Trade unions' objectives and inflation*

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Abstract. Important results recently achieved in games between trade unions and central banks rest on the assumption that workers' organisations are interested, besides real wages and employment, in inflation *per se*. This hypothesis is crucial because: (i) the results are not robust to its removal; (ii) the justifications provided to support it are not without problems. The paper raises the issue, critically examines the positions emerged in the debate and stresses that an existing and more convincing explanation of unions as political organisations has been disregarded. However, under this alternative view, the recent results hold only in a special case: under a left-wing government.

Keywords: Trade unions, inflation, policy games.

JEL classification numbers: J51, E24, E31, E58, J58

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1. Introduction

Several important results recently achieved by the literature on policy games between trade unions and central banks (CB) rest on the assumption that workers' organisations are interested in inflation *per se*. By this we mean that the rate of change, or the level, of prices is conceived of as an independent argument of unions objective function, which traditionally contained only the variables which are certainly and directly relevant for union members, that is, real wages and employment. In our view, the topic is important because: (i) those results are not robust to the removal of the hypothesis under scrutiny; (ii) the justifications provided to support this new goal of trade unions are not without problems, from both the theoretical and the empirical points of view.

The aims of this paper are to raise the issue, to critically discuss the positions emerged so far and to stress that an existing and more convincing justification for unions' concern about inflation has been disregarded by the most recent literature. This possibility is based on the idea that trade unions have also political goals, which induce them to support left-wing governments. If the votes the ruling party (or coalition) can obtain in the elections are negatively related to the value of inflation in the current period, there exists an obvious reason to introduce it into the unions' objective functions. However, if this view is accepted, the results obtained in recent policy games hold in general only in a special case, that is, under a left-wing government. Under a conservative government, unions would in fact obtain positive (and not negative, as it is instead assumed) utility by inflation, since this would reduce the number of votes the ruling party (or coalition) could obtain in the elections.

The paper is structured in a few steps. In the next section we briefly survey the main results cropped up in recent policy games and we show how they rest on the assumption of unions' concern about inflation. In section 3 we summarise the justifications for these assumption which have been proposed by the same literature and we address them, both in general terms and with reference to the specific set ups in which they are placed. In session 4 we further elaborate on the possibility to conceive unions as political organisations and we re-consider the role previously assigned to the electoral mechanism in the explanation of their objectives. Session 5 offers concluding comments.

2. A brief summary of the literature

The structures of the papers to be discussed and the key issues there addressed are summarised in Table 1 in Appendix, where all the *U*'s are utility functions (U_i is the utility function of union *i* in the case of many unions), *n* = employment (or output); π = inflation (price level in single period models); *w* = nominal wages; ω_r = real wages; *u* = unemployment rate; *q* = CPI; c_j = consumption for worker j. Asterisks denote the union's bliss point.

In Cubitt's (1992) policy game - where income is linked to the level of employment, in its turn dependent upon the real wage through a standard demand curve for labour - the main results by Barro & Gordon (1983) do not hold. In particular, strategic precommitment is unable to lower the equilibrium rate of inflation. If inflation is removed from the utility function, the results are however of the Barro-Gordon type: the Nash game has an inflationary equilibrium; government precommitment reduces inflation (it makes it equal to zero). The analysis of Cubitt (1995) on the degree of corporatism is based on the same model and thus suffers from similar limitations.

The same applies to Gylfason & Lindbeck (1994), where standard results of the Barro-Gordon type are obtained when unions do not care about inflation: the equilibrium employment (or output) level is optimal for the union (the private sector) and monetary policy is neutral.

Jensen (1997) analyses Rogoff's (1985) monetary policy problem, i.e., the Barro-Gordon issue in a two-country economy, with the aim of showing how cooperation between two policy makers, lowers inflation and improves employment when wage setters are inflation adverse. However, if $B = 0$, Rogoff 's results re-appear: employment is that chosen by unions and inflation is greater under international cooperation.

Results different from the Barro-Gordon's inflationary bias may emerge in Skott's (1997) intertemporal model with a multiplicity of unions: a central banker which cares only about employment can rise general welfare. This result depends however on the hypothesis $B \neq 0$ (besides the assumption that there exist more than one union): if this were not the case, the Barro-Gordon's results would hold.

