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ABSTRACT

Why do dynamic inconsistencies in monetary policy exist? In this paper a traditional model with output inefficiencies is introduced, but monetary policy is allowed to be influenced by the various constituencies in the economy, that pressure Congress in turn to pressure the central bank to adopt a particular policy stance. The paper shows that in this economy an inflation bias arises due to the lobbying pressures of outsiders. Furthermore, it shows that if lobbying pressures are high enough, an inflation bias cannot be avoided for any finite level of central bank independence. It also shows that introducing the realistic feature of lobbying pressures has an impact on the stabilization properties of monetary policy. When a supply shock occurs, the shock is totally absorbed by a non myopic trade union which has no lobbying costs. This is independent of any finite degree of conservativeness of the central banker, who has to accept an extreme increase in price instability. It is shown that monetary policy delegation is therefore sub-optimal in achieving price-stability compared to labor-market reforms meant to remove monopsonistic elements. However, the same structural policies will induce greater output instability by strengthening the power of conservative central bankers.

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1. Introduction

Jensen (1997) has provided a formal approach for the argument raised by some authors (see Posen (1995)) that delegation of monetary policy into the hands of an independent central bank may not be a solution for eliminating the inflation bias in societies. In one sentence, this is because governments always have the option of renegotiating that delegation once expectations have been formed and can thereby reap the benefits of unexpected inflation. In equilibrium this is not a credible solution and an inflation bias is created even under a Walsh (1995)-contract type of arrangement.

Jensen (1997) achieves this result by positing an exogenous cost of renegotiating the re-appointment of the central banker once expectations have been fixed. He concludes appropriately that his results suggest that "recent emphasis on delegation has diverted attention away from the question of real importance: Why do dynamic inconsistencies exist?".[1]

This paper tries to provide an answer to this question. It models an economy with output inefficiencies subject to supply shocks.[2] However, monetary policy is allowed to be influenced by the various constituencies in the economy, that pressure the Congress in turn to pressure the central bank to adopt a particular policy stance.[3]

In this model, workers-insiders, after having chosen a desired real wage, set the nominal wage and observed the supply shock, lobby for a counter cyclical monetary policy to preserve their membership levels and avoid the consequences of hysteresis. Outsiders instead lobby Congress for expansive unexpected monetary policies to enlarge the pool of employed workers.[4]

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[1] Jensen (1997), p. 919.

[2] Traditionally, in these models monetary policy produces an inflation bias and has a role in stabilizing output. Output inefficiencies here arise in labor markets, due to trade union's market power. In other models output inefficiencies are due to market power by firms in the goods market (see for example Neiss, Katharine (1999)).

[3] That the origins of the inflation bias is likely to be political and not due to a benevolent policy-maker willing to improve welfare in society has been often argued (see among others Cukierman (1992) and Piga (2000)).

[4] One should note the different emphasis with respect to Cukierman's (1992, Part II) analysis of monetary policy with private information on the changing preferences of the Central Bank. The paper shares Cukierman's assumption that the "Central Bank policy is not totally divorced from the pressures and counter-pressures exerted on and by the executive and legislative branches of government" (p. 145). However, in Cukierman the lobbying pressures are instrumental to generate an effectiveness in monetary policy due to an asymmetric information regarding the level and type of such pressures between the Central Bank and the public. In this paper, instead, such effectiveness derives from a more traditional nominal rigidity and the existence of random supply shocks following wage contracts. In this paper, lobbying pressures are instrumental to determine who drives the inflation and output

The paper shows that in this economy an inflation bias arises due to the lobbying pressures of outsiders and therefore that more competitive labor markets produce a lower inflation bias.[5] Furthermore, it is shown that if lobbying pressures are high enough, an inflation bias cannot be avoided for any finite level of central bank independence. The conclusion is that one must shift Jensen's question on the causes of time-inconsistency to asking what causes these lobbying pressures to be particularly pronounced and in which situations they are more likely to develop. It also shows that introducing the realistic feature of lobbying pressures has an impact on the stabilization properties of monetary policy. When a supply shock occurs, the shock is totally absorbed by a non myopic trade union which has no costs of lobbying, independently of any finite degree of conservativeness of the central banker, who has to accept an extreme increase in price instability. When lobbying costs are present, the supply shock is less than perfectly absorbed and the role of the central bank is re-established in diminishing price instability for any given level of lobbying.

The paper shows that monetary policy delegation is therefore sub-optimal in achieving price-stability compared to labor-market reforms meant to remove monopsonistic elements. However, the same structural policies will induce greater output instability by strengthening the power of conservative central bankers.[6]

A similar political framework is used by Herrendorf and Neumann (1998) and by Fratianni, Von Hagen and Waller (1997) to evaluate the properties of monetary policy and enquiry the diverse origin for the inflation-bias and output variability. In the conclusions we point to the departures of our model from theirs, both in terms of assumption and implications.

