined as the sum of consumption, gross fixed investment, and government expenditure, for the rest of the world is calculated as the product-specific export share-weighted average of Canada's 22 export destinations (Australia, Austria, Belgium, Finland, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Korea, Taiwan Province of China, Republic of China, Philippines, Singapore, Mexico, United Kingdom). The original export shares for individual products are from the U.N. Comtrade Database (SITC rev.2, available on an annual basis), which we then re-classify to match the North American Product Classification System and linearly interpolate to obtain quarterly estimates. In the case of the Republic of China, real GDP is used instead of real domestic demand due to data availability, with historical quarterly GDP estimates taken from Abeysinghe and Rajaguru (2004).
- *Foreign product prices*—Foreign product price indices for individual products are calculated as the product-specific export-share weighted PPIs of the United States, euro area, Japan, United Kingdom, and the Republic of China. Due to data availability, we use product-level PPIs for the U.S., euro area, Japan, and aggregate PPIs for the United Kingdom and the Republic of China.

**Table 1. Canada's Non-Energy Export Performance: Model-based Assessment**

(All figures in percent)

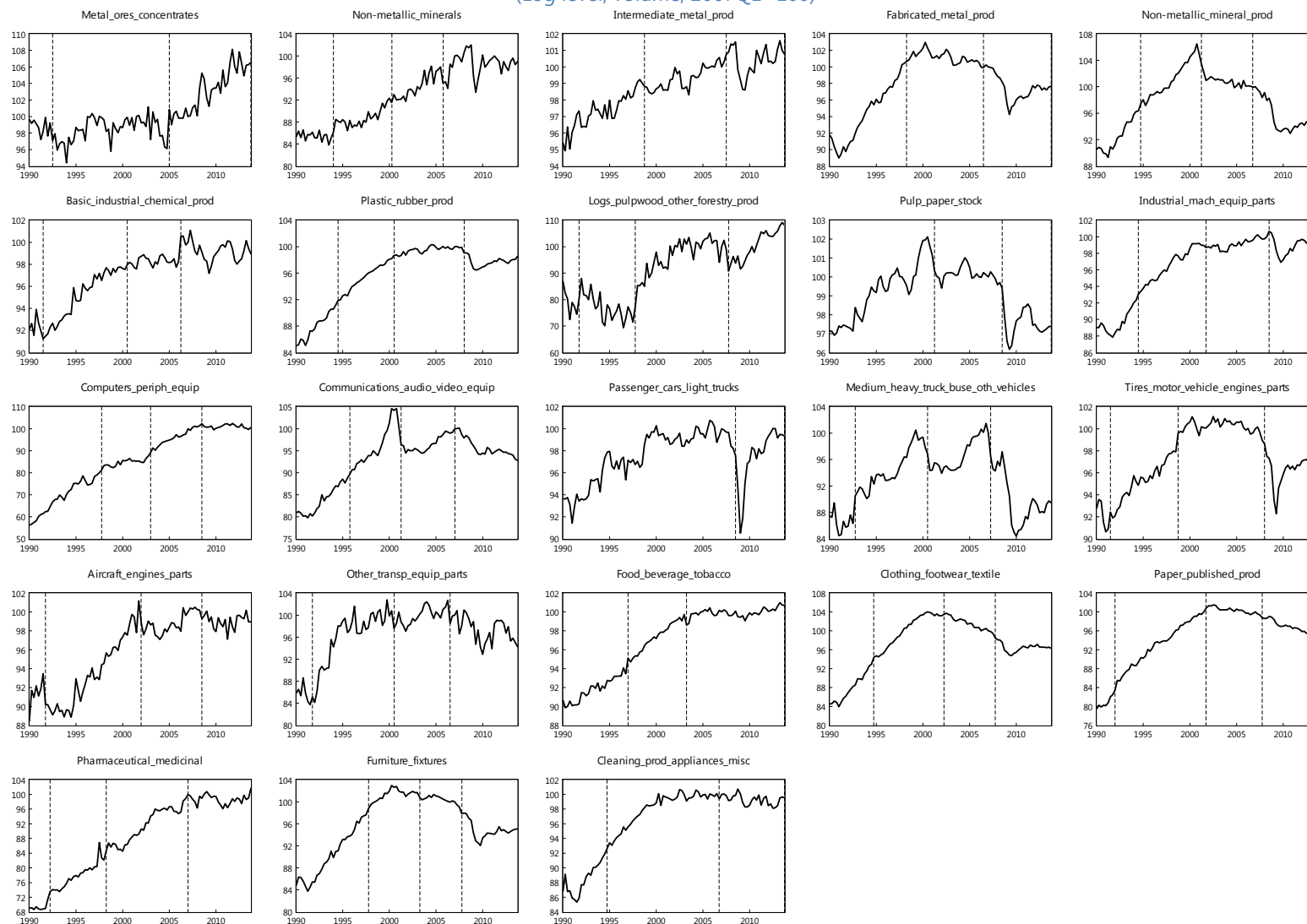
Products 1/	Cumulative Growth Rate (2009Q1-13Q4)			Level Gap w.r.t. Model (2013Q4)
	Actual (A)	Model (B) 2/	A - B	
Passenger cars and light trucks (13)	159	15	143	0.7
Food, beverage and tobacco products (6)	13	3	10	0.6
Plastic and rubber products (4)	20	-6	26	1.7
Pulp and paper stock (3)	8	-5	13	0.3
Non-metallic minerals (2)	26	6	21	0.8
Intermediate metal products (11)	18	3	15	-0.4
Basic chemicals and industrial chemical products (6)	6	4	2	-0.6
Tires, motor vehicle engines and motor vehicle parts (5)	41	6	36	-0.2
Aircraft, aircraft engines and aircraft parts (4)	-10	1	-12	0.1
Metal ores and concentrates (3)	47	36	11	-0.1
Cleaning products, appliances, and misc. goods (3)	-5	1	-5	0.1
Furniture and fixtures (1)	7	3	4	-0.9
Clothing, footwear and textile products (1)	8	6	1	-1.0
Paper and published products (1)	-19	-21	2	-0.6
Fabricated metal products (1)	20	7	13	-0.7
Logs, pulpwood, and other forestry products (0)	182	121	62	-2.5
Industrial machinery, equipment and parts (8)	-1	14	-15	-0.6
Pharmaceutical and medicinal products (2)	10	77	-67	-1.2
Communications and audio and video equipment (1)	-26	4	-30	-2.3
Medium/heavy trucks, buses and other motor vehicles (1)	-23	13	-36	-1.8
Other transportation equipment and parts (1)	-31	1	-32	-3.2
Computers and computer peripheral equipment (1)	0	74	-75	-3.9
Non-metallic mineral products (0)	6	8	-2	-1.4

1/ Figures in paranthese denote the percent nominal share of each product in non-energy goods exports as of 2013Q4.

2/ Model benchmarks are calculated from the fitted export volume of each product over the entire sample period (1986Q1-13:Q4).

Sources: Bank of Canada; Statistics Canada; IMF staff estimates.

**Figure 1. Canada's Non-Energy Exports 1/**  
(Log level, volume, 2007Q1=100)



1/ Dashed lines indicate structural breaks identified using the sequential  $l$  vs.  $l+1$  break point method by Bai and Perron (2003).

Sources: Statistics Canada; IMF staff estimates.

**Figure 1. Canada's Non-Energy Export Elasticity 1/**

(Full Sample: 1986Q1-2013Q4)

**Figure 1. Long-run Non-Energy Export Elasticity 1/**

(Full Sample: 1986Q1-2013Q4)



1/ Each bar indicates the coefficient's 95 percent confidence interval.

Sources: Bank of Canada; Statistics Canada; IMF staff estimates.



Table 2. Long-Run Export Elasticity: Before and After GFC<sup>1/</sup>

	Relative Price		U.S. Bus. Investment		U.S. Consumption		U.S. Gov. Investment		Non-U.S. For. Dmd	
	Before	After	Before	After	Before	After	Before	After	Before	After
<b>Outperformers</b>										
Passenger cars and light trucks	● -0.1	● -5.5	● 1.9	● 0.9	● -2.2	● 14.1	● 7.6	● 34.8	-	-
Intermediate metal products	● 0.2	● 0.2	● -1.3	● 1.2	● 3.2	● 0.6	● -9.8	● 10.0	● -1.6	● -2.0
Tires, motor vehicle engines and motor vehicle parts	● -0.5	● 1.1	● 0.8	● -0.1	● -1.1	● 3.2	● 6.0	● 2.7	● 2.1	● 20.9
Plastic and rubber products	● -0.3	● 0.5	● 0.0	● 0.9	● 1.1	● 0.2	● -0.8	● 4.4	● -0.8	● 1.9
Pulp and paper stock	● -0.4	● 2.1	● 0.8	● -0.4	● -0.9	● 3.5	● 1.5	● 5.1	● 0.6	● 1.9
Furniture and fixtures	● -0.4	● -0.5	● 0.4	● 2.5	● 0.6	● -0.6	● -6.6	● 14.9	● -6.5	● 4.4
Clothing, footwear and textile products	● -0.8	● 0.0	● 0.0	● 1.2	● -1.3	● 1.4	● -2.8	● 12.9	● 2.8	● -0.7
Paper and published products	● -0.4	● -0.5	● 0.2	● 0.8	● -0.4	● -4.2	● 0.4	● 2.8	● -0.9	● 3.4
Logs, pulpwood, and other forestry products	● -0.7	● -0.2	● 1.2	● 0.3	● -1.9	● 5.5	● 29.1	● -2.8	● -2.5	● 2.7
<b>Underperformers</b>										
Industrial machinery, equipment and parts	● -0.4	● -0.9	● -0.8	● 1.8	● 3.3	● -0.3	● -4.3	● 8.4	● -1.8	● -0.7
Aircraft, aircraft engines and aircraft parts	● -2.7	● -0.6	● -1.9	● 0.7	● 1.7	● -1.5	● -3.3	● -0.1	-	-
Medium and heavy trucks, buses and other motor vehicles	● 0.4	● -2.7	● 0.4	● 4.6	● 4.1	● -8.0	● -15.7	● 12.1	-	-
Computers and computer peripheral equipment	● 0.0	● -1.3	● -0.6	● 0.3	● 8.2	● 1.6	● 8.2	● 7.6	● -4.6	● -1.1

