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WAGE SETTING UNDER DIFFERENT MONETARY REGIMES

Steinar Holden*

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CESifo
Center for Economic Studies & Ifo Institute for Economic Research
Poschingerstr. 5, 81679 Munich, Germany
Phone: +49 (89) 9224-1410 - Fax: +49 (89) 9224-1409
e-mail: office@CESifo.de
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Abstract

In an economy with large wage setters (like industry unions), the monetary regime affects the trade-off between consumer real wages and employment and profits faced by the wage setters. This paper shows that an exchange rate target, including participation in a monetary union, is likely to involve lower wages in the traded sector, and higher wages in the non-traded sector, than does a price target. An exchange rate target also involves higher prices on non-traded goods relative to traded goods. Overall welfare is likely to be higher under a price target.

Keywords: wage bargaining, monetary union, inflation target, monetary regime, equilibrium unemployment.

JEL Classification: J5, E5.

Steinar Holden
University of Oslo
Department of Economics
Box 1095 Blindern
0317 Oslo
Norway
steinar.holden@econ.uio.no

I. Introduction

The last few years, there has been a growing interest in the relationship between wage setting and monetary regime in economies with large wage setters,[1] The basic argument is that different monetary regimes involve different reaction functions of the central bank to the outcome of the wage setting, which under most circumstances (to be discussed below) will imply that large wage setters face a different trade-off between consumer real wages and employment and profits. In a regime where the monetary policy dampens the negative effects on employment and profits of a marginal increase in the consumer real wage, large wage setters will choose a high real wage, leading to low levels of employment and output.

This paper compares two monetary regimes, an exchange rate target and a consumer price target, in a model with a traded and a non-traded sector. These regimes are the natural modern options for most open economies, in particular as exchange rate targeting encompasses membership in a monetary union. Distinguishing between traded and non-traded sectors is motivated by the idea that the monetary policy has different effects on these two sectors, a difference that turns out to be crucial.

The main results are as follows. In the non-traded sector, an exchange rate target involves higher consumer real wages than does a price target, for the following reason: Under an exchange rate target, a rise in non-traded wages is not countered by the central bank, but allowed to increase non-traded prices. This dampens the negative effect on employment and profits in the non-traded sector. In effect, the trade-off between real wages on the one hand,

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[1] Early contributions are Horn and Persson (1988), Holden (1990), Akhand (1992), Sørensen (1992) and Jensen (1993), while the more recent literature includes Bratsiotis and Martin (1999), Soskice and Iversen (1998, 2000), Wibaut (1998a), Cukierman and Lippi (1999, 2001) and Holden (2001). A related literature, following Cubitt (1992), shows similar mechanisms under the assumption that unions are also concerned about inflation.

and employment and profits on the other, is more favourable, and wage setters the non-traded sector respond by setting a higher wage.

In the traded sector, the ranking is reversed: Consumer real wages are highest under a price target. A wage rise in the traded sector has a contractionary effect on output and income, reducing demand for the non-traded good and thus also its price. The reduction in non-traded prices implies that constant consumer prices can be maintained with a depreciation of the exchange rate. The depreciation dampens the negative effect on employment and profits in the traded sector, making it more attractive to raise the wage. This mechanism is not present under an exchange rate target.

The feature that the monetary regime has different effects on the different sectors of the economy implies that the monetary regime affects both relative prices and the sectoral structure of the economy. The moderating effect on traded sector wage setting under an exchange rate regime implies that the price of non-traded goods relative to traded goods is likely to be higher under an exchange rate target, even in a long run steady state equilibrium where foreign trade is balanced. The effect on the relative size of the two sector depends on the elasticity of substitution between traded and non-traded goods.

As the regimes have different effects on different sectors, the aggregate outcome depends on which effect dominates. Numerical simulations suggest that in most cases overall welfare and aggregate employment are higher under a price target than under an exchange rate target. However, the union in the non-traded sector benefits from high real wages under an exchange rate target.

Seen from a technical point of view, the results of the present paper are not surprising: Changing the strategic variable of one of the players (the central bank) will in general affect the outcome of a game. However, the results are in sharp contrast to the common view (e.g.

Svensson, 1997) that in the long run monetary policy cannot affect real variables, nor can it affect the relative price of traded versus non-traded goods.

The paper is organised as follows. The model is presented in section II, using a theoretical framework drawing upon Rasmussen (1992). To focus on the long run effects of the monetary regime, I use a static model with no shocks. Thus the model is not suitable for evaluating the stabilization properties of different monetary regimes.[2] Section III explores the equilibrium of the model, as well as providing results of numerical simulations. Section IV concludes.

