Discussion

Craig Burnside

Gabriel Srour presents an interesting paper on the effectiveness of monetary policy in a relatively small open economy such as Canada's. He concentrates on theoretical modelling and considers three models, all of which are single-period static models:

- a baseline model in which there is one domestically produced good, called a primary good, and one foreign-produced good;
- an expanded model in which there are two domestically produced goods (the primary good and another good, which is highly substitutable with foreign-produced goods), and one foreign-produced good;
- a model in which there are fixed costs of production. This model is equivalent in other respects to the baseline model.

As the introduction indicates, the author compares these models in an attempt to shed light on four developments in the Canadian economy over the past several decades:

- a decline in the share of primary goods in Canada's trade;
- a secular decline in the relative price of primary goods;
- increased labour mobility;
- a decline in exchange rate pass-through.

A decline in the share of primary goods in trade is captured in a rather brute-force way through the introduction of the second domestic good in the expanded model versus the baseline model. Increased labour mobility is captured by considering two versions of the expanded model. In one version, labour is assumed to be perfectly mobile across sectors, so that there is a single labour market. In the other version, each worker is assumed to be associated with one sector or another, and cannot change sectors in response to shocks. Most models in the paper consider the case where all relative prices are determined abroad, all goods are tradable, and purchasing-power parity (PPP) holds for all goods. By considering an example where the relative price of one of the domestic goods is determined endogenously, the effects of variable exchange rate pass-through can also be examined. The paper does not really have anything to say about the effects of a downward trend in the relative price of primary goods.

In comparing models, the author consistently asks the following question: "When wages are set in advance, is monetary policy able to replicate the equilibrium that would result if wages were flexible?" The author also provides solutions for the size of the monetary policy response that is needed to obtain the flexible-wage equilibrium. The answer to the question posed above is "yes" for the baseline model, "yes" for the expanded model if labour is mobile, "no" for the expanded model if labour is immobile, and "it depends" for the model with fixed costs.

My comments on the paper focus on providing intuition for the basic results for the baseline and expanded models. I will show that the model always boils down to four equations that can be understood in a simple supply and demand diagram.

Since the model in the paper is static, we can think of any standard model in which households maximize their utility by choosing consumption and labour supply subject to a budget constraint. In the model, consumption is a basket of goods, but this adds a layer of complication from which we can abstract. For my purposes, the household's utility is

$$U = \frac{1}{1-\sigma}C^{1-\sigma} - \frac{1}{1+\phi}N^{1+\phi} + \chi\ln(M/P), \tag{1}$$

and, in equilibrium, the household's budget constraint is

$$C = \text{real wages} + \text{real profits}, \tag{2}$$

where C is a consumption aggregate, N is household labour supply, M is nominal money balances, and P is the domestic price level.

1 The Baseline Model

1.1 Flexible wages

Wage-setting equation. In the baseline model, there is only one domestically produced good, so real wages are just wN, where w is the real wage rate. In standard dynamic macro models, there is an intratemporal Euler equation that sets the marginal utility of leisure equal to the marginal utility of consumption times the real wage. The model in this paper is slightly different, because households are price-setters (monopolistic competitors) in labour markets.[1] Hence, the following first-order condition holds:

$$-U_N = U_C w(1 - 1/\lambda), \tag{3}$$

where U_N and U_C represent the partial derivatives of the utility function with respect to labour and consumption, and $\lambda > 1$ is the elasticity of substitution between different types of labour. In a model of perfect competition, we would simply have $\lambda = \infty$. Of course, given the utility function in equation (1), equation (3) can be rewritten as

$$C^{\sigma} N^{\phi} = w(1 - 1/\lambda). \tag{4}$$

This wage-setting equation can be used to express w as a function of N, with C as a shifter.