The next section describes the timing and preferences of the players involved. Section 3 solves the model. Section 4 draws the conclusions.

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process. In Cukierman, instead, these pressures are modelled as "stochastic shifts in the relative preference of policy for price stability versus high economic activity" (p.147) with little interest for the source of those shifts.

[5]Waller (1992), focussing its definition of competitiveness of labor markets on the extent of lack of nominal wage rigidity rather than on the extent of lack of insider's power, also concludes that more competitive labor markets generate a lower inflation-bias.

[6]In this the paper complements the insight of Waller (1992) that found that in sectors with nominal wage rigidity one should expect greater opposition to a conservative central banker.

2. A political model of inflation

2.1 The timing of the game

Where does the incentive for inflation surprises arise according to the traditional time-inconsistency set-up? Should one infer that central banks are inherently interested in unemployment-reducing or redistributive policies? Several authors have pointed out that this bias derives from political pressures on Central Banks from legislative and executive bodies (Leijonhuvud and Heymann (1995), McCallum (1996a), and Patinkin (1993)). If this is the case, a model of inflation including these actors explicitly is bound to provide a better understanding of the underlying mechanisms of the workings of the world and, in so doing, may help us to draw new or clearer predictions and/or policy implications. In this section a model which expands on Hetzel (1990) and Waller and Van Hoose (1992) is put forth.

The model has five players: Congress, the Central Bank, a representative firm, a representative trade union and outsiders. The temporal setting of the game involves the following stages:

1) before observing the supply shock, the trade union chooses a target real wage that minimizes the losses from employment variability around the current membership level and the political costs of lobbying to keep membership constant. The Trade Union fixes inflation expectations in their nominal contract not knowing the type of supply shock that will hit the economy, aiming at achieving the target real wage;

2) once the supply shock occurs and before monetary policy is implemented, the Trade Union and outsiders engage in a costly lobbying effort which will affect the congressional stance on monetary policy. Outsiders press for positive levels of unexpected inflation since this would increase employment. The Trade Union is assumed not to be myopic. It therefore lobbies for stabilizing output around its preferred level, thereby trying to avoid that a supply shock generates hysteresis through the traditional channel of trade union membership.[7] The equilibrium level of lobbying is given by a Nash game between the various lobbies;

3) the equilibrium intensity of lobbying determines congressional preferences over monetary

[7] If membership changes in period t because of a shock, then in period (t+1) the number of members of the union will change, leading to a different outcome than in period t, given that firms choose labor once the target real wage is chosen by the monopoly union. In particular, negative shocks reduce permanently membership and raise the real wage of the remaining members, while positive shocks increase the number of employees, thereby diluting the bargaining power of unions.

policy. The Congress, acting as a Stackelberg leader, then engages in a game with the Central Bank, which acts as a follower, that controls money supply and inflation. The game between the Central Bank and Congress takes place, using expectations formed in part 1), the intensity of lobbying determined in part 2) and the supply shock.

4) After monetary policy is set, the firm chooses the level of employment.

The temporal setting of the game is similar to most models of monetary policy that allow a role for stabilization. It differs from the standard treatment only in that the preferences of Congress are "micro-founded" by introducing the possibility that the latter responds to political pressures of economic agents.

2.2 The players of the game

2.2.a Firms

Consider a representative perfectly competitive firm operating in the economy with a production function (variables in log) :

$$y = \alpha_0 n + \epsilon \qquad \textbf{(1)}$$

($0<\alpha_0<1$) whose total output, y, depends on the total labor input, n, and a supply shock ϵ. The firm faces a monopoly trade union representing N workers, which fixes nominal wages based on optimal expected real wages and let firms make employment decisions based on profit maximization.[8] Let all variables be expressed in logs and let $p_{t-1}= 0$, so that p_t (from now on p, as all variables from now on will refer to period t) can be interpreted both as the price level and the inflation rate. The labor market is therefore described by the following equations:

$$n^d = -\alpha_1(w - p - \epsilon), \quad \alpha_1 = \frac{1}{1 - \alpha_0} \qquad \textbf{(2)}$$

[8]Therefore in this model the market failure arises from the labor market side and not the product market side. For an alternative approach see among others Neiss (1999). It can be shown that the results hold even in the presence of "n" competitive and identical firms with the same technology, each facing a monopoly trade union representing N' = (N/n) workers and each lobbying the Congress with the same objective function.

