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Acocella, Nicola and Di Bartolomeo, Giovanni and Pauwels, Wilfried

University of Teramo

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Nicola Acocella
University of Rome La Sapienza

Giovanni Di Bartolomeo
University of Teramo

Wilfried Pauwels
University of Antwerp

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Abstract. This paper studies corporatism as the outcome of bargaining between the government and a representative labor union. We show that if negotiations between these two parties only relate to macroeconomic stabilization, corporatism can never be beneficial to both parties. As corporatist policies are nevertheless commonly observed in this context, we discuss possible explanations that reconcile the theory with actual observations. The policy implications of these explanations are also discussed.

Keywords: Social pacts, axiomatic bargaining, unions, issue linkage.
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Corresponding Author: Prof. Nicola Acocella – Dipartimento di Economia Pubblica, Università di Roma 'La Sapienza,' Via Castro Laurenziano, 9, 00161 Roma, Italy. nicola.acocella@uniroma1.it.

1. Introduction

When studying how actual decisions of economic policy are made, bilateral or trilateral cooperative agreements between unions, employers' associations and the government are often found to be rather common. Policies derived from such agreements are generally defined as corporatist (See OECD, 1997; Visser, 1998; Traxler and Kittel, 2000; Rhodes, 2001). These agreements often involve many issues rather than a specific one. Corporatist policies are claimed to result from the public nature of economic stabilization (see the references in Cubitt, 1995). However, the underlying reasons and dynamics of such agreements are less clear, and the

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theoretical literature has only made a few steps to investigate these questions. On the contrary, many economists, as e.g. Burda (1997), underline a "formal reticence" of researchers to develop models of corporatism.[1]

Observed corporatist policies are the result of negotiations among social partners and the government. Any analysis of such negotiations requires an understanding of the rules that guide the interaction among the participants (Olson, 1965; Keohane, 1984; North, 1990; Shepsle and Weingast, 1995). The rules that set the agenda and define the procedures of negotiations influence the scope of issues and the process for choosing among available alternatives. A powerful tool to formalize the negotiation mechanisms is provided by game theory. In particular, cooperative solutions can be interpreted as the result of a negotiation process, and the properties of cooperative solution concepts summarize the rules that guide the interaction among participants.

In 1953 John Nash formally defined cooperation as

> "… situations involving two individuals whose interests are neither completely opposed nor completely coincident. The word 'cooperation' is used because the two individuals are supposed to be able to discuss the situation and agree on a rational joint plan of action, an agreement that should be assumed to be enforceable…" (Nash, 1953: 128).

The above definition implies that, for cooperation to be implementable, mutual benefits for all the cooperating agents are essential. In this paper we apply this idea to the negotiations between a government and a trade union, by assuming that the former wants to stabilize prices and employment, and that the latter's objectives depend on the real wage and the employment level. With respect to these variables, our main result is negative, as the targets only partially overlap and, more importantly, there is a trade-off between them. When starting from any noncooperative outcome, the trade union will never gain from cooperating. The government may lose from cooperating, or it could simply stay at the initial noncooperative outcome. In some cases, it may gain. Hence, efforts that attempt to promote corporatism in such a setting are useless. These kinds of round tables are bound to fail.

[1] In particular, the "formal reticence" is related by Burda to the remarkable imprecision with which the concept is defined. The reticence is even more pronounced with reference to the kind of corporatism in which we are interested in this paper. Some exceptions to this reticence are Cubitt (1995), Acocella and Di Bartolomeo (2006), and Acocella *et al*. (2006b).

At the same time, however, casual observations show that such cooperative agreements are often quite common in practice. We will then also discuss some possible explanations that may reconcile the theory with empirical observations.

In order to highlight those explanations we isolate the problem of coordinating the policies of the union and the government from that of coordinating the action of unions among them (i.e., the issue of centralization of wage bargaining),[2] by considering an all-encompassing union. More specifically, if nominal wages are set in a decentralized manner by multiple unions, negative externalities arise.[3] In this case, there may exist room for cooperation between the government and the unions. However, once the unions coordinate their policies, the model collapses to the standard case investigated here, since unions then internalize the wage externalities, and no further externalities exist. We also do not consider the existence of other institutions and/or policy instruments, which would introduce other problems of coordination.[4]

The paper is organized as follows. The next section describes the model. Section 3 derives various noncooperative solutions. Section 4 concerns cooperative solutions, and derives our main result against cooperation in the setting chosen. We also check the robustness of our results for different noncooperative and cooperative solutions. Section 5 applies our results to macro-models describing unionized economies. Section 6 discusses alternative explanations of the observed cooperative behavior, and gives some hints for correct and successful policy recommendations. A final section concludes and evaluates our results in the light of other possible explanations of corporatism.

2. The model

We consider a simple unionized economy in which a competitive firm uses labor to produce one final good. An all-encompassing monopoly union sets the nominal wage level, and a public policy maker (the government) controls aggregate demand.

[2] Sometimes corporatism is intended as centralization of wage setting. This is the object of a number of contributions (see, e.g., Horn and Wolinsky,1988, Calmfors and Driffill, 1988, Layard *et al*., 1991, Pekkarinen *et al*., 1992, Teulings and Hartog, 1998, Acocella and Di Bartolomeo, 2004a).

[3] Although the argument is old, it has been fully modeled only recently (see, among others, Cukierman and Lippi, 1999; Coricelli *et al*.2006).