II. The model

The economy under consideration consists of two sectors, with traded and non-traded goods. In each sector there is a large exogenous number, n, identical firms and one union organising all workers in the sector. Wages are set at sector level, in a bargain between the union and the employers' association in the sector. Traded goods have an exogenous world market price P*, so that the price in domestic currency, P^T, is given by $P^T = EP^*$, where E is the nominal exchange rate. Households are either workers or shareholders (who receive all profits of the firms). Including households in the model (instead of postulating demand functions directly) has the advantage that it allows for an explicit welfare comparison of the regimes. Throughout the paper, all agents are assumed to have perfect information.

The sequence of moves in the model is the following. First, wages are set simultaneously in each sector. Second, the central bank sets the exchange rate so as to ensure that the monetary target is fulfilled. Third, production and consumption take place.

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[2] Leitemo and Røisland (1998) find that CPI-inflation targeting is likely to outperform fixed exchange rate regimes in terms of stabilization properties.

The reason for distinguishing between the traded and non-traded sectors is, as alluded to above, that the implications of various monetary regimes differ sharply between the sectors. It is true that in actual economies the distinction between traded and non-traded goods is not always sharp. Furthermore, over time an increasing number of goods have been subject to international trade. However, it is still the case that a wage rise in the export industry has a different impact on the consumer price level than a wage rise in the non-traded sector. It is also the case that a change in the exchange rate has different impact on output and employment in different sectors of the economy. These are important distinctions that should be taken into account in a comparison of different monetary regimes.

The assumption that wage setting takes place separately in the two sectors is critical for the results of the paper. If there had been a single, economy-wide union, bargaining over a common wage for both sectors, the monetary regime would not matter. With a common wage, the relative price of traded and non-traded goods would be given, and the tradeoff between employment and real wages would be uniquely given from the aggregate labour demand schedule, unaffected by the monetary regime. In this case the outcome of the wage setting would also be unaffected by the monetary regime. This corresponds to Cukierman and Lippi (2001), Proposition 1 (ii), that at least two unions are required for the monetary regime to affect wage setting. Note, however, that this result is model-dependent: in Bratsiotis and Martin (1999) and Holden (2001), the monetary regime affects wage setting and equilibrium unemployment even under complete centralisation (ie. one union), because monetary policy affects employment directly (via the real money stock), and not only via the effect on the real wage.

My justification for assuming that wage setting takes place separately in the traded and non-traded sectors is that it captures an important element of realism: In many European countries, large wage setters are typically industry unions, some of which belong primarily to

the traded sector, while others primarily belong to the non-traded sector. In Denmark and Norway, industry unions in the manufacturing sector have formed a cartel, while in Sweden and Finland, unions operating in export industries have discussed the formation of bargaining cartels (Vartiainen, 1999).

Households

There is large number, M, households in the economy, of which M^j are members of the union in sector j, j = T, N, and $M - M^T - M^N$ are shareholders. All households have identical preferences that are separable in consumption and leisure, and where the subutility function associated with consumption is of the CES-type. The utility function of household h is

$$(1)\quad V_h = \left[\gamma^{1/\rho}(C_h^N)^{(\rho-1)/\rho} + (1-\gamma)^{1/\rho}(C_h^T)^{(\rho-1)/\rho}\right]^{\rho/(\rho-1)} + v(H_h),$$

$$0<\gamma<1,\ \rho>0,\ \rho\neq 1,\ h=1,2,..\ M$$

where C_h^N and C_h^T are consumption of non-traded and traded goods respectively, ρ is the elasticity of substitution, and $v(H_h)$ is the subutility function associated with leisure, H_h. To simplify the exposition, I assume that workers are either fully employed, supplying one unit of labour, where $v(H_h) = 0$, or completely unemployed, $v(H_h) = v_0 > 0$. The budget constraint of household h is $P^N C_h^N + P^T C_h^T = I_h$, where I_h is the nominal income of household h. Aggregate nominal income $\Sigma_h I_h$ is equal to PY, where Y is the real aggregate output in the economy and P the consumer price index that corresponds to the CES utility function (1) (Y^j is output in sector j, j = T,N)

$$(2)\quad Y = (P^N Y^N + P^T Y^T)/P$$

$$(3)\quad P = (\gamma (P^N)^{1-\rho} + (1-\gamma)(P^T)^{1-\rho})^{1/(1-\rho)},$$

If the elasticity of substitution ρ = 1, we have the Cobb-Douglas case, where:

(4) $V_h = \frac{1}{a}(C_h^{\ N})^{\gamma}(C_h^{\ T})^{1-\gamma} + v(H_h), \qquad a = \gamma^{\gamma}(1-\gamma)^{1-\gamma}, \quad 0<\gamma<1, \text{ h=1,2,.. M}$

(5) $P = (P^N)^{\gamma}(P^T)^{1-\gamma}.$

It is straightforward to show that aggregate domestic demand for traded goods, and aggregate demand for non-traded goods are

(6) (a) $C^N = \gamma\left(\frac{P^N}{P}\right)^{-\rho} Y$ (b) $C^T = (1-\gamma)\left(\frac{P^T}{P}\right)^{-\rho} Y$

Firms

The production technology in each sector satisfies (labour is the only input)

(7) $Y^j = (1/\beta)\,(L^j)^{\beta}, \qquad 0 < \beta < 1, \qquad j = T, N,$

where L^j is employment (to simplify notation I do not distinguish between aggregate and firm-level variables; taken literally there is only "one" firm in each sector which nevertheless acts as a price taker). The real profits of a firm in sector j are $\pi^j = (P^j Y^j - W^j L^j)/P$, j = T,N, where W^j is the nominal wage in the sector.

As seen from each firm, prices and wages are exogenous, and maximising profits using (7), results in the labour demand, output supply and real profits as follows:

(8) $L^j = (P^j/W^j)^{1/(1-\beta)},$

(9) $Y^j = (P^j/W^j)^{\beta/(1-\beta)}\beta^{-1},$

(10) $\pi^j = (1-\beta)\beta^{-1}\,(P^j)^{1/(1-\beta)}\,(W^j)^{-\beta/(1-\beta)}/P.$

Unions

Unions are assumed to be utilitarian in the sense that they maximise the sum of their members' utilities. The indirect utility of an employed worker in sector j is (using (1) and (2))

$$(11) \qquad u^j = (W^j - T^j)/P,$$

where T^j is the fee paid by union members to the unemployment insurance fund in the sector. The unemployment insurance fund in each sector is assumed to be fully financed by fees paid by workers in the sector, so that $T^jL^j = B^j(M^j-L^j)$, where B^j is the nominal unemployment benefit in sector j.[3] The indirect utility function of an unemployed worker in sector j is

$$(12) \qquad u_b^j = B^j/P + v_0.$$

The sum of utilities of union members is (using (11) and (12))

$$(13) \qquad U^j = L^j u^j + (M^j - L^j)u_b^j = L^j W^j/P + (M^j - L^j) v_0 = (W^j/P - v_0) L^j + M^j v_0.$$

Monetary policy

Two regimes are considered: a consumer price target $P = P^G$ and an exchange rate target $E = E^G$.[4] The central bank sets the exchange rate so that the monetary target is always fulfilled, and all agents in the model know that this will be the case, ie there is perfect credibility. A possible interpretation of a perfectly credible exchange rate target is that the country under

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[3] As is apparent from equation (13) below, the level of benefits B does not matter when they are fully financed by the workers in the sector, and utility functions are linear.

[4] As the model is static, and none of the specified agents are assumed to care about inflation per se, a price level target is identical to an inflation target.

consideration is a small part of a monetary union; while a price target can be made credible under an independent central bank with a strong reputation. The key part of the model is that the two monetary regimes involve different response functions for the central bank, that is, for various outcomes of the wage setting, the exchange rate set by the central bank will differ.

Wage setting

The wage setting takes place simultaneously in both sectors, so that the outcome of the wage setting in one sector cannot affect the wage setting in the other sector. As there is no uncertainty, the wage setters in one sector can perfectly predict the outcome in the other sector. Formally, there is Nash equilibrium in a static game between the wage setters in each sector, as represented by the Nash maximand.

In case of a dispute in the bargaining, the union members go on strike, so that the firm earns zero profits. Workers on strike have no strike pay, so they have utility v_0. The union part of the Nash maximand is thus

$$U^j - U_0^j = (W^j/P - v_0) L^j, \qquad j, = T,N. \tag{14}$$

The payoff of the employers' association is assumed to be equal to the profits of the firms. The outcome in the wage setting is given by the Nash bargaining solution, that is, W^j is set so as to maximise the Nash product

$$H^j = (U^j - U_0^j)\, \pi^j, \qquad J = T, N. \tag{15}$$

Substituting out using (8), (10) and (14), the Nash product reads (letting lower case letters denote natural logarithm)

$$(16)\quad h^j = \ln\left(\frac{W^j}{P} - v_0\right) + \frac{1}{1-\beta}p^j - \frac{1}{1-\beta}w^j + \ln\left(\frac{1-\beta}{\beta}\right) + \frac{1}{1-\beta}p^j - \frac{\beta}{1-\beta}w^j - p,$$

for j= T,N. Recognising that both prices are endogenous, the first order condition can be solved for the real wage outcome of the bargaining:

$$(17)\quad \frac{W^j}{P} = \frac{1+\beta-2\frac{dp^j}{dw^j}+(1-\beta)\frac{dp}{dw^j}}{2\beta-2\frac{dp^j}{dw^j}+2(1-\beta)\frac{dp}{dw^j}}v_0, \qquad j = T, N.$$