$$w = w^* + p^e \qquad \textbf{(3)}$$

The first equation represents labor demand for the firm and arises from equating the product of labor and real wages, w* represents the Trade Union desired real wage, so that the

$$y^{\circ} = -\alpha_0\alpha_1 w^* + \epsilon(1 + \alpha_0\alpha_1) \qquad \textbf{(4)}$$

second equation represents the contracted wage equation and the third the full-information level of output for the representative firm, obtained replacing in (1) labor demanded when p^e, expected inflation, equals actual inflation p. w* is derived optimally, in expectation, by a trade union of N employees that only cares about preserving the status of its members as employed. If one assumes that the membership rule of the trade union is that employees that are laid off quit the union, we are therefore assuming a forward-looking union, that it will react to supply shocks in order to bring employment back to N. We do not inquire how the Union reached its current membership of N, but only assume that the labor force is greater than N and that therefore there exists a strictly positive pool of unemployed, from here on named "outsiders", whose reservation wage is supposed to be zero, thereby making them involuntarily unemployed for any level of the real wage. When workers form their expectation p^e they do not know the realization of the supply shock but only that they are white noise processes. The choice of the real wage is derived from the maximization of the representative trade union, facing the representative firm that trades off the gains of preserving its current membership equal to N with its costs (more on this later). Note that, given the supply shock ϵ, membership N is preserved if and only if output in the firm equals $\alpha_0 N + \epsilon$[9].

Henceforth set $\beta = \alpha_0\alpha_1$. Aggregate supply in this economy is given by:

$$Y^s = [-\beta w^* + \beta (p - p^e) + (1 + \beta)\epsilon] \qquad \textbf{(5)}$$

[9] Choices of the nominal wage given expectations on a supply shock are studied by Gottfries and Horn (1986) and Blanchard and Summers (1986). Their trade union had however different goals than the one modeled here in that it aimed at achieving the a higher real wage taking into account its (negative) effects on the probability of employment for the members of the union.

where $(-\beta w^* + (1+\beta)\epsilon)$ is the full information output. Aggregate demand is given by:

$$Y^d = m - p \qquad (6)$$

It can thus be shown that the price level p is equal to:

$$p = +\beta w^* + m^e + \frac{1}{1+\beta}(m - m^e - \epsilon(1+\beta)) \qquad (7)$$

Notice what (7) implies: a potential inflation bias, $\beta w^* + m^e$, monetary surprises and supply shocks affect the price level. The determinants of the potential inflation bias will become clearer at the end of this paper. As for the stochastic component of the price level, it will be shown that the Central bank is not interested in monetary surprises "per se". As "p" is under the direct control of the Central Bank, this implies that in equilibrium what will matter for the price level is the extent to which monetary authorities will be willing to absorb the effects of supply shocks on the price level.

2.2.b The Congress and the central bank

Money supply, set by the Central Bank, determines the level of inflation p. Expectations p^e are formed by the Trade Union without knowledge of the realization of supply shocks. The money supply is the result of a game played by the Central Bank and Congress. While the Central Bank dislikes inflation, Congress[10] is pressed by different interest groups to use the money supply as a tool of economic policy. Both institutions suffer a cost from disagreeing with one another.

It is assumed that:

a) The Congress minimizes the loss function L^c by choosing the appropriate level of inflation to

[10]That the legislative branch, Congress, might influence monetary policy has been well synthesized by Grier (1991). In commenting his empirical results he argued "The White House is not the only building in Washington that affects monetary policy" (p.213). The word "Congress" however is not meant to limit the results of this model to the U.S. nor to exclude the influence of executive office on monetary policy. It is meant to synthesize all agents that gather the instances of constituencies on monetary policy and submit them to the Central Bank.

demand of the Central Bank, p^D:

$$Min_{p^D} \quad L^c = [k\cdot(p^e - p^D) + (p^D - p)^2] \qquad \textbf{(8)}$$

where p^D is the inflation demanded by the Congress of the Central Bank, p is the inflation supplied by the Central Bank, p^e is the expectation of inflation included in the contracts and is therefore a given value, k is an index of the strength of the inflation constituency and the last term is an index of Congressional sensitivity to conflicts with the Central Bank. k therefore will represent the relative weight given by Congress to pressures from constituencies relative to its dislike of disagreements with the Central Bank. When k is greater than zero the inflation constituency is stronger than the deflationary one. In this case Congress will try to impose unanticipated inflation to the Central Bank.[11]

What determines the parameter "k" in equation (8) that stands for the taste for redistribution through inflation of the Congress? In this paper it is assumed that it depends on pressures from lobbying groups, namely insiders (trade unions) and outsiders, which Congress internalizes so as to satisfy those interest groups:

$$k = l^{tot} = l^{TU} + l^{OUT} \qquad \textbf{(9)}$$

where l^{OUT} is the total lobbying pressures by outsiders and l^{TU} total lobbying pressures by the Trade Union.

b) The Central Bank minimizes instead the following loss function by choosing the appropriate level of inflation:

[11]Unexpected inflation or deflation is a powerful tool for governments to redistribute wealth across citizens or groups. Beetsma (1996) shows the effects in the Calvo (1988) set-up of such a redistributive tax in the presence of individuals with different nominal debt-holdings. That this constituency pressure on Congress will end-up affecting the central Bank's behavior is noted by McCallum (1996b), p.10, when he argues that "... I would expect that the relative importance given to inflation and unemployment avoidance will be approximately the same by a Central Bank and the society of which it is a part."

$$Min_{p^s} \quad L^b = [\gamma \ (p - p^D)^2 + b \ (p)^2] \qquad \textbf{(10)}$$

γ is a positive number representing the degree of "legal" dependence of the Central Bank on Congress[12] where $\gamma=0$ represents complete independence and as γ increases independence decreases, while *b* is strictly positive and has the usual interpretation of the Central Bank's aversion to inflation.

These objective functions present the realistic feature that the Central Bank does not care about unexpected policies "per se", but because of the cost of disagreeing with Congress. The latter is subject to pressure from constituencies which it will be shown to be at the root of the inflationary process.

2.2.c The lobbies

The total level of lobbying pressure in this model is simply the result of competing pressures from two classes of agents: a Trade Union which produces a lobbying effort l^{TU}, and outsiders, l^{OUT}. The Trade Union, having already fixed its inflationary expectations and having observed the supply shock, will lobby to preserve the level of membership within the union. This means that positive supply shock will be countered with pressures on Congress to be deflationary, so as not to enlarge the membership and to have the trend real wage decline. In the case of negative supply shock the Trade Union will lobby for expansive monetary policies so as not to shrink membership in the next period. In essence, while the Trade Union is selfish in that it does not care about outsiders, it is nonetheless not myopic in that it understands the potential hysteresis embedded in defending a given real wage when supply shocks occur.[13] Outsiders

[12] As it will become clearer later on, γ is an indicator of formal or legal independence: effective independence will be given by $k\gamma$. The parameter γ could in principle be affected by the dominant constituency in society, i.e. by *k*. For example, one might expect higher independence of the Central Bank where anti-inflationary constituencies are stronger. However, this effect is probably a long term one, since institutions change slowly over time. This paper concentrates on short-term issues and therefore γ is a given.

[13] Blanchard and Fischer (chapter 9, p. 450) describe a similar non myopic union once a supply shock has occurred, in the case in which unions do not discount future pay-offs. In their setting, however, unions choose the real wage directly. In this setting, that would imply a renegotiation of the contract, which this paper has excluded. However, the paper allows for lobbying activity on monetary policy which amounts to an indirect choice of the real wage and output combination.

instead will lobby for an unanticipated expansive monetary policy so as to generate more employment. It is assumed that outsiders can organize in one unique lobby.

Lobbying is costly. The Trade Union's objective function can be formulated as follows:

$$\min_{l^{TU}} L^{TU} = \left[\left(\frac{1}{2}(-\alpha_0 N - \epsilon + y)\right)^2 + \frac{c}{2}(l^{TU})^2\right] \quad \textbf{(11)}$$

cl^{tu} represent the marginal cost of lobbying, while the first term indicates the preference for output stabilization within the Trade Union around the level of output that guarantees employment only to members of the union.[14] When lobbying in the third stage of the game, the Trade Union will minimize the loss function in (11) having observed the shock ϵ. In the first stage of the game the Trade Union will choose its real wage w* and will do so by minimizing the expected value of the loss function in (11) without knowing the realization of the shock. This implies that the desired real wage will be set to ensure that expected employment is equal to N: $w^* = (-\alpha_0 N/\beta)$. [15]

The objective function of the outsiders is the following:

$$Min_{l^{OUT}} L^{OUT} = \left[(p^e - p) + \frac{d(.)}{2}(l^{OUT})^2\right] \quad \textbf{(12)}$$

where dl^{OUT} is the marginal cost of lobbying for outsiders. When realized inflation is greater than expected inflation embedded in the nominal contracts by insiders, a strictly positive amount of outsiders is hired from the pool of unemployed. This increases the welfare of the lobby of outsiders. Note that the parameter d (.) could be a function of several variables: the size of the

[14] This is intended to capture the greater level of real wage deriving from the behavior of forward-looking trade unions discounting less the future than myopic ones in the face of shocks that trade-off greater wages today with the threat of being unemployed from tomorrow on (see Blanchard-Fisher (1989) and references therein).