[4] This can explain social pacts in other contexts (see Acocella *et al*, 2006b).

Formally, the simple economic setup is described by an aggregate production function, an aggregate demand function, and the preferences of the two players.

The production function is $y = f(n)$ with $f_n(n) > 0$ and $f_{nn}(n) < 0$ (subscripts indicate derivatives), where *y* is real output and *n* is employment. Employment *n* is bounded between zero and $\overline{n}$, the exogenously given labor supply. $\overline{n}$ is the full employment level of *n*. Competitive profit maximization requires $f_n(n) = \omega$, where ω is the real wage level. Labor demand is given by $n = f_n^{-1}(\omega)$. Aggregate supply of output is obtained as $y^s = q(\omega) = f(f_n^{-1}(\omega))$. Clearly, $q_\omega(\omega) < 0$.

Aggregate demand is given by a function $y^d = d(p,m)$, where p is the absolute price level,[5] and *m* represents a policy variable (e.g. money supply or fiscal expenditure), controlled by the government. We assume that $d_p(p,m) < 0$. The sign of $d_m(p,m)$ depends on the exact interpretation of *m* which we will leave open.[6]

Let *w* be the nominal wage level. Equilibrium on the output market requires that $q(w/p) = d(p,m)$. The wage level *w* is assumed to be controlled by the trade union, while the government controls *m*. We assume that, for any combination (w,m), the price level *p* instantaneously adjusts to realize equilibrium on the output market.

The preferences of the two players are represented by the following payoff functions. The trade union's payoff function is denoted by $\pi^T(n,\omega)$, with $\pi_n^T(n,\omega) > 0$ and $\pi_\omega^T(n,\omega) > 0$ (for a microeconomic foundation, see Oswald (1985)). The government's payoff function is denoted by $\pi^G(y,p)$, with $\pi_y^G(y,p) > 0$ and $\pi_p^G(y,p) < 0$. Both payoff functions are assumed to be strictly concave.

In all the games we will analyze, we assume that the firm, given a real wage ω, instantaneously adjusts its employment and its supply of output according to its

[5] We assume the parametrically initial price is equal to zero. We can then talk of inflation and current prices interchangeably (Cubitt, 1995: 247).

[6] A similar game is described by Cubitt (1995). Our assumption that the trade union does not affect aggregate demand is not essential. It is introduced only to simplify the exposition.

demand function for labor $n = f_n^{-1}(\omega)$ and its supply function of output $q(\omega)$. We will not treat the firm as a separate player.[7]

3. Noncooperative solutions.

In this section we will analyze three different noncooperative games, based on the model of section 2. Before doing that, we will first analyze how the price level p depends on the actions taken by the trade union and the government.

For any combination (w,m), we can determine the corresponding price level p that realizes equilibrium on the output market. This involves solving the equation $q(w/p) = d(p,m)$ for p. This equilibrating price level p can be written as a function $p = \phi(w,m)$. Differentiating both sides of the identity

$$q\left(\frac{w}{\phi(w,m)}\right) = d(\phi(w,m),m) \tag{1}$$

with respect to w, one obtains

$$q_\omega(\omega)\left[\frac{p - w\phi_w(w,m)}{p^2}\right] = d_p(p,m)\phi_w(w,m) \tag{2}$$

so that $\phi_w(w,m) = \dfrac{q_\omega(\omega)\ p}{p^2 d_p(p,m) + w q_\omega(\omega)}$.

It follows that $\phi_w(w,m) > 0$. An increase in the wage level w requires an increase in the price level p to restore equilibrium on the output market. As in (2) the sign of the LHS must equal the sign of the RHS. It then follows that

$$\frac{w}{p}\phi_w(w,m) < 1 \tag{3}$$

This implies that a one percent increase in w requires a less than one percent increase in p to restore equilibrium.[8] If inequality (3) holds, then by changing w the trade union does affect the real wage level.

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[7] Alternatively, firms can be considered as a player (follower) that, given the real wage, sets employment and output as a strategic variable. See, e.g., Coricelli *et al.* (2006). However, the issue is a purely terminological one.

[8] It is worth noticing that we have assumed $d_p(p,m)<0$. According to equation (2), if $d_p(p,m)$ were zero, in equation (3) 'inequality' would be substituted by 'equality.' In this case the trade union would not be

Differentiating the two sides of (1) with respect to *m* shows that the sign of $\phi_m(w,m)$ must be the same as the sign of $d_m(p,m)$.

We will now derive the reaction functions of the two players. We start with the *reaction function of the trade union*. For any given value of *m*, we want to determine the corresponding optimal value of *w* for the trade union. Using (3) we know that, for any given value of *m*, the trade union can control the real wage level $\frac{w}{\phi(w,m)}$ by manipulating *w*. Through the demand for labor, this control over the real wage level also allows control over employment and output. The trade union is then in a position to choose *n* and ω so as to maximize its payoff $\pi^T(n,\omega)$, subject to $n = f_n^{-1}(\omega)$. This problem is illustrated in the third quadrant of Figure 1. We denote the solution of this problem by (n^*,ω^*). Hence, for any value of *m*, the trade union will choose that value of *w* such that the resulting real wage equals ω^*. Employment and output are then given by $n^* = f_n^{-1}(\omega^*)$ and $y^* = f(n^*)$. In Figure 1 the production function (fourth quadrant) transforms employment *n* into output *y*. More formally, the reaction function of the trade union is given by

$$\varphi_T(m) = \left\{ w \,\middle|\, \frac{w}{\phi(w,m)} = \omega^* \right\} \tag{4}$$

