INSTITUT C.D. HOWE INSTITUTE
Essential Policy Intelligence | Conseils indispensables sur les politiques

E-BRIEF

March 31, 2016

MONETARY POLICY

Mounting Evidence: Findings from Natural Experiments in Inflation Targeting

by
Michael Parkin

- Does inflation targeting by central banks achieve lower and more predictable inflation, faster growth of real gross domestic product (GDP), lower unemployment and a more moderate business cycle?
- The author surveys a sample of 27 countries from 1980 to 2013, comparing the macroeconomic outcomes of inflation-targeting experiments with outcomes for economies in which monetary policy arrangements have not changed.
- The findings broadly support the merits of inflation targeting as a monetary tool conducted by central banks with clear independence.

How does inflation targeting, as it is practised in Canada and a few other countries, influence macroeconomic performance? Does it, as the Bank of Canada claims,[1] achieve lower and more predictable inflation, faster growth of real gross domestic product (GDP), lower unemployment

This E-Brief is a condensed, updated and amended version of "The Effects of Central Bank Independence and Inflation Targeting on Macroeconomic Performance: Evidence from Natural Experiments," *Review of Economic Analysis* 6, no. 1 (2014): 1–35. I thank Finn Poschmann and anonymous referees for helpful comments and suggestions.

1 The Bank of Canada explains the purpose of its inflation-control targets in the introduction to its *Monetary Policy Report*. Starting in the May 1997 issue and repeated every quarter, the Bank says that "[l]ow inflation allows the economy to function more effectively and thereby contributes to better growth potential over time," and "[i]nflation-control targets ensure that monetary policy will help to moderate cyclical fluctuations in income and employment"; see Bank of Canada (1997).

and a more moderate business cycle? I answer these questions by comparing the macroeconomic outcomes of inflation-targeting experiments with outcomes for economies in which monetary policy arrangements have not changed. In some inflation-targeting countries, the relationship between the central bank and the government changed, with the bank becoming more independent, so I also examine the effects of this change.

My main conclusion is that the Bank of Canada is broadly correct. When a central bank becomes an inflation targeter, the inflation rate and the variability of inflation fall, the growth rate of real GDP increases and its variability decreases and the unemployment rate falls. Of these effects, those on inflation are large and statistically significant. The other effects are economically significant, and some, with qualification, are statistically significant.

In what follows, I first describe the macroeconomic performance data to be used, then describe the monetary framework events and identify the inflation-targeting experiments. Finally, I examine the outcomes of the experiments and their implications for monetary policy.

Macroeconomic Performance Data

The data I use to describe macroeconomic performance is the inflation rate according to the Consumer Price Index (CPI), the real GDP growth rate and the unemployment rate as reported in the International Monetary Fund's (IMF's) *World Economic Outlook* annual database from 1980 to 2013 for the 36 economies that the IMF classifies as "advanced" (see IMF 2014). Using annual data, rather than higher-frequency quarterly or monthly data, serves the objective of discovering how long-term average measures of macroeconomic performance respond to structural changes in monetary policy arrangements. Using data starting in 1980 avoids contaminating performance comparisons with the confusions of the collapse of the Bretton Woods system, when central banks were groping for procedures to cope with the new flexible-exchange-rate world. Using data for "advanced" economies provides a reasonably homogeneous sample, and avoids differences that arise from the state of economic development.

On a preliminary examination of the data, I excluded seven economies because their data are seriously incomplete or because the economies are too small to be given the same weight as the others.[2] I also excluded Iceland and Israel because their average inflation rates and variability of inflation place them in a different distribution than the other countries.[3] After these exclusions, 27 economies remain for further examination.

Monetary Policy Framework Events, Treatments and Controls

Five of the advanced economies adopted inflation targeting over the study period: New Zealand (1989), Canada (1991), the United Kingdom (1992), Sweden (1993) and Australia (1993). In three of these countries, a change in central bank law replaced the government as the policy maker with an independent central bank board: New Zealand (1989), the United Kingdom (1998) and Sweden (1999). These economies constitute the treatment set,

2 The seven are Cyprus, the Czech Republic, Estonia, Malta, San Marino, the Slovak Republic and Slovenia.

3 For the 27 countries remaining in the sample, between 1980 and 2013 the mean inflation rate was 4.4 percent and the standard deviation of inflation was 4.3 percent. For Iceland and Israel, the mean inflation rate over the same period was 31 percent and the standard deviation 57 percent. On the scale of these two countries, the other 26 compress to a single data point, and the significance of the variability across them that one wants to reveal is lost.

divided into "inflation targeters" and "more independent inflation targeters." All five cases might be described as involving transparent flexible inflation targeting. Transparency takes the form of detailed, frequent reporting of central bank forecasts of inflation and other indicators of aggregate performance. It is flexible in the sense that, although the target and its range are the primary objective, the speed of return to target in response to shocks is judged with a view to avoiding excessive departures from full employment.