Lawler (2000) analyses Rogoff's problem of the optimal appointment of a central banker in a stochastic enviroment where a central banker, who is less inflation adverse than society as whole, can bring about (differently from Rogoff) the optimal general welfare. If the union is not inflation averse, Rogoff's result obtains. In a subsequent paper, Lawler (2001) widens this analysis and shows that, both in a deterministic and a stochastic framework: (i) the timing of players' moves has a sensible influence on the optimal choice of the parameters contained in the central banker's utility

function and on outcomes; (ii) monetary policy precommitment does not guarantee welfare improvements; (iii) little support can be found for the appointment of a conservative central banker. Once again, if the union is not inflation averse, results of the Barro-Gordon-Rogoff fashion obtain.

Cuckierman & Lippi (1999) investigate the relationships between central bank independence, wage bargaining structure and economic performance. A Calmfors-Driffil U-shaped curve and other important results are obtained under the hypothesis $B \neq 0$. If this does not apply, all their propositions (except for 1 and 4) fail to be true: the Calmfors-Driffil curve leaves room to a monotonic inverse relationship between centralisation (number of unions) and economic performance.

In Grüner & Hefeker (1999) there are two countries (with one union in each of them) and several monetary regimes are considered (monetary union vs. national monetary independence). As they themselves state: "we show that EMU have an effect on employment when national labour unions are concerned with monetary stability *per sé* (…) Absent [this kind of] inflation aversion, the monetary regime does not matter".

Guzzo & Velasco (1999) present a model with centralised monetary policy and decentralised wage bargaining (many unions). Each union has an objective function equal to the sum of the utility functions of the workers (indexed by *j*: see table 1 in Appendix) belonging to that union; inflation is included among its arguments. The paper shows that: 1) the relationship between centralisation of wage bargaining and economic performance can be U-shaped (as in Calmfors-Driffil) for certain parameter values, while for others values it can monotonically decrease with the number of unions; 2) for a given number of unions, only a "populist" central banker (i.e., who cares only about employment), as opposed to a conservative one, can achieve maximum social welfare. Once again, if $B = 0$, 1) and 2) do not hold: the Barro-Gordon inflation bias is obtained and economic performance monotonically decreases with the number of unions for all parameter values.

Lippi (2002) uses Guzzo & Velasco's (1999) analytical setup but adopts Cukiermar & Lippi's (1999) Stackelberg scheme of interaction between unions and the central bank. The aim is to highlight a flaw by Guzzo & Velasco: when wages are negotiated in nominal terms, their results are valid only in a special case, i.e., when there exists only a single union. In general, a populist central banker decreases social welfare. Guzzo & Velasco (2002) accepted Lippi's criticism, but showed that their previous results continue to hold, although under more specific conditions. The finding that a more conservative central bank can yield lower employment now applies also if workers and unions are not inflation adverse. The humped-shaped relation between inflation and the central bank degree of conservativeness still holds, but only when there exist few unions very concerned about inflation. The main result, i.e., that a populist central banker (not interested in

inflation) can bring about maximum social welfare (optimal output and inflation), holds in unconditional form only in the case of a monopoly union; if there are several unions, they must be strongly inflation adverse.

The general conclusion to draw is straightforward: none of the important results described above are robust to the removal of inflation (price level) from unions' (or workers') objective functions.

3. Justifications

Vague (or even tautological) claims aside,[1] the main justifications provided for the assumptions that unions are concerned about inflation *per se* (as besides real wages and output) can be grouped into three main arguments.

1) Inflation affects unions' (or union members') utility in ways not captured by the relations explicitly considered in the model (e.g., Lawler 2001), possibly due to agents' erroneous beliefs. In particular, inflation can influence allocation and distribution: (i) via relative prices or wages, real interest rates and the tax system (Cukierman & Lippi, 1999; Grüner & Hefeker, 1999; Gylfason & Lindbeck, 1994); (ii) via savings, pensions and other nominal or not fully indexed assets owned by union members (Cuckierman & Lippi, 1999; Grüner & Hefeker, 1999). In an open economy, inflation can also decrease the competitiveness of domestic firms and increase the likelihood of devaluation, with a subsequent rise in interest rates (Gylfason & Lindbeck 1994).
2) Money is included directly in the workers utility function, or is held for shopping-technology purposes (Guzzo & Velasco, 1999 and 2002; Lippi, 2002): individual utility would decrease with expected inflation, and also with realised inflation if inflation tax revenues were not rebated.
3) Unions are political organisations, and this allows them to take into account the effects of some aggregate variables which are not considered by the single members (Cubitt, 1992; 1995; Cukierman & Lippi, 1999; Gylfason & Lindbeck, 1994; Jensen, 1997). This includes the appeal to arguments such as that by Clamfors & Driffil (1988) that in highly centralised economies unions can properly take into account the inflationary consequences of their actions.