We now turn to the *reaction function of the government*. This player takes the value of *w* as given. Suppose $w = w_1$. Aggregate supply $q(\omega)$ is then given by $q(w_1/p)$. This supply function is be drawn as a function of *p* in the first quadrant of Figure 1. This quadrant describes the output market. If the government decides on a value of *m*, it determines the price level $p = \phi(w_1,m)$, and aggregate output $q(w_1/\phi(w_1,m))$. The government is then in a position to maximize $\pi^G(y,p)$ with respect to *y* and *p*, subject to $y = q(w_1/p)$. The solution of this problem for $w = w_1$ is illustrated in the first quadrant of Figure 1. If *w* is increased from w_1 to w_2, the constraint in quadrant 1 shifts to $q(w_2/p)$, and a new optimal combination of *y* and *p* can be determined.

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able to control the real wage level: a one percent change in *w* would always lead to a one percent change in p, leaving the real wage unchanged.

The set of all such solutions for all values of *w* then traces out the locus BN in Figure 1. More formally, the reaction function of the government is given by

$$\varphi_G(w) = \arg\max_m \pi^G \left[\phi(w,m), q(w/\phi(w,m))\right] \tag{5}$$

We now consider three noncooperative games. The first game is a *static game* in which the trade union and the government move simultaneously. The Nash equilibrium of this game is given by the strategy combination (w^*, m^*), leading to the points H and N in Figure 1, where $p^* = \phi(m^*, w^*)$ and $\omega^* = w^*/\phi(w^*, m^*)$. The solution of the trade union's problem in the third quadrant leads to a unique real wage level ω^* and employment level $n^* = f_n^{-1}(\omega^*)$. Given the action m^* by the government, the trade union will determine *w* such that $\omega^* = w/\phi(w, m^*)$. This occurs when $w = w^*$. The government takes w^* as given, and then manipulates *m* so as to find the best point on the supply curve $q(w^*/p)$. This is obtained for the value m^* for which $p^* = \phi(m^*, w^*)$ and $y^* = q(w^*/\phi(w^*, m^*))$. This Nash equilibrium reveals the traditional results of the inflation bias (p^*) and demand policy neutrality.[9]

Consider now the sequential game in which *the trade union moves first*. For every value of *w*, there is a corresponding supply function in the first quadrant on which the government will choose its best point. The trade union will then choose that value of *w* for which the government chooses $y = y^*$. This will be the case if $w = w^*$, so that the government chooses the value $m = m^*$ for which $p^* = \phi(w^*, m^*)$ and $y^* = q(w^*/\phi(w^*, m^*))$. In Figure 1 this again leads to the points H and N.

Finally, consider the sequential game in which *the government moves first*. For any value of *m*, the trade union will choose the value of *w* such that the real wage equals ω^*. Real output is then always y^*. The government will then choose that value of *m* for which the price level is minimal. In Figure 1 this results in the outcomes H and S. As compared to outcome N, the government realizes a first mover advantage. As is well-known, the inflation bias in S vanishes as a result of the credible commitment of the government not to tolerate any inflation.

[9] See Acocella and Di Bartolomeo (2004b) for monetary policy neutrality in a similar context.

Summarizing, all noncooperative games imply the same unemployment $\overline{n} - n^*$. The trade union enjoys a corresponding real wage premium equal to $\omega^* - \omega^C$. (ω^C is the real wage at which $\overline{n} = f_n^{-1}(\omega^C)$.) The inflation bias is zero or positive (p^*) depending on the credibility of the government to support a demand policy that will not attempt to inflate the economy in order to raise employment.

4. Cooperative solutions.

In this section we discuss various cooperative solutions of the same game. All these solution concepts make use of the utility possibility curve and of the set of feasible payoff combinations. We first specify these notions in the context of our game.

The utility possibility curve can be constructed as follows. We start by considering point *H* in Figure 1. The corresponding payoff of the union is $\pi^T(n^*, \omega^*) = \alpha_1$. The union cannot raise its payoff further. By contrast, for $n = n^*$ and $\omega = \omega^*$, an infinite set of possible payoffs for the government exists the depending on price level that supports the pair (n^*, ω^*). Hence, starting from the Nash equilibrium point N (β_1, α_1) in Figure 2, it is always possible to increase the government's payoff along the segment NS, without affecting the union's payoff, by reducing inflation until it is zero. This is the case in the commitment solution (β_2, α_1), in point S.

From point *S* (where $n = n^*$, $\omega = \omega^*$, and $p = 0$), further increases in the government's payoff must imply a reduction in the union's payoff. Indeed, to further increase the government's payoff, unemployment (and the real wage) must be reduced. Employment higher than n^* with zero inflation raises the payoff of the government to β_3 and reduces that of the union to α_3. Note that (β_3, α_3) is Pareto efficient: it is on the utility possibility frontier as no Pareto improvements are possible. Starting from the payoff β_3, the government's payoff can be further increased to its maximal level β_4 by increasing employment and decreasing inflation to the levels $n = \overline{n}$ and $p = 0$, i.e. point B. This will further reduce the union's payoff to α_4.

The utility possibility curve is then given by the heavily drawn curve in Figure 2. The shaded area is the set Ω of all feasible payoff combinations. If the payoff functions π^G and π^T are strictly concave, this set must be convex.