The monetary regime affects the real wage outcome via the effect on dp^j/dw^j and dp/dw^j, that is, the effects of a wage rise on the own sector price and the consumer price. To the extent that a wage rise in one sector leads to higher prices in the same sector, $dp^j / dw^j > 0$, this dampens the negative effect on employment and profits of a wage rise. Thus, this effect will lead the wage setters to agree on a higher real wage. To the extent that a wage rise leads to higher consumer prices, the purchasing power of money wages and profits is reduced. This effect makes the wage setters agree on a lower real wage.

III. Equilibrium

Equilibrium of the model is a situation where households choose consumption so as to maximise their utility; firms set employment so as to maximise their profits; the central bank sets the exchange rate to achieve the monetary target; the sectoral wage is set in a Nash bargain in each sector; and the price of non-traded goods is given by the market clearing condition

$$(18)\quad C^N = Y^N.$$

From the budget condition of the households, it follows that there is balanced trade, $Y^T = C^T$, in equilibrium. To derive the equilibrium, we must explore the marginal impact on the various prices of a wage rise, to be inserted into the solution for the outcome of the wage bargaining (17). The impact varies across monetary regimes, and this is the topic of the next subsections.

Exchange rate target

Under an exchange rate target, the price of traded goods is not affected by the wage setting, so $dp^T/dw^T = dp^T/dw^N = 0$. However, a wage rise will affect the price in the non-traded sector, and therefore also the consumer price level. Consider first wage setting in the traded sector. (All derivations are in the appendix)

$$(19) \qquad \frac{dp}{dw^T} = \frac{-\gamma_E \beta}{\beta + \rho(1-\beta)} < 0,$$

where

$$(20) \qquad \gamma_i \equiv \left(\frac{P^N Y^N}{PY}\right) = \gamma\left(\frac{P^N}{P}\right)^{1-\rho}, \qquad i = E, P$$

is the equilibrium share of non-traded goods of total nominal output under monetary regime i; E (exchange rate) and P (price target). (The latter equality in (20) can be derived from (6a), using that $C^N = Y^N$ in steady state.) As is apparent from (20), γ_i varies across regimes because the equilibrium values of P^N/P, Y^N and Y differ between the regimes.

The mechanism behind (19) is as follows. Higher wages in the traded sector reduce traded sector output, so that aggregate output and income are reduced. When households' income goes down, they reduce their demand for non-traded goods, inducing a reduction in the price on non-traded goods, and thus also a reduction in consumer prices.

Turning to wage setting in the non-traded sector, we have

$$(21) \quad \frac{dp^N}{dw^N} = \frac{\beta}{\beta + \rho(1-\beta)} > 0,$$

$$(22) \quad \frac{dp}{dw^N} = \frac{\gamma_E \beta}{\beta + \rho(1-\beta)} > 0.$$

Higher nominal wages in the non-traded sector lead to both higher prices on non-traded goods and higher consumer prices, due to the negative effect on the supply of non-traded goods (although the price increase is dampened by the negative income effect due to the reduction in output).

Price target

Under a target for the consumer price level, wage rises may affect prices in both sectors. However, the central bank adjusts the exchange rate so that the consumer price level is equal to the target, and thus unaffected by the wage setting, i.e. $dp/dw^T = dp/dw^N = 0$. Consider first wage setting in the traded sector

$$(23) \quad \frac{dp^T}{dw^T} = \frac{\gamma_P \beta}{\beta + \rho(1-\beta)} > 0.$$

Higher nominal wages in the traded sector lead to higher prices on traded goods, via the following mechanism. Higher wages in the traded sector reduce traded sector output, so that aggregate output and income is reduced. When households' income go down, they reduce their demand for non-traded goods, inducing a reduction in the price on non-traded goods, with a corresponding dampening effect on consumer prices. To maintain the price target, the central bank depreciates the currency, so that traded sector prices increase measured in domestic currency.