Budget constraint. Since the value of all domestically produced output is distributed to domestic households either as wages or as profits, if we assume that the output of the domestic good is

$$Y = AN^{1-\alpha}/(1-\alpha), \tag{5}$$

then equation (2), the budget constraint, can be rewritten as

$$C = pAN^{1-\alpha}/(1-\alpha), \tag{6}$$

where p is the price of the domestic good relative to the overall price level.[2] This relative price is set in world markets, so if we combine equations (4) and (6), we get the **labour supply curve**,

$$w = \frac{\lambda}{\lambda-1}\left(\frac{A}{1-\alpha}\right)^{\sigma} p^{\sigma} N^{(1-\alpha)\sigma+\phi}, \tag{7}$$

which is a simple upward sloping function with p as an exogenous shifter.

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1. The labour market is structured in this way to facilitate the modelling of forward-looking wage-setting when we look at the case where wages are set in advance.

2. That is, p is equal to P_X/P, where P_X is the domestic price of the domestic good, and P is a price aggregator that combines the price of domestic goods, P_X, and the domestic price of foreign goods, P_F. Since PPP holds for all goods, p is determined by relative prices in the world market.

Labour demand curve. Firms are price-takers in labour markets and maximize real profits given by $\pi = pY - wN$. Hence, they set N consistent with the relative wage being equal to the marginal product of labour:

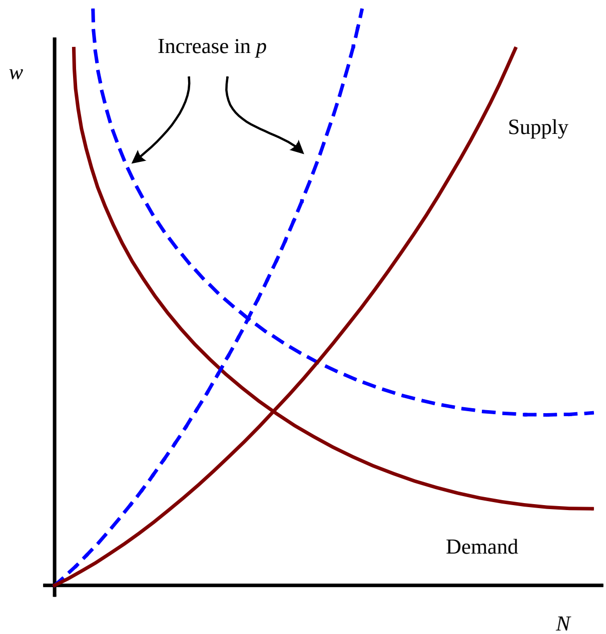
$$w = pAN^{-\alpha}. \tag{8}$$

This is a simple downward sloping function with p as an exogenous proportional shifter.

Equilibrium is determined by labour supply equalling labour demand. As we can see from combining equations (7) and (8) and from Figure 1, the equilibrium quantity of N depends on p and is equal to

$$N^*(p) = \left[\frac{\lambda - 1}{\lambda}(1-\alpha)^{\sigma}(pA)^{1-\sigma}\right]^{1/[(1-\alpha)\sigma + \phi + \alpha]}. \tag{9}$$

Figure 1
Equilibrium in the flexible-wage model



The equilibrium values of the real wage and consumption can then be found by substituting N^* into equations (6) and (8).

Money demand. There is no interesting role for monetary policy in the flexible-price model. The first-order condition for money balances implies $M = \chi PC$ or

$$M/S = \chi P^* C, \tag{10}$$

where P^* is the price aggregator evaluated at world prices (which are exogenous). Hence, in a flexible exchange rate regime, where M is set by the monetary authority, S responds passively to make equation (10) hold. In a fixed exchange rate regime, M responds passively to make equation (10) hold. But the effects of monetary policy are completely contained within equation (10): money has no real effect.

1.2 Wages set in advance

When nominal wages are set in advance, the only change is that the wage-setting equation is replaced by an expectational version of equation (3):

$$-E(U_N) = W(1-1/\lambda)E(U_C/P), \tag{11}$$

where W is the nominal wage. Rather than formally analyze this equation, I simplify by replacing the wage-setting equation by $W = W_0$, where W_0 is some arbitrary value of the nominal wage.[3] The labour market clears by assuming that households satisfy labour demand at W_O.