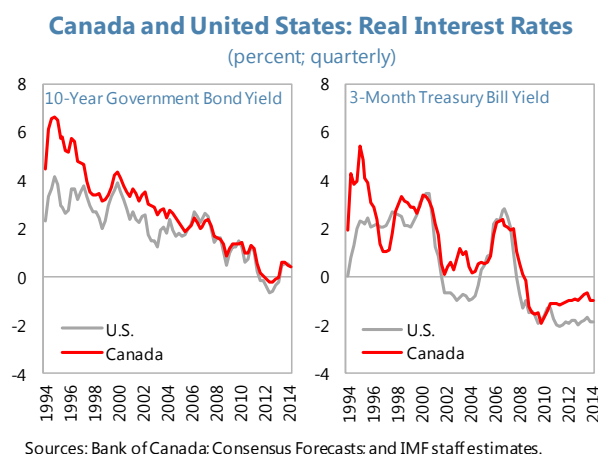
1/ The red/pink and black/gray circles denote positive and negative elasticity, respectively.

Sources: Bank of Canada; Statistics Canada; IMF staff estimates.

# NEUTRAL RATE OF INTEREST IN A SMALL OPEN ECONOMY: THE CASE OF CANADA<sup>1</sup>

## A. Context and Motivation

**1. Real interest rates in Canada, as elsewhere in the world, have been low for a remarkably long period of time.** Current low interest rates are the result of cyclical and trend (i.e., structural) factors. Global factors—such as higher savings in emerging market economies and increased demand for safe assets—are largely responsible for the trend decline in interest rates (e.g., IMF, 2014; Mendes, 2014; Wilkins, 2014). Cyclical factors such as slow growth in advanced economies and lower investment rates have also contributed to keeping global demand for funds low since the global financial crisis. In Canada, real long-term rates averaged just  $\frac{3}{4}$  percent in 2008–14, and short-term rates have been in negative territory since end-2008 (Chart). Also, with remarkably stable inflation expectations, anchored at the Bank of Canada’s target rate of 2 percent, the dynamics of real and nominal rates coincide.



**2. The unprecedented global low interest rate environment challenges the evaluation of the appropriate monetary policy stance.** More specifically, given low global real rates, it is harder to assess the degree of accommodation (tightness) of their monetary policy stance. The present Selected Issues Paper will try to answer the following questions for the case of Canada:

- How much monetary accommodation is currently present in the economy in light of secular trends in interest rates and cyclical conditions?
- Looking forward, conditional on the US monetary policy normalization, how much policy accommodation will be present in the economy given current policy rate projections?

To shed light on the above questions we introduce and estimate the *neutral* (natural) interest rate for Canada, which is the most direct benchmark to assess monetary policy conditions.<sup>2</sup> In particular,

<sup>1</sup> Prepared by Andrea Pescatori (WHD).

<sup>2</sup> We will use the terms *neutral* and *natural* rate of interest interchangeably even though it is not appropriate to associate the term ‘neutral’ to an allocation of resources. This subtle difference between the two terms is, however, immaterial in the current context.

assessing the degree of monetary policy stimulus is important to appropriately balance current and expected costs and benefits of the monetary policy stance.

**3. A neutral rate of interest is a useful benchmark against which to assess a country's monetary policy stance.** We define the neutral rate as the short-maturity (real) interest rate such that any (real) policy rate below (above) the neutral rate implies that the central bank is stimulating (restraining) the economy relative to its *natural* course—i.e., a course that is affected only by *non-monetary factors* in absence of rigidities related to the existence of money. It is also useful to think of the neutral rate as determined by a mean-zero cyclical factor and a slow moving trend—both of them affected by non-monetary factors. Indeed, various non-monetary factors that influence the business cycle will also affect the cyclical component of the neutral rate (see next section).

**4. Our analysis finds that monetary policy in Canada has generally been quite accommodative in the post-recession period and the neutral interest rate is expected to increase smoothly towards its long-term value as U.S. monetary policy normalizes.** More precisely, the current neutral rate plus inflation is estimated to be between 1¾ and 2½ percent and expected to converge to between 3–4 percent over the medium term.<sup>3</sup>

The rest of the paper is divided as follows: Section B will define the concept of the natural rate, Section C describes the model and methodology, Section D presents and interprets the results, and Section E concludes.

## B. The Neutral Rate of Interest

### Definition

**5. Estimates of neutral interest rates help central banks think about monetary conditions and how to communicate them.** Since neutral interest rates are unobservable and difficult to estimate precisely, they are best thought of as providing a useful conceptual framework for thinking about monetary policy (Chetwin and Wood, 2013). In this regard, it is helpful to distinguish between a short-term cyclical component and the longer-term component of the neutral rate.

**6. In the short term, the neutral rate varies with the cycle.** Following the New Keynesian tradition, the neutral rate is defined as the one prevailing in absence of nominal rigidities and other frictions associated with the existence of money.<sup>4</sup> In other words, the neutral rate is affected by all

<sup>3</sup> This range for medium-term neutral rates is in line with the Bank of Canada's estimates obtained using several different approaches (see Mendes, 2014).

<sup>4</sup> The natural rate is best described by the following popular citation: "There is a certain rate of interest on loans which is neutral in respect to commodity prices [...] This is necessarily the same as the rate of interest which would be determined by supply and demand if no use were made of money and all lending were effected in the form of real capital goods" (Wicksell, 1898).

shocks that are deemed non-monetary (i.e., real shocks) such as technology shocks, time preference shocks (which may capture demographic shifts), and external shocks. For example, even in the absence of money, a demand shock—possibly induced by expectations of higher income growth due to faster technological progress in the near future—may increase demand for funds and, in turn, the neutral rate. The advantage of keeping track the neutral rate over the cycle is that it can be used to gauge the monetary policy stance on a high-frequency basis. It may also be useful to assess how much stimulus is present in the economy when nominal interests are constrained by the zero lower bound.<sup>5</sup>

**7. Over the medium to long term, the neutral rate is the real policy rate consistent with output at its potential level and stable inflation.** Over the long term, we expect the neutral rate to be determined solely by its trend component which is the rate prevailing after the effects of all cyclical shocks have dissipated. Some authors have defined the neutral rate as just its trend component (e.g., Mendes, 2014). The advantage of this definition might be in terms of communication with the public and in part methodological. The two concepts, however, are clearly complementary. In the current paper we will focus on the first but we use knowledge from IMF (2014) and Mendes (2014) to calibrate the range of where the neutral rate is expected to be in the long term.

**8. A simple illustration.** Formally, we can write the neutral rate as follows:

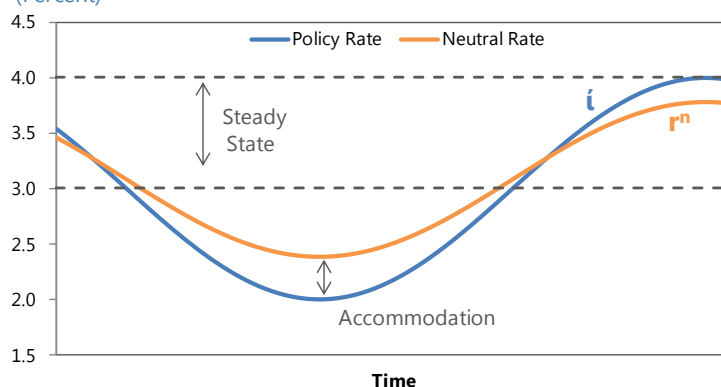
$$r_t^n = \rho_t + r_t^{n,c},$$

where the first term is a slow moving process or drift term while the second term is a mean-zero cyclical process. A monetary policy rule could be expressed as:

$$i_t = \bar{\pi} + r_t^n + \varphi_\pi(\pi_t - \bar{\pi}) + \varphi_x x_t$$

where the short-term policy rate responds to inflation's deviation from target ( $\pi_t - \bar{\pi}$ ) and the output gap  $x_t$ , and moves one-to-one with the

**Neutral Rate and Policy Rate**  
(Percent)



<sup>5</sup>In relation to the literature, the most recent work that similarly adopts our definition of the neutral rate is Barsky and others (2014) for the United States. A seminal contribution, even though it relies on a more reduced-form backward-looking approach, is Laubach and Williams (2003).

natural rate,  $r_t^n$ . Over the cycle, monetary policy can turn out to be tight,  $i_t > \bar{\pi} + r_t^n$ , even though the policy rate is below its long-term value  $i_t < \bar{\pi} + \rho_t$  (Chart).<sup>6</sup> Finally, in the presence of a trade-off between inflation and output gap stabilization, setting the policy rate to the neutral rate  $i_t = \bar{\pi} + r_t^n$  in general is not an optimal choice.<sup>7</sup> In other words, the optimal policy rate may deviate from the neutral rate over the cycle depending on the state of the economy.

