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Wage Formation and Credibility

by

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Section 1:

Introduction

In the last years a growing literature in macroeconomic policy evaluation is concerned to stress game–theoretic aspects of optimal policy design. Frequently a government is playing a game against a sophisticated private sector as its counterpart in an economy. Usually the game is assumed to possess a hierarchical structure in the sense that the government acting as the dominant player, having the power to carry out its policies on the private sector. Under such circumstances a government has a credibility problem because of the incentive to seek gains by reneging on a previous announced policy. In the absence of the possibility for the government to make a precommitment such announcements become insignificant and the only sustainable equilibrium in the economy is an inferior Nash–equilibrium in which only a second best solution is realized and beyond it the government is forced to give up its leadership role.

Important recent works analyse the credibility problem by appealing the concept of repeated games or supergames[1]. In this context a government operates under the certainty that an attempt to cheat in any period is met by a loss of credibility or reputation subsequently. Provided a threat of loss of credibility is credible itself, a reputational equilibrium[2] exists which is subgame perfect[3]. This is then superior to the Nash–equilibrium in the single–stage game. In this analytical framework Barro and Gordon[4]

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[1] See the seminal contribution of
Friedman, J.W. (1971): "A Non–cooperative Equilibrium of Supergames, Review of Economic Studies, 28, pp. 1 – 12.

[2] See
Kreps, D.M. and R. Wilson (1980): "Sequential Equilibria", Econometrica, 50, pp. 863 – 894,
Selten, R. (1975): "Re–examination of the Perfectness Concept for Equilibrium Points in Extensive Games", International Journal of Game Theory, 4, pp. 25 – 55.

[3] Shortly, the perfectness of equilibria rules out equilibria which rely on non–credible threats and ensures that the conditions for the equilibrium are satisfied in every stage of the game. Because of the fact that the incentive to renege announced policies is referred to as the time inconsistency of optimal policies it can be shown that subgame perfectness is sufficient but not necessary for time consistency.

[4] See
Barro, R. and D. Gordon (1983): " Rules, Discretion and Reputation in a Model of Monetary Policy", Journal of Monetary Economics, 12, pp. 101 – 121.

consider a repeated macroeconomic policy game with the inability of the government to precommit to an announced zero inflation policy because of the anticipated incentive for the government to exploit gains from producing bouts of inflation. Then an equilibrium with a lower rate of inflation can be sustained, when the game is repeated and the government takes into account the effects of its current strategy on future credibility or reputation. Introducing asymmetric information about the preferences of the players is an important extension of this framework.

This paper analyses the effects of stabilization policy in a unionized economy. A government or a central bank[5] announces a policy rule at which in this model the government attempts to minimize unemployment and inflation and where the trade union sets nominal wages in order to reach its objective concerning employment and real wages.

The paper proceeds as follows: Section 2 presents a stylized model to be employed in the subsequent sections. Section 3 derives the optimal policies for the government and the trade union, in the considered conflict situation between them. Section 4 gets more strategic complexity. We introduce an expectation mechanism where the union's beliefs about future actions of the government are linked to the current actions. More precisely, we assume that the union always expects the government to pursue a similar policy in period t + 1 as it did in period t. The resulting strategy of the union might be described as 'tit–for–tat' strategy because it increases the wage if the central bank devalues in period t and keeps the wage down if there was no devaluation in period t. In this context it is possible to analyse reputational aspects of policy making and we can show that therefore it is possible to substitute formal commitments for a non–expansionary policy. Section 5, finally, offers concluding comments and some remarks on further possible extensions of the model.

[5] If we consider the institutional aspect between the interaction of the central bank and the government we assume that the central bank is not independent from the intention of the government. This describes the concrete situation in the UK whereas the situation in West–Germany is characterized by a central bank (Bundesbank) which can create the policy of money supply without direct influence of the government. Therefore we suppose a bargaining situation in which the union is trying to enforce its conception about nominal wage for a period t and is confronted with the government as contrahent.

Section 2:

The Model

Consider an economy in which the labor market is characterized by the demand for labor. Therefore the demand for labor schedule can be written in period t as a function of the real wage, which is assumed to be negative exponential.

