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Large labour unions and terms-of-trade externality☆

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HIGHLIGHTS

- I study optimal monetary policy in an open economy in the presence of large unions.
- The loss in domestic output from wage claims is offset by the gains in domestic consumers' purchasing power internationally.
- The traditional incentive of optimal monetary policy to affect the terms of trade is diminished.

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ABSTRACT

This paper shows that large labour unions reduce the incentive for uncoordinated monetary policies to improve the terms of trade. This finding implies that concentrated labour markets significantly affect the optimal policy prescription in an open economy.

1. Introduction

New Open Economy Macroeconomic models, pioneered by Obstfeld and Rogoff (1995) and exploited for optimal monetary policy analysis by Corsetti and Pesenti (2001) (henceforth CP), have emphasized that non-cooperative monetary policies may be too deflationary because of the incentive to manoeuvre international prices in favour of the domestic economy. In an open economy, an improvement in the terms of trade decreases the relative price of imported goods, triggering a rise in domestic consumers' purchasing power internationally and a reduction in the disutility of labour, as the burden of production is shifted abroad (namely a terms-of-trade externality).

However, hinging on atomistic wage setters the CP model and much of the subsequent literature disregard the fact that in several OECD countries, particularly in European economies, wage negotiations are delegated to few large unions whose decisions affect the aggregate wage at the national or sectoral level. I show that labour markets featuring non-atomistic wage setters (NAWS) reduce the influence of the terms-of-trade externality on the optimal monetary prescription. Intuitively, NAWS anticipate that an increase in nominal wages boosts domestic producer prices by raising firms' marginal costs. This yields two opposing effects on wage demands. On the one hand, the real interest rate rises in the wake of higher domestic inflation, leading domestic workers to switch consumption from the short run to the long run. This effect restrains wage demands. On the other hand, the terms of trade improve, prompting domestic workers to switch their consumption towards foreign goods in the short run. The latter effect fosters wage demands and offsets both the impact on the real interest rate and the policy maker's incentive to improve the actual terms of trade.

2. Wage setting

The model is adapted from CP. The world economy is composed of two countries: home and foreign. Each country specializes in

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the production of a single traded good and is populated by a continuum of identical households with size normalized to 1. Households' preferences are similar across countries, so I focus on the representative household j in the home country (foreign variables will be denoted by *).

In each country, households (monopolistic suppliers of productive inputs) are organized into $n > 1$ labour unions. As common in the NAWS literature, I assume that all types of labour j are unionized and equally distributed among unions (e.g. Soskice and Iversen, 2000; Lippi, 2003). Therefore, $1/n$ indicates both the representative union's mass and the fraction of workers whose pay is negotiated by the u-th union (i.e. $1/n = j \in u$). Because of this assumption, the u-th union anticipates that[1]

$$\frac{\partial W}{\partial W(u)} = \frac{1}{n}, \tag{1}$$

where $W(u)$ denotes the nominal wage of labour types $j \in u$, while W is the nominal wage index defined as

$$W_t = \left(\int_0^1 W_t(j)^{1-\sigma} \mathrm{d}j \right)^{\frac{1}{1-\sigma}} \quad \sigma > 1. \tag{2}$$

Note that the lower is n, the more each union internalizes the impact of wage settlement on aggregate wage and hence on firms' marginal costs. Specifically, each union realizes that a wage hike triggers inflationary pressures through the profit maximizing condition of firms (i.e. $P_H = W$) as follows

$$\frac{\partial P_H}{\partial W(u)} = \frac{1}{n}. \tag{3}$$

If unions are atomistic ($n \to \infty$), the impact of wage claims on the home producer price index, P_H, is zero, while it is positive and increasing in the size of unions, $1/n$.

Nominal wages in period t are predetermined with contracts signed at time $t-1$. Each union plays a Nash game with the monetary authorities and other unions: they simultaneously set nominal wages, taking money supplies and other unions' wages as given. In doing so, the u-th labour union chooses the nominal wage $W(u)$ for all members $j \in u$ and maximizes the following utility function

$$U_t(u) = n \int_{j \in u} \left[\frac{C_t(j)^{1-\rho}}{1-\rho} - \frac{\kappa}{2} \ell_t(j)^2 \right] \mathrm{d}j \quad \rho > 0 \tag{4}$$

subject to the budget constraint

$$B_{t+1}(j) \leq (1 + i_t) B_t(j) + W_t(j) \ell_t(j) - P_t C_t, \tag{5}$$

and labour demand

$$\ell_t(j) = \left(\frac{W_t(j)}{W_t} \right)^{-\sigma} Y_t, \tag{6}$$

where C denotes final consumption, ℓ is the amount of labour supplied by the household, Y is the total output demanded, B is an internationally traded bond denominated in composite consumption units, and its nominal yield (paid at the beginning of period t) is i_t. The consumption-based price index P is given by

$$P_t \equiv \frac{P_{H,t}^{\gamma} (\mathscr{E}_t P_{F,t}^*)^{1-\gamma}}{\gamma^{\gamma} (1-\gamma)^{1-\gamma}} \quad 0 < \gamma < 1, \tag{7}$$

where P_F^* is the price of the foreign good in foreign currency and $\mathscr{E}$ is the nominal exchange rate expressed in home currency per unit of foreign currency.

