

Discussion

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I am honoured to be included in this wonderful event celebrating Chuck Freedman's career and very pleased to be discussing Pierre Fortin's thoughtful paper on the Phillips curve in Canada. The short version of my discussion is: Chuck is amazing, Phillips curve research is important, and I thoroughly enjoyed the paper. Let me start with a few words about Chuck before I turn to the lessons from three decades of Phillips curve research and offer a few specific comments on Pierre's paper.

Like so many generations of economists at the Bank, I began one of my first research assignments by reading something Chuck had written many years earlier. I remember being impressed by its thoughtful marriage of well-articulated economic theory with a healthy respect for the facts about the Canadian economy—something that is always harder than it sounds. But what has impressed me even more than his early papers is that Chuck has stayed at the forefront of the literature and has continued to produce insightful papers on a wide range of topics at an extraordinary pace throughout his career.

Chuck has also been a great enthusiast for the research of his colleagues, always reading our work carefully, appreciating the good parts and challenging us on the weak links. I will never forget how Chuck systematically pulled apart a draft of an article I was writing for the *Bank of Canada Review*. I also remember he did it in such a friendly and constructive way that by the next day I was actually excited about how much better my

* These comments benefited from helpful discussions with Jean-Pierre Aubry, Allan Crawford, and Maral Kichian.

article was going to be once I addressed his comments. This is a rare talent. Like so many of my colleagues, I have learned a great deal from Chuck and that has made the Bank a much more interesting place to work.

Pierre Fortin has also made the Bank a more interesting place to work. While Chuck and Pierre have not always agreed on monetary policy, both share a deep understanding of economic theory and a respect for the data and empirical research. Pierre's many contributions to monetary research, starting with his Ph.D. thesis at the University of California (Fortin 1975), have all been read very carefully at the Bank. Chuck and the Bank have learned a great deal from Pierre's research over the years on the Phillips curve and on many other topics.

Three Lessons from Phillips Curve Research

Phillips curve research is plagued by a number of uncertainties. The Phillips curve describes the behaviour of a single observable variable—inflation—in terms of various unobserved variables—usually expected inflation, some measure of slack in the economy, and supply shocks—in a relationship of unknown functional form. The fundamental problem is that there are too many unknowns. There is uncertainty about the measurement of the unobserved variables, and there is uncertainty about the functional form. To make matters worse, inferences about the shape of the Phillips curve depend on the measurement of the variables, and the proper measurement of the variables depends on the shape of the Phillips curve.

This uncertainty leaves plenty of room for researchers to come to different conclusions, and Pierre Fortin and researchers at the Bank often have. But the central message I took from Pierre's thorough review is a clear sense of progress. Indeed, one measure of this is that Pierre's views and those of the Bank are closer together than they have been for some time, though I would not want to pretend there is agreement on all fronts.

What have we learned? Pierre's review points to three broad conclusions.

- (i) *Macro time-series data are not enough.* What we can learn from estimating Phillips curves on macro time-series data alone is limited. There are simply too many unknowns and not enough observations. To be able to distinguish between the alternatives, we need to explore the implications of these alternatives on a wide range of data.

This is one lesson where I think researchers at the Bank of Canada have learned a great deal from Pierre Fortin's work. Pierre has been a leader in bringing microeconomic data to bear on macro issues. In particular, he has used micro data, as well as cross-provincial and cross-country variation, to sharpen the identification of structural factors that affect

the measurement of the degree of slack in the economy and of the form of the Phillips curve.

- (ii) *Inflation expectations are not entirely backward-looking.* Inflation expectations are not well described solely by past inflation, nor are they fully model-consistent, as suggested by the strong form of rational expectations. Here, at the risk of putting words in Pierre Fortin's mouth, I think he has learned something from the empirical work at the Bank. In his own work, Pierre has modelled expectations as entirely backward-looking and has typically operationalized this using fixed-coefficient distributed lags of past inflation. Research at the Bank over the past dozen or so years has devoted considerable attention to including elements of forward-looking behaviour into the Phillips curve, or at least allowing the formation of inflation expectations to change with the changes in the monetary regime. While not entirely uncritical of this research, Pierre concludes by lauding Bank research for taking a middle ground on the modelling of expectations. I interpret this as a sign of progress.
- (iii) *Low inflation has changed something in the Phillips curve,* even if researchers cannot agree on exactly what has changed. As Pierre's review highlights, his own research has stressed downward nominal-wage rigidity and near rationality as sources of non-linearity, whereas research at the Bank has put more emphasis on changes in the way expectations are formed in a low-inflation regime. My own view is that the Bank's research on this issue is more compelling, but I am hardly a disinterested bystander, and even here, puzzles remain.