Formally

$$N_t = f\left[\frac{w_t}{p_t}\right]$$

$$= \alpha_0 \, e^{-\frac{w_t}{p_t}}$$

with

$$\frac{d\,N_t}{d\left[\frac{w_t}{p_t}\right]} < 0 \text{ iff } (w_t,p_t) \in W_t^+ \times P_t^+$$

and

$$\frac{d^2 N_t}{d^2\left[\frac{w_t}{p_t}\right]} < 0 \text{ iff } (w_t,p_t) \in W_t^+ \times P_t^+ .$$

Denoting the nominal wage by w_t and the price level by p_t at which α_0 represents the slope of the function.

The labor market is not perfect competitive and all workers are organized by an encompassing union. To get interaction between the government and the union we assume that the union is able to set its most preferred nominal wage unilaterally. Moreover we assume that in each period the union sets the nominal wage so as to maximize its "expected" real wage bill

$$U_t := N_t \cdot \frac{w_t}{p_t}.$$

Formally this optimization problem has the structure

$$\max_{w_t} N_t \cdot \frac{w_t}{p_t}$$

subject to

$$N_t = \alpha_0 \, e^{-\frac{w_t}{p_t}}.$$

In game theoretic language w_t is the action parameter of the union. To capture the governments preferences for the stability of the price level and high employment, we specify a cost function for the government.

The costs for the government in period t increase quadratic in the rate of inflation and decrease linear in employment. Thus we have

$$G_t := \frac{1}{2} \gamma P_t^2 - \beta N_t .$$

where $\gamma > 0$ and $\beta > 0$ must be fulfilled.

The government objective is to minimize this function relative to p_t at which p_t is the action parameter of the government. The structure of the last function shows that the costs of a policy increase if the government chooses an inflation pattern and vice versa. Reversely the costs of the government decrease if it reaches a high level of employment.

Section 3:

Non–cooperative behavior in a single stage game

This section illustrates the basic problem of credibility in a full information one shot game, i.e. the time horizon of the players is one period only.

In the absence of precommitment the only sustainable equilibrium is when the government treats the setting of w_t as parametric and the union solves its optimization problem under the assumption that p_t is given.

Formally

$$G_0 = \frac{1}{2}\gamma P_0^2 - \beta\alpha_0 e^{-\frac{w_0}{p_0}} \xrightarrow[p_0]{} \min$$

given w_0

and

$$U_0 = \alpha_0 e^{-\frac{w_0}{p_0}} \cdot \frac{w_0}{p_0} \xrightarrow[w_0]{} \max$$

given p_0

thereby $t = 0$ represents the considered period.

The actors now solve under verification of the first order conditions their optimization problems simultaneously and for the union we get

$$w_0 = p_0$$

but for the government we must consider the equation

$$\gamma P_0^3 - \beta\alpha_0 e^{-\frac{w_0}{p_0}} \cdot w_0 = 0$$

which is not explicitly representable as a function of the structure

$$p_0 = f(w_0).$$

A comparison of these two reaction functions gives

$$p_0 = \sqrt{\frac{1}{e} \cdot \frac{\beta\, \alpha_0}{\gamma}}$$

and we have the Nash–equilibrium

$$(p_0^N, w_0^N) \in P_0^t \times W_0^t$$

with the explicitly coordinates

$$p_0^N = \sqrt{\frac{1}{e} \cdot \frac{\beta\, \alpha_0}{\gamma}} \quad \text{and} \quad w_0^N = \sqrt{\frac{1}{e} \cdot \frac{\beta\, \alpha_0}{\gamma}} \quad .$$

When the Nash–equilibrium determines the policy evaluation of the government the union's realized real wage in the economy is

$$\frac{w_0^N}{p_0^N} = 1$$

with utility of the union of

$$U_0(p_0^N, w_0^N) = \frac{1}{e}\, \alpha_0$$

and demand for labor of

$$N_0(p_0^N, w_0^N) = \frac{1}{e}\, \alpha_0$$

at which the costs for the government amount to

$$G_0(p_0^N, w_0^N) = -\, \frac{\beta\, \alpha_0}{2e} .$$

We define

$$p_0^a := \mu < p_0^N \in P_0^+$$

as the announcement of the government, given the institutional framework in the economy permits that the government can commit itself to a preannounced rule for the price level in this period. When the government is following such a structure of policy design the game starts with the government announcement of its policy rule. Then the union sets the wage rate so as to solve its optimization problem, after which the price level is set according to the rule.

