Discussion 3

Pierre Duguay

Introduction

First, let me thank Bill Scarth for his tribute to our dear friend and colleague John Kuszczak. I also want to thank all of you, and especially the presenters, the discussants, and my fellow panellists, for making this conference a success.

The occasion has given us a unique opportunity to take stock of the current state of knowledge on important interactions between economic decisions and monetary policy. I will review the presentations and discussions in the context of the following questions, with an emphasis on the implications for monetary policy and further research.

1. What is the best way to represent empirically the price-adjustment process?
2. What do small open-economy models say about price adjustment and/or monetary policy?
3. What are the implications of a technology shock?
4. How has sustained low inflation affected labour market behaviour?

1 What is the best way to represent empirically the price-adjustment process?

As Bowman and Doyle wisely observe, monetary policy remains an empirical endeavour. It thus seems appropriate to begin with the papers on empirical models of price adjustment.

The papers by **Kozicki** and **Tinsley** and by **Guay**, **Luger**, and **Zhu** address issues that strike at the core of our preoccupations as central bankers. We are grappling with conceptual and empirical issues around the appropriate measure of the output gap—needed in real time, as pointed out by Simon van Norden, the representation of expectations, the unscrambling of intrinsic from expectational dynamics, and the choice of an inflation measure. In addition, we would like to identify the implications of regime changes, including changes in the degree of credibility of monetary policy, for the dynamics of inflation. I was thus keenly interested in reading the empirical papers and in hearing the discussion on them. I have learned a great deal and will offer some observations in return.

Guay, **Luger**, and **Zhu** test the ability of a New Keynesian Phillips curve specification to explain the behaviour of inflation in Canada. That specification relates inflation to real marginal costs rather than to the output gap. If we accept the assumption that real marginal costs are proportional to the labour share of output, that gives the specification a distinct advantage over the more traditional Phillips curve. It can rely on observed data rather than on judgmental estimates of the unobserved output gap. Unfortunately, the New Keynesian Phillips curve model is found not to provide a good representation of inflation dynamics for Canada.[1]

That result did not surprise me. The New Keynesian pricing model focuses on the adjustment of prices from the point of view of a firm that takes wage costs as given. It is missing the core Phillips relationship between demand pressure and wage growth. Given the procyclical nature of profits, I find it hard to think of the labour share as an adequate proxy for excess demand.

I would also question the appropriateness of the New Keynesian pricing specification for a small open economy like Canada, where a significant proportion of prices (commodities and automotive products, for example) are set in world markets rather than by Canadian producers. Indeed, fluctuations in the Canadian GDP deflator largely reflect externally driven movements in the terms of trade. I would therefore suggest that, at a minimum, it is the terms of trade or real commodity prices, rather than real import prices or the real exchange rate, that should be used to augment the New Keynesian pricing equation when explaining the Canadian GDP deflator. Alternatively, the New Keynesian pricing equation could be used to explain final demand rather than domestic value-added deflators, with real marginal costs expanded to include the cost of intermediate inputs such as imports. The point is that while one would expect the broad trend of

1. André Kurmann (2002) raised serious doubts about the ability of the model to track inflation behaviour in the United States.

inflation to be reflected in most aggregate price indexes, there can be significant differences in short-run movements of different indexes.

Kozicki and **Tinsley** conclude that inflation dynamics are better captured by models with both leads and lags of inflation—a position that we adopted for the Bank's projection model—and possibly leads and lags of the output gap as well. While I strongly subscribe to David Laidler's empirical observation that "unemployment and output changes seem to precede the price and wage changes associated with them" (Laidler 1982, 129), I can easily conceive of price-setting depending on expected future demand and not only on the current or past output gap, particularly in the case of non-perishable goods and services.

That would help explain why the Phillips curve appears to have flattened under inflation targeting (Dupasquier and Ricketts 1998). The flattening cannot be explained merely by the fact that inflation expectations are better anchored. But when we consider that inflation control acts also as an economic stabilizer, we begin to see how a given output gap may put less pressure (up or down) on inflation if it is expected to be short-lived.

But the key message from Kozicki and Tinsley is the importance of paying attention to shifts in the nominal anchor when modelling the behaviour of inflation. And their major, original result is their interpretation of the low persistence of inflation in the 1990s as evidence of increased credibility for the low-inflation target in Canada. You will not be surprised that I find this interpretation appealing. But beyond that, it accords quite well with survey evidence and qualitative information, and it helps explain what Pierre Fortin refers to as the mystery of the missing deflation. With the announcement of the target renewal in May 2001, we have tried to consolidate our gains on this front by extending the target horizon, by focusing on the 2 per cent midpoint of the target range, and by committing to explain any sustained deviation of actual inflation from the midpoint.