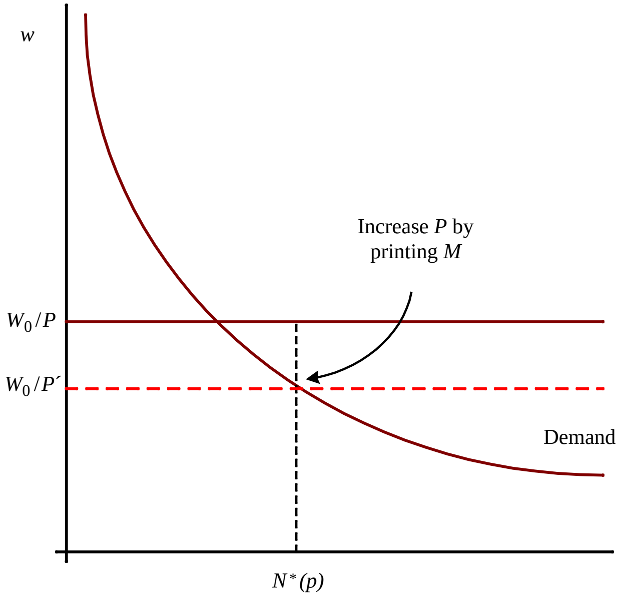
Since the nominal wage is predetermined, it is clear that consumption, labour, and the price level (or equivalently, the exchange rate) will be determined jointly by our other three equations: (6), (8), and (10). As Figure 2 shows, as long as the monetary authority can manipulate the price level for a given value of W_0 and p, the horizontal supply schedule can be made to intersect the demand schedule at any quantity, including the flexible-price equilibrium quantity, $N^*(p)$.

How does the monetary authority manipulate the price level in exactly the right way? This can be determined by solving equations (6), (8), and (10) under the assumption that $N = N^*(p)$. It is easy to show that:

$$M = \chi N^*(p) W_0/(1-\alpha). \tag{12}$$

3. The spirit of my discussion is not changed if one assumes that W_0 is an optimal choice of preset nominal wage consistent with equation (11).

Figure 2
Equilibrium when wages are set in advance



Note that with this monetary policy, equilibrium consumption is also equal to the same value as in the flexible-wage equilibrium.

One way of thinking about the magnitude of the required monetary policy response is to measure the change in the money supply that is required as the result of any unanticipated change in the terms of trade, p. Since the desired money supply is proportional to $N^*(p)$, this can be measured in terms of the elasticity of $N^*(p)$ with respect to p, which is easily obtained from equation (9).

While replication of the flexible-wage equilibrium is interesting, it might also be useful to consider other monetary policies. For example, it might be constructive to establish whether there is a monetary policy that can offset the effects of imperfect competition in labour markets.

2 The Expanded Model

2.1 Mobile labour

The assumption that labour is mobile between sectors means that labour must be paid the same wage regardless of which sector it works in. Hence, despite the fact that there are two different goods being produced in the domestic economy, there is a single domestic labour market.

Wage-setting works exactly as it did before, so that equation (3) still holds. The budget constraint works a little differently and is now given by

$$C = p_X A_X N_X^{1-\alpha}/(1-\alpha) + p_H A_H N_H^{1-\alpha}/(1-\alpha), \tag{13}$$

where X and H represent the two goods whose prices relative to the consumption price index are $p_X/P_X/P$ and $p_H = P_H/P$, respectively. As we will see, the share of the labour supply that works in sector X, which I denote $x = N_X/N$, will be a function only of p_X and p_H, which are set in world markets. I denote this function $x = x(p_X, p_H)$. Hence, we can write equation (13) as

$$C = [p_X A_X x^{1-\alpha} + p_H A_H (1-x)^{1-\alpha}] N^{1-\alpha}/(1-\alpha). \tag{14}$$

Combining this expression with equation (3), we obtain a labour supply schedule much like we have for the basic model in Figure 1. The key difference is that this labour supply schedule is buffeted by shocks to two relative prices, p_X and p_H, instead of just one.