## C. Methodology

We perform a Bayesian estimation of a small open economy (SOE) model (Adolfson and others 2014, and Justiniano and Preston, 2010) using Canadian and U.S. data. For parsimony, the model abstracts from the commodity sector.<sup>8</sup>

**9. The model economy.** The core model has non-commodity tradable consumption and investment goods that can be imported from (and exported to) the United States. Capital and labor are factors into the production function; capital accumulation is subject to investment adjustment costs.<sup>9</sup> Four Phillips curves capture nominal rigidities in wages, domestic prices, import prices, and export prices which result in relative price dispersion. The central bank responds to lagged interest rates, 1-year ahead expected CPI inflation and to a weighted average of the model-consistent output gap and the Bank of Canada's estimate of the output gap.<sup>10</sup> Financial capital is perfectly mobile, the exchange rate is free to adjust, and a home and foreign bond can be traded globally.

**10. The natural equilibrium is defined as the one where prices and wages are free to adjust.** A trend growth shock (a combination of a labor augmenting and investment-specific technology shock), a time preferences shock, shocks to U.S. variables' block, and shocks to expectations to export demand and investment profitability (news shocks) are deemed *fundamental* shocks and, thus, affect the actual and the natural equilibrium alike. News shocks affect expectations on export demand and the profitability of investment up to 4 quarters ahead.<sup>11</sup>

<sup>6</sup> This is particularly useful to understand the U.S. Federal Reserve's decision to embark on unconventional monetary policy measures in the aftermath of the crisis: even though interest rates were at historically low levels, there was the clear perception that monetary policy was actually tight on the base of a substantially negative neutral rate.

<sup>7</sup> Indeed, having the policy rate equal to the (nominal) neutral rate is a necessary but not sufficient condition for having *both* inflation and output gap stabilized around their desired levels.

<sup>8</sup> A detailed description of the model and its estimation is available from the author upon request.

<sup>9</sup> Physical capital and labor can be freely reallocated across firms.

<sup>10</sup> The introduction of the Bank of Canada's output gap reduces the risk that misspecification in the determination of the output gap affects the monetary policy reaction function.

<sup>11</sup> See Jaimovich and Rebelo (2009), among many, for a description of the role of news shocks in driving business cycle.

**11. Habit formation, uncovered interest parity, and new shocks have a major role in the framework.** The core behavioral equations (common to both the actual and natural equilibrium) relates the real interest rate of maturity  $j$  to the time-preference shock  $\xi$  and expected growth in household consumption,  $c$ . Habit formation, captured by the parameter  $h$ , implies that consumption accelerations (rather than increases) positively affect the real rate in the short run (Campbell and Cochrane, 1999):<sup>12</sup>

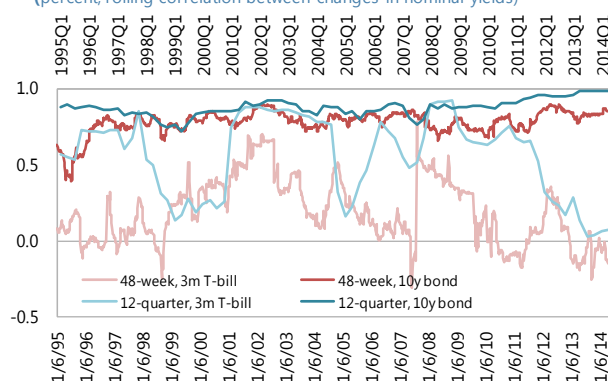
$$r_t^j = (1 - \rho^j)\xi_t + \frac{E_t \Delta^j c_{t+j}}{1 - h} - h \frac{E_t \Delta^j c_{t+j-1}}{1 - h}$$

The stationary but persistent exogenous process  $\xi$  captures slow movements in the neutral rate. Over the balanced-growth-path the neutral rate has a one-to-one relation with consumption growth. Domestic and foreign interest rates are linked through uncovered interest parity conditions, holding at 3-month and 1-year horizons. Expressed in real terms we have:

$$r_t^j = r_t^{j,US} + E_t \Delta^j e_{t+j} + \epsilon_t,$$

where  $\Delta^j e_{t+j}$  is the bilateral real exchange rate depreciation over the bond maturity period and  $\epsilon_t$  is a non-fundamental shock. This formulation allows U.S. interest rates to exert a strong effect on Canadian interest rates, consistent with stylized facts (Chart). Finally, news shocks that affect export demand and investment profitability allow us to gauge the degree of pessimism (optimism) present in the economy relative to the smaller information set available to the rational expectations agent in the model.

**Correlation between Canadian and U.S. Interest Rates**  
(percent; rolling correlation between changes in nominal yields)



Sources: Bank of Canada; and IMF staff estimates.

**12. The empirical strategy:** We first estimate the exogenous U.S. block, which is summarized by a 4-variable VAR(2) in GDP growth, CPI inflation, the Fed Funds rate, and the 1-year Treasury bill real yield. We then proceed to estimate the parameters of the exogenous processes and some of the parameters of the core model by Bayesian methods. Finally, we back up the *smoothed* estimates of the neutral rate (and other non-observable variables) using the Kalman filter.<sup>13 14</sup>

<sup>12</sup> A balanced-growth path requires using an inter-temporal elasticity of substitution of one.

<sup>13</sup> The smoothed estimate of a variable  $x$  exploits all the available information in the sample; it is, thus, given by  $E_T x_t$  for  $t = 1, \dots, T$ .

<sup>14</sup> The Canadian observable variables are the 3-month Treasury bill yield, CPI inflation, 1-year inflation expectations, GDP growth (excluding inventories, natural gas and oil), business investment growth, and non-energy export growth.

## D. Main Results: Assessing Monetary Policy Stance and the Determinants of the Neutral Rate

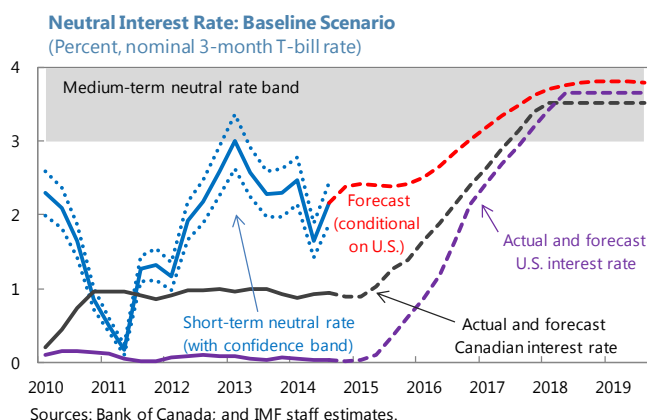
### 13. In the post-crisis period

#### monetary policy has been

#### substantially accommodative.

The neutral rate dropped dramatically during the global recession in 2009. However, it recovered quickly alongside growth prospects in the aftermath of the crisis. Overall, monetary policy has been quite accommodative from 2010 to today as highlighted by the average interest rate gap over the period being

-0.9 percent per quarter.<sup>15</sup> Only for a short period in 2011 did the interest rate gap record positive values. The neutral rate has remained strictly positive throughout this period, consistent with the fact that the zero lower bound on the policy rate has not been an issue in Canada during the recovery. In the last 3 quarters the interest rate gap has been below -1 percent, suggesting continued accommodation in the Bank of Canada's policy stance.



**14. The export sector has negatively affected the neutral rate until recently.** Weak non-energy exports reduced the neutral rate on average during the recession and post-recession period mainly through weak investment and labor demand, which, in turn, have negatively affected household income prospects. In particular, prospects of a strong export recovery were disappointed in 2010, and expectations turned pessimistic in 2011 before recovering by the end of the year. Export expectations turned again pessimistic, on average, between the end of 2012 and early 2014; especially before recovering sharply on the backdrop of a surprise contraction of U.S. GDP in 2014Q1 (Chart).<sup>16</sup>

**15. Perceived low investment profitability has negatively affected the neutral rate.** After a quick turnaround at the end of the recession, labor productivity and, especially, the investment-specific shock (which drives investment profitability) have been underperforming until recently, reducing the demand for funds and, thus, preventing the natural rate from rising. In particular, news shocks to investment profitability turned particularly overly pessimistic by the end of 2011 even though labor productivity has been slowly improving.