[1] Eq. (1) is evaluated at a symmetric equilibrium, $W(u) = W$, and is key to the model results (see Appendix A).

The solution to the union's problem is

$$\mathrm{E}_{t-1}[\kappa \ell_t^2(u)] \frac{\phi}{\phi - 1} = W_t(u) \mathrm{E}_{t-1} \left[\frac{1}{P_t} \frac{\ell_t(u)}{C_t^{\rho}} \right], \tag{8}$$

where $\phi \equiv \frac{\Sigma_\ell}{1 - \Sigma_P} > 1$ is the elasticity of labour demand to real wages perceived by the u-th union derived in Appendix B and

$$\Sigma_Y \equiv \left| \frac{\partial \log Y}{\partial \log W} \right| = 1 - \gamma + \frac{\gamma}{\rho}, \tag{9}$$

$$\Sigma_P \equiv \frac{\partial \log P}{\partial \log W(u)} = \frac{1}{n} - (1-\gamma) \frac{1}{n}, \tag{10}$$

$$\begin{aligned} \Sigma_\ell \equiv \left| \frac{\partial \log \ell(u)}{\partial \log W(u)} \right| &= \sigma \left(1 - \frac{1}{n} \right) + \left| \frac{\partial \log Y}{\partial \log W} \right| \frac{1}{n} \\ &= \sigma \left(1 - \frac{1}{n} \right) + \Sigma_Y \frac{1}{n}. \end{aligned} \tag{11}$$

It is worth noting that the wage mark-up $\phi/(\phi-1)$ is higher, the greater is the degree of openness, $1-\gamma$, and the lower the intertemporal elasticity of substitution in consumption, $1/\rho$. Intuitively, domestic unions perceive inflationary wage pressure through Eq. (3) as triggering two effects. First, the real interest rate rises, thereby reducing aggregate consumption because workers switch consumption from the short run to the long run (through the Euler equation). This *intertemporal* effect discourages wage claims and is captured by $1/\rho$. Second, in an open economy (i.e. when $\gamma < 1$) inflationary wage pressure also involves the re-allocation of consumption internationally. Specifically, unions anticipate that an increase in aggregate wages will lead to an improvement in the terms of trade given by $1 - \gamma$. As the home good becomes more costly than the foreign one, domestic workers switch their consumption towards the foreign good in the short run (through the demand functions for a typical good produced in the home and foreign country). This *intratemporal* effect encourages wage claims and its strength is captured by the impact of wages on the terms of trade.[2] In other words, labour unions perceive an improvement in the terms of trade caused by inflationary wage pressure as increasing their monopoly power. They can in fact raise the real wage of home workers relative to foreign workers by lowering the relative price of imported goods.

It is worth noting that ϕ is not affected by monetary policy.[3] Many contributions in the NAWS literature investigate the *anticipated* real effect on labour supply of a change in the policy rule. In this paper, monetary policy is instead an *unanticipated* monetary shock that hits the economy. I prefer following the approach of CP and assessing how the incentives of policy makers are affected by the presence of large unions. However, introducing an endogenous conservative monetary policy would simply magnify the above mechanisms (Cuciniello, 2011).

3. Welfare analysis

The economy is initially at a symmetric steady state with zero net-asset positions (variables indexed by the subscript 0). At time t,

[2] This intratemporal mechanism is proportional to the size of demand elasticity for the country products. In CP the elasticity of intratemporal substitution in consumption is equal to 1. A general discussion about the role of cross-country substitutability for the international transmission of shocks can be found in Tille (2001).

[3] Many studies analyse trade unions whose choice of real wage depends on the anticipated reaction of monetary policies. For a non-exhaustive list of works investigating the long-run effect of central bank preferences on wage setting in an open economy see, for example, Jensen (1993), Cavallari (2001), Grüner and Hefeker (1999), Cukierman and Lippi (2001), Coricelli et al. (2004), Acocella et al. (2007), and Cuciniello (2011).

a permanent monetary shock, $\overline{M}$, occurs. Wages are set for period t (the short run) and can be adjusted only at period $t+1$. From period $t+1$ on, the economy is at a new steady state (the long run). The long-run values are denoted by an upper bar, while the short-run values are plain variables.

3.1. Discussion

Differentiating domestic welfare with respect to $\overline{M}$ yields

$$\frac{\partial U}{\partial \overline{M}} = \frac{\gamma}{\rho \overline{M}}\left[C^{1-\rho} - \kappa Y^2\left(1+\rho\frac{1-\gamma}{\gamma}\right)\right]. \tag{12}$$

Consider first the case of a small monetary innovation by evaluating (12) at $\overline{M} = M_0$ as follows

$$\text{Sign}\left(\frac{\partial U}{\partial \overline{M}}\right)\Big|_{\overline{M}=M_0} = \text{Sign}\left[1-D\right], \tag{13}$$

where

$$D \equiv \frac{\phi-1}{\phi}\left(1+\rho\frac{1-\gamma}{\gamma}\right)$$
$$= \left(1+\frac{(n-\gamma)\rho}{\gamma+(n-1)\rho(\sigma-1)}\right)^{-1}\left(1+\rho\frac{1-\gamma}{\gamma}\right) \tag{14}$$

captures the monetary authority's incentive to contract its money supply. As highlighted in CP, a tightening policy improves the terms of trade, triggering expenditure switching in both countries away from the domestically produced good and towards the foreign produced good. This creates a beggar-thy-neighbour spillover into the foreign households, as they bear the burden of production (see also Tille, 2001; Benigno, 2002).