2 What do small open-economy models say about price adjustment and/or monetary policy?

Bowman and **Doyle** survey the literature on New-Keynesian, open-economy models. Their survey received high praise from the discussants and participants and will serve as a benchmark for years to come. I found their discussion on the implications of producer currency pricing (PCP) and local currency pricing (LCP) particularly interesting. As it turns out, the extent of PCP versus LCP is a key issue for the formulation of monetary policy.

The authors show that with PCP, typically assumed by default, monetary policy should aim to stabilize domestic production prices and allow the consumer price level to move with the real exchange rate. They qualify this result somewhat by noting that where the real balance effect is important, the literature suggests that the authorities should incorporate CPI inflation into the targeting process.

Bowman and Doyle also note that extensive LCP implies more variability of the nominal exchange rate, because larger changes are needed to affect the relative prices of imports. But I wonder whether the smaller response of import and export demand might not be partly offset by a larger supply response.

In Canada, we know that a significant proportion of our producers (I mentioned car and commodity producers) are price-takers in world markets. There is also strong evidence of LCP of some imports. Earlier this year, Bank of Canada staff conducted an Internet survey of the prices of 55 consumer products (of which 25 were different car models) in Canada and the United States. The price quotes were drawn from affiliated companies or comparable large stores, they excluded taxes and transport costs, and they pertained to rigorously identical products in both countries. We found strong evidence of LCP for some products—automobile, furniture, compact discs, for example, but not for others.

It would appear that our situation in Canada could be described by the incomplete pass-through literature. My reading of Bowman and Doyle would be that the CPI is thus the appropriate target for monetary policy. This is an important insight. At one point, we were considering whether we should not pay more attention to a measure of trend inflation that excluded the estimated direct pass-through effect of exchange rate movements on prices in formulating monetary policy, as suggested by Ball (1999). The difficulty of obtaining precise estimates of what appeared to be a vanishing pass-through held us back.

Devereux and **Yetman** suggest that this vanishing of the exchange rate pass-through may, in fact, be an endogenous outcome of low-inflation policy. They show how low and stable inflation may imply less frequent price changes and lower exchange rate pass-through than higher and more variable inflation. And they present cross-country evidence to support their hypothesis. Like the discussants, I have reservations about the econometrics, given that the estimating regression is not a complete model of price determination. However, I find the argument intuitively appealing and consistent with the stylized facts. For instance, we have observed a clear reduction in the exchange rate pass-through in the 1990s in Canada and many other countries. And we know that inflation underwent a widespread

decline from the 1970s and 1980s to the 1990s. This leads me to ponder whether we might not gain greater insights by splitting the sample period around 1991–92. This would allow us to compare for a given country the change in the estimated pass-through coefficient between a high- and a low-inflation environment.

Gabriel Srour uses the rigorous setting of New Keynesian models to re-examine the conventional wisdom on the role of monetary policy in a small open economy producing goods whose prices are set on the world market. The most interesting question he addresses is the implications of the degree of cross-sector labour mobility for monetary policy. In a country as large and regionally diverse as Canada, this is a perpetual issue. One thing is clear: monetary policy can be controversial. Without labour mobility, monetary policy is always too tight for some regions or industries, and too loose for others. However, as Craig Burnside points out, the model may be too stark. It would be more helpful to examine the case of imperfect labour mobility, allowing for adjustment costs, than the two extremes of complete mobility or immobility. While complete immobility will definitely thwart the ability of monetary policy to replicate the flexible-price equilibrium, it does not follow that complete mobility is required to achieve that goal.

3 What are the implications of a technology shock?

What happens after a permanent technology shock? In light of the technology boom-bust cycle that recently sent a shock wave across the world economy, the answer given by **Christiano**, **Eichenbaum**, and **Vigfusson**—that hours worked rise monotonically rather than first falling—does seem rather unspectacular. But a follow-up answer ignited a fascinating debate that brought the very identification of technology shocks to the front door of the central bank! As Tiff Macklem commented, technology shocks are found to matter little for the real economy but a lot for inflation. And if monetary policy gets it wrong, it can create considerable havoc in the real economy.