For the controls, I selected from the other 22 economies those that have an exchange-rate regime that gives monetary policy independence and no material change in monetary policy arrangements. The exchange-rate regime eliminates Hong Kong, which, since 1984, has pegged its currency to the US dollar through the operation of a currency board. The creation of the euro in 1999 also savagely reduces the ranks of the control economies. I divided the euro area into two aggregate groups, the D-mark group and the rest. The D-mark group consists of Germany and the five countries that, before the creation of the euro, pegged their currencies to the German mark and constituted a single monetary economy.[4] I regard the creation of the euro and the European Central Bank (ECB) as not materially changing the monetary policy framework of this group, because the independence status of the ECB is similar to that of the Bundesbank. So I regard these six economies as constituting a single economy that had no change in its monetary policy framework and a valid member of the controls.

The creation of the euro and the ECB radically changed the monetary policy arrangements of Finland, France, Ireland, Italy, Portugal, Spain and later Greece (2001), and for this reason I exclude these economies from the controls. Thus, after the various exclusions and aggregation of European economies, the controls are the D-mark group, Norway, Singapore, Switzerland, Taiwan and the United States. Data for the D-mark group are GDP-weighted averages of the seven national economies in the group. Table 1 summarizes the above discussion and lists the dates on which the events occurred.

For the five inflation targeters and six controls listed in Table 1, I computed the mean and the standard deviation of inflation rates and real GDP growth rates, as well as the mean unemployment rate, for both a "before" period and an "after" period. For the treatment groups, the "before" period ends approximately one year after the policy change date shown in Table 1; the "after" period begins one year later. The rationale for this time lag is that it reasonably represents the types of lags found in time-series studies for the effects of changes in monetary policy. These lags also provide time for the new institutional arrangement to be clear of any transition effects that followed the change.

For the control group of economies, seven "before" and "after" sets correspond to the seven different break dates for the two treatment groups: 1991, 1993, 1993–98 and 1993–99 for the inflation-targeting comparisons, and 1990, 1999 and 2000 for the more independent inflation targeting comparisons.[5]

4 The countries are Austria, Belgium, Denmark, Luxembourg and the Netherlands.

5 The break years do not deliver exact one- and two-year time lags because regime changes occurred at various times of the year. For the three changes that occurred in January, February and March, I regard the year of change as incorporating a one-year lag. For the four changes that occurred in June, September and December, I regard the year following the change as incorporating a one-year lag.

Table 1: Inflation Targeting Treatments and Controls

Inflation Targeters		More Independent Inflation Targeters	
Canada	February 26, 1991	**New Zealand**	December 20, 1989
United Kingdom	September 1, 1992	**United Kingdom**	June 1, 1998
Sweden	January 1, 1993	**Sweden**	September 11, 1999
Australia	March 31, 1993		
Controls			
D-mark group, Norway, Singapore, Switzerland, Taiwan, United States			

Note: The dating of the adoption of inflation targeting in Australia is the generally accepted one, based on the date of the Governor of the Reserve Bank of Australia Bernie Fraser's trial balloon.

Looking for the Effects of Inflation Targeting

If inflation targeting influences monetary policy outcomes, these influences should be visible after a country becomes an inflation targeter. And if the effects of inflation targeting are influenced by central bank independence, these effects should be visible when a targeter becomes more independent.

Table 2 describes the macroeconomic performances of inflation targeters, more independent inflation targeters and the control economies before and after the changes in monetary policy frameworks. What jumps out from this table is the Great Moderation: macroeconomic performance improved everywhere. But were the improvements greater for the inflation targeters and more independent inflation targeters? Table 3 provides the data that answers this question. It is revealing to interpret the data on the outcomes of the experiments in terms of their influence on two policy tradeoffs: the Taylor curve (see Taylor 1979, 1281), the long-run tradeoff between the variability of both inflation and output; and the Phillips curve, the short-run tradeoff between inflation and unemployment.

The Long-Run Taylor Curve Tradeoff

In a Taylor curve graph, the x-axis measures the variability of inflation as its standard deviation over some relevant period and the y-axis measures the variability of aggregate output. The position of the Taylor curve depends on features of the economy that include the size and persistence of exogenous shocks, the degree of wage and price rigidity and the credibility and transparency of monetary policy. If the adoption of inflation targeting increases the credibility and transparency of monetary policy, it shifts the Taylor curve downward and leftward.

