

Discussion

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Attempts to confront the New Keynesian Phillips curve (NKPC) with Canadian data have met with mixed results. While Gagnon and Kahn (2005) find favourable evidence for a hybrid version of the NKPC, Guay, Luger, and Zhu (2003) and Nason and Smith (2005) identify several aspects of the data that are not properly captured by such a model of the inflation process. The main evidence against the NKPC concerns the rejection of its over-identifying restrictions for some implementations of the estimation, as well as potential identification problems.

But what does this weak empirical evidence really mean? It is possible that the Canadian data are inconsistent with the core elements of the underlying pricing theory. If so, the Canadian evidence would challenge a fundamental building block of an entire class of New Keynesian models. But this weak empirical support could also result from specific features of the Canadian economy—unrelated to the core elements of the theory—that have yet to be accounted for.

Amano and Murchison attempt to shed light on this crucial question. Without substantively altering the underlying pricing model, they conjecture that a set of sensible, and arguably peripheral, modifications to the NKPC derivations might lead to a better fit with Canadian data. The key modifications to the benchmark hybrid NKPC (e.g., Galí and Gertler 1999 or Christiano, Eichenbaum, and Evans 2005) that they contemplate are: (i) the possibility that the central bank inflation target has been changing over time; (ii) an alternative measure of the marginal costs that allows for a more general, non-Cobb-Douglas, production function, the possibility of adjustment costs in labour, and that acknowledges the role of imported intermediate goods; and (iii) firm-specific capital rather than a common rental market.

In light of the previous evidence, the empirical results are impressive. Not only does their specification of the NKPC yield reasonable parameter estimates, but the restrictions embedded in the specification cannot be statistically rejected (against a VAR(1) or a VAR(2)). This clearly suggests that the modifications contemplated by Amano and Murchison are important indeed.

But which of these new ingredients really make the NKPC work? This is a significant question, especially to identify which part of the paper's conclusions is likely to be a universal feature of the NKPC and which would be specific to the Canadian context. The results in Table 4 provide a useful insight, since they allow us to identify the individual contributions of most of these ingredients to the paper's findings.

One of the most important conclusions that stem from Table 4 is that allowing for a time-varying inflation target is critical to the fit of the NKPC. The reason for this is fairly intuitive: A shifting inflation target would introduce a large degree of persistence in the inflation process that the structure of the NKPC can only partially capture by putting a large weight on lagged inflation. If taken literally, in the context of the benchmark hybrid NKPC, this should be interpreted as a large degree of inflation indexing or a large fraction of backward-looking price-setters. And this explains why, for the estimation based on raw inflation data—the results in the first two columns of Table 4—the estimated degree of inflation indexing is much greater than in the case of “detrended” inflation, and in fact close to the upper limit of 1.

But beyond the fact that it almost mechanically has to help the fit of NPKC, the idea that the inflation target has changed over time seems plausible. There is evidence suggesting that in the early 1980s, important changes occurred in the way that many central banks conducted monetary policy.¹ Broadly speaking, empirical evidence suggests that this evolution has been towards some form of inflation targeting, even in cases where such an evolution has not been made explicit, such as in the United States. The Canadian experience during that period, and the adoption of an explicit inflation target in 1991, certainly appear consistent with this trend. It also seems reasonable to believe, on anecdotal grounds at least, that part of this shift towards a more direct response to inflation targets involved a change—in fact a reduction—in the numerical value of these targets, even when they might have been only implicit, such as in the late 1980s in Canada.

1. See Clarida, Galí, and Gertler (1998) for international evidence on the evolution of monetary policy in the early 1980s. More specifically for the United States, see Clarida, Galí, and Gertler (2000); Cogley and Sargent (2005); and Boivin (forthcoming), among others.

Moreover, Figure 1 and the estimates of the long-run mean of inflation presented in this paper appear consistent with such an account.

However, one implication of a time-varying inflation target does not appear in the paper's empirical specification of the NKPC. It is not clear that the log linearization used to derive equation (11) is necessarily the right one when the inflation target is time varying. The reason is that the standard log linearization used to derive the NKPC is around a zero inflation steady state. If the inflation target is not zero—and hence steady-state inflation—and if the degree of inflation indexing is less than 1, it can be shown that the coefficients on inflation, expected inflation, and the marginal cost would depend on the level of the inflation target (see Kozicki and Tinsley 2003 and Ascari 2004). And in the presence of a time-varying inflation target, one might conjecture that the coefficients of the NKPC should themselves be time varying, as in Cogley and Sbordone (2005). Whether or not omitting the implied time variation in the coefficients of the NKPC matters in practice for Canada is an open question, and it might be possible to argue that this is really of secondary importance. An easy way to check, however, given the importance of the variation in the inflation target found in the paper, would be to test for the stability of the NKPC parameter estimates.

Another important conclusion from Table 4 is that including a time-varying inflation target, while perhaps necessary, is not sufficient to make the NKPC consistent with Canadian data. As the last column of Table 4 shows, the benchmark model estimated on the basis of detrended inflation data is still rejected against an unrestricted VAR(2). The implication is that the alternative definition of the marginal cost measure contemplated in this paper also plays an important role. A question that the paper leaves unanswered, however, is why this measure is more effective. In fact, the marginal cost measure considered here differs in more than one way from the proxy for unit labour cost used in the benchmark model. There are, in fact, three key differences with the benchmark proxy for unit labour cost: (i) it assumes a constant elasticity of substitution production function rather than a Cobb-Douglas production function ($\sigma \neq 1$); (ii) it assumes labour adjustment costs ($\chi \neq 0$); and (iii) it provides a role for imported intermediate goods in production. Does this measure perform better because it captures a specific characteristic of the Canadian economy (e.g., by giving a role to the intermediate imported good), or should we expect this measure to be a superior proxy in any economy (e.g., because it assumes a more flexible production function or a richer labour market structure)? Knowing which of the three ingredients are instrumental to the results would be helpful.

Finally, the authors contemplate firm-specific rather than a common rental market for capital. This modification does not affect the ability of the NKPC

to fit the Canadian data but, as the authors make clear, only allows for a re-interpretation of the estimated coefficient relating inflation to the measure for marginal cost. In particular, the modification helps reduce the implied frequency of price reoptimization in the preferred specification from 10.8 to 2.6 quarters. It is important to note, however, that in the presence of inflation indexing, prices are changing every period, even when the frequency of reoptimization is 10.8 quarters. Consequently, if we interpret the model literally, and given that evidence available concerns the frequency of price changes and not price reoptimization per se, it is not clear that this is a very useful dimension for discriminating among models.

In my opinion, a broad conclusion that emerges from the results is that the Canadian data should not (yet) be seen as inconsistent with the core theoretical underpinning of the NKPC theory; sensible, and mostly peripheral modifications to the benchmark NKPC deliver a specification that cannot be rejected using Canadian data. Allowing for a time-varying inflation target is an important ingredient to this success. Given that many central banks have implemented important changes in their conduct of monetary policy in the past 25 years, this finding is likely to be relevant beyond the Canadian context. As for the marginal cost measure, there is greater uncertainty about what makes it work. Whatever the source of its success, however, the proposed measure should be a good candidate for any small open economy.

While this paper provides encouraging results for the NKPC as a model for the aggregate inflation process, important questions remain, especially in the Canadian context. Two of particular interest are: (i) to what extent these results are dependent on the specific aggregate inflation measure used and typically assumed to be free of error; and (ii) to what extent this class of model can be reconciled with the Canadian micro evidence on prices.

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