Turning to the non-traded sector, we have

$$(24) \qquad \frac{dp^N}{dw^N} = \frac{(1-\gamma_P)\beta}{\beta + \rho(1-\beta)} > 0 .$$

Higher nominal wages in the non-traded sector lead to higher prices on non-traded goods, due to the negative effect on supply.

Comparing regimes

A direct comparison of the effect of the monetary regime is made difficult by the fact that the share of non-traded output of total nominal output (γ_E or γ_P) depends on the monetary regime. This problem is circumvented in the Cobb-Douglas case, where the share of non-traded output is the same in all regimes, $\gamma_E = \gamma_P = \gamma$, cf Proposition 1.

Proposition 1: In the Cobb-Douglas case, $\rho = 1$, the consumer real wages in the traded sector and non-traded sectors, W^T/P and W^N/P, are given by

$$\frac{W^T}{P}\Big|_{E=E^G} = \frac{1+\beta-(1-\beta)\gamma\beta}{2\beta-2(1-\beta)\gamma\beta} v_0, \qquad \text{under an exchange rate target,}$$

$$\frac{W^T}{P}\Big|_{P=P^G} = \frac{1+\beta-2\gamma\beta}{2\beta-2\gamma\beta} v_0, \qquad \text{under a price target,}$$

$$\frac{W^N}{P}\Big|_{E=E^G} = \frac{1+\gamma\beta}{2\gamma\beta} v_0, \qquad \text{under an exchange rate target,}$$

$$\frac{W^N}{P}\Big|_{P=P^G} = \frac{1-\beta+2\gamma\beta}{2\gamma\beta} v_0, \qquad \text{under a price target.}$$

The ranking of consumer real wages is

$$\frac{W^T}{P}\Big|_{P=P^G} > \frac{W^T}{P}\Big|_{E=E^G}$$

$$\frac{W^N}{P}\Big|_{P=P^G} < \frac{W^N}{P}\Big|_{E=E^G}$$

while the ranking of relative wages is

$$\frac{W^N}{W^T}\Big|_{P=P^G} < \frac{W^N}{W^T}\Big|_{E=E^G}$$

Thus, in the traded sector, consumer real wages are higher under a price target than under an exchange rate target. The intuition behind the ranking builds on the fact that the highest real wage is set in the monetary regime that provides the wage setters with the most favourable trade-off between real wages on the one hand and employment and profits on the other. Under a price target, a wage rise in the traded sector has a contractionary effect on output and income, reducing demand for non-traded goods, and thus reducing non-traded prices. This gives room for a depreciation of the exchange rate, mitigating the negative effect on employment and profits. Under an exchange rate target there is no such offsetting effect.

In the non-traded sector, consumer real wages are highest under an exchange rate target. This reflects that under an exchange rate target, a wage rise in the non-traded sector is allowed to feed into higher non-traded prices, mitigating the negative effect on employment and profits. The counteracting effect via the increasing consumer prices is less important.

The ranking of relative wages follows directly: non-traded wages are higher under an exchange rate target, while traded wages are higher under a price target. To derive the ranking of relative prices, we use (18) and the budget condition to get

$$(25) \qquad \frac{C^N}{C^T} = \frac{Y^N}{Y^T}$$

Substituting out for (6a,b) and (9), and rearranging, we get

$$(26) \qquad \left(\frac{W^N}{W^T}\right)^{\beta/(1-\beta)} = \left(\frac{P^N}{P^T}\right)^{\beta/(1-\beta)+\rho}$$

Inspection of (26) reveals that P^N/P^T is strictly increasing in W^N/W^T. From Proposition 1, it is then immediate that

Proposition 2: In the Cobb-Douglas case, the ranking of relative prices satisfies

$$\frac{P^N}{P^T}\Big|_{E=E^G} > \frac{P^N}{P^T}\Big|_{P=P^G}$$

Thus, prices of non-traded goods relative to traded prices are higher under an exchange rate than under a price target. The intuition is that the high non-traded wages under an exchange rate target decreases supply of non-traded goods, raising non-traded prices. In contrast, a price target also keeps wages down in the non-traded sector.

Numerical solutions to the model

In this subsection I explore further the difference between the monetary regimes by use of numerical simulations of the model, based on equations (3), (17, j = T, N), (20) and (26). The numerical simulations show the sensitivity to the parameter values, as well as allowing for an additional feature that sheds light on the overall robustness of the conclusions (see below).

Because of the highly stylised nature of the model, the magnitudes of the differences cannot be taken seriously. Yet the simulations provide a rough indication of the effects that are at work. Comparing columns in Table 1 pair-wise, a number of features are apparent.