[15] The arguments of the quadratic function for deviations of output from its target level will turn out to be equal to zero in expected value. Similarly, the expected value of the deviations of lobbying by the trade union from their full information level is zero. Following Horowitz (1987) this means that this quadratic specification for output and lobbying losses is robust to a larger class of loss functions. This also implies that the trade union aiming at reaching expected employment equal to N will set the desired real wage at $w^* = (-\alpha_0 N/\beta)$.

pool of the involuntarily unemployed (as it increases, the marginal costs of lobbying should decrease), the degree of discouragement of an outsider (as it increases, the marginal costs of lobbying should increase), etc.

3. Solving the game

The solution of this game will be a sub-game perfect equilibrium and will be obtained by solving the game backwards. Thus, the paper first examines the sub-game between Congress and Central Bank, given the target real wage w*, inflationary expectations p^e of wage-setters, the equilibrium level of lobbying by the insiders and outsiders and the supply shock affecting the economy.

It is assumed that Congress acts as a Stackelberg leader in setting p^D. Thus, the reaction function of the central bank, with respect to the inflation demanded by Congress, is first found, by minimizing (10) and taking as given expected inflation embedded in contracts and the level of political pressures, k. The central bank's reaction function is:

$$p\ (p^D) = \frac{\gamma}{\gamma + b} p^D \qquad \textbf{(13)}$$

Congress minimizes (8) subject to the central bank's reaction function (13). Doing this one obtains the inflation demanded by the Congress:

$$p^D = \frac{k(\gamma + b)^2}{2b^2} \qquad \textbf{(14)}$$

Replacing (14) in (13) one obtains the level of inflation conditional on the realization of the shock, the pressures "k" of lobbying groups, expected inflation and the target real wage to be determined below:

$$p = \frac{k(\gamma + b)\gamma}{2b^2} \qquad \textbf{(15)}$$

It is worth noting what affects inflation in this system. Inflation will be higher for: a higher net level of inflationary pressures arising from lobbies, a lower level of legal

independence of the Central Bank and a lower aversion to inflation by the Central Bank. Let us now move to the previous stage of the game to determine lobbying pressures.

Outsiders choose that level of lobbying that minimizes (12) subject to (15) given inflationary expectations. It easy to show that:

$$l^{OUT} = \frac{\gamma(\gamma + b)}{2b^2 d} \qquad \textbf{(16)}$$

Notice that the equilibrium strategy of outsiders is independent of those of the Trade Union. Indeed, from (16), since the level of l^{OUT} is always positive, it is easy to see that outsiders will always ask for expansive monetary policies. The intensity of lobbying is greater the more the Central Bank is legally dependent and the lower the costs of lobbying.

From now on, let $[(\gamma+b)\gamma/2b^2] \equiv g(\gamma;b)$ with $g_\gamma > 0$ and $g_b < 0$.

The Trade Union, after seeing the realization of the supply shock, chooses the optimal level of lobbying l^{TU} by minimizing (11) subject to supply in the industry and to (15), while taking as given, inflation expectations set in contracts, the desired real wage w* and the level of lobbying by outsiders, l^{OUT} as in (16). Its reaction function is given by:

(17)

$$l^{TU} = \frac{-\beta[g(\gamma;b)]}{c+\beta^2[g(\gamma;b)]^2}\left[\frac{\beta[g(\gamma;b)]^2}{d} - \beta p^e + \beta(\epsilon - w*) - \alpha_0 N\right]$$

Given (16), (17), (15) and (9) one can turn the attention to the second stage of the game when the Trade Union sets nominal wages unaware of the realization of the supply shock. The expected inflation incorporated in nominal contracts is given by:

$$p^e = \frac{[g(\gamma;b)]^2}{d} + \frac{(\alpha_0 N+\beta w*)\beta[g(\gamma;b)]^2}{c} \qquad \textbf{(18)}$$

Where w* is the desired real wage chosen by the Trade Union in the first stage of the game. Replacing (18) in (17) one finds that the total lobbying level of the Trade Union given a certain choice of the real wage is:

$$l^{TU} = \frac{-\beta[g(\gamma;b)]\epsilon}{c+\beta^2[g(\gamma;b)]^2} + \frac{(\beta w* + \alpha_0 N)[g(\gamma;b)]}{c}$$

(19)

The level of inflation given the real wage chosen in the first stage of the game is therefore equal to:

(20)

$$p = \frac{[g(\gamma;b)]^2}{d} + \frac{(\alpha_0 N+\beta w*)\beta[g(\gamma;b)]^2}{c} - \frac{\beta^2[g(\gamma;b)]^2\epsilon}{c+\beta^2[g(\gamma;b)]^2}$$