In this situation the question could be important whether an equilibrium, given this behavior of the government which can be described as Stackelberg–equilibrium with the government as leader in game theoretical terminology is enforceable in the economy. The reason for this is that the government can gain from cheating now.

Step one: The government announces

$$p_0^a = \mu .$$

Step two: The union believes this announcement and chooses

$$w_0^a = \mu .$$

Step three: The government deviates from the announcement and takes

$$p_0 = p_0^N .$$

The resulting real wage is then

$$\frac{w_0^a}{p_0^N} = \frac{\mu}{\sqrt{\frac{1}{e}\frac{\beta\,\alpha_0}{\gamma}}}$$

which gives the labor market effect

$$N_0(w_0^a, p_0^N) = \alpha_0\, e^{-\frac{\mu}{\sqrt{\frac{1}{e}\frac{\beta\,\alpha_0}{\gamma}}}} .$$

This labor market effect must be compared with the effects of this market if the government follows its preannounced policy rule.

With

$$N_0(w_0^a, p_0^a) = \frac{1}{e}\,\alpha_0$$

we see

$$N_0(w_0^a, p_0^N) > N_0(w_0^a, p_0^a)$$

at which this strong inequality is fulfilled, if

$$\sqrt{\frac{1}{e}\frac{\beta\,\alpha_0}{\gamma}} > \mu .$$

Considering the costs for the government which occur if one of the two policy design alternatives would be implemented we see

$$G_0(w_0^a, p_0^a) > G_0(w_0^a, p_o^N)$$

given the union believes the preannounced rule of the government.

Proof: Assume $G_0(w_0^a, p_0^a) \leq G_0(w_0^a, p_0^N)$.

To fulfill this weak inequality it must be worth

$$\sqrt{\frac{1}{e}\frac{\beta\,\alpha_0}{\gamma}}\,(1 + \ln 2 - \ln 3) \leq \mu$$

because of the logarithm's monotonicity it is

$1 + \ln 2 - \ln 3 < 1.$

If the government chooses

$$p_0^a = \mu < \sqrt{\frac{1}{e}\frac{\beta\,\alpha_0}{\gamma}}\,(1 + \ln 2 - \ln 3) < \sqrt{\frac{1}{e}\frac{\beta\,\alpha_0}{\gamma}} \in P_0^+$$

the last weak inequality cannot be valid such that

$$G_0(w_0^a, p_0^a) > G_0(w_0^a, p_0^N).$$

q.e.d.

Thus the inequalities

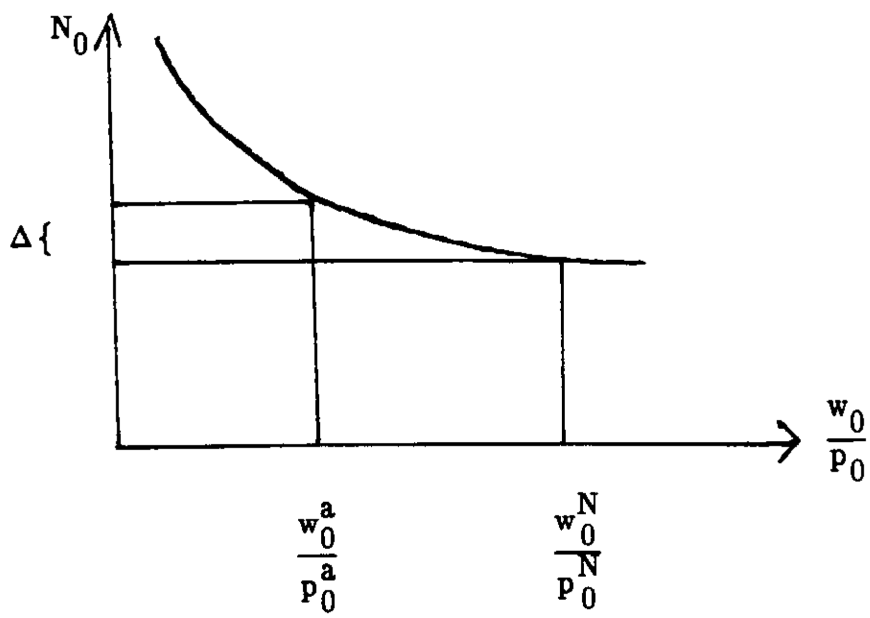
$$N_0(w_0^a, p_0^N) > N_0(w_0^a, p_0^a)$$