Explanation 1) cannot be accepted without remarks. From a general point of view, the direct inclusion in unions' objective function of the *effects* of variables not explicitly included in the model does not guarantee, by itself, general coherence. The correct procedure to follow would be to define the objective function properly and to exhaustively model the economic set-up, including all the constraints faced by the union (i.e., by specifying that unions must care about pensions because pensioners are among their members (Chiarini 1999), or that workers hold non indexed assets), so that both the relevant variables and the "indirect" effects on its utility are taken into account.

And yet, the influence of inflation on workers' (unions') welfare - via allocation and distribution (relative prices or wages, real interest rates and the tax system), or via savings, pensions and other nominal and not fully indexed assets owned by union members, or finally via exchange rate and competition in an open economy - is never adequately "rooted" in the foundations of the models cited above. Three main observations support this claim.

Firstly, the aggregate nature of these models does not allow to consider the effects of inflation operating via allocation and distribution because, for example, in one-good models it is not straightforward to refer to interest rates and to relative prices different form the real wage. To provide another example, if a tax system exists, then fiscal policy and its effect on income (employment) should also be modelled (Acocella & Ciccarone, 1997). Moreover, the costs of inflation generated via distorted taxation affects mainly capital income (and investment decisions), which for workers is not the most important source of income. The distortion could be in any case overcome through indexation.

Secondly, the effects of inflation on savings, pensions and other nominal and non fully indexed assets are not straightforward: (i) in most European countries pensions and savings are, at least to an important extent, indexed; (ii) in the aggregate models in hand, if a financial system and the consumption-loan behaviour of agents are not explicitly described, the wage level should be conceived of as including all other existing forms of workers' income (or wealth).

Thirdly, the appeal to effects operating via exchange rates and international competitiveness relies on links possibly in contrast with the structure of the model itself. In most of the papers, in fact, only a closed economy is considered; this is true, in particular, for Gylfason & Lindbeck (1994).

In brief, in order to properly take into account the influence of inflation on unions' preference function via distribution and allocation, pensions and savings, and the open economy it would be necessary to introduce substantial changes in the existing macroeconomic settings, and

[1] For example, Skott (1997, p. 609n) claims that this is a "standard assumption in the literature…", while Lawler (2000, p. 560) states that it "reflects the share of the costs [of inflation] borne by union members."

there is no guarantee that the properties and the results of the models would not be affected by such changes.

As for the second justification, i.e., money enters the workers' utility function, or is held for shopping-technology purposes, it should first be noticed that the issue relates to the never settled debate over the utility produced by real money balances. Furthermore, in the models where this assumption is made, dividends are distributes according to ownership and workers are assumed to own firm's assets. By caring for workers' consumption, and thus considering their budget constraints, unions would then seem to take into account (indirectly) the workers' utility deriving from real money holdings (and so prices, or inflation) and (directly) the workers' dividends. And yet, as the latter are taken as given, *de facto*, real money balances (inflation) influence unions' behaviour, whereas worker's dividends do not. This appears to us a rather unsatisfactory (*ad hoc*?) way to define the arguments of union's objective function.

It should also be noted that the issue also relates to the general debate over inflation costs, another field where research has not yet yielded definite conclusions. The usual costs associated to inflation, such as shoe-leather and menu costs, are probably nowadays too small to be a relevant justification for workers' (unions') inflation aversion. Other possible costs are those connected with individual price decisions in "customer markets" (Okun, 1975) where, due to long term relations between buyers and sellers (based on reciprocal trust and the like), prices do not adjust frequently and inflation can induce an unfavourable climate. Such product market set-up is however different from that generally adopted in standard union-central bank policy games, where competitive product markets are assumed. In any case, the literature has not reached a general consensus on the width of such effect.