<sup>15</sup> From a normative standpoint, Poloz (2014) argues that in the absence of this significant monetary stimulus in both Canada and the United States the output gap would have widened substantially.

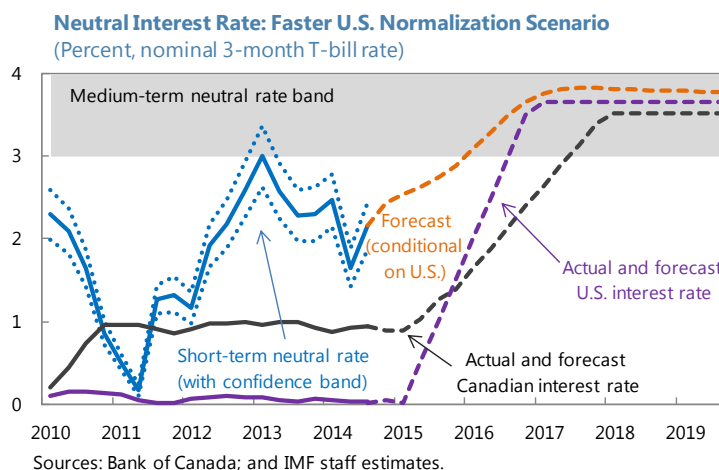
<sup>16</sup> Non-energy export expectations are a combination of the 4-quarter ahead U.S.-VAR forecast and news shocks on export demand.

**16. U.S. real rates have a strong influence on the Canadian neutral rate.** A typical<sup>17</sup> 100 basis point (bps) permanent increase in the (short-term) U.S. real rate translates into about a 50 bps increase in the neutral real rate over one year, and 100 bps over the long run, by assumption.<sup>18</sup>

**17. Looking forward, the neutral rate is expected to slowly converge to about 3.5 percent by the end of 2017.**

Conditional on the U.S. Fed Funds rate that begins increasing in September 2015 and converges to 3.75 percent in 5 years, the Canadian neutral rate will start

increasing by the end of 2015, crossing 3 percent in the second half of 2016. The Canadian neutral rate is quite sensitive to the U.S. interest rates. Indeed, if U.S. rates converged faster, two years earlier in 2016, the neutral rate in Canada would cross 3.5 percent already in 2016 (Chart).



## E. Conclusions

**18. A substantial degree of monetary policy accommodation is currently present in the Canadian economy.** Estimates of the short-term neutral rate for Canada suggest that monetary policy has been very supportive of the economy during the post recession period on average. Current estimates indicate the policy rate is more than one percent below the neutral rate, suggesting that a large degree of monetary policy accommodation is present in the economy.<sup>19</sup>

**19. Disappointing non-energy exports and labor productivity have been the main domestic factors that have kept the neutral rate low in recent years.** Excessively pessimistic expectations on non-energy exports and on investment profitability and disappointing labor productivity performance have prevented the neutral rate from rising substantially in the post-recession period and have prevented monetary policy from becoming too accommodative.

<sup>17</sup> We do not identify U.S. shocks specifically, so movements in U.S. rates will come along with the typical movements in output and inflation.

<sup>18</sup> In the short run, exchange rate movements and the shock to the UIP allow Canadian and U.S. interest rates to deviate. In the long-run, however, the exchange rate is assumed to be constant. An interest rate differential arises only because of a non-zero, long-run net-foreign-asset position.

<sup>19</sup> The estimates of the neutral rate abstract from the contribution of the oil sector to output growth which would likely mildly underestimate (overestimate) the neutral rate during the oil boom (bust) periods.



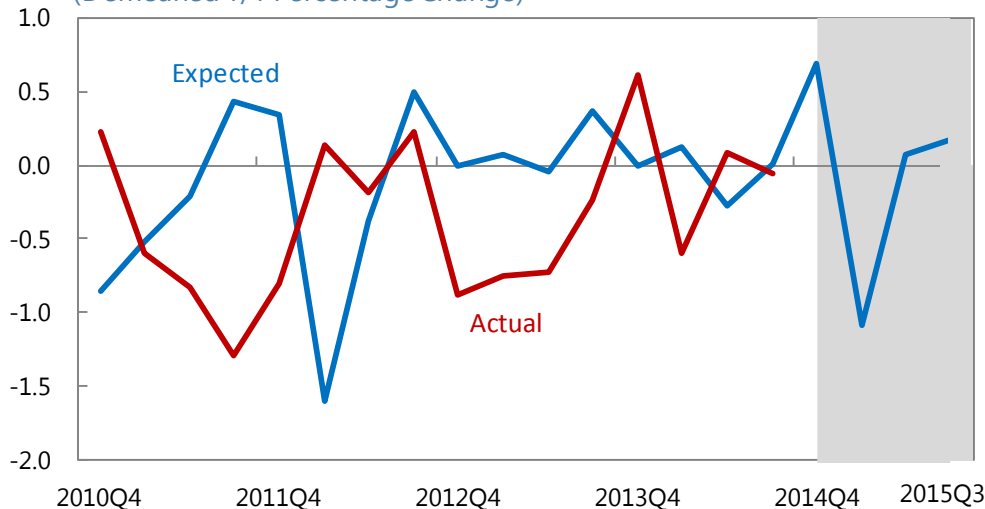
**20. U.S. monetary policy is key to understanding future developments in the Canadian neutral rate.** Looking forward, conditional on the projected U.S. monetary policy rate path, the neutral rate is expected to start increasing toward the end of 2015 toward its long-term level.

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## Appendix 1. Figures

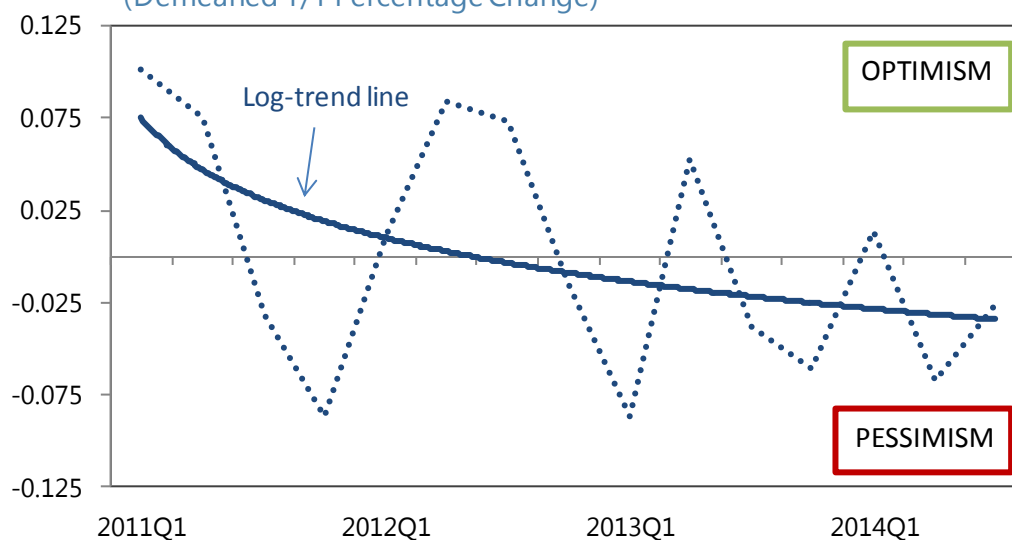
**Actual vs. Expected 1-Year Ahead Non-Energy Export Demand**  
(Demeaned Y/Y Percentage Change)



Sources: Bank of Canada; and IMF staff estimates.

1 year ahead export demand index expectations (Blue line) vs actual export demand index realizations (red line). The export demand index is a combination of U.S. GDP growth and an exogenous AR(1) process with news shocks. Forecasts of U.S. GDP growth comes from the U.S. VAR block.

**1-Year Ahead Investment Profitability Perception**  
(Demeaned Y/Y Percentage Change)



Sources: Bank of Canada; and IMF staff estimates.

Values above (below) zero represents positive (negative) 1-year ahead news shocks on investment specific technology process. The blue line is a log-trend line.

## Appendix 2. Data and Definitions

### Canadian Variables

Nominal interest rate – Average 3-month treasury bill yield.

Inflation – Headline CPI.

Inflation Expectations – Year over year change of one-year ahead consumer price inflation.

GDP – Real gross domestic product at market prices excluding inventories, exports of natural gas, and exports of crude oil and bitumen.

Investment – Business gross fixed capital formation.

Consumption – Household final consumption expenditure excluding consumption of durable goods.

Government Spending – General government final consumption expenditure.

Output Gap – Bank of Canada production function output gap.

### U.S. Variables

U.S. Inflation – Headline CPI.

U.S. Nominal Interest Rate – Average 3-month treasury bill yield.