The luxury of being a discussant is that you can pick and choose what to focus on. Below I expand on three issues in Phillips curve research, two of which Pierre addresses—non-linearities and downward nominal-wage rigidity—and the other he does not—the open-economy dimension. These comments are intended to augment Pierre's review from the perspective of someone who has worked in the Research Department in various capacities through roughly half of Chuck's career at the Bank.

Non-linearities

In his examination of non-linearities, Pierre focuses on research done at the Bank on one form of non-linearity, namely the possibility that the relationship between inflation and the output gap is convex. This type of non-linearity is usually associated with the argument that the further the economy gets pushed into excess demand, the more capacity constraints limit the ability of firms to increase output, and hence, the less output rises and the more inflation goes up. Pierre's focus on this type of non-linearity reflects the considerable attention it has received from Bank researchers.

It is worth mentioning that other forms of non-linearity were also explored. A paper by Dupasquier and Ricketts (1998), in particular, provides a useful taxonomy that includes five types of non-linearities: convexity (due to capacity constraints), concavity (due to the Stiglitz monopolistically competitive model), a flatter Phillips curve at lower rates of inflation (due to menu costs and/or longer contracts), a flatter Phillips curve at more stable rates of inflation (due to the Lucas islands model), and a flatter Phillips curve at very low rates of inflation (due to downward nominal-wage rigidity). On Canadian data they found some evidence for three of the five types of non-linearity: convexity and flatter Phillips curves at either low or more stable rates of inflation.

Subsequent research has also tended to provide evidence that the slope of the Phillips curve has declined as inflation fell through the 1980s and 1990s (e.g., Beaudry and Doyle 2001; Kichian 2001; Khalaf and Kichian 2003). Why this is the case is less clear.

One possibility is that it is a statistical artifact of better inflation control. Beaudry and Doyle (2001) provide a theoretical model to formalize this idea, and Rowe and Yetman (2002) provide empirical support for the hypothesis. The basic idea is that with a successful inflation-targeting central bank, in the limit, inflation is a constant, and hence not correlated with anything. This makes it impossible or at least very difficult to identify the Phillips curve.

Another possibility is that it reflects the failure to control for changes in the way expectations are formed in a regime of low, stable inflation. When Khalaf and Kichian (2003) test for instability across a range of parameters, they find that instability is mainly associated with the coefficients describing inflation dynamics. They also find that forward-looking expectations become more empirically important as inflation declines through the 1980s and 1990s. A similar conclusion was reached by Clifton, Leon, and Wong (2001), who find that inflation in OECD countries became more forward-looking as countries put more emphasis on inflation control.

Still another possibility is that lower inflation has also brought lower inflation uncertainty, and this has led to a lengthening of wage and price contracts. Recent work by Fay and Lavoie (2003) has confirmed earlier work on Canadian data that finds a negative relationship between inflation uncertainty and the duration of union labour contracts.

A final possibility is downward nominal-wage rigidity. Most of the empirical work cited above suggests that the decline in the slope of the Phillips curve was relatively continuous with the unwinding of inflation through the 1980s and 1990s. This is not suggestive of downward nominal rigidity as the

primary source of non-linearity, but more on this particular non-linearity below.

Understanding why the Phillips curve appears to be getting flatter at low rates of inflation is important since the monetary policy implications of the various explanations are very different. This remains an important area for Phillips curve research.

Downward Nominal-Wage Rigidity

If nominal wages are rigid downward, a low-inflation policy could raise the average rate of unemployment. So when Pierre Fortin produced evidence of a dramatic increase in the proportion of union contracts with zero wage gains that coincided with the sharp fall in inflation in the early 1990s (Fortin 1996), this immediately caught Chuck's attention, and a number of researchers at the Bank examined the evidence closely. As Pierre reports in his review, what they and others found is that for several reasons the spike at zero in the wage-change distribution overestimates the true extent of downward nominal-wage rigidity. They also found little evidence of significant employment effects of downward nominal-wage rigidity.

Pierre, however, remains unconvinced by this evidence on Canadian data. Instead he draws on two U.S. studies that suggest there is evidence of downward nominal-wage rigidity. I could cite other U.S. studies that find very little evidence, but this misses the point.

Even the research on Canadian data shows there is some excess sensitivity at zero wage change—not a great deal, but it is there. This is not surprising; in fact, I would have been surprised if there was no evidence, because the idea that workers would be more resistant to a nominal-wage cut than an equivalent real-wage cut has an intuitive ring to it. The more important issue is whether the excess sensitivity that has been identified affects employment.