In the first stage of the game the Trade Union minimizes the expected value of (11) not knowing the realization of the supply shock, by choosing an expected real wage w*, subject to equations (18), (19) and (20). The real wage is chosen therefore so as to minimize the expected costs of lobbying and the expected deviations from the output level that guarantees employment to all N members of the Trade Union. As already discussed earlier on, this implies that the Trade Union aims at setting a real wage targeted to make expected employment equal to the Trade Union's membership, N:

$$w^* = \frac{-\alpha_0 N}{\beta} \qquad \textbf{(21)}$$

Equation (21) says that the Trade Union chooses a lower expected real wage the higher the membership that has to be attained.[16] Inserting (21) in (18) and (19) yields additional insight on the choice of the Trade Union:

$$p^e = \frac{[g(\gamma;b)]^2}{d} \qquad \textbf{(22)}$$

[16] The costs of strategy (21) are not zero and increase with the variance of the supply shock. The more supply-shocks are volatile around their expected value the higher the variance of output around its desired level given a certain lobbying effort and the higher the lobbying costs to achieve a given output level. Notice also that if the trade union had no costs of lobbying the choice of the target real wage would be irrelevant and the value of the loss function when minimized would be zero.

Compare (18) and (19) with (22) and (23) respectively. From (23), one sees that the choice of the real wage by the Trade Union is meant to eliminate that component of the trade

$$l^{TU} = \frac{-\beta[g(\gamma;b)]\epsilon}{c+\beta^2[g(\gamma;b)]^2} \qquad \textbf{(23)}$$

union's expected costs that was known with certainty at the first stage of the game and as such was incorporated in the nominal wages. Because of that it would have been irrelevant for output stabilization purposes, but still costly with respect to the lobbying component of the loss function.

Expression (22) is key for the purposes of this paper in that it shows that there is an inflation bias in this economy strictly related to the existence of the lobby of outsiders and not to the willingness of the Central bank to produce monetary surprises in the presence of distortions in the labor market. The inflation bias increases with the level of legal dependence of the bank, γ. However, one sees that for any given level of γ, there always exist values of d (the scale for the marginal cost of lobbying for outsiders) low enough such that the inflation bias is high. Legal independence is therefore not sufficient to ensure effective independence which is guaranteed when the Central bank can deliver price stability.

If one imagines that the gains of unexpected inflation increase with the strain of outsiders, and that the costs of lobbying decrease the higher the pool of unemployed, one sees that recessions are a time in which the inflation bias can be potentially large. To echo Governor Burns, the Fed chairman during the oil crisis:

"Viewed in abstract, the Federal Reserve System had the power to abort inflation ... It did not do so because the Federal Reserve was itself caught up in the philosophical and political currents that were transforming American life and culture ... It is illusory to expect central banks to put an end to an inflation .... that is continually driven by political forces... (and that) will not be vanquished ... until new currents of thought create a political environment in which the difficult adjustments required to end inflation can be undertaken".[17]

[17]From Timberlake (1993), pp. 345-346.

Equation (23) is important in several respects. First it shows us that the lobbying activity of Trade Union is unrelated to the inflation bias. The latter has already been incorporated in nominal wages by insiders, who are not concerned about it. However, non myopic trade unions care about output stability to avoid the negative effects on membership that the phenomenon of hysteresis could bring about. When a negative supply shock occurs, l^{TU} is positive, implying that the Trade Union lobbies for expansive monetary policies to prevent membership from being permanently shrinking in the next period. If positive shocks occur, the Trade Union will instead lobby for restrictive monetary policies to avoid hiring of outsiders. Note that myopic trade unions that do not care about output fluctuations avoid expensive lobbying, thus exposing themselves to the danger of hysteresis.

Replacing (20), (21) and (22) in (5) and (7) one is able to determine the value of inflation and output:

(24)

$$p = \frac{[g(\gamma;b)]^2}{d} - \frac{\beta^2[g(\gamma;b)]^2\epsilon}{c+\beta^2[g(\gamma;b)]^2}$$

(25)

$$Y^s = [\alpha_0 N+\epsilon - \beta[\frac{\epsilon\ 4b^4c}{4b^4c+\beta^2\gamma^2(\gamma+b)^2}]]$$

The equation for output is particularly enlightening. The supply shock does not have its "classic" effects because of the political channel. Indeed, if the Trade Union could lobby at no cost (c=0), they would be capable of eliminating fully any variation in employment and ensure the appropriate level of output (the real wage would decline precisely as to re-establish the full-information natural rate). When the Trade Union suffers a cost from lobbying, it weighs these costs against the distaste for output variability; in any case they do not succeed in stabilizing output completely except in extreme cases. Notice that if the Trade Union has no cost in lobbying, the inflation variability is highest.

When trade unions are myopic, real wages are constant, output variability is maximized and price stability is ensured by the central bank.

4. Conclusion

We have used a political economy framework to understand the impact of monetary policy institutional arrangements on output volatility and the inflation bias. A similar political framework is used by Herrendorf and Neumann (1998) and by Fratianni, Von Hagen and Waller (1997) for a similar purpose. We differ from their approach in several ways.