The point on the Taylor curve at which the economy operates depends on how much the central bank dislikes real variability and inflation variability. If inflation targeting puts greater weight on avoiding inflation variability, it brings a movement upward and leftward along the Taylor curve. Figure 1 shows the outcomes in Taylor curve space. The open dots show the data before inflation targeting or more independent inflation targeting, but after

Table 2: Before and After Inflation Targeting: Absolute Changes

	Inflation		Real GDP Growth		Unemployment
	Mean	Standard Deviation	Mean	Standard Deviation	Mean
Inflation Targeters					
Before	**6.56**	**3.62**	2.42	1.96	7.77
After	**1.99**	**1.01**	2.51	1.83	6.97
Change	**–4.56**	**–2.61**	0.09	–0.13	–0.80
t-statistic	**9.01**	**11.84**	1.54	0.30	0.55
More Independent Inflation Targeters					
Before	**8.10**	**4.39**	**1.98**	2.14	6.37
After	**1.96**	**1.10**	**2.24**	2.38	6.51
Change	**–6.14**	**–3.29**	**0.26**	0.24	0.14
t-statistic	**4.60**	**7.27**	**2.22**	–0.82	–0.08
Controls (average)					
Before	**4.32**	**3.16**	4.26	2.28	4.01
After	**1.70**	**1.04**	3.11	2.19	4.28
Change	**–2.62**	**–2.12**	–1.16	–0.10	0.27
t-statistic	**4.13**	**3.38**	0.87	0.17	–0.22

Notes: Bold-faced entries indicate that the means are significantly different at the 5 percent level on a one-tail test where the t-statistics and degrees of freedom are computed assuming unequal variances.

The inflation rate and real GDP growth rate are annual percentage changes and the unemployment rate is a percentage of the labour force.

the average change of the control group, while the black dots show the final outcome. The movement indicated by the arrows is the estimated effect of inflation targeting and more independent inflation targeting.

The control economies lowered the variability of inflation by 2.1 percentage points and the variability of real GDP growth by 0.1 of a percentage point. So the open-dot starting points in Figure 1 are the actual points before inflation targeting plus these control changes. In Figure 1a, the move downward and leftward (New Zealand and the United Kingdom) and downward (Australia) was an unambiguous improvement in performance. A move upward and leftward (Canada and the United Kingdom in Figure 1a, and Sweden in both Figures 1a and 1b) bought more stable inflation with higher output variability.

Table 3: Treatments Relative to Controls

	Inflation		Real GDP Growth		Unemployment
	Mean	Standard Deviation	Mean	Standard Deviation	Mean
Inflation Targeters					
Change for inflation targeters	**–4.56**	–2.61	0.09	–0.13	–0.80
Change for inflation targeters control	**–2.65**	–2.22	–0.82	–0.32	0.33
Difference	**–1.92**	–0.39	0.91	0.20	–1.13
t–statistic	**–2.64**	–0.70	1.54	0.40	–0.66
More Independent Inflation Targeters					
Change for more independent inflation targeters	**–6.14**	–3.29	**0.26**	0.24	0.14
Change for more independent targeters control	**–2.60**	–2.02	**–1.49**	0.13	0.53
Difference	**–3.54**	–1.27	**1.75**	0.11	–0.39
t–statistic	**–2.48**	–1.69	**2.22**	0.26	–0.18

Notes: Bold-faced entries indicate that the means are significantly different at the 5 percent level on a one-tail test where the t-statistics and degrees of freedom are computed assuming unequal variances.

The inflation rate and real GDP growth rate are annual percentage changes and the unemployment rate is a percentage of the labour force.

In both panels of Figure 1, the clearest effect is the decrease in the variability of inflation for all economies except Australia's. The decrease was small for Canada, but large for the others. In Figure 1b, the black dots cluster at or below a standard deviation of 1 percentage point but have a large spread in the standard deviation of real GDP growth rates.

Both a move to greater independence and the adoption of inflation targeting make monetary policy more efficient in the sense that they improve the Taylor curve tradeoff. Canada, the United Kingdom and Sweden took the efficiency gain in the form of a decrease in the variability of inflation and kept the variability of real GDP growth (approximately) unchanged. Australia lowered the variability of real GDP growth with almost no change in the variability of inflation. Only in Sweden was there no clear improvement in the variability tradeoff and an outcome that paid for more predictable inflation with more variable real GDP growth.