and

$$G_0(w_0^a, p_0^a) > G_0(w_0^a, p_0^N)$$

characterize the incentives for the government to differ from the announcement.

Graphically the figure



elucidates the gain of cheating for the government on the labor market Δ.

Given the union can understand this incentive an inferior open loop Nash–equilibrium arises from the lack of credibility of governments announcements. This anticipation of the incentive to cheat nullifies any possibility for the government to stimulate the economy over the creation of surprise inflation and the equilibrium is characterized by a rate of high inflation without positive influence on the labor market.

Section 4:

Multi stage games and reputation

So far there have been no intertemporal links in the model. In this section we shall introduce such links, however, by assuming that the union bases its expectations about the future policy evaluation of the government on the foundation of its current behavior. Consequently this introduces dynamic considerations into the governments optimization problem since the union's future wage setting depends on the present inflation rate.

If we have an expectation mechanism of the Barro–Gordon type the government can announce a price level p_t^* before the union chooses the wage. The price level that the union expects then satisfies the condition

$$p_t^e = \begin{cases} p_t^* & \text{iff} \quad p_{t-1} = p_{t-1}^* \\ \hat{p}_t & \text{iff} \quad p_{t-1} \neq p_{t-1}^* \end{cases}$$

with

$$\hat{p}_t := p_t^N = \sqrt{\frac{1}{e}\frac{\beta\,\alpha_0}{\gamma}}$$

and

$$p_t^* := \sqrt{\frac{1}{e^3}\frac{\beta\,\alpha_0}{\gamma}} < p_t^N$$

whereby

$$p_t^* < \mu$$

holds.

This means if the government did what it announced in period $t-1$, the union expects it to stick to its announcement also in t. If the government deviates from its announcement in the period $t-1$ a policy decision of the government according to the Nash–equilibrium would be expected in period t. The aim is to investigate what the optimal time consistent policy is under such circumstances. Specifically we are interested to implement a policy $p_t^* < p_t \; \forall \, t$ in the economy.

Under this assumption the union sets the wage in the following way

$$w_t = \begin{cases} p_t^* & \text{iff} \quad p_{t-1} = p_{t-1}^* \\ \hat{p}_t & \text{iff} \quad p_{t-1} \neq p_{t-1}^* \end{cases} .$$

We can see that this pattern of the union for wage setting has the character of a "tit–for–tat" strategy. As long as the government follows its announcement the union keeps back its wage increases, but if the government deviates from its promise the union responds with a higher wage increase in the next period.

Here we must consider a special property of the mechanism, what the government gives the possibility to influence the behavior of the union strategical. The reason for this is that the government can reduce the union's expectations of expansionary policy once it has cheated if it sets in the next period a lower rate of inflation when the union has set w_t anticipating the higher rate.

Before we solve the governments new optimization problem some notation must be introduced here.