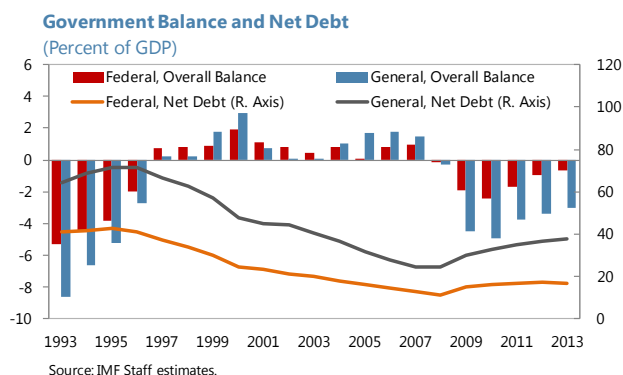
U.S. Real Interest Rate – Cleveland Federal Reserve 1-year real interest rate.

# ANCHORING SUSTAINABLE FISCAL POLICY: A NEW FISCAL RULE IN CANADA<sup>1</sup>

*There has recently been some debate in Canada on introducing a fiscal rule to better anchor fiscal policy and strengthen the medium-term fiscal framework at the federal level. Drawing on international experience in the design of fiscal rules, particularly in federal nations, this paper: (i) presents options for a fiscal rule framework; and (ii) highlights essential design features for an effective implementation of the new rule. While the mere introduction of fiscal rules is not a panacea, the paper suggests that a well-designed expenditure rule combined with a debt-based anchor could constitute a sensible option as it provides an operational instrument in ensuring convergence towards a debt objective while encouraging counter-cyclical fiscal policies. With respect to budget balance rules which are the most common and also being considered in Canada, defining them over a longer time horizon (three or seven years) tends to increase their flexibility and reduce their procyclicality.*

## A. Why a Fiscal Rule for Canada?

**1. Successful fiscal consolidation and remarkable fiscal discipline since the 1990s led to a sizeable decline of Canada's public debt until the 2008 financial crisis.** From 1991 to 1996, the Federal Spending Control Act limited all program spending except self-financing programs. In 1998, the debt repayment plan set out a "balanced budget or better" policy. This rule-based approach helped anchor fiscal policy and led to a sizeable decline in public debt (Chart). However it was not a legislated fiscal rule and was discontinued in 2006. The 2008 financial crisis led to a return of large deficits and debt accumulation but fiscal consolidation efforts since 2011 have made significant progress in returning towards budget balance, especially at the federal level.



**2. The authorities are considering the introduction of a legislated fiscal rule at the federal level.** To lock in the gains from recent consolidation efforts and preserve fiscal sustainability in face of still significant global risks, the federal government announced its intention to "enshrine in law its successful and prudent approach." The Speech from the Throne opening the second session of the 41st Parliament in October 2013 announced the Government of Canada's intention to introduce

<sup>1</sup> Prepared by Tidiane Kinda (FAD). Tafadzwa Mahlanganise and Rania Papageorgiou provided excellent research assistance.

balanced-budget legislation<sup>2</sup>. While the mere introduction of fiscal rules is not a panacea (IMF, 2009), this is of a particular interest at the current juncture as the federal government is approaching its balanced budget target, and questions arise about Canada's overall fiscal stance going forward amid still-pressing fiscal challenges at the provincial level.

The rest of this paper presents international experience with fiscal rules (Section II), analyzes options for a fiscal rule framework in Canada (Section III), and discusses essential design features to support a new rule (Section IV).

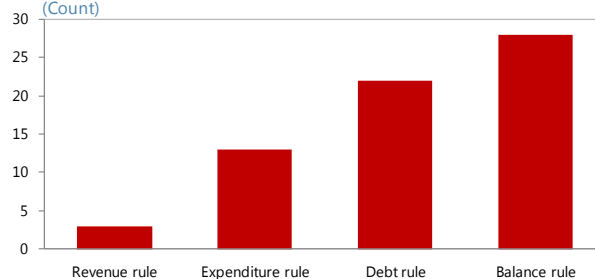
## B. Experience with Fiscal Rules in Advanced Economies

### Which Fiscal Rules Are in Place?

#### 3. Fiscal rules can be grouped into three main categories depending on their objectives.<sup>3</sup>

- Budget balance rules are the most common rules in advanced economies (Charts). They are present in 28 advanced economies, including five federations.<sup>4</sup> These rules can support debt sustainability, help with economic stabilization, and are relatively easy to monitor and implement depending on their specification (overall balance, primary balance, structural balance, etc.). Structural balance rules account for economic shocks, such as cyclical and/or commodity price fluctuations for commodity exporters, enhancing the economic stabilization role of fiscal policy. However, inherent uncertainties in estimating output and commodity price gaps make these rules difficult to monitor and communicate.

Number of Countries with Fiscal Rules, 2013 <sup>1/</sup>  
(Count)



<sup>1/</sup> Advanced economies with national and supranational rules.  
Source: IMF Staff estimates.

Number of Federations with Fiscal Rules, 2013 <sup>1/</sup>  
(Count)



<sup>1/</sup> Federal advanced economies with national and supranational rules.  
Source: IMF Staff estimates.

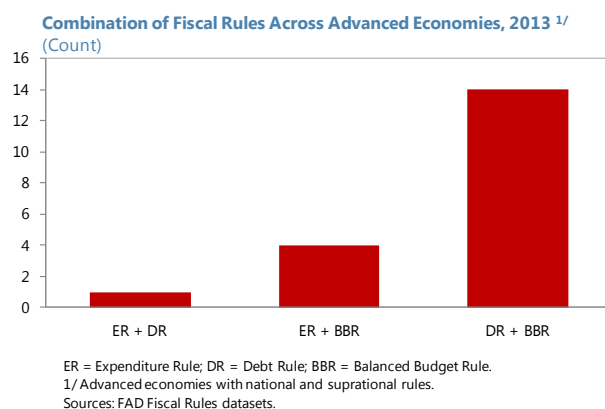
<sup>2</sup> The balance-budget legislation plans to "require balanced budgets during normal economic times, and concrete timelines for returning to balance in the event of an economic crisis" <http://www.speech.gc.ca/eng/full-speech> and Cameron (2014).

<sup>3</sup> We will not discuss revenue rules that are less common and essentially target the size of the government by boosting revenue collection or precluding an excessive tax burden.

<sup>4</sup> Federal advanced economies in this paper include: Australia, Austria, Belgium, Canada, Germany, Switzerland, and the United States.

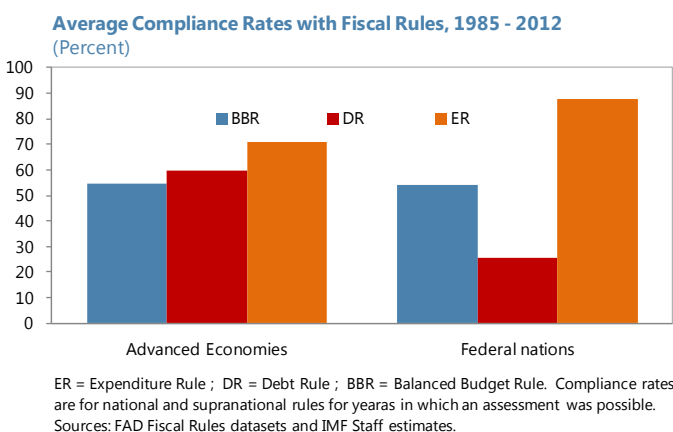
- Debt rules are the second most common rules in advanced economies (22 countries, including four federations). These rules are theoretically the most effective rules in ensuring convergence to a debt target and they are easy to communicate. However, debt rules do not provide short-term guidance for fiscal policy because policy slippages and budgetary measures impact debt ratios with a lag. An additional operational challenge with debt rules is the difficulty of setting the appropriate debt target or objective.
- Expenditure rules, usually defined as caps to nominal spending or real expenditure growth, are the third most common rules in advanced economies. Relatively easy to monitor and communicate, these rules are present in 13 advanced economies, including three federations (Australia, Germany, and the United States). Expenditure rules can also enhance the stabilization role of fiscal policy by constraining spending during booms, when windfall revenues, particularly commodity-related revenues, are temporarily high, but allowing tax revenues to adjust to cyclical or discretionary changes during downturns. While most cyclically-sensitive items are on the revenue side, expenditure rules could potentially constraint automatic stabilizers on the spending side (e.g., unemployment benefits) during downturns. Excluding cyclically-sensitive expenditures from target variables is often discussed as a solution but this may complicate monitoring. By setting spending levels, expenditure rules can also provide operational guidance in choosing fiscal targets. However, expenditure rules alone do not provide a direct anchor for debt sustainability.

**4. Because of the trade-offs across different rules with respect to their properties, many countries have combined elements of various fiscal rules.** To minimize the gaps associated with each specific rule, the most common combinations among advanced economies associate a balance budget rule with a debt rule or an expenditure rule (Chart). Only Australia combines an expenditure rule with a debt anchor.