We now consider various possible cooperative solutions. We start with the *utilitarian solution*. This solution concept is used, e.g., by Gylfason and Lindbeck (1994) and Cubitt (1995) in a similar context. It is obtained as

$$(\beta_C, \alpha_C) = \arg\max \left\{ \delta\pi^G + (1-\delta)\pi^T \mid (\pi^G, \pi^T) \in \Omega \right\} \tag{6}$$

where $\delta \in (0,1)$ measures the bargaining power of the players. In Figure 2 this solution is given by the point C (β_3, α_3), where inflation is zero and employment is between n^* and $\bar{n}$. Comparing this outcome with any of the noncooperative outcomes, we observe that cooperation always implies higher employment and lower (or equal) inflation. The government is always better off. However, the trade union is always worse off: the real wage ω will always be lower than ω^*, while employment will be higher than n^*. We can conclude, therefore, that there is no scope for corporatist policies, in the sense of the utilitarian solution, whatever the noncooperative starting point. Such policies can never be beneficial to the trade union.

We can generalize the utilitarian solution by reducing the set Ω to a subset Ω_F, defined as

$$\Omega_F = \left\{ (\pi^G, \pi^T) \in \Omega \mid \pi^G \geq \bar{\alpha}, \pi^T \geq \bar{\beta} \right\} \tag{7}$$

Here $(\bar{\alpha}, \bar{\beta}) \in \Omega$ is the disagreement point, i.e., the payoff combination that obtains in the case of a breakdown of the negotiations. We could then specify $(\bar{\alpha}, \bar{\beta})$ as the noncooperative outcomes (β_1, α_1) or (β_2, α_1), i.e., as points N or S. If we take (β_1, α_1) as the disagreement point, the *constrained utilitarian solution* is given by point S, which increases the payoff π^G of the government, and leaves the payoff of the trade union π^T unaffected. If (β_2, α_1) is taken as the disagreement point, point S is again the constrained utilitarian solution, and no player gains from cooperation.

The effects of introducing a point of disagreement are clear now. In case the government can credibly commit in advance, the constrained utilitarian solution coincides with the noncooperative one. In the case of the other two noncooperative

games the constrained utilitarian solution only succeeds in reducing inflation, while the unemployment rate is unaffected. The government then gains. The trade union is unaffected.

Another cooperative solution is the *Nash bargaining solution* (1953) in which the product $(\pi^G - \overline{\beta})^{\alpha}(\pi^T - \overline{\alpha})^{1-\alpha}$ is maximized over Ω_F for some $\alpha \in (0,1)$. If we then specify $(\overline{\alpha}, \overline{\beta})$ as (β_1, α_1) or as (β_2, α_1), the Nash bargaining solutions coincide with the noncooperative solutions.

Finally, if we use the *Kalai-Smorodinsky solution* (1975) as a cooperative solution concept, the solution is again point S in Figure 2, independent of whether we specify $(\overline{\alpha}, \overline{\beta})$ as (β_1, α_1) or as (β_2, α_1).

The above results can be summarized as follows. Starting from any noncooperative solution, none of the cooperative solutions improves the payoff of both players. The trade union never gains from cooperating. If in the noncooperative stage the government moves first, cooperation does not benefit the government either. If the government cannot commit in advance, the government only gains in the utilitarian solution and in the Kalai-Smorodinsky solution.

5. An application to the macro-models describing unionized economies.

This section compares our results to the literature on standard policy games involving union-government interactions.[10] We begin by considering a Barro-Gordon model with explicit endogenous wage setting, i.e. a simple policy game between the government and a representative union of the kind of Gylfason and Lindbeck (1994) – extensively used in the literature.[11] Then we extend our discussion to the case of multiple unions emphasized by the recent literature and consider unionized segmented-labor markets and monopolistic competition in the goods markets (as in Soskice and Iversen 1998; or Coricelli *et al*. 2006). For the sake of brevity, we expose the model in the simplest and most compact way leaving further details to our references. In particular, we use as a benchmark Acocella *et al*. (2006a). Of course,

[10] See Cukierman (2004) for a recent survey.

[11] Among a wide number of papers see e.g. Cubitt (1992, 1995), Detken and Gärtner (1994), Lawler (2000a, 2000b), Lippi (2002), Acocella and Di Bartolomeo (2004a, 2004b), and Di Bartolomeo and Pauwels (2006).

this section does not cover all possible applications. However, it focuses on the more interesting case from our perspective, i.e. the case of the macroeconomic models of union actions.

We consider a simple four-equation model.[12] Two equations describe the players' preferences and two equations the structural form. Formally, the preferences of the government and (representative) union are defined as:

$$\pi^G = -\frac{\beta}{2}p^2 - \frac{1}{2}u^2 \tag{8}$$

$$\pi^T = b(w-p) - \frac{1}{2}u^2 \tag{9}$$

where p is the price level,[13] u is the unemployment rate, $w-p$ is the real wage. The government's payoff depends on the employment and price deviations from targets normalized to zero. The union (or the representative union) seeks to maximize a linear-quadratic preference function with the real wage and unemployment rate as arguments. The economy is described by:

$$p = \alpha w + (1-\alpha)m \tag{10}$$

$$u = -\frac{1}{1-\alpha}(w-p) \tag{11}$$

where $\alpha \in (0,1)$ is the labor coefficient of the Cobb-Douglas production function. Note that equation (11) is directly derived from the labor demand of the representative firm.