Let

$\hat{G}_t(w_t,p_t)$ denote the governments costs when it follows its informal rule, whereby

$$\hat{G}_t(w_t,p_t) = \frac{1}{2} \cdot \frac{1}{e} \beta \alpha_0 - \alpha_0 \beta \frac{1}{e}$$

$\overset{\circ}{G}_t(w_t,p_t)$ denote the governments costs when the union believes the announcement p_t^* but the government cheats by setting $\hat{p}_t$, whereby

$$\overset{\circ}{G}_t(w_t,p_t) = \frac{1}{2} \frac{1}{e^3} \beta \alpha_0 - \beta \alpha_0 \left[\frac{1}{e}\right]^{\frac{1}{e}}$$

$\overset{\bullet}{G}_t(w_t,o_t)$ denote the governments costs when from the union $\hat{p}_t$ is expected but the government follows the informal rule, whereby

$$\overset{\bullet}{G}_t(w_t,p_t) = \frac{1}{2} \frac{1}{e^3} \beta \alpha_0 - \beta \alpha_0 \left[\frac{1}{e}\right]^{e}$$

$\check{G}_t(w_t,p_t)$ denote the governments costs when the union believes the government chooses $\hat{p}_t$ and the realized policy is $\hat{p}_t$, whereby

$$\check{G}_t(w_t,p_t) = \frac{1}{2}\frac{1}{e}\beta\alpha_0 - \beta\alpha_0\frac{1}{e}.$$

We showed in section 3 that there exists an incentive structure for the government, given by the following inequalities

$$N_0(w_0 = p_0^*, p_0 = \hat{p}_0) > N_0(w_0 = p_0^*, p_0 = p_0^*)$$

for the result of the labor market and

$$\overset{\circ}{G}_0(w_o,p_0) < \hat{G}_0(w_0,p_0)$$

for the governments cost structure. These inequalities are fulfilled in this context too.

Assume that in the current period t the government sets

$$p_t \neq p_t^*.$$

In the following period t + 1 the government has the two strategical alternatives

$$p_{t+1} = p_{t+1}^*$$

or

$$p_{t+1} = \hat{p}_{t+1}\ .$$

The costs in the current period are given by

$$\overset{\circ}{G}_t(w_t,p_t).$$

Two cases must be distinguished

Case 1: The government implements in the period after

$$p_{t+1} = p_{t+1}^*$$

Because of the observing

$$p_t = \hat{p}_t$$

in the period before the union expects according to the wage setting mechanism then

$$w_{t+1} = \hat{p}_{t+1}$$

which induces costs for the government

$$\overset{\bullet}{G}_{t+1}(w_{t+1}, p_{t+1}) \, .$$

Now if the period t + 2 begins the union has observed the stage result

$$p_{t+1} = p^*_{t+1}$$

in the period before this.
Therefore the union expects in this period the policy action p^*_{t+2} and sets

$$w_{t+2} = p^*_{t+2}.$$

Hence the government has an incentive to cheat and chooses

$$p_{t+2} = \hat{p}_{t+2}$$

which costs

$$\overset{\circ}{G}_{t+2}(w_{t+2}, p_{t+2}).$$

If we repeat the argumentation above we get

$$\overset{\circ}{G}_t(w_t, p_t) + \lambda \overset{\bullet}{G}_{t+1}(w_{t+1}, p_{t+1}) + \lambda^2 \overset{\bullet}{G}_{t+2}(w_{t+2}, p_{t+2}) + \lambda^3 \overset{\bullet}{G}_{t+3}(w_{t+3}, p_{t+3}) + \ldots$$

as the sequence which represents the present time costs for this policy design with $\lambda \in (0,1)$ as the discount factor.

This destroys the time consistency of the policy

$$p_t = p^*_t \;\; \forall \, t.$$

Because no commitments can be made, time consistency requires that the costs following the pattern

$$\hat{G}_t(w_t,p_t) + \lambda\, \hat{G}_{t+1}(w_{t+1},p_{t+1})$$
$$+ \lambda^2\, \hat{G}_{t+2}(w_{t+2},p_{t+2}) + \lambda^3\, \hat{G}_{t+3}(w_{t+3},p_{t+3}) + \ldots .$$

Therefore the following inequality must be valid

$$\sum_{\tau=t}^{\infty} \lambda^{\tau-t}\, \hat{G}_t(w_t,p_t)$$
$$\leq \mathring{G}_t(w_t,p_t) + \sum_{\tau=t}^{\infty} \lambda^{2(\tau-t)+1}\, \dot{G}_{2\tau+1-t}(w_{2\tau+1-t},p_{2\tau+1-t})$$
$$+ \sum_{\tau=t}^{\infty} \lambda^{2(\tau-t)+2}\, \mathring{G}_{2\tau+2-t}(W_{2\tau+2-t},P_{2\tau+2-t})$$

which excludes an incentive for the government to renege.