Figure 1: Outcomes in Taylor Curve Space

Figure 1a: Outcomes for Inflation Targeters (IT)

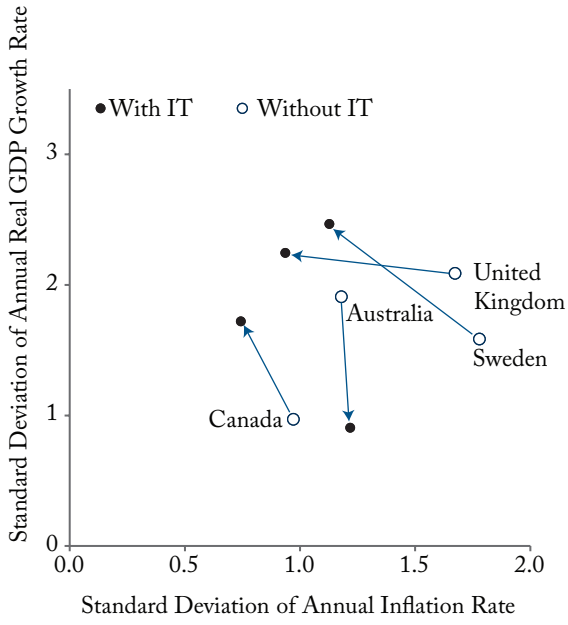
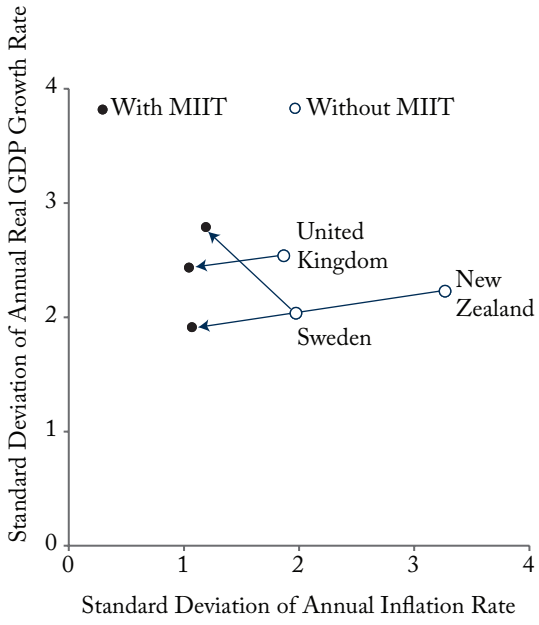


Figure 1b: Outcomes for More Independent Inflation Targeters (MIIT)



Source: Author's calculations.

The Short-Run Phillips Curve Tradeoff

If inflation targeting lowers the expected and actual inflation rate, the short-run Phillips curve shifts downward, meaning the economy can achieve this lower inflation without paying for it with a rise in the unemployment rate. And if lower inflation variability makes markets function more efficiently, the natural unemployment rate might decrease, further improving the short-run policy tradeoff. Do these things happen?

Figure 2 answers this question by showing the outcomes of the experiments in Phillips curve space. The dots use the same conventions as those for the Taylor curve tradeoff in Figure 1. The control economies lowered their inflation rate by 2.6 percentage points and raised their unemployment rate by 0.3 of a percentage point. So the open-dot starting points in Figure 2 are the actual points before inflation targeting plus these control changes. Figures 2a and 2b show a similar outcome for inflation targeters and more independent inflation targeters. In both graphs, the inflation rate falls and by large amounts, and are significant at the 5 percent level. The unemployment rate fell in Australia, Canada and the United Kingdom, remained the same in New Zealand and rose in Sweden. It is Sweden's behavior that makes the unemployment effect insignificant. Omitting Sweden, the outcome is significant at the 5 percent level.

Figure 2: Outcomes in Phillips Curve Space

Figure 2a: Outcomes for Inflation Targeters (IT)