Inflation engenders also troubles in planning long-term investments or mortgages. This effect resides mainly in limitations in agents' planning ability; its likelihood increases with the time-span of investments. However, for this problem to arise, agents' imperfect or bounded rationality is required, whereas all the policy games considered here assume that agents are fully rational. Moreover, also the introduction of these costs would require to change substantially the structure of the models, so that the achieved results would no longer be guaranteed.

Also explanation 3) raises important problems. First, there is an issue regarding those models with many unions. Berger, de Haan, and Eijffinger (2001, p. 9) claim that the main reason supporting the monopoly union's aversion to inflation is consistency, since this union encompasses most of society, which in its majority is taken to be inflation averse. Nevertheless, while the assumption seems to them reasonable when a single union is considered, in model with multiple smaller unions it "looks slightly less innocuous, since the degree of inflation-aversion might vary

widely across branches or crafts and some unions might simply be insensitive to the cost of rising prices". Secondly, the "political" explanation requires to address the question of whether and how unions' preferences are derived form those of their members. Some attempts have tried to identify the conditions under which well defined unions' objectives can be obtained from the preferences over wage and employment of heterogeneous union members (Blair & Crawford, 1984; Gans & Smart, 1994), but the relationship holding in general between the objectives of the latter and those of unions remains as difficult as that between the objectives of citizens and those of governments. In the union case, things are even more complex, because it is here necessary to preliminary explain why workers should be interested inflation *per se*, leading us back to explanations 1) and 2) above.

It could be alternatively thought that unions' objective functions may contain arguments different from those affecting workers' utility. This point of view can be supported by the following explanations.

a. According to a public choice point of view, the union's objective function can be identified with that of its egoistic leaders, who would benefit (for political visibility, power, prestige etc.) from their acting, in part, as policy-makers (who insert inflation in their objective functions). This explanation would however be inconsistent with the assumed absence of information problems in the economy: fully informed members would simply not re-elect these leaders.
b. Another possibility is to reject the assumption of egoistic union leaders and to suggest that they are able to convince members that inflation is prejudicial to *social* welfare and that this is indeed what the union should pursue. In order to accept this proposal, the process leading union members to espouse the search for collective welfare should be described, and the negative influences of inflation on non-workers' welfare should be properly included in the modelled set-up.
c. The third possibility is to envisage members as delegating unions to express an attitude towards macroeconomic variables unrelated to real wages and employment in the *period* explicitly modelled. In a one-shot game, short-sighted workers may underestimate the future costs of inflation relatively to the wage-employment combination they can enjoy today. In line with the often alleged superiority of institutions in estimating the future, unions' care about inflation would then derive form the irrational behaviour of unions' members, or to their lack of information. This idea of inflation as a sort of merit good would thus be once again incompatible with the main assumptions of standard policy games on rationality and information. Also in this case, the negative influences of inflation on *future* workers' welfare should be properly modelled.

To conclude with an empirical finding, it should be noted that the answers to a questionnaire, from a sample of German and US citizens, suggest that people tend to identify the costs of inflation with its effects on the standard of living and on income (Shiller, 1996). This effect is the very one which should be captured by the real wage in the workers-union utility function. Even if other reasons for the dislike of inflation were found (issues of exploitation, political instability, loss of morale and of national prestige), the causal nexus could in such cases run from those factors, which are what people really want to avoid, to inflation.

The general conclusion we believe we can draw is that the assumption that unions care about inflation *per se*, although crucial to obtain the innovative results summarised in section 2, has not been adequately justified.

4. Political unions and elections

The most convincing way to justify the presence of inflation in unions' objective function appears to us to envisage them as true political organisations, this being a feature shared by most of European unions. The development of adequate models of such "political" unions rises of course complex problems, also because of the conflicting empirical evidence on unions' behaviour which is presently available (Abowd, 1989; Card, 1990)

First of all, even if such unions are composed of membership and leadership, and it is plausible to believe that the objectives of the two may differ, the reason why leaders care about inflation should be clarified. A reason cited above relates to their desire to gain political prestige and visibility but, at a deeper sight, this does not appear as a very strong justification. What is not clear is how, in general, a preference for low inflation could provide particular political popularity or great prestige to the leaders of organisations such as the trade unions.