- The results of Propositions 1 and 2 show up in the CES-cases too: a price target leads to higher real consumer wages in the traded sector, while an exchange rate target leads to higher real consumer wages in the non-traded sector, as well as higher non-traded prices relative to traded sector prices.
- In the CES-cases, the relative size of the sectors depends on the monetary regime. For $\rho < 1$, the higher relative prices on non-traded goods under an exchange rate target implies that non-traded sector constitutes a larger share of the overall economy, $\gamma^E > \gamma^P$. For $\rho > 1$, the effect is reversed.

Table 1: Numerical simulations of the model

	Basis	Basis	ρ: 0.8	ρ: 0.8	ρ 2	ρ 2	φ:0.95	φ:0.95
Var.\Target	CPI	Exch	CPI	Exch	CPI	Exch	CPI	Exch
W^N/P	0.75	1.00	0.77	1.19	0.70	0.75	0.72	0.80
W^T/P	0.75	0.70	0.77	0.71	0.70	0.68	0.72	0.68
P^N/P^T	1.00	1.27	1.00	1.45	1.00	1.06	1.00	1.12
γ^i, i = P,E	0.50	0.50	0.50	0.52	0.50	0.49	0.50	0.50
L	4.74	3.47	4.39	2.60	5.83	5.50	5.34	5.01
Y	5.33	4.29	5.07	3.51	6.12	5.88	5.77	5.53
Y^N	2.67	1.90	2.54	1.52	3.06	2.78	2.89	2.64
Y^T	2.67	2.41	2.54	2.04	3.06	3.10	2.89	2.89
$V=Y - Lv_0$	2.96	2.55	2.87	2.21	3.21	3.13	3.10	3.02
U^N	0.59	0.71	0.59	0.70	0.58	0.64	0.59	0.69
U^T	0.59	0.41	0.59	0.33	0.58	0.53	0.59	0.49
π^N	0.89	0.71	0.85	0.61	1.02	0.95	0.96	0.93
π^T	0.89	0.71	0.85	0.56	1.02	1.01	0.96	0.91

Basis simulation: $\rho=1$, $\gamma = 0.5$, $\beta = 2/3$ and $v_0 = 0.5$. The other columns show effects of changing one of the parameters relative to the basis simulation. $\varphi= 0.95$ indicates that a share $1-\varphi = 0.05$ of the workers organised in the traded (non-traded) sector union work in the non-traded (traded) sector (see explanation in main text). In the figures for household and union utility, V and U^j, the constant term $M^j v_0$ is left out.

- The union in the non-traded sector gain from an exchange rate target (due to high real wages), whereas the union in the traded sector, as well as employers in both sectors, generally gain from a price target.
- In most cases, a price target is superior, by resulting in higher household utility and higher aggregate output and employment.
- Modifying the sharp sectoral split of the unions reduces the differences between the regimes, but does not affect the qualitative results (columns φ=0.95 in Table 1). In this simulation, 1-φ of the members in each union are assumed to work in firms in the other sector, yet there is a common wage for all workers in the same union. Thus, the employment of say, members of the traded sector union working in the non-traded sector depends on the real wage W^T/P^N (details in the appendix). The effect is that unions also take into consideration the employment effects of the price in the other sector, and this mitigates the strategic effects of the monetary regime.

Table 2: Numerical simulations of the model: the effect of the relative size of the sectors

	γ: 0.1	γ: 0.1	γ:0.25	γ:0.25	γ:0.75	γ:0.75	γ:0.9	γ:0.9
Var.\Target	CPI	Exch	CPI	Exch	CPI	Exch	CPI	Exch
W^N/P	1.75	4.00	1.00	1.75	0.67	0.75	0.64	0.67
W^T/P	0.64	0.64	0.67	0.66	1.00	0.75	1.75	0.79
P^N/P^T	0.94	1.63	0.91	1.33	1.10	1.44	1.06	1.86
γ^i, i = P,E	0.10	0.10	0.25	0.25	0.75	0.75	0.90	0.90
L	4.06	3.38	4.43	3.18	4.43	4.16	4.06	4.45
Y	4.16	3.53	4.83	3.72	4.83	4.68	4.16	4.52
Y^N	0.44	0.23	1.30	0.75	3.54	3.20	3.72	3.82
Y^T	3.72	3.34	0.81	2.99	1.30	1.54	0.44	0.79
$V=Y - Lv_0$	2.13	1.84	2.62	2.13	2.62	2.60	2.13	2.29
U^N	0.20	0.21	0.40	0.44	0.60	0.78	0.54	0.68
U^T	0.54	0.46	0.60	0.45	0.40	0.26	0.20	0.11
π^N	0.14	0.12	0.40	0.31	1.21	1.17	1.25	1.36
π^T	1.25	1.06	1.21	0.93	0.40	0.39	0.14	0.15