As claimed in section 3, the first best solution of the union can be easily obtained by maximizing the union payoff subject to the "labor demand":

$$u^{FB} = (1-\alpha)b \tag{12}$$

[12] The model is quite general. For further details on its micro-foundations, see Acocella *et al*. (2006a). See also Cubitt (1992) or Di Bartolomeo and Pauwels (2006).

[13] As usual we assume an initial price equal to zero thus we can interchangeably speak of inflation and price level.

as the real wage and the employment are not independent variables (see equation (10)). In this case the union (first best) satisfaction is $\pi_{FB}^{T} = \frac{1}{2}(1-\alpha)^2 b^2$ (in figure 2 $\alpha_1 = \frac{1}{2}(1-\alpha)^2 b^2$).

It is easy to compute the Nash solution of the game, which implies:

$$p^N = b\beta^{-1} \tag{13}$$

$$u^N = (1-\alpha)b \tag{14}$$

As is well known, the government's policy is neutral with respect to employment and an inflation bias exists. By comparing (12) to (14), the union is clearly able to reach its first best solution and there are no incentives for cooperation with the government for the reasons discussed above. The losses computed by using equation (13) and (14) correspond to point *N* in figure 2. By considering monetary commitment it is easy to verify that point *S* corresponds to $p^S = 0$ and $u^S = (1-\alpha)b$, and the case of union leadership does not differ from the Nash one.

We now consider the more general case of multiple unions. In this case our results might not hold, since, some recent contributions[14] show that, if there is a multiplicity of unions and product markets are monopolistically competitive, a Barro-Gordon framework delivers policy non-neutrality even if unions have standard preferences, i.e. they are not inflation averse. In the economy there is a continuum of monopolistic competitive firms distributed on a segment of mass one and *n* symmetric unions that set sector nominal wages; thus, equation (9) must be indexed to distinguish the different unions:

$$\pi_i^T = b(w_i - p) - \frac{1}{2}u_i^2 \qquad i \in \{1,2,...n\} \tag{15}$$

and a further equation describing the specific-union unemployment rate must be added:

$$u_i = \frac{\eta}{\alpha + \eta(1-\alpha)}(w_i - p) - \frac{1}{\alpha + \eta(1-\alpha)}(m - p) \tag{16}$$

[14] See Soskice and Iversen (1998, 2000), Coricelli *et al*. (2006), Cukierman and Lippi (2002), Lawler (2005)

In equation (15), w_i is the wage set by the *i* union; $\eta > 1$ is the degree of monopolistic competition, $w = \sigma w_i + (1-\sigma) w_j$ is the average wage, where $\sigma = n^{-1}$ is an index of the segmentation in the labor market (or union coordination), the general level of prices is defined according to the Dixit-Stiglitz's tradition as $p = \int_0^1 p_{ij} dj$.[15]

Under the assumption of imperfect competition (i.e. $\eta \neq \infty$) the one-to-one correspondence between the specific-union unemployment rate and the real wage no longer holds. The Stackelberg equilibrium (with unions as leaders) gives:[16]

$$p = \frac{\left(1-\left(\alpha-\phi+\alpha\phi\right)\sigma\right)\left(\alpha-\phi+\alpha\phi\right)\left(\alpha+\left(1-\alpha\right)\eta\right)b}{\left\{\eta\left(1-\sigma\left(\alpha-\phi+\alpha\phi\right)\right)+\alpha\sigma\left(1+\phi\right)\right\}\left(1+\phi\right)} \geq 0 \qquad (17)$$

$$u = \frac{\left(1-\left(\alpha-\phi+\alpha\phi\right)\sigma\right)\left(\alpha+\left(1-\alpha\right)\eta\right)b}{\eta\left(1-\left(\alpha-\phi+\alpha\phi\right)\sigma\right)+\alpha\sigma\left(1+\phi\right)} > 0 \qquad (18)$$

and monetary policy is non-neutral, since $\phi = \frac{\alpha(1-\alpha)\beta - 1}{(1-\alpha)^2 \beta + 1}$ is a measure of the monetary policy stance.[17]

From equation (18), it seems that there might be room for cooperation between the unions and the government. However, this is not the case if coordination among unions is considered. In fact, union coordination implies that $\sigma \to 1$ and the unemployment rate is:

$$u = (1-\alpha) b \,, \qquad (19)$$

which corresponds to equations (12) and (14). Unions as a whole have not interest in further cooperating with the government, since the union coordination internalizes all the externalities due to the market segmentations. Put in different words, there are no

[15] Equation (16) is the union's employment function stemming from a traditional labor demand derived by real profit maximization assuming a Blanchard and Kiyotaki's (1987) firm's demand. It refers to the micro disaggregated equilibrium condition, which is fully compatible with the other two macro relationships previously described (for technical details, see Acocella *et al*., 2006a).

[16] In such a model Nash equilibrium and the Stackelberg equilibrium with union leadership are different: see Acocella *et al*. (2006a) for a discussion. This, however, does not affect our argument, since union coordination leads to the same outcomes irrespectively of which of the two non-cooperative solutions is considered.

[17] More precisely it is the coefficient of the reaction function of the government with respect to the aggregate nominal wage.

cross externalities that can be internalized by cooperation between unions and the government. Note also that labor market segmentation is a necessary but not sufficient condition for union externalities, since if the goods market is competitive, $\eta \to +\infty$ and the unemployment equilibrium is also given by equation (19). It follows that, if unions cooperate, they have no incentive to cooperate with the government. A cooperative solution in which each union separately cooperates with the government, would be possible, but it would represent a second best solution, since the union cooperation also improves the government satisfaction by fully internalizing the negative externalities due to the wage decentralization as shown in Acocella *et al*. (2006a).