Union leaders could perhaps "pretend" to exhibit this kind of preference in order to gain "external" (to union members) support. For instance, they could try to appear inflation averse so as to convince their entrepreneurial counterpart that they are not willing to endanger stable and mildly clashing bargaining relations in order to obtain higher wage premiums, as inflation could start a kind of wage-price spiral due to competing claims on distribution (see Layard et. al., 1991). This motivation should however be adequately conceived of as a strategic choice made by union leaders, taking into account the fact that the true leaders' objectives would be only indirectly related to inflation, which could *not* be considered as an exogenous preference. Leaders would be interested in

personal “power” or influence, and their inflation aversion would be only a derivative of their true objectives. Of course, the problem of properly modelling this process of “apparent objective choice” remains an open issue.

The attempt to provide a correct interpretation of the relationship between “personal or political power” and union leaders’ concern about inflation raises further difficulties. What could reasonably be their political aspiration? To be elected in an existing political party, or to build a new one (as it recently happened in Italy)? To become an important public bureaucrat? May be a mix of the two?

In the first case, since union leaders presumably have greater chances by joining a left-wing party (it seems unlikely that unionists could have brilliant careers in a conservative party), it is necessary to explain why their attention to inflation should be positively judged (conservative parties are indeed the ones traditionally conceived of as inflation averse). Appeals to international competitiveness and the like are certainly possible but, for this attempt to be accepted, changes in the existing economic set-ups would probably be, once again, required. In the second case, it does not seem realistic to assume that bureaucrats are inflation averse, as their main interest in the maximisation of their bureau’s budgets should rather induce them to favour inflationary outcomes.

An alternative and fairly consistent explanation is available. It is based on the idea that unions are interested in both economic and political targets and that they “typically have close ties with parties from the left half of the political spectrum” (Detken & Gärtner, 1992, p. 43). More in details, “if the labour union’s program contains *political items* such as equal educational opportunities for working class children, extended co-determination, a more equal distribution of wealth, and the like, they [unions] will prefer to see those parties in power who show the best prospects of implementing those items” (*ibid.*, p. 50).

If the number of votes the government can obtain in the elections depend (positively) on income/employment and (negatively) on inflation – an assumption which is straightforwardly coherent with all the policy-makers’ objective functions adopted by the games under examination – these two economic variables can be conceived of as fundamental arguments of unions’ objective function. Income aside, unions’ strategies pay attention to the effects of the wage level on inflation because this influences the re-election prospects of the ruling party. The value of the vote share the government can obtain has however opposite effects on unions’ utility, depending on whether the union supports the government or the opposition.

Hence, according to this view, there exist two different unions’ functions: when conservative parties are in power, the government vote share enters utility with a negative coefficient, and inflation with a *positive* coefficient; the opposite occurs under left-wing

governments. This implies that the unions' functions discussed in section 2 can be adopted, and the results there summarised can hold, only when left-wing governments are in power. In the opposite case, the re-computation of equilibrium values shows that the results are different.

Cubitt's (1992) main result, criticising the effectiveness of monetary precommitment in enhancing general welfare, is not clear-cut when inflation enters union's objective function with a positive value. It is still possible to obtain this result, but it depends on the parameters' values in a much more complicated (and less probable) way than in the original paper. More precisely, the departure from the result of Barro & Gordon (1983) depends on the hypothesis of a non negligible union's inflation *aversion*; it is the fact that the union prefers *low levels* of inflation which reduces the potential inflationary bias generated by dynamic inconsistency. In the case of a *positive* preference for inflation, the logic of union's behaviour must however be explained in a different way, and this implies that the very interpretation of the outcome of the amended model has to change.

Similar consequences hold for Gylfason & Lindbeck, (1994), Jensen (1997) Skott (1997) and Gruner & Hefeker (1999): when $B < 0$ their results are no longer valid in general, but turn out to depend on the specific parameters' values in a rather complicated way. The equilibrium equations would require also in this case a completely different economic interpretation.

Problems are even greater in Cukierman & Lippi (1999) and Lawler (2000) since none of their results remain valid if the sign of *B* is changed. Similarly, in Guzzo & Velasco (1999), only one proposition remains valid (1999, result 2, p.1329); the remaining propositions do not hold, but these are indeed the main results achieved by the paper. Finally, Lippi's (2002) criticism of the analysis by Guzzo & Velasco (1999) continues to apply, but the results which are obtained with a negative sign of *B* are different from those derived under the original hypothesis of a positive sign. In particular, if $B < 0$, inflation under a "populist" central banker is still different form zero (the optimal level); it is however *negative*, while in the original paper it was positive. Furthermore, inflation turns out to be *decreasing* (instead of increasing) in the number of unions.