Contrary to Herrendorf and Neumann (1998), we first abstract from the issue of seniority among workers to concentrate on the role played by insiders and outsiders in society. Second, we do not assume that workers care about inflation per se but only about employment opportunities. Third, we abandon the median voter set-up to focus on the role of lobbies in the political decision-making process. Fourth, in their paper central bank independence is intended as a process of representation of the median voter, while in ours it is meant to represent the interests of a purely anti-inflationary stance not desired by anyone else in society but the central banker. In Fratianni, Von Hagen, Waller (1997) the inflation bias is due to:

a) the incentive of a self-interested "Congress" to be re-elected in the presence of asymmetric information between voters and politicians and asymmetric competence in office between incumbent and challenger;
b) the pursuit of self-interest of the central banker who is appointed by the leader;
c) the strength of the incumbent re-election chances in the absence of interventions by the central bank.

The output variability in Fratianni Von Hagen and Waller (1997) exists in the form of a stabilization bias, which is due to "endogenous risk-aversion" of the incumbent: the more competent the incumbent the more output stabilization she will produce. The bias however occurs only in election periods. In this paper output variability, in any period, is related to lobbying costs and trade union myopia.

In this paper we abstract from elections, asymmetric information and issues of competence in politicians. The nature of the inflation bias is due to the existence of insider's market power in the labour markets.

To measure the "value added" of this paper, it is important that one contrasts its results with those of traditional analyses of the time-inconsistency problem of inflation arising in the labor markets which do not specify either the lobbies reaction function or the game between government and central bank. Suppose that the preferences of the monetary authorities are defined by:

$$L_t = bn^2_t + p^2_t \quad \textbf{(24)}$$

where n_t represents employment deviations from the full employment level and p_t inflation. (1/b) can be identified as an indicator of central bank independence. In this case it is easy to show that expected inflation (and the inflation bias) is given by:

$$p^e_t = b\alpha_1 u^\circ \quad \textbf{(25)}$$

where u° is the natural unemployment rate, and inflation is simply, expected inflation plus a state contingent component that depends on the supply shock. Notice that implicitly left aside in these traditional models is the issue of why workers do not renegotiate nominal contracts after seeing the realization of the shock. Costs of renegotiating are usually an answer provided. In this model trade unions suffer a cost from lobbying and one must therefore assume that those costs are lower than the ones of renegotiating. If the visibility of actions entails higher costs, then lobbying may indeed turn out to be less expensive than re-negotiating. In this regard, however, this paper is certainly not more enlightening than the literature. Jensen's paper (1997) suffers from the same problem when he assumes that nominal contracts are in place for longer periods than it takes for institutions to be changed.

Having said this, what could one infer from this traditional model without going through the complicated calculations of the previous section? First, the inflation bias depends on the component "b". A greater "b" could be understood to imply greater Central Bank dependence and/or greater outsiders' power relative to the insiders' power in influencing the Central Bank. u°, on which the inflation bias depends in this simplified and traditional model, could mean that what matters for the size of the inflation bias is once again insider's relative power compared to outsiders.

The model too indicates that even if outsiders were infinitely powerful in their lobbying activity ("d" tending to zero), they might not be able to achieve anything in terms of employment, but would only generate an infinite inflation bias, because trade unions would

incorporate this activity in their contracts.[18] However, more insights have derived from the perspective[19] that central bankers are mainly concerned with price stability and that pressures to deviate from that goal are brought by Congress subject to the pressures of constituencies interested in economic policy outcomes.

Allowing for such a feature in a simple time-inconsistency model permits to identify more clearly the sources of the inflation bias: pressures from constituencies interested in unexpected inflation. While this result may not seem startling, it generates important implications that are generally overlooked. First, monetary delegation to a Central Bank, even in the presence of low costs of disagreement with Congress, will reduce the inflation bias only if the pressures from constituencies remain relatively low. In Herrendorf and Neumann (1998) and in Fratianni, Von Hagen and Waller (1997)[20] the inflation bias is instead eliminated with a central bank legally independent from the government. In our model lower lobbying costs or a higher desire for unemployment reducing policies will make any legally independent Central Bank more prone to produce an inflation bias: legal indices of central bank independence (see Cukierman (1992) for a survey) would not be relevant for testing the capacity to resist the production of inflation bias.[21] This result is relatively robust, since it extends to a setting where the time-inconsistency arises in the government bonds market.[22]

The results seem to suggest - as a positive implication - that countries where the insiders are very powerful and create a mass of unemployed outsiders, are more likely to generate inflation biases than other countries. Note that if the current low inflation in many industrialized

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[18]Obviously extremely powerful outsiders could lobby for structural labor market reforms and obtain an increase in employment. However, the paper is here analyzing monetary policy issues. Furthermore, if such structural labor reforms were implemented they would have new effects on monetary policy as the paper will soon argue.