In summary, our application describes our results in a widely used context and shows that the case of multiple unions can be reduced to that of a monopoly union, at least with reference to a standard Barro-Gordon setting. Then the simplifying assumption we have used in our model, i.e., that of a monopoly union, is justified, at least in such a setting. In fact, a monopoly union solves the main problem arising in a multi-union context, i.e., the coordination problem among the different unions. This is of overriding relevance with respect to other coordination issues, in particular that between unions and the governments. Policy attitudes can have an influence on the coordination between unions and the government, but they can never attain the first best solution, which can only be obtained if unions cooperate, at least in settings similar to that used in this section.[18] If the unions can solve the main coordination failure arising in the labor market by cooperating, one can doubt if there is any space left for cooperating with the government. We will consider this case in the next section in relation to the possibility of some unions defecting from their agreement.

6. Possible explanations of corporatist policies

We have shown that, in the context of macroeconomic stabilization policies, the scope for successful corporatist policies is very limited. However, as noted in the introduction, casual observation tells us a different story. Corporatist policies have been rather common, at least in European economies after the Second World War.

[18] The same is true if international wage-setting externalities are considered in a two-country model. No cross externalities between unions and governments exist and for the unions all coalitions different from that of all the unions, which implies government policy neutrality, are suboptimal (see Acocella and Di Bartolomeo, 2004a).

Hence, there is the problem of explaining why these policies are indeed so common. We will now elaborate on the following possible explanations, while remaining within our setting:

1. Threats.
2. Side payments.
3. Issue linkage.
4. Political exchange.
5. Delegation of public functions to unions.
6. Social pacts as a coordination device.

Some of these explanations – in particular, the first and the second, the second and the third – may overlap. There are, however, also differences which justify their separate presentation.

All explanations share common problems. Agreements usually result from a long process of negotiations, which also involves strategic behavior by the partners. In the course of these negotiations each partner can resort to a number of actions to increase his bargaining power. First, a partner may try to hide his "true" preferences, or the constraints he faces. In particular, the unions may exaggerate the costs associated with wage moderation, whereas employers' associations and the government will overestimate the negative consequences of wage increases on employment. Strategic action may also involve threats in order to extract high compensatory payments from the opponent.

In addition, in many cases (in particular, for threats and side payments, but also issue linkages) problems of time consistency can arise. As a consequence, in repeated games corporatism can prove difficult to be reached if one of the partners in a corporatist agreement has a high time preference or does not want to build reputation for other reasons. In what follows we focus on one-shoot games and assume that a mechanism supporting an agreements exists.

1. *Threats* are rather uncommon in social pacts. Sometimes they come from the government, and are addressed to social partners (mostly unions) in order to induce them to cooperate. The threats refer to the possibility for the government to introduce measures harmful for the social partners (taxation, wage restraint, etc.) in case there is

no agreement on some kind of wage setting, particularly in order to preserve price stability. In some other cases threats come from one of the social partners and are addressed to the other social partner or to the government. However, the success of a threat strategy depends upon the credibility of the threats. Threats must be credible to be relevant. This drastically restricts the cases in which threats support social pacts. Probably, threats become credible only in situations of acute governmental crisis.

The Wassenaar agreement of 1982 in the Netherlands, with the government ostensibly present behind the scene, threatening wage controls and other norms (Boeri et al., 2001: 76), is a perfect example of government threats, tending to facilitate social pacts. The pact was signed in a particularly deep economic crisis of the Dutch system (see Ebbinghaus and Visser, 1997). By contrast, in Belgium the threat strategy of the early 90s was noncredible. This explains why bipartite agreements between labor and enterprise organizations failed, and the government finally introduced a wage setting regulation in 1993 and 1996, as well as a reduction in social expenditures (Boeri *et al*., 2001: 76-77; Schmitter and Grote, 1997: 193).

Threats support cooperative strategies in the case of infinitely repeated games under some appropriate assumptions about discount factors, as in these circumstances the Folk theorem applies. From the pioneering article of Barro and Gordon (1983) it is well-known that a cooperative macroeconomic equilibrium can be supported by threats. In fact, if the assumptions of the Folk theorem are satisfied, a trigger strategy supports the zero inflation equilibrium, but this does not represent the only perfect sub-game equilibrium of the case (e.g. a trivial alternative equilibrium is the infinite repetition of the non-cooperative static single-period Nash equilibrium).

Apart from the technicalities, it must be noticed that even if a trigger strategy can be used to support cooperation, its practical applications to our case are rather limited. In fact, cooperation could lead to no better solution than the non-cooperative Stackelberg equilibrium. Thus the only social pacts that can be sustained by a trigger strategy are those designed to reduce inflation without affecting the level of employment. This seems far to be close to the stylized facts, which often associate the social pact to wage moderation to support the employment level. In addition, if the government, by (autonomously) committing to a monetary rule, can secure zero inflation with the maximum employment, there is no ground for cooperation. For this reason it seems

important to explore alternative avenues to support more realistic theoretical justifications of the social pacts.