## How Has Compliance Been with Fiscal Rules?

**5. Spending-based rules tend to be associated with effective control as countries comply more often with expenditure rules than with other rules.** Drawing from Cordes and others (2014), this section assesses countries' compliance rate with respect to the three main types of fiscal rules. The analysis highlights that, across advanced economies, expenditure rules have a better compliance record than budget balance and debt rules



(Chart). The higher compliance rate of expenditure rules is even more striking when focusing on federal nations. Indeed, federal nations have complied with their expenditure rules close to 90 percent of the time. This higher compliance rate of expenditure rules is consistent with the fact that they are easy to monitor and immediately enforceable through the annual budget. In opposite to the budget balance and debt rules that are more exposed to shocks out of the government's control (interest rate-growth differential, realization of contingent liabilities, etc.), expenditure rules are more directly connected to instruments effectively under the policymakers' control.

## C. Which Fiscal Rule Framework for Canada?

### Key Considerations

6. **An appropriate fiscal rule framework should address the need for short-term stabilization while ensuring long-term fiscal sustainability.** Given the importance of natural resources for the Canadian economy, the design of a fiscal framework needs to internalize the higher likelihood of amplified business cycle that could stem from commodity price fluctuations. Balanced budget rules for headline fiscal balances are relatively simple and easy to communicate but can lead to procyclical fiscal policies. Among existing fiscal rules, the structural balance and expenditure rules better accommodate business cycle fluctuations by enabling automatic stabilizers to function. The technical complexity associated with the structural balance rule has, however, raised serious concerns for its implementation, including in Europe where this rule constitutes a centerpiece of the fiscal surveillance framework (Eyraud and Wu, 2014). Expenditure rules, on the other hand, allow a full play of automatic stabilizers on the revenue side and are relatively simple to implement.
7. **A broader issue with expenditure-based rules is that they do not provide an anchor for long-term fiscal policy.** While expenditure rules provide a proper operational target for fiscal policy in the short term, they do not offer a longer-term anchor. Expenditure rules are often directly related to the formulation of the annual or multi-year budget. These rules directly target expenditure pressures, often at the origin of excessive deficits, but still have a weaker link to debt sustainability than other rules with a broader coverage of fiscal aggregates (budget balance or debt rules).
8. **Combining a short-term operational target with a long-term anchor could be a sensible option for Canada.** A hybrid fiscal rule in a federal nation, the Swiss "debt brake," has attracted a lot of attention thanks to its successful implementation. This arrangement combines an explicit correction mechanism through which the rule's operational target (expenditure) is adjusted to reflect developments in the anchor (structural balance). Operationally, the Swiss "debt brake" implies that deviations from the structural balance target are recorded in an "amortization account" and need to be eliminated through spending cuts (Kinda and others, 2013). While fulfilling many criteria of an adequate rule, the Swiss type "debt brake" relies on the structural balance, which as explained above is a potential drawback because of the uncertainty in measuring the output gap.



**9. A valuable alternative to the Swiss-type rule would be an expenditure rule anchored in a debt objective** (Debrun, Epstein, and Symansky, 2008). Such combination would also be consistent with the authorities' objective to reduce their debt-to-GDP ratio in the medium-term and contain spending, as put forward in the 2013 Speech from the Throne and confirmed in subsequent budgets. The new rule would trigger a correction (via spending) when debt deviates from a defined desirable debt path. By not relying on a measure of the business cycle, the proposed rule would be relatively simple and easy to communicate. It would also foster economic stabilization by preventing pro-cyclical spending during booms and encouraging the use of revenue windfalls for debt reduction. The rule would include three key elements: (i) a specific debt path (debt norm) leading to the medium or long-run debt objective; (ii) medium-term expenditure caps consistent with the deficits derived from the debt norm; and (iii) a debt-feedback or error-correction mechanism (ECM). In implementing the rule, the government will: (i) first define a desirable path for debt and a date to reach a debt target; and (ii) every three years set annual nominal growth ceilings for total government spending that are binding and met every single year to ensure a constant reduction in debt (given reasonable revenue forecasts). The ECM will imply progressive elimination of past deviations when expenditure ceilings are revised at the end of each planning horizon (see Box 1 for a conceptual framework of the expenditure rule with a debt-based ECM).<sup>5</sup>

### Simulated Properties of Alternative Fiscal Rules

**10. This section assesses the performance of five alternative fiscal rules at the federal level for Canada:** (i) an annual balanced budget; (ii) a balanced budget over three years; (iii) a balanced budget over seven years; (iv) a debt-based ECM with a constant error-correction parameter; and (v) a debt-based, non-linear ECM with a variable correction parameter that increases with positive deviations from the debt norm and decreases with negative deviations. The first fiscal rule option targets a balanced budget every single year while options (ii) and (iii) allow for positive and negative deviations (up to ½ percent of GDP) that are corrected within three years (option ii) or seven years (option iii). Consistently with the authorities' objective, the path under our assumed debt norm would reduce the federal government gross debt ratio in the medium term.<sup>6</sup>

**11. The performance of the selected fiscal rules is assessed under three scenarios: a baseline and two deterministic shock scenarios.** Under the baseline, nominal growth is assumed to converge to its potential of 4½ percent in 2018, closing the output gap. The first shock scenario assumes a positive output shock. Under this scenario, the output gap widens in 2016 and reaches 4¾ percent of potential GDP in 2018, before gradually converging to zero. The second shock

<sup>5</sup> Large deviations of actual debt from the norm could also trigger revisions of the spending ceilings before the end of the normal three-year planning horizon.

<sup>6</sup> The path under our assumed debt norm would reduce debt-to-GDP to around 20 percent of GDP by 2020, a slightly lower debt ratio than under the authorities' plans.

scenario is a boom-bust cycle, relatively common with commodity price fluctuations, where the output gap first increases in 2016 and reaches  $4\frac{3}{4}$  percent of potential GDP in 2017, then drops to  $-6\frac{3}{4}$  percent in 2021 before closing by 2023. All simulations are performed under a partial equilibrium approach.<sup>7</sup>

**12. The assessment of the relative performance of each fiscal rule is based on its properties for debt reduction along the debt norm and economic stabilization (cyclicality).**

The root mean squared deviation (RMSD) from the debt norm captures the flexibility of each fiscal rule option while the mean deviation from the norm and the deviation from the norm in 2020 capture the precision in hitting the debt objective. The cumulative procyclical impulses over the period 2016–20 capture the procyclicality associated with each fiscal rule option. Cumulative procyclical impulses correspond to improvements in the primary balance during bad times, and deteriorations of the primary balance in good times.<sup>8</sup> A higher indicator corresponds to a more procyclical rule with negative number indicating that fiscal impulses have been countercyclical during the period.

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<sup>7</sup> There is no feedback from fiscal to output in the simulations.

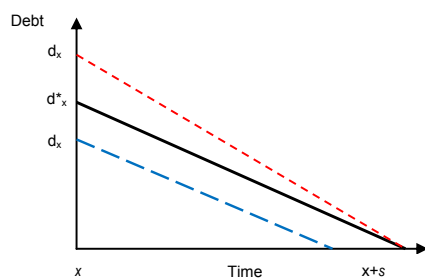
<sup>8</sup> Bad (good) times are defined as period when actual growth is below (above) its potential.

### Box 1. A Conceptual Framework for an Expenditure Rule with a Debt-Based Error Correction Mechanism

Following Debrun and others (2008), the debt brake approach illustrated below relies on two main components: an anchor and an operational target. The anchor is a specific debt path (debt norm) leading to the government's long-run debt objective. The operational target (or implementation tool) is a set of expenditure ceilings that are consistent with the deficits underlying the debt norm. Assuming a planning period of  $s$  years (we assume three years in the simulations), the government should set (at the end of year  $x$ ) nominal expenditure ceilings for each year between  $x+1$  and  $x+s$ .

- If actual debt is below the defined normative debt path  $\{\mathbf{d}_\tau^*\}_{\tau=t_0}^T$ , that is if  $(\mathbf{d}_x \leq \mathbf{d}_x^*)$ , but above the long-run debt objective of the government ( $\mathbf{d}^0$ ), the government should define expenditure ceilings that preserve the margin with respect to the norm and aim at reducing debt at a similar pace as the norm (see figure).
- If actual debt is above the norm ( $\mathbf{d}_x > \mathbf{d}_x^*$ ), expenditure ceilings should be defined to ensure a faster reduction in debt during  $s$  years (along a transitional path  $\{\mathbf{d}_\tau^{**}\}_{\tau=x}^{x+s}$  but not an over correction:  $|\Delta_{x+1, x+s} \mathbf{d}_t^*| < |\Delta_{x+1, x+s} \mathbf{d}^{**}| \leq |\mathbf{d}_{x+s}^* - \mathbf{d}_x|$ .

#### Illustrative Paths: Norm and Actual Debt



The required debt reduction could take the following functional form:

$$\Delta_{x+1, x+s} \mathbf{d}^{**} = \begin{cases} \Delta_{x+1, x+s} \mathbf{d}^* - \lambda_x (\mathbf{d}_x - \mathbf{d}_x^*), & \text{if } \mathbf{d}_x > \mathbf{d}_x^* \text{ and } \mathbf{d}_{x+1} < \mathbf{d}_x^* \text{ or if } \mathbf{d}_{x+1} = \mathbf{d}_x^* \\ \Delta_{x+1, x+s} \mathbf{d}^*, & \text{if } \mathbf{d}_x \leq \mathbf{d}_x^* \text{ and } \mathbf{d}_{x+1} < \mathbf{d}_x^* \end{cases}$$

with  $\lambda_x = \lambda_0 + \lambda(\mathbf{d}_x - \mathbf{d}_x^*)$  and  $0 < \lambda_x < 1$ . The adjustment speed  $\lambda_x$  is set to increase with the actual deviation from the norm but remains below 1, implying that deviations are not fully corrected within a year and the required fiscal efforts do not lead to excessive adjustment.