Since $\hat{G}_t(w_t,p_t)$, $\mathring{G}_t(w_t,p_t)$, $\check{G}_t(w_t,p_t)$ and $\dot{G}_t(w_t,p_t)$ are independent of the period index t a sufficient condition for a rule

$$p_t = p_t^* \;\; \forall\, t$$

to be time consistent is

$$\hat{G} - \mathring{G} \leq \sum_{\tau=t}^{\infty} \lambda^{2(\tau-t)+1}\, \dot{G} + \sum_{\tau=t}^{\infty} \lambda^{2(\tau-t)+2}\, \mathring{G} - \sum_{\tau=t}^{\infty} \lambda^{\tau-t}\, \hat{G}$$

whereby

$$\hat{G}_t(w_t,p_t) = \hat{G}_{t+1}(w_{t+1},p_{t+1}) = \hat{G}_{t+2}(w_{t+2},p_{t+2}) = \ldots = \hat{G}$$
$$\mathring{G}_t(w_t,p_t) = \mathring{G}_{t+1}(w_{t+1},p_{t+1}) = \mathring{G}_{t+2}(w_{t+2},p_{t+2}) = \ldots = \mathring{G}$$
$$\dot{G}_t(w_t,p_t) = \dot{G}_{t+1}(w_{t+1},p_{t+1}) = \dot{G}_{t+2}(w_{t+2},p_{t+2}) = \ldots = \dot{G}$$
$$\check{G}_t(w_t,p_t) = \check{G}_{t+1}(w_{t+1},p_{t+1}) = \check{G}_{t+2}(w_{t+2},p_{t+2}) = \ldots = \check{G}$$

because of the independence of time.

Algebraic rearrangements give the condition

$$\hat{G} - \overset{\circ}{G} \leq \lambda(\overset{\bullet}{G} - \check{G})$$

for the time consistency of the policy rule

$$p_t = p_t^* \ \ \forall\, t$$

if the government makes the policy decision

$$p_{t+1} = p_{t+1}^*$$

after the policy choice of the preceding period was

$$p_t \neq p_t^* \, .$$

Case 2: The government implements in the period after

$$p_{t+1} = \hat{p}_{t+1}.$$

Because the union expects in this period according to its expectation mechanism

$$p_{t+1}^e = \hat{p}_{t+1}$$

which implies the policy action

$$w_{t+1} = \hat{p}_{t+1} \, ,$$

the expectations of the union are fulfilled and the costs for the government are then

$$\check{G}_{t+1}(w_{t+1}, p_{t+1}).$$

In the next period the union believes that a policy action

$$p_{t+2}^e = \hat{p}_{t+2}$$

will determine the economic activity and therefore it sets then

$$w_{t+2} = \hat{p}_{t+2}.$$

Now the government has no incentive to deviate from the informal rule and

$$p_{t+2} = \hat{p}_{t+2}$$

is the realized inflation rate.

The costs for the government are again

$$\check{G}_{t+2}(w_{t+2}, p_{t+2}).$$

Repeating the same argumentation induces the following present cost sequence for this policy with the structure

$$\mathring{G}_t(w_t, p_t) + \lambda\, \check{G}_{t+1}(w_{t+1}, p_{t+1}) + \lambda^2\, \check{G}_{t+2}(w_{t+2}, p_{t+2}) + \lambda^3\, \check{G}_{t+3}(w_{t+3}, p_{t+3}) + \dots .$$

To get time consistency of the policy scheme

$$p_t = p_t^* \;\; \forall\, t$$

a weak inequality of the form

$$\sum_{\tau=t}^{\infty} \lambda^{\tau-t}\, \hat{G}_t(w_t, p_t) \leq \mathring{G}_t(w_t, p_t) + \sum_{\tau=t+1}^{\infty} \lambda^{\tau-t}\, \check{G}_t(w_\tau, p_\tau)$$

must be valid.