2. *Side payments*, in the form of reduced taxes (usually for lower incomes), higher social spending, or a relatively contained reduction in social spending can obviously make corporatist policies beneficial as long as the gains from cooperation for the government exceed the compensation required by the unions. Increases in public expenditures (in the form of welfare expenditures, housing programs, etc.) were rather common in the pacts of the 1970s (Pizzorno, 1978) and 1980s, but were also granted by the government in Finland after 1992. Their controlled reduction was more common in the pacts of the 1990s. This was the case, e.g., in Belgium (Visser, 2002: 10; Schmitter and Grote, 1997: 193). Tax reductions, especially for lower incomes, were agreed in Ireland after 1987, and in Finland after 1992 (Boeri *et al* , 2001: 76).

This is really a mechanism that could support cooperative solutions. To show the possibility for the union to accept a cooperative solution if a side payment is made, we must examine the issue in more detail.

Let us consider the case of a possible *given* side payment, *t*, made by the government to the union aiming at securing the latter's agreement about a social pact. We begin by considering the simplest case of a fixed-monetary unilateral transfer. Formally, the players' payoffs must be modified as follows:

$$\tilde{\pi}^G(y,p,t) = \pi^G(y,p) - g(t) \tag{20}$$

$$\tilde{\pi}^T(n,\omega,t) = \pi^T(n,\omega) + h(t) \tag{21}$$

The payoffs are now functions also of $t \in \{0, \bar{t}\}$. For the sake of simplicity, we assume a linear-symmetric payoff from the transfer, i.e. $g(t) = h(t) = t$. The assumption will be later relaxed.

Now the cooperative solutions will be constrained by a new possibility set, which also takes account of the fixed transfer. The macroeconomic outcomes in terms of *y* and *p* deriving from any pair of *w* and *m* are independent of the transfer, but the transfer changes the final payoff, and therefore also the incentive to adopt a cooperative strategy for the two players.

We call Ω' the set of all payoffs *with a given transfer* (i.e. for a $t = \bar{t} > 0$) and Ω the set without a transfer. The latter corresponds to that depicted in Figure 2. As to the former, since the economic outcomes are independent of the transfer (and the utility is separable), the set Ω' can be easily obtained by shifting the set of payoffs without transfer, Ω, to the North-West, to an extent that depends on the amount of t. The set Ω' is represented in Figure 3. Notice that, to each given pair of w and m (and therefore also to each triple of ω, y and p), there corresponds in Ω' a higher utility (+ t) for the union and a lower utility ($-t$) for the government. More specifically, points N', S' and B' correspond, respectively, to the outcomes ω^*, y^*, p^* and a side payment of $\bar{t}$, to the outcomes ω^*, y^*, $p = 0$ and a transfer $\bar{t}$, and to the outcomes ω^*, $\bar{y}$, $p = 0$ and a transfer $\bar{t}$. Other points correspond to a transfer $\bar{t}$ and macroeconomic outcomes intermediate between those indicated. If also the case of $t = 0$ is taken into account, we can refer to the set $\Omega^t = \Omega \cup \Omega'$, which defines the enlarged possibility set due to a side payment.

From our graphical analysis we can draw the following conclusions:

1. If Ω' includes the payoff from the non-cooperative solution, a cooperative agreement with a side payment of $\bar{t}$ would be always feasible under any kind of cooperative solution.

2. By considering the constrained-utilitarian or the Nash cooperative solution, a non-trivial cooperative solution always implies a lower inflation and higher employment since the tangency between the utilitarian function or the Nash product and the frontier will be on the non-linear side of Ω'. By contrast, a Kalai-Smorodisky solution can be also compatible with a reduction of inflation only.

In Figure 3, point C' is a cooperative solution which is Pareto superior to both the Nash and the Stackelberg ones, and which can be implemented in both the utilitarian cooperative function and the Nash product. Notice that the feasibility set (centered in N, since no party will accept an agreement leading to a utility lower than the non-cooperative solution) is not empty as in the case without transfers. (For the sake of simplicity we have only emphasized the feasibility set based on the noncooperative Nash solution. The extension to the Stackelberg case is trivial).

More generally, *if the government can choose the size of the transfer*, a utility possibility frontier can be obtained by taking the union of all the possibility sets for all the possible transfers up to a threshold value ($t^{\max}$). This threshold value is determined such that the utility of the government is equal to that achieved in the non-cooperative case. It follows that the government has no incentive to cooperate for a $t > t^{\max}$.

Formally, the new utility possibility set is defined as:

$$\Omega^{*} = \bigcup_{i \in [0, t^{\max})} \Omega(i) \tag{22}$$

where $\Omega(i)$ is the utility possibility set for a given transfer i (of course, $\Omega(0) = \Omega$ and $\Omega(\bar{t}) = \Omega'$). Graphically, Ω^{*} is the envelope of the $\Omega(i)$ sets and is represented in Figure 3 by a dotted line. A cooperative solution always exists (because of the continuity) and it singles out the economic outcome and the size of the equilibrium transfer. Without loss of generality, we have drawn the figure to get both the cooperative Nash and utilitarian solution for $\bar{t}$.

Side payments need not be monetary transfers. E.g., they could also take the form of lower taxation which increases workers' disposable income. In principle, gains and/or losses can be in terms of objects different from money, without affecting our analysis.