[19]The claims no originality by adopting this perspective, which has been supported previously by several authors. See Piga (2000) for a survey.

[20]For this latter model the inflation bias is only present in electoral periods, a feature that might be testable and the results of which would strengthen or weaken the capacity of the paper to explain monetary arrangements.

[21]Empirical results (see Alesina and Summers (1993)) and models (see for example Fratianni, Von Hagen and Waller (1997)) that analogously find no link between legal indices of central bank independence and output variability suffer from an omitted variable problem, in that these analyses do not control for effective central bank independence as measured by the monetary stance in the face of changing lobbying pressures.

[22]See Pecchi-Piga (1999). However, they show that the inflation bias is not related to the extent of nominal contracts in society as usually suggested but rather to the strength of the tax-payers' lobby compared to the bondholders' lobby.

countries is due to a reduced inflation bias, then it would have to be explained not necessarily by increased central bank independence (see Herrendorf and Neumann (1998)) but by either a decline in trade unions bargaining power (which in turn would have decreased the natural rate of unemployment) or by some sort of reduced efficiency in the lobbying technology of outsiders (triggered maybe by an abandonment of the labor force). The model also suggests that while a more organized lobby of outsiders may have beneficial effects at the bargaining table with employers, it may also have negative effects if outsiders instead use their increased bargaining power to demand expansive monetary policies.

At the normative level, the model justifies better than previous analyses why monetary delegation is an imperfect tool for generating the desired inflation level, and reminds the reader that structural reforms of the labor market meant to reduce the power of insiders will have other benefits beside lowering the natural rate of unemployment, i.e. reducing the inflation bias.

One additional important result of this model is that the inflation bias is only part of the total bias occurring in this economy: another bias being due to the total level of lobbying activities exercised by outsiders, which achieve no better outcome than the one in the absence of lobbying and therefore amounts to a waste of resources.[23][24]

The paper also showed that stabilization policies meant to tackle shocks in the economy arise as endogenous responses to political pressures from constituencies. Stabilization of output around its (inefficiently low) level will be more effective the stronger the capacity of employed workers to have their desires represented through lobbying.

While, like Herrendorf and Neumann (1998), the paper shows that a lower inflation bias and lower output volatility might indeed arise contemporaneously, it differs from their analysis by arguing that this might not be due to central bank independence. Indeed, while not explicitly modeled here, the paper suggests that enhancing atomistic labor markets and decreasing trade

[23]Brunner (1985), p.8, claims that this bias is inherent to every society: "the incentives to invest in the political process for purpose of acquiring wealth from others or for protective political action lowers the allocation of resources to socially productive activities."

[24]A referee has pointed out that in this paper the direction of the lobbying activities of trade unions is cyclical in nature, contrary to the one of outsiders. It is an important and testable implication. In principle, "inconsistency" over time in lobbying activity might undermine the effectiveness of such lobbying activities. We believe in this case it does not. Consider strikes as an effective lobbying activity by unions. Over an entire cycle such strikes show an average amount of hours detracted from work. If we interpret our trade union's lobbying as departures from this average level, then recessions are period of above average strikes and expansions periods of lower than average strikes. Counter-cyclical strikes (an important feature of the lobbying activity of unions) amounts to a consistent strategy that does not weaken *per se* the effectiveness of the union's action .

unions capacity to organize themselves effectively may therefore generate a trade-off. While on the one hand it may eliminate the inflation bias by reducing outsiders' pressures, it may also increase output instability if the monetary policy is left in the hands of a central banker that is not pressed by Congress to achieve output stabilization. This is because lobbying costs in turn could be too high under atomistic markets.[25] If the Central Bank turns out to care only about price-stability, then too much output instability will be generated if society cares even only slightly about output instability. In positive terms, a conservative central banker will therefore have its way only in a competitive world where in addition lobbying costs are prohibitively high.

The micro foundation of the time-inconsistency bias cannot end here. Two issues seems to be particularly worth exploring: What are the exogenous determinants of lobbying activities and how are these determinants likely to affect the biases in society? Can one provide a positive theory of why central bankers care about inflation more than society? Answering these two questions is likely to provide us with a greater understanding of the workings of fiat-money regimes.

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[25]This would occur if lobbying power were modelled as endogenous (and not as exogenous as in this paper) and if one is willing to accept that as the union's bargaining power decreases so does its lobbying power. In this case there won't be lobbying for stabilization simply because in atomistic markets lobbies cannot organize themselves (this could happen for example for free-rider problems). If workers preserve their lobbying power even in the absence of a non-powerful union, then this argument would not go through.

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