I must say that I am puzzled by the finding that under unchanged money growth, a positive technology shock should produce initial declines in output and employment. I would have thought that under sticky nominal wages, unchanged nominal spending could accommodate the higher output resulting from a positive technology shock through lower prices with unchanged employment. And since a positive technology shock would increase investment, it would also tend to raise interest rates and lower money demand. Thus, a constant money-growth rule might, in fact, accommodate some increase in nominal spending. Whether that would be enough to accommodate the possible increase in labour supply brought

about by higher real wages, or whether some hard-to-come-by contraction in wage growth might still be needed to equilibrate demand and supply for labour, remains an open question. But I would not have expected employment to fall under the circumstances.

I am also curious about the estimated reaction function of the Fed that produces the accommodative policy. I find it difficult to believe that the Fed that has kept inflation under 3 per cent in the last seven or eight years is using the same rule as the Fed that allowed inflation to get into the double digits in the 1970s and 1980s. In fact, allowing for a regime shift may help resolve some of the thorny identification questions that were raised during the discussion.

Michelle Alexopoulos considers a positive technology shock in her limited-participation model with an embedded efficiency wage model. She finds the responses to be qualitatively consistent, although not quantitatively identical, with the predictions of the standard limited-participation model—output, real wages, employment, investment, and interest rates all rise, and the price level decreases. Her objective is to replicate the conjunction of low real wage variation and high employment variation observed in the U.S. data without having to rely on unrealistically large elasticity of labour supply. Her imaginative answer is to enrich the model with the notions of shirking, pay-at-risk, unemployment, and risk-sharing arrangements. From the perspective of a monetary policy maker, this is a welcome leap for a dynamic general-equilibrium model. Although, as pointed out by the discussant and a number of participants, it would be instructive to incorporate other frictions. As an aside, I should correct the misconception that lump-sum cash injections from the central bank are a source of profit for the banking system. Seigniorage from money creation actually goes to the government.

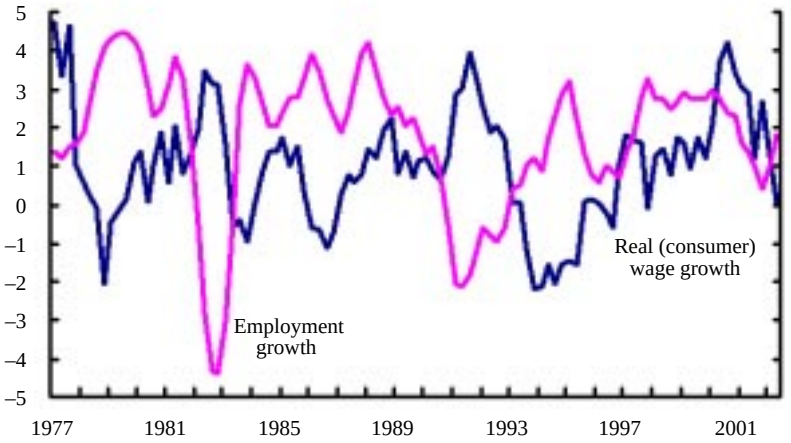
The model does not seem to fit the Canadian data. A glance at Canadian and U.S. real wage and employment data tells the story (Figure 1). It reveals much larger co-movements between real wage and employment in the United States than in Canada. This suggests that technology shocks may have been more dominant in the United States and demand shocks more dominant in Canada.

4 How has sustained low inflation affected labour market behaviour?

Howitt (1997) and others have noted that low, stable inflation should facilitate long-term plans and commitments. **Fay** and **Lavoie** ask whether reduced inflation uncertainty can be shown to have played a role in the lengthening of labour contracts in the inflation target period. In doing so,

Figure 1
Real (consumer) wage growth and employment growth
Year-over-year percentage change

Canada



United States

they are careful to account for both real and inflation uncertainty and to make a distinction between uncertainty and variability: not all variability is uncertain. Their results corroborate previous studies in finding that low inflation uncertainty (usually associated with sustained low inflation) leads to longer wage contracts and hence lower bargaining costs overall, and thus, in turn, helps make inflation more stable.

Some participants expressed unease at the finding that real and inflation uncertainty had different effects on the length of labour contracts—namely, real uncertainty had none. I believe there could be a simple explanation for this. Real shocks tend to affect different sectors in different ways, requiring greater idiosyncratic adjustments in real product wages, output, and employment across sectors than in relative wages (see Baldwin, Durand, and Hosein (2001) for empirical evidence on this). Therefore, real shocks should not require renegotiation of labour contracts. But inflation shocks would, because they would disturb relative wages. This asymmetry of real and inflation uncertainty on the length of labour contract is reminiscent of the asymmetry of optimal indexation to real and nominal shocks (Gray 1976).