From the analysis above it turns out that the size of unions, $1/n$, affects D, namely the terms-of-trade externality. Specifically, the lower n, the less is the monetary authority's incentive to improve the terms of trade. In the extreme case of a single union $n=1$, expression (14) shows that, with a small monetary shock, the terms-of-trade externality is exactly offset by the unions' monopolistic distortion. With a large shock, policy makers always have the incentive restrict their monetary policy to improve the terms of trade. However, when $\sigma > 1+\gamma/[\rho(1-\gamma)]$, the lower n, the smaller is the contraction bias. As a consequence, more concentrated labour markets reduce the discrepancy between the optimal monetary policy (obtained by solving Eq. (12) when it is equal to zero) and the monetary policy required to raise output to its efficient level.

3.2. Concluding remarks

With NAWS, inflationary wage demands raise real interest rates and improve the terms of trade. These two effects re-allocate consumption, respectively, from the short run to the long run and from home to foreign goods. The latter effect, however, implies that the loss in domestic output from wage claims is offset by the gain in domestic consumers' purchasing power internationally and the traditional incentive of optimal monetary policy to affect the terms of trade is thus diminished.

Appendix A. An impact of union wage on aggregate wage

From the wage index (2),

$$\frac{\partial W}{\partial W(u)} = \frac{\partial}{\partial W(u)}\left[\int_0^1 W(j)^{1-\sigma}\mathrm{d}j\right]^{\frac{1}{1-\sigma}}$$
$$= \frac{\partial}{\partial W(u)}\left[\int_{j\in u} W(j)^{1-\sigma}\mathrm{d}j + \int_{j\notin u} W(j)^{1-\sigma}\mathrm{d}j\right]^{\frac{1}{1-\sigma}}$$
$$= \frac{1}{n}\left[\frac{W(u)}{W}\right]^{-\sigma} = \frac{1}{n}, \tag{A.1}$$

where the last equality holds in a symmetric equilibrium, i.e. when $W(u) = W$.

Appendix B. Elasticity of labour demand perceived by the u-th union

In CP national net-asset positions are always given by $B = \overline{B} = 0$. In equilibrium the ratio of home and foreign consumption (in the short and long run) is then constant and equal to $\gamma/(1-\gamma)$.

Combining these results and the purchasing power parity conditions, $P = \mathscr{E}P^*$, with the money market equilibrium, $\overline{M}/P = \chi C^{\rho}(1+i)/i$, in the short and long run yields[4]

$$\mathscr{E} = \overline{\mathscr{E}} = \frac{\overline{M}}{\overline{M}^*}\left(\frac{\gamma}{1-\gamma}\right)^{-\rho} \tag{B.1}$$

and

$$i = i^* = \delta. \tag{B.2}$$

Aggregate demand, $Y = \gamma(C+C^*)P/P_H$, can be rewritten as follows

$$Y = \left(\frac{\mathscr{E}W^*}{W}\right)^{1-\gamma}\frac{C}{\gamma_W}$$
$$= \frac{(\mathscr{E}W^*/W)^{1-\gamma}}{\gamma_W}\left[\frac{\beta(1+i)}{\overline{P}\gamma_W}W\left(\frac{\mathscr{E}W^*}{W}\right)^{1-\gamma}\right]^{-\frac{1}{\rho}}\overline{C}. \tag{B.3}$$

The second equality stems from the Euler equation, $C^{-\rho} = \beta(1+r)\overline{C}^{-\rho}$, where $0<\beta<1$ is a subjective discount factor and r is the short-run real interest rate.

Using the above expression and taking long-run variables as given yields, in a symmetric equilibrium, Σ_Y in the text. Similarly, the elasticity of the consumer price index to changes in wage $W(u)$ can be obtained from

$$\Sigma_P \equiv \frac{\partial \log P}{\partial \log W(u)} = \frac{\partial \log(W(\mathscr{E}W^*/W)^{1-\gamma}/\gamma_W)}{\partial \log W(u)}$$
$$= \frac{1}{n} - (1-\gamma)\frac{1}{n}. \tag{B.4}$$

Finally, the perceived elasticity of labour demand to *real* wages is

$$\phi \equiv \left|\frac{\partial \log \ell(u)}{\partial \log W(u)/P}\right| = \frac{\left(1-\frac{1}{n}\right)\sigma + \frac{1}{n}\Sigma_Y}{1-\Sigma_P}. \tag{B.5}$$

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