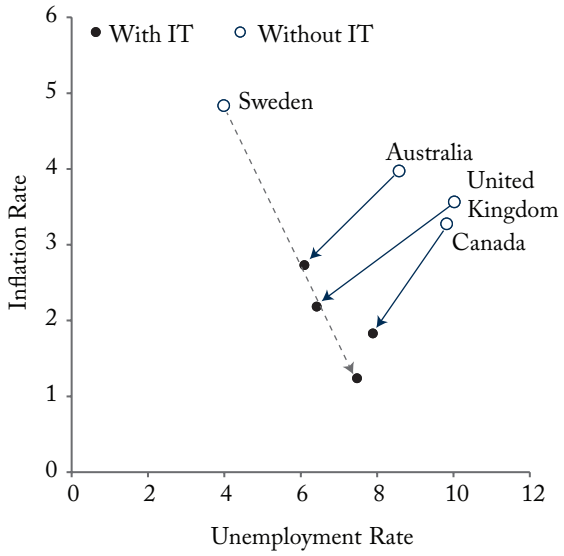
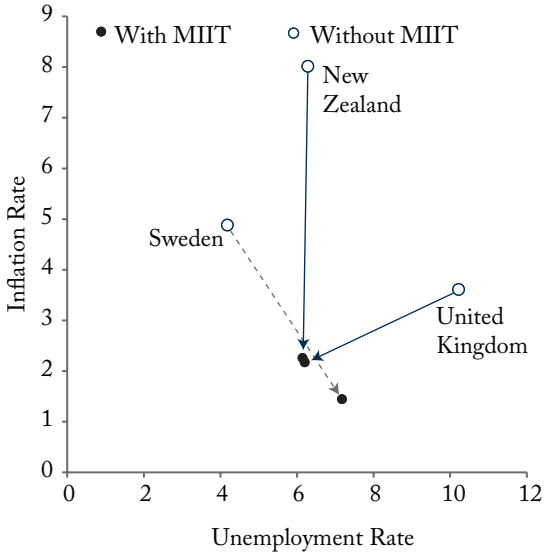


Figure 2b: Outcomes for More Independent Inflation Targeters (MIIT)



Source: Author's calculations.

The data in both panels of Figure 2 show that inflation targeting shifts the short-run Phillips curve downward. The changes in inflation are clearly seen in the graphs, with the black dots distinctly lower than the open dots. The short-run tradeoff is too short lived, however, to show up on the time scale of these experiments. It constrains monetary policy over months and quarters, but not over years. For this reason, the change in the unemployment rate should be interpreted as a change in the natural rate. This interpretation is consistent with the idea that low and predictable inflation improves the ability of markets to function and allocate resources efficiently. The combined change in the unemployment rate and the inflation rate challenges the traditional view of a permanent long-run tradeoff between these two variables.

Studies of the relationship between inflation and economic growth have found that low inflation is good for growth (see Barro 1998). These experiments reinforce that view. The mean real GDP growth rate increased in both groups of targeters but decreased in the control economies. The difference in the difference in growth rates is significant in the case of the more independent inflation targeters.

Policy Conclusions

The conclusions from the flexible inflation-targeting experiments suggest that this institutional arrangement is effective. Credibly and transparently pursued, flexible inflation targeting – pursuing a target inflation range while avoiding an excessive departure from full employment – does a good job of keeping inflation low and the variability of inflation and output low. As practised in Australia, Canada, Sweden and the United Kingdom, this approach to monetary policy has been successful. It perhaps can be refined and improved upon, but not by placing a misguided emphasis on a broader mandate. Flexible inflation targeting is the best currently known dual mandate policy. It is today's "gold standard." Mark Carney put it well when he wrote: "In my view, flexible inflation targeting – as practiced in both Canada and the UK – has proven itself to be the most effective monetary policy framework implemented thus far" (Carney 2013, 7).

In the Canadian context, the policy implications of these experiments are that the Bank of Canada should remain fiercely independent in its implementation of monetary policy, and that the highly successful joint venture between the government and the Bank to target inflation should be steadfastly guarded. Monetary policy can do some things well; it should maintain its focus on those things, and not get diverted into areas beyond its effective reach. Central banking might be improved but it does not appear to need reinventing.

References

Bank of Canada. 1997. *Monetary Policy Report*, May 1997. Available online at http://www.bankofcanada.ca/wp-content/uploads/2010/04/mpr_apr_1997.pdf.

Barro, Robert J. 1998. *Determinants of Economic Growth: A Cross-Country Empirical Study*. Cambridge, MA: MIT Press.

Carney, Mark. 2013. Written Answers to the UK House of Commons' Treasury Committee Questionnaire. London: Bank of England. Available online at http://www.bankofengland.co.uk/publications/Documents/other/treasurycommittee/other/carneytsc.pdf.

International Monetary Fund. 2014. *World Economic Outlook Database*. Washington, DC, April 2014. Accessed December 6, 2014.

Taylor, John B. 1979. "Estimation and Control of a Macroeconomic Model with Rational Expectations." *Econometrica* 47 (5): 1267–86.

This E-Brief is a publication of the C.D. Howe Institute.

Michael Parkin is Professor Emeritus, University of Western Ontario and a Research Fellow at the C.D. Howe Institute.

This E-Brief is available at www.cdhowe.org.