5. Conclusions

Several important results recently achieved by the literature on policy games between trade unions and central banks are not robust to the removal of the hypothesis that unions are interested in inflation *per se*. In spite of its importance, the justifications provided to support this hypothesis are

however controversial, from both a theoretical and an empirical point of view. In the first part of this paper (sections 2 and 3) we tried to provide support to these two claims.

We then deepened the analysis of unions as (also) political organisations, and we re-considered an early explanation linking the assumption under discussion with unions' interest for the vote share the government can obtain in the election. According to this view, the results of section 2 generally hold only when left-wing governments are in power (inflation enters utility with a negative coefficient); In fact, when unions prefer a high inflation so as to harm the electoral prospects of a right-wing government, those results are no longer valid in general, since they vary according to the specific values taken up by parameters: in some cases, they can be even reversed.

Thus, our attempt to draw on that disregarded explanation in order to overcome the crucial shortcoming we addressed in the paper makes things more articulated than believed, confirming Johnson's (1975) claim that the modelling of unions' behaviour is a difficult problem to solve. Our conclusion is that the aim to provide model consistent justifications for unions' concern about inflation should find adequate space in the research agenda. The only possible alternative is to drop the assumption straight away.

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APPENDIX

Table 1: Unions' utility functions in recent policy games

Articles	Union's utility function	Macroeconomic set-up	Problems addressed
Cubitt (1992; 1995)	$U = -A_u (n - n_u^*)^2 - (\pi - \pi_u^*)^2$	Real wage–employment trade off; one shot game, with both simultaneous and sequential moves: union and CB as Stackelberg leaders	Validity of monetary policy precommitment; endogenisation of corporatism in monetary policy games between unions and CB
Gylfason and Lindbeck (1994)	$U = -(w - \pi - \omega_r^*)^2 + - A(n - n_u^*)^2 - B(\pi - \pi_u^*)^2$	Real wage–output trade off; one shot game with simultaneous moves between union and CB	Monetary policy and wage formation in unionised economies; noneutrality of money supply
Jensen (1997)	$U = -n^2 - B(q - q_u^*)^2$	Two countries and economic interdependency; game with sequential moves: union as Stackelberg leaders	Effects of international monetary policy cooperation between unionised economies
Skott (1997)	$U_i = -B\pi^2 - A(n_{it} - n_i^*)^2$	One shot and repeated games between one CB and many unions; unions move simultaneously with respect to each others, while act as Stackelberg leaders with respect to CB	Validity of monetary policy precommitment and inflationary bias in unionised economies
Grüner and Hefeker (1999)	$U = (w_i - \pi_i) - \frac{A_i}{2}(n_i - n_i^*)^2 + - \frac{B_i}{2}(\pi_i)^2$	Two countries in a monetary union; sequential move games with unions as Stackelberg leaders	Monetary policy and unions' reactions in a monetary union
Cukierman and Lippi (1999)	$U_i = 2\omega_{ri} - Au_i^2 - B\pi^2$	One shot game between one CB and many unions; unions move simultaneously with respect to each others, while act as Stackelberg leaders with respect to CB	Monetary policy in an economy with many unions; effects of wage bargaining structure and CB conservativeness (independence) on economic performance (Calmfors-Driffil relation)
Guzzo and Velasco (1999; 2002); Lippi (2002)	$U_i = m \int_{i-1/m}^{i} \left\{ c_j - \frac{A}{2}(n_j)^2 - \frac{B}{2}\pi^2 \right\} dj$	General equilibrium model; one shot game between one CB and many unions; unions move simultaneously with respect to each others, and act as Stackelberg leaders with respect to CB.	Effects of wage bargaining structure and CB conservativeness (independence) on economic performance (Calmfors-Driffil relation)
Lawler (2000)	$U = -A(n - n^*)^2 - B(\pi)^2$	Three stage game: choice of Central Banker, choice of union's wage policy, choice of monetary policy	Optimal design of monetary institutions (Rogoff's problem) in unionised economy
Lawler (2001)	$U = -A(w - \pi - \omega_r^*)^2 - B(\pi)^2$	Three stage game as in Lawler (2000).	Optimal design of monetary policy institutions as in Lawler (2000). Problems of time inconsistency and precommitment