See notes table 1

- Somewhat surprisingly, exchange rate targeting involves higher welfare and output when the non-traded sector is by far the larger ($\gamma = 0.9$). Under price targeting, the smaller traded sector union exploits the strategic advantage of being small, in the sense that the aggregate effects of a high wage in the small sector is not so large (this corresponds to the findings of Hersoug, 1985, with the telling title "The importance of being unimportant - on trade unions' strategic position"). Thus, the wage moderating effect of exchange rate targeting in the smaller traded sector dominates the wage moderating effect of price targeting in the larger non-traded sector.

IV. Concluding remarks

A recent literature has shown that the choice of monetary regime influences the equilibrium rate of unemployment in an economy with large wage setters, by affecting the slopes of the trade-offs between consumption real wages and employment/profits. This paper extends this literature by comparing exchange rate targeting with consumer price targeting. It is shown that traded sector wages are likely to be higher under a price target than under an exchange rate target. The reason is that an increase in traded sector wages has a dampening effect on non-traded prices (via a negative income effect in the demand), and under a price target the dampening effect on non-traded prices provides room for a depreciation of the currency. The depreciation mitigates the negative effects on employment and profits of a wage rise in the traded sector, leading wage setters to agree on higher wages. On the other hand, wages in the non-traded sector are likely to be higher under an exchange rate target than under a price target. Under an exchange rate target a wage rise in the non-traded sector is fully reflected in non-traded prices as well as in the consumer prices. Although wage setters dislike the increase

in the consumer prices, this is outweighed by the increase in non-traded prices, which mitigates the negative effects on employment and profits of a wage rise.

An important consequence of the model is that the monetary regime affects relative prices and the sectoral structure of the economy. Higher non-traded wages under an exchange rate target implies that non-traded prices are higher, relative to the price of traded goods, even in steady state equilibrium where foreign trade is balanced. The effect on the relative sizes of the sectors depends on the elasticity of substitution between traded and non-traded goods. If the elasticity of substitution is above unity, low traded sector wages under an exchange rate target stimulate production in the traded sector, while high non-traded wages dampen production in the non-traded sector. This is in contrast to the common view (e.g. Svensson, 1997) that in the long run monetary policy cannot affect real variables, nor can it affect the relative price of traded versus non-traded goods.

The results depend on the wage setting being non-atomistic. If wage setting is sufficiently decentralised so that the aggregate variables are exogenous to the individual wage setter, then the regimes are identical in the present model. However, in many European countries, some wage setters are big enough to have a non-negligible impact on aggregate variables. There are powerful trade unions concentrated in industries that belong to the traded sector, and others in industries that belong to the non-traded sector. This may suggest that the effects studied in this paper also are of considerable empirical relevance.

An interesting extension of the model would be to endogenise the capital stock. Although a proper analysis is outside the scope of the present paper, it seems likely that some of the results of the paper might be exacerbated. A high real wage in one sector implies that the return to capital is low, leading to less investment in this sector. It seems likely that under an exchange rate target, capital would flow out of the high-wage non-traded sector and in to

the low-wage traded sector, and thus reducing non-traded production while traded production is increased. Under a price target, capital may flow in the opposite directions.

The results of the numerical simulations are in most cases favourable to a consumer price target regime, as this regime involves higher aggregate output and higher household utility. Now one should be very careful in drawing policy conclusions from numerical simulations of a stylised model as in the present paper. However, it appears that the main reason for this result is that an exchange rate target provides insufficient incentive to wage restraint in the non-traded sector. A possible policy implication is that countries with powerful unions in the non-traded sector should adopt a price target rather than an exchange rate target.

The results of the present paper should also be of interest for a country with strong unions that is contemplating to enter EMU (Sweden is an obvious example). For a single country, EMU involves an exchange rate target, in the sense that a wage rise in the non-traded sector will feed into higher non-traded prices with negligible reaction from the central bank. Thus, the argument in this paper indicates that membership in the EMU may lead to higher equilibrium rate of unemployment (as also argued by Soskice and Iversen, 1998, and Cukierman and Lippi, 2001) than an independent inflation target.[5] However, an effect not identified by Soskice and Iversen and Cukierman and Lippi is that membership in the EMU will lead to wage moderation in the traded sector, and thus strengthen in this sector. Numerical simulations suggest that unions in the non-traded sector benefit from an exchange rate target (as EMU), while other agents lose.