### Box 1. A Conceptual Framework for an Expenditure Rule with a Debt-Based Error Correction Mechanism (concluded)

This mechanism yields to a downward trend in the debt ratio as long as debt is above the government's long-run debt objective ( $\mathbf{d}^0$ ). When debt becomes lower than the government's long-run debt objective, the symmetry in the error correction mechanism can be restored, allowing for more expenditure growth under the fiscal rule framework.

The expenditure ceilings can be defined in nominal terms as:

$$\begin{cases} \bar{\mathbf{G}}_{x+1} = [\tau_{x+1} - \mathbf{b}_{x+1, x+s}^*] \mathbf{E}_x \mathbf{Y}_{x+1}, \\ \vdots \\ \bar{\mathbf{G}}_{x+s} = [\tau_{x+s} - \mathbf{b}_{x+1, x+s}^*] \mathbf{E}_x \mathbf{Y}_{x+s} \end{cases}$$

with  $E_x$  representing the expectation operator conditional on information available at the end of year  $x-1$  and  $\mathbf{b}_{x+1, x+s}^*$  the required annual budget-balance over the planning horizon  $[x+1; x+s]$  to achieve the targeted debt reduction  $\Delta_{x+1, x+s} \mathbf{d}^{**}$ .  $Y$  represents the nominal GDP and  $\tau$  the revenue to GDP ratio. Alternative formulations of the expenditure rule include a cap on nominal expenditure growth consistent with  $\bar{\mathbf{G}}_{x+1}, \dots, \bar{\mathbf{G}}_{x+s}$ .

The budget-balance can be expressed as:

$$\mathbf{b}_{x+1, x+s}^* = \left[ \frac{(1+g)^{-(s+1)} - 1}{\sum_{j=0}^s (1+g)^{-(s-j)}} \right] \mathbf{d}_x - \Delta_{x+1, x+s} \mathbf{d}^{**}$$

with  $g$  representing a constant predicted nominal GDP growth rate.

While expenditure ceilings are normally set for  $s$  years to allow for automatic stabilizers on the revenue side, they require certain flexibility. Setting a maximum deviation from the debt norm beyond which tighter expenditure ceilings are defined is critical to prevent excessive deviation from the debt norm.<sup>1</sup> If  $m > 0$  represents the maximum deviation under the debt norm, a new set of expenditure ceilings covering the years  $k+1$  to  $k+3$  ( $k \in [x+1; x+3]$ ) should be defined if  $\mathbf{d}_k > \mathbf{d}_k^* + \mathbf{m}$ . Exceptional circumstances such as a well-defined large economic contraction or a natural disaster should be accommodated through revisions of expenditure ceilings and if need be the debt norm.

<sup>1</sup> Setting a maximum deviation of about 5 to 10 percent of GDP to avoid significant contractions in bad times would be a sensible choice but this remains a matter for discussion. The framework does not account for the potential impact of fiscal multipliers.

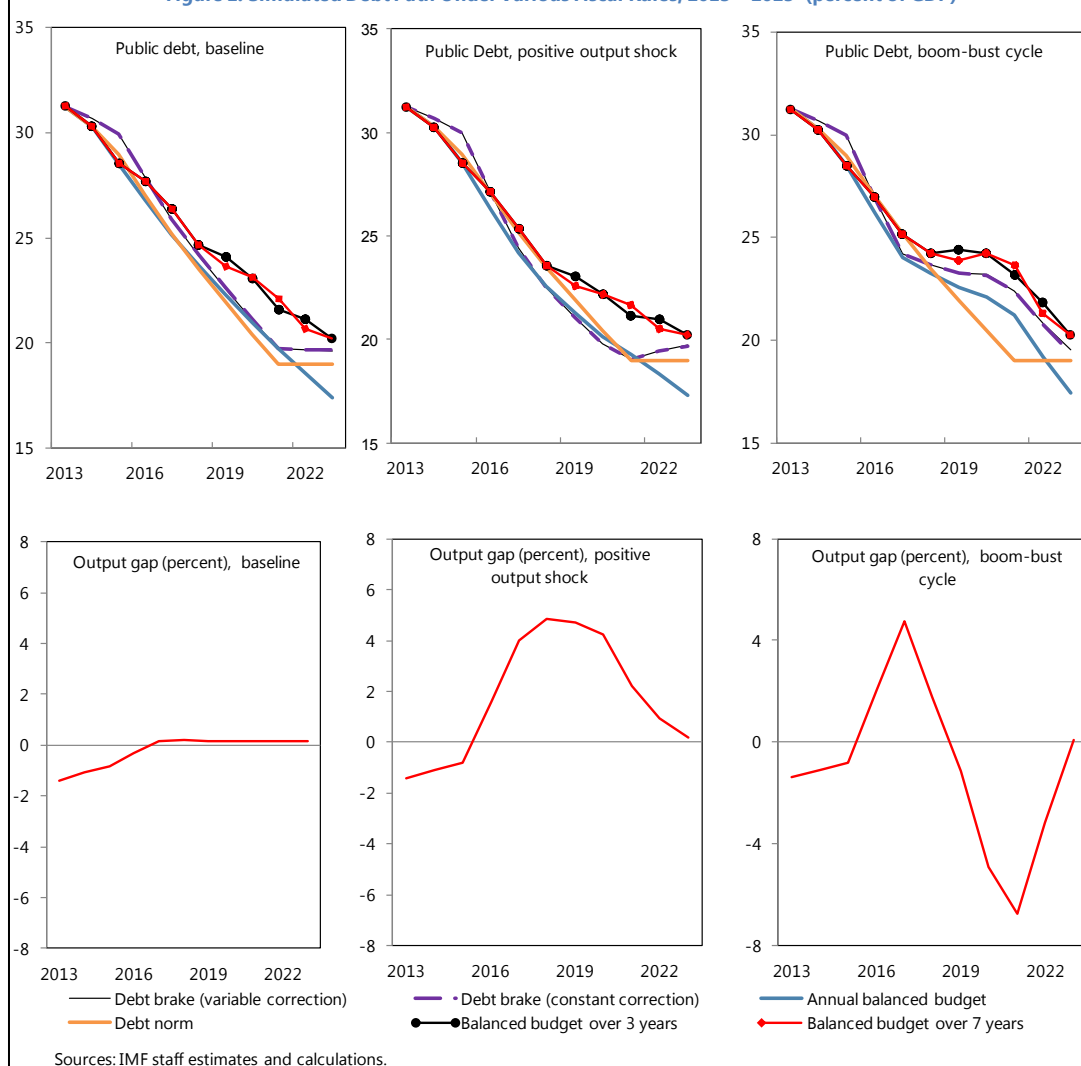
Table 1. Comparative Performance of Alternative Fiscal Rules for Canada, 2016-2020

	Balanced budget			Expenditure rule with debt anchor	
	Annual	Over three years	Over seven years	Constant error correction	Variable error correction
<b>Baseline</b>					
Root mean square deviation with respect to the norm path 1/	0.32	1.70	1.59	0.73	0.71
Mean deviation with respect to the norm path 1/	0.17	1.54	1.44	0.73	0.71
Difference from 20 percent debt in 2020	0.55	2.61	2.63	0.71	0.68
Procyclicality (+ is procyclical; -is countercyclical)	0.07	-0.61	-1.13	-0.29	-1.34
<b>Positive output shock</b>					
Root mean square deviation with respect to the norm path 1/	0.76	0.54	0.35	0.73	0.74
Mean deviation with respect to the norm path 1/	-0.74	0.21	0.11	-0.63	-0.64
Difference from 20 percent debt in 2020	-0.65	1.11	0.61	-0.64	-0.65
Procyclicality (+ is procyclical; -is countercyclical)	0.36	1.71	0.18	-0.89	-0.89
<b>Boom-bust cycle</b>					
Root mean square deviation with respect to the norm path 1/	1.03	2.07	1.96	1.43	1.43
Mean deviation with respect to the norm path 1/	0.02	1.41	1.31	0.63	0.62
Difference from 20 percent debt in 2020	1.67	3.84	3.84	2.74	2.74
Procyclicality (+ is procyclical; -is countercyclical)	0.16	-0.51	-1.04	-0.80	-0.80

Sources: IMF staff estimates and calculations.

1/ Percent of GDP (2016-2020).