Here there is much less evidence. The research at the Bank does not find significant disemployment effects (Farès and Hogan 2000; Faruqui 2000; Crawford and Wright 2001). As Pierre acknowledges, there is a general lack of micro evidence showing disemployment effects (Groschen and Scheitzer 1999; Altonji and Devereux 1999). Moreover, even Pierre's preferred U.S. study by Lebow, Saks, and Wilson (1999) finds little evidence of macro employment effects.

Why is this? I offer you an intuitive answer. As part of the research into downward nominal-wage rigidity, the Bank surveyed firms on their wage practices in October 1996.¹ I was involved in these interviews and I found

1. The results of this survey are reported in Crawford and Harrison (1998).

them very interesting. What we heard from many businesses is that it is a little harder to cut nominal wages than to simply raise them less than the rate of inflation. But what we also heard is that the wage is only one part of the labour contract, and when facing an extra rigidity in the wage change, management looks to other elements of labour costs or labour practices so as to equate the marginal product of labour to real labour costs without reducing employment. What we forget as economists when we draw our simple two-dimensional diagrams is that firms want workers to produce output, and they have many more margins than simply the base wage.

So I, at least, am convinced that the employment consequences of downward nominal rigidity at low rates of inflation are small. The micro and the macro evidence is consistent, it lines up well with what we have heard from firms, and the story makes intuitive sense. This does not always occur in economics, so you have to enjoy it when it does.

The Phillips Curve in an Open Economy

The second theme I want to expand on is an aspect of the research at the Bank that Pierre does not cover in his review, namely the open-economy dimension. This is worth mentioning for two reasons. First, Canadian economists have a strong tradition in open-economy issues. Second, with the Canadian dollar having appreciated sharply in the first half of 2003, exchange rate pass-through is once again topical.

Estimated Phillips curves at the Bank have traditionally estimated the impact of persistent exchange rate changes on the core CPI to be about 20 per cent of the change in the value of the Canadian dollar (Duguay 1994). This corresponds roughly to the import share of the core CPI in the 1980s. Since the import share is estimated to be about 30 per cent today, one might expect exchange rate pass-through to have increased over time. In fact, Phillips curves estimated by Bank researchers in recent years have found the opposite—pass-through appears to have fallen or become more gradual (Fillion and Léonard 1997; Kichian 2001). This finding has been shared by a number of other countries, notably Australia, the United Kingdom, and Sweden (Cunningham and Haldane 1999; Debelle and Wilkinson 2002).

Why is this happening? There are at least two potentially complementary views. One is that it is a macro phenomenon related to increased credibility for low, stable inflation. With lower, more stable inflation, changes in inflation are not viewed as persistent, and hence, shifts in relative costs and prices, such as fluctuations in the costs of imported goods and services, have less effect on expected inflation (Taylor 2000). In addition, low, stable inflation may result in longer wage and price contracts (Fay and Lavoie 2003), which will tend to slow the pace of exchange rate pass-through

(Devereux and Yetman 2003). Gagnon and Ihrig (2002) find empirical support for the macro view. In particular, they report a statistically significant link between the decline in pass-through and the variability of inflation across industrialized countries.

An alternative is that lower exchange rate pass-through is more of a micro phenomenon. There are several variations on this theme. Campa and Goldberg (2002) present cross-country evidence suggesting that the macro evidence of lower pass-through primarily reflects a change in the composition of imports in many countries associated with a rising import share of manufactured goods and a declining import share of energy. Another possibility is that it reflects a decline in the pricing power of firms. Still another is that it is a consequence of the increasing influence of large multinational corporations operating globally and using national borders as a means to price discriminate between different markets.

Sorting out the relative importance of these alternative explanations remains an important topic for future research.

I am hopeful that a survey of firms in Canada that is currently being conducted by Bank staff will shed light on these and other issues. In the spirit of work by Alan Blinder in the United States, the survey asks firms a variety of questions related to how they set prices, including prices for domestic sales and exports. We have just completed the data-collection stage and are about to begin the analysis. So stay tuned for the next chapter.

To conclude, I enjoyed reading Pierre Fortin's paper. The good news is that the research at the Bank on the inflation-unemployment trade-off has produced real progress. Chuck has played a key role in this progress through his personal contributions, through his guidance and comments, and through his enthusiasm and commitment to quality. Of course, not all the outstanding issues have been resolved, and new puzzles are always emerging. So the research, the discussion, and the debate must continue, and I know Chuck would not have it any other way.

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