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[5] On the other hand, in Holden (2001), I argue that membership in the EMU may strengthen the incentives for wage setters to co-ordinate their wage setting, as the consequences of failing to co-ordinate are more damaging when there is no country-specific central bank to discipline wage setting.

Appendix

To derive the effect of a wage rise on the various prices, we explore the effect on the market for non-traded goods. Substituting out in (18) for (6a), (2) and (9), we obtain (in log form)

$$(A1)\quad \frac{\beta}{1-\beta}(p^N - w^N) - \ln\beta = \ln\gamma_i - \rho(p^N - p) + \ln\left(((e^{p^T})^{1/(1-\beta)}(e^{w^T})^{-\beta/(1-\beta)}\beta^{-1} + (e^{p^N})^{1/(1-\beta)}(e^{w^N})^{-\beta/(1-\beta)}\beta^{-1})/e^{p}\right)$$

By total differentiation with respect to wages and prices, and rearranging, we get

$$(A2)\quad (\beta + \rho(1-\beta) - \gamma_i)dp^N - \beta(1-\gamma_i)dw^N = (1-\gamma_i)dp^T - \beta(1-\gamma_i)dw^T - (1-\beta)(1-\rho)dp$$

Consider first the effect of a marginal increase in w^T under an exchange rate target. Thus, we set $dp^T = dw^N = 0$, so that (A2) simplifies to

$$(A3)\quad (\beta + \rho(1-\beta) - \gamma_i)dp^N = -\beta(1-\gamma_i)dw^T - (1-\beta)(1-\rho)dp$$

To solve for the effect on consumer prices, we need to substitute out for dp^N. From the definition of the consumer price level (3), total differentiation yields (in log form)

$$(A4)\quad dp = \gamma_i\, dp^N + (1-\gamma_i)\, dp^T,$$

Under an exchange rate target, the price of traded goods is constant, so that there is a simple relationship between changes in prices on non-traded goods and changes in consumer prices

$$(A5)\quad dp = \gamma_i\, dp^N.$$

Substituting out for dp^N in (A3), using (A5), and rearranging, we obtain (19) in the main text. (21) and (22) are derived correspondingly.

Consider then the effect of a marginal increase in w^T under a price target. Thus, we set dp = dw^N = 0, so that (A2) simplifies to

$$(A6) \quad (\beta + \rho(1-\beta) - \gamma_i)dp^N = (1-\gamma_i)dp^T - \beta(1-\gamma_i)dw^T$$

Under a price target, the central bank must set the exchange rate so that changes in the prices of traded and non-traded goods balance each other. From (A5), dp = 0 entails that

$$(A7) \quad \gamma_i dp^N = -(1-\gamma_i)\, dp^T .$$

Substituting out for dp^N in (A6), using (A7), we obtain (23). (24) is derived correspondingly.

The sensitivity with respect to the split of unions along traded/non-traded lines

The motivation for this simulation is to explore the sensitivity to the split of the unions along the sectoral lines. Specifically, in this simulation it is assumed that 1-φ of the members in each union work in firms in the other sector, yet there is a common wage for all workers in the same union.[6] The unions bargain with employers' associations representing the firms for which their members work. To obtain tractable solutions, I assume that union utility is a geometric average of the utility of the members employed in the two sectors, with the shares as weights, while the employers' association maximize the geometric average of the profits of the firms in the two sectors. The Nash product is now

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[6] Obviously, this implies that otherwise identical firms, producing the same homogenous good, employ workers with the same productivity, who nevertheless are organised in different unions and thus are paid differently. This scenario raises several new issues, but this is outside the scope of this sensitivity analysis.

(15') $H^j = (W^j/P - v_0)^{\varphi} (L^j)^{\varphi}(W^g/P - v_0)^{1-\varphi} (L^g)^{1-\varphi}(\pi^j)^{\varphi}(\pi^g)^{1-\varphi}$ $\quad j,g = T,N;\ j \neq g$

where $L^g = (P^g/W^j)^{1/(1-\beta)}$ is labour demand for workers located in firms in the "other" sector. For tractability, I also approximate production in each sector as the geometric average of production in firms with workers from different unions, ie that $Y^j = (P^j/W^j)^{\varphi\beta/(1-\beta)}(P^j/W^g)^{(1-\varphi)\beta/(1-\beta)}$, j, g = T, N, j ≠g. The further analysis is as in the main case. As shown in the simulations, the effect of this assumption is that unions also take into consideration the employment effects of the price in the other sector, and this mitigates the strategic effects of the monetary regime.

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