The labour demand schedule works exactly as before, except that there are two goods; hence, equation (8) holds for each good:

$$w = p_X A N_X^{-\alpha} = p_H A N_H^{-\alpha}. \tag{15}$$

Note that it follows from equation (15) that

$$x = \frac{(p_X A_X)^{1/\alpha}}{(p_X A_X)^{1/\alpha} + (p_H A_H)^{1/\alpha}}, \tag{16}$$

and that the labour demand curve is

$$w = p_X \chi^{-\alpha} A_X N^{-\alpha}. \tag{17}$$

This is only slightly different from the demand schedule in Figure 1 in that, like the supply curve, it is affected by shocks to two relative prices instead of one.

Given that the demand and supply for labour still appear as they do in Figure 1, but are buffeted by more shocks, one's intuition would be that under sticky nominal wages, monetary policy could still achieve the flexible-price equilibrium as long as the price level could be manipulated. The reason is straightforward: there is a single labour market. Hence, for any W_0, monetary policy can manipulate the real wage so that the aggregate quantity of labour is the same as in the flexible-wage equilibrium. The allocation of labour across sectors will be the same as well, because labour is fully mobile.

The monetary policy rule that achieves the flexible-price equilibrium is similar to the one in the baseline model, except that it depends on both relative prices. In particular, if the flexible-wage equilibrium level of labour supply is $N^*(p_X, p_H)$, then equations (10), (14), and (15) can be solved assuming $N = N^*(p_X, p_H)$ to obtain the appropriate expression for M.

2.2 Immobile labour

The model of immobile labour assumes that certain households or members of households are associated with particular production sectors. The paper does not make clear precisely how this is modelled. Are there different types of workers within the household? Do households share the proceeds of their work effort and profits from ownership of the firms in a common pool of resources so that consumption is identical across individuals? This seems to be the implicit assumption in the paper, but I make it my working assumption here. I assume that the household divides up into X workers and H workers at the beginning of the period, where each group makes separate wage-setting decisions, understanding the resource pooling that will occur later. This means that the labour supply curves in the two sectors have the same shape and only differ depending on the arbitrary allocation of workers across sectors.

Because labour is not mobile, nothing requires the equilibrium real wage to be equal across sectors. Hence, there are two separate labour demand curves. We therefore end up with two diagrams that resemble Figure 1, one for each sector.

When wages are established in advance in this setting, monetary policy will no longer be able to replicate the flexible-wage equilibrium. The reason is straightforward. Monetary policy could attempt to replicate the flexible-wage equilibrium in one of the two labour markets, but not in both. It could also try to replicate the outcome for total labour supply. But since monetary policy, through its manipulation of the price level, is a single instrument, it cannot fully achieve two potentially conflicting outcomes in the two labour markets.

Concluding Remarks

The paper presents an interesting set of models that allow us to compare the efficacy of monetary policy in different economic environments for a small open economy. The paper shows that when prices are set in advance, the ability of monetary policy to replicate the flexible-wage equilibrium depends on whether there are multiple sectors in the model, and labour mobility across sectors. In particular, the flexible-wage equilibrium can be achieved as long as labour is fully mobile. If there are costs of adjusting the sectoral allocation of labour, then the flexible-wage equilibrium cannot be fully replicated in a multi-sector model.

Future research would do well to assess the importance of these findings quantitatively. In reality, Canada’s economy has always had multiple sectors. Furthermore, there has always been some degree of labour mobility. How monetary policy has been affected by these changes over time would require a modelling framework in which we could think less starkly about the diversification of Canada’s economy and the changes in its labour markets. Future research would also need to discuss the changing nature of wage-setting in the Canadian economy, and the changing instruments of monetary policy.

In sum, I am suggesting that future research should focus on empirical assessments of the issues that Srour raises. His theoretical results are interesting—but their importance demands a closer, more empirical investigation.