A lot of algebra using the independence of time from the periodical costs gives then the condition

$$\hat{G} - \mathring{G} \leq \frac{\lambda}{1-\lambda}(\check{G} - \hat{G}).$$

Therefore for the time consistency of the policy

$$p_t = p_t^* \;\; \forall\, t$$

we get

$$p_t = p_t^* \ \forall t \xrightarrow{t+1} \begin{array}{ll} p_{t+1} = p_{t+1}^* & \hat{G} - \overset{\circ}{G} \leq \lambda(\overset{\bullet}{G} - \hat{G}) \\ p_{t+1} = \hat{p}_{t+1} & \hat{G} - \overset{\circ}{G} \leq \frac{\lambda}{1-\lambda}(\check{G} - \hat{G}) \end{array}$$

We see that

$$\hat{G} - \overset{\circ}{G}$$

can be identified with Barro and Gordon's "temptation to cheat" namely as the gain from cheating in the present whereby the right hand sides of this weak inequalities can be interpreted as the costs born in the future when the government considers its strategic alternatives after deviating in a period t.

The analysis above shows how the consideration of reputational aspects can substitute fully or partially formal commitments. A critical conceptional point is that we have assumed a rule of thumb for the formation of expectation which has no foundation in the optimizing behavior. This is the reason that the equilibria cannot be perfect in our context analyzed here. Another point of view is that it is not possible for the government to influence the believes of the union in its sense, because of the union has complete information about the government's preferences. Therefore the game theoretic solution concepts as perfect equilibrium and sequential equilibrium which are based on types concepts cannot be employed then consequently.

Section 5:

Conclusion

We showed that if the government has the possibility to make an announcement to a policy of lower inflation the existence of an incentive for it to cheat induces a second best solution in the economy represented by the effects of the realized policy on the labor market. The Nash–equilibrium with higher inflation rate and higher nominal wage requirements of the union determine then the policy result. The existence of such an incentive for the government gives therefore the same effects as the case of pure discretion. A formal commitment given the institutional framework to a rule cannot help out of this situation.

Extending this analysis to a repeated game in section 4 reveals how the existence of reputational forces can substitute for formal commitments through punishment mechanisms which in our model are reduced to 'tit for tat' strategies in form of an expectation mechanism for the union of Barro–Gordon type. Now if we consider a single stage result the inferior Nash–equilibrium is interchangeable against an equilibrium with lower inflation rate and lower nominal wage. We get the same labor market effects as in the case before whereby the level of the policy parameter is lower. Considering the infinitely repeated game context this superior equilibrium is valid for the sequences of policy decisions if conditions of the time consistency which we have found are fulfilled.

Our model can deterministically be extended in the following ways

First: As already mentioned at the end of the preceding section the restriction to 'tit for tat' strategies of Barro–Gordon type for the expectation mechanism of the union is a critical conceptual point in our model. Therefore it would be a useful extension to get rid of this restriction and to implement an expectation mechanism based on the optimization behavior of the union only without further 'ad hoc' assumptions.

Second: A main problem of policy design can be interpreted as a problem arising from imperfect information, more precisely asymmetric information about the characteristics of a contrahent. Under such circumstances, the game gets another strategical dimension because players may have an incentive to conceal their identity for some time in order to mislead a rival into a position which can be exploited. Given this context we can analyse perfect equilibria and sequential equilibria which determine then the policy sequences at which in the last case the players update the probability of a particular type from the opponent about Bayesian learning. To analyse problems in the context of uncertainty of one side or uncertainty of two sides are possible in our framework.

Third: This reputational equilibria aspect above can be completed if we consider the game as an announcement game in which one player tries to design strategies which force its contrahent into revealing its true identity. If this is possible then a separating equilibrium represents policy decision and incentive compatibility is served in a sense that no player can profit from misrepresenting private information.

Fourth: A different approach can be made if we take into account a behavior of a policy maker to reveal his own identity early on in a game. This falls within the class of signalling games where a sure identification yields a separating equilibrium. In the other case a pooling equilibrium without chance to disclose his own type for the policy maker determines the policy in the economy.

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