Figure 1. Simulated Debt Path Under Various Fiscal Rules, 2013 - 2023 (percent of GDP)



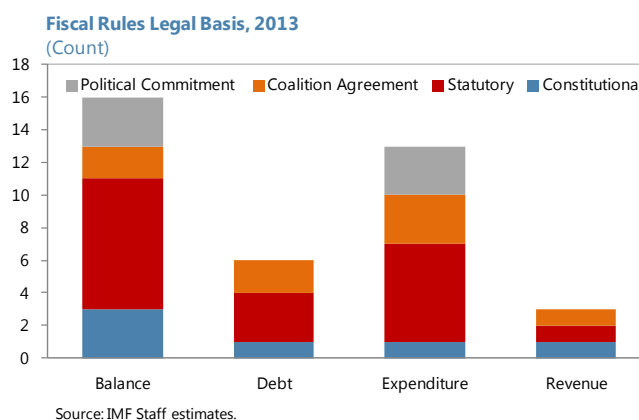
**13. Results from the simulations highlight that while balanced budget rules can be flexible, expenditure rules with a debt anchor are consistently associated with countercyclical fiscal policies** (Table 1 and Figure 1):

- All rules, as specified, lead to a convergence towards the medium-term debt objective. The rule aiming for an annual balanced budget allows for a slightly better targeting of the 2020 debt objective under the baseline and the boom-bust scenarios. However, this rule is the least flexible option, as indicated by its lower root mean square deviation. The balanced budget rules defined over three or seven years stand out as the most flexible rules, in particular when economy faces large fluctuations as in the boom-bust scenario. Expenditure rules with a debt anchor rank in the middle range in terms of flexibility in response to shocks.
- The two variants of the expenditure rules with a debt anchor tend to consistently foster more countercyclical fiscal policies. The expenditure rule with a debt anchor and a variable error correction, which allows for faster correction of larger deviations from the debt norm, is particularly countercyclical under baseline. The balanced budget rules defined over a multi-year horizon, particularly seven years, can also support countercyclical fiscal policies (baseline and boom-bust scenarios). However, setting the balanced budget rule in annual term is consistently associated with a procyclical stance of fiscal policy (under the baseline and the shock scenarios).

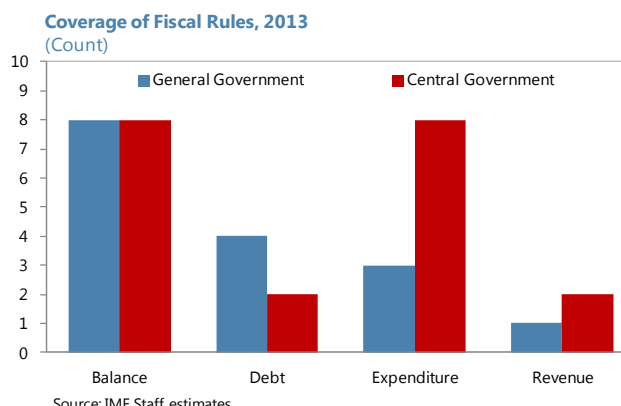
## D. Fiscal Rules Design Features and Supporting Institutions

To be effective, fiscal rules need to be well-designed and supported by adequate legal and institutional arrangements (Debrun and others, 2008).

- 14. A strong legal basis of the rule would increase the reputational cost of non-compliance.** Rules with statutory or constitutional legal basis would be more difficult to reverse and carry a greater reputational cost for non-compliance than coalition agreement or simple political agreement. While more than half of existing fiscal rules in advanced economies (Chart) have a relatively strong legal basis—statutory or constitution—federal states among these countries have their fiscal rules either enshrined in constitutions (Germany and Switzerland) or with a statutory basis (Australia, Austria, and the United States) (Kinda and others, 2013).



**15. The most comprehensive coverage for fiscal rules would better support fiscal sustainability.** Because sub-national governments usually account for a large share of the budget in federal nations, it would be most effective for these countries to have the most comprehensive coverage for their fiscal rules (general government) to better control fiscal sustainability. While this could create incentive for the central government to find ways to ensure better compliance by subnational entities, the usually weak control of the central government over subnational entities could force them to compensate for slippages at the subnational level. This tension may explain why, depending on the country, fiscal rules in advanced economies cover the central or general government. While the coverage of budget balance rules is equally split between the central and the general governments, debt rules tend to be more at the general government level and expenditure rules at the central government level (Chart).



**16. Well-defined escape clauses are essential to strengthen the flexibility of fiscal rules and reduce the pressure to change or abandon them in face of large shocks.** To be well-defined, escape clauses should only include: (i) a very limited range of factors that allow such escape clauses to be triggered; (ii) clear guidelines on the interpretation and determination of events (including voting rules); and (iii) specification on the path back to the rule and treatment of accumulated deviations (Schaechter and others, 2012). Federal nations such as Germany and Switzerland have well-defined escape clauses that cover natural disasters and economic recessions and clearly indicate a voting mechanism and a transition path back to the rules (Table 2).

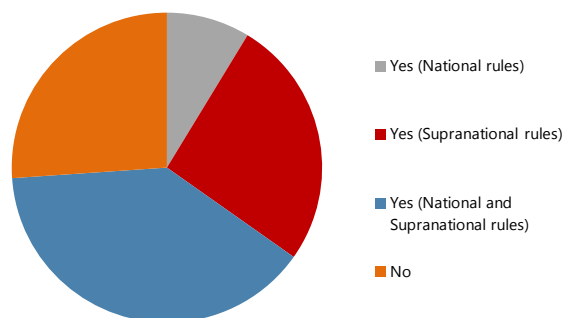
Country and Date	Natural disaster	Economic recession	Banking system bailout	Other events outside govt. control	Voting mechanism defined	Transition path defined	Escape Clause Description
Germany* (since 2010)	X	X	-	X	X	X	Natural disasters or unusual emergency situation which are outside government control and have major impact on the financial position of the government. Absolute majority of parliament is needed to trigger the escape clause. Parliament must approve an amortization plan with a specified timeframe for reducing the accumulated deviation.
Slovakia (since 2012)	X	X	X	X	-	-	Escape clauses for a major recession, banking system bailout, natural disaster, and international guarantee schemes.
Spain (since 2002)	X	X	-	X	X	X	In case of natural disasters, exceptional slowdown, exceptional budget deficits are accompanied by a medium-term financial plan to correct this situation within the next 3 years (to be approved by a majority vote by the parliament).
Switzerland* (since 2003)	X	X	-	X	X	X	The government can approve by supermajority a budget deviating from the budget balance rule in "exceptional circumstances," which are defined in Budget Law as natural disaster, severe recession, and changes in accounting methods.
EU member states/ euro area (since 2005)	-	X	-	-	-	X	An excessive deficit procedure may not be opened when the 3 percent deficit limit is exceeded only temporarily and exceptionally, and the deficit is close to the deficit limit (both conditions need to apply). Deadlines for excessive deficit correction can be extended in case of adverse economic developments.

Source: National authorities; and IMF staff assessment from Schaechter et al. (2012) and Kinda and others (2013).  
Note: \* indicates federal nations.

### 17. Independent fiscal agencies, the so-called “fiscal councils,” can enhance the credibility of fiscal rules.

Through their external monitoring of the rules and independent assessment or preparation of macroeconomic and budgetary forecasts, well-functioning fiscal councils can support the implementation of fiscal rules. Most countries (about 80 percent) with fiscal councils often have fiscal rules and the majority of the councils monitor compliance with numerical rules when they are in place (Debrun and Kinda, 2014 and Chart). The parliamentary budget office (PBO) established in 2008 in Canada could play a role in monitoring implementation of the new federal fiscal rules. The PBO could also have a role in defining and changing the debt norm under the proposed fiscal framework (section III) as well as establishing the existence of circumstances to invoke the escape clause. Fiscal councils do not directly control policy instruments and influence the conduct of fiscal policy mostly indirectly through the public debate. It is therefore key that these institutions benefit from operational independence and resources that are commensurate with their task to fulfill their mandate (Debrun and Kinda, 2014).

Monitoring of Fiscal Rules in Countries with Fiscal Councils, 2013



Source: Debrun and Kinda (2014).

## E. Conclusion

A rules-based approach to fiscal policy at the federal level is currently under consideration in Canada. To inform the debate, this note illustrates the variety of fiscal rules in place in advanced economies and federal nations and highlights that countries tend to combine multiple fiscal rules because of the trade-offs associated with each option. The evidence on compliance with fiscal rules indicates that countries, particularly federal nations, have complied better with expenditure rules than other rules (budget balance and debt rules). Comparing the fiscal and macroeconomic performance of various rules, an annual balanced budget rule at the federal level in Canada would reduce debt towards a medium-term objective but lead to procyclical fiscal policy, particularly when the economy faces shocks. Defining the balanced budget rule over a longer time horizon (three or seven years) tends to increase the flexibility of this rule and reduce its procyclicality. Two variants of an expenditure rule with a debt anchor would also reduce debt towards a medium-term objective along with exhibiting countercyclical properties, in particular in presence of large shocks. In addition to defining the numerical targets, essential features for an effective fiscal rules framework include a relatively strong legal basis (statutory or constitutional) to buttress the credibility of the new rules, well-defined escape clauses to deal with exceptional events, and a well-functioning fiscal council to monitor the new rule.



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