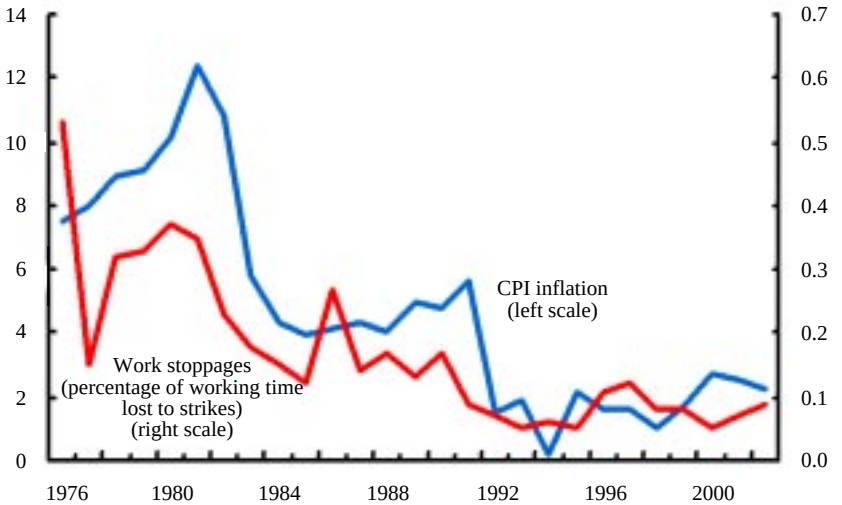
Howitt also argued that with low, stable, and predictable inflation there would be less uncertainty about real and relative wages and hence less need for labour confrontations, resulting in lower person-day loss to strikes. This conclusion also seems to be corroborated by Canadian evidence (Figure 2).

Conclusions

The objective of this conference was to examine the current state of knowledge on critically important issues for the conduct of monetary policy. We have learned a lot about the considerable conceptual insights from the latest generation of general-equilibrium models, and we confronted a number of empirical issues. If there is one lesson that I hope we all take from this conference, it is the importance of allowing for regime changes in the conduct of monetary policy when doing empirical investigation of the behaviour of inflation.

As to where we go from here, I believe that Beverley Lapham and Gregor Smith have pointed the way. We need more microeconomic analyses of price-setting behaviour. We also require a better understanding of the decisions along the distribution chain, of the reasons for local currency pricing or pricing to market, and of the differences by industry. With that in mind, the Bank's regional offices are undertaking a survey of firms, much in the spirit of Blinder et al. (1998), and will be asking real-world price-setters how prices are set and in which currency.

Figure 2
Inflation and percentage of person days lost because of strike activity



Finally, a review of large empirical multi-country models could be an instructive complement to David Bowman and Brian Doyle's excellent survey of the literature.

References

Baldwin, J.R., R. Durand, and J. Hosein. 2001. "Restructuring and Productivity Growth in the Canadian Business Sector." Statistics Canada Catalogue No. 15-204-XPE, January, 25–37.

Ball, L. 1999. "Policy Rules for Open Economies." In *Monetary Policy Rules*, edited by J.B. Taylor. Chicago: University of Chicago Press.

Blinder, A.S., E.R.D. Conetti, D.E. Lebow, and J.B. Rudd. 1998. *Asking About Prices: A New Approach to Understanding Price Stickiness*. New York: Russell Sage Foundation.

Dupasquier, C. and N. Ricketts. 1998. "Non-Linearities in the Output-Inflation Relationship." In *Price Stability, Inflation Targets, and Monetary Policy*, 131–73. Proceedings of a conference held by the Bank of Canada, May 1997. Ottawa: Bank of Canada.

Gray, J.A. 1976. "Wage Indexation: A Macroeconomic Approach." *Journal of Monetary Economics* 2 (2): 221–35.

Howitt, P. 1997. "Low Inflation and the Canadian Economy." In *Where We Go from Here: Inflation Targets in Canada's Monetary Policy Regime*, edited by D. Laidler, 27–68. Policy Study No. 29. C.D. Howe Institute.

Kurmann, A. 2002. "Quantifying the Uncertainty about a Forward-Looking New Keynesian Pricing Model." Forthcoming in *Journal of Monetary Economics.*

Laidler, D. 1982. *Monetarist Perspectives*. Oxford: Philip Allan Publishing Limited.