3. An explanation of corporatist agreements – which generalizes the side-payment solution while being capable of avoiding some of its shortcomings – can emerge from *issue linkages*. The idea of issue linkages was originally formulated with reference to the bargaining between multinationals and their host countries (see, e.g., Vaitsos, 1974: p. 124). It became popular for environmental problems (see Folmer *et al.*, 1993; and Cesar and De Zeeuw, 1996). The intuition is that, by interconnecting two or more areas of bargaining between two or more agents a cooperative behavior can emerge, in which some agents gain on a given issue, whereas other agents gain on another one. The linkage between different issues may take the form of a threat to negate some existing advantage (Folmer *et al*, 1993: 315).[19] By linking the issues, the agreement in which the agents decide to cooperate on them may become profitable to all of them.[20]

[19] Bargaining on environment could be linked to negotiations on trade or arms control or other issues.

[20] Technically the issue linkage enlarges the payoff space and often increases the benefits of cooperation for all players.

In our context, the basic idea behind issue linkages is to design an agreement in which participants do not negotiate on economic stabilization only, of interest mainly to the government, but on other issues as well (e.g., taxation policy or pension reform or labor market reform, of interest to the social partners).[21]

Formally, issue linkage can be modeled as in equations (20) and (21), by assuming that $t = \left\{ t^G, t^T \right\}$ is the vector of the two policymakers' additional instruments. This can be analyzed in a manner similar to the side payment case.[22] One could even speak of 'side payments in kind' in the case of issue linkages (Folmer *et al*, 1993). The effect of issue linkages is in fact that of enlarging the utility possibility set and sustaining cooperative solutions. In order to be effective, issue linkage should link an issue where the government has a bargaining advantage to the wage negotiations since, as shown in the case of side payments, in order to support a cooperative solution a non-empty space is needed in the utility possibility set to the northeast of the noncooperative threat point.

Issue linkage (in addition to side payments) was at the basis of corporatist pacts in Italy in the 1970s, where unions sought price stability and employment in the *Mezzogiorno*. It was also used in Finland in the early 1990s, where the Government promised to abstain from laying off civil servants (Schmitter and Grote, 1997: 190).

The case of issue linkages can be dealt with in terms entirely similar to those of side payments. Instead of a transfer, there will be some other object that can increase the union's satisfaction to the detriment of the government.

4. A relationship between unions, employers' associations and governments based on *political exchange* is a specific case of issue linkages, in which the *quid pro quo* for one of the cooperating partners has a truly political nature.[23] Quite often, all partners

[21] The idea of issue linkage has been introduced also as a way to increase cooperation on issues where the incentives to free ride are particularly strong. The purpose of issue linkages has been then to determine under which conditions players actually prefer to link the negotiations on two different issues rather than negotiating on the two issues separately. This has been investigated in the context of endogenous coalition formation (see Carraro and Marchiori, 2003).

[22] Notice that, in the case of issue linkages the vector *t* corresponds to the values of the two instruments geared by both players, whereas in the case of a side payment it would correspond to a unique instrument, unilaterally geared by the government to the end of reaching a cooperative agreement.

[23] The meaning we attribute to the term "political exchange" is rather limited, as we refer to situations where the *quid pro quo* for wage moderation lays in the realm of politics, more than in that of economics. Other authors speak of political exchange in a more comprehensive way, as they include in the counterpart to unions increased public sector expenditure, compensating social policies (which we

have an interest in granting or receiving some kind of legitimacy,[24] and in avoiding exclusion (Streeck, 1998). Or they want to guarantee social cohesion or to ensure some common political goal, such as controlling the effects of political shocks (liberation from Nazism and Fascism, transition to a democratic regime), or the effects of a shift in economic regime (oil shocks, choice of the option of a non-accommodating monetary regime within the ERM, participation in EMU, entry to the EU).[25]

The relevance of "political exchange" derives from the fact that considerations other than performance may guide the partners of a social pact (Traxler, 2003: 6). "Political exchange" is often more of a 'foundational' than a "managerial" pact (Karl, 1985), and often has a loose (even rhetorical) content (Crouch, 2000a: 216).

"Political exchange" is a solution intrinsically difficult to be implemented in reality, for at least three reasons. First, as we have just said, it often assumes a rhetorical form (rather than having a precise technical content). Secondly, the time distribution of the costs and benefits to each partner is different and time inconsistency can thus emerge. And finally, each partner can only partially control the implementation of decisions agreed upon (Regini, 2000: 161).

One of the first examples of political exchange was given by the post-Nazism and post-Fascism social compromises in France and Italy. Another example was the *Pacto de Moncloa* of 1977 in Spain, after the death of Franco. The pact signed in January 1984 in Italy tried to cope with the (lagged) effects of the second oil shock. The unions mainly gained in terms of social cohesion, stemming from reduced inflation and from the protection of employment in the *Mezzogiorno*. Numerous pacts were subscribed in European countries after the Maastricht Treaty in the early 1990s. Here

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have referred to as cases of side payments), or employment protection (which in our case is the result of an issue linkage) (see Visser, 2002: 10).

[24] This is often demanded by unions, particularly in times when the degree of unionization tends to decrease. But there are cases in which governments ask for legitimacy, as it happened not only occasionally in the cases of France and Italy cited before, but also on a regular basis in Austria, where, as declared by the first president of the OGB, Bohm, no government could be formed without the support of the unions (Tarantelli, 1986: 183). There are also cases where some kind of legitimacy (i.e., controlling the labour force, or preventing unions from deploying 'whipsawing tactics' against isolated employers) is sought by employers' associations through social pacts (Traxler, 2003: 3).

[25] In a different context, the importance of the political relationship between the governments and labor unions has been stressed also by Alvarez *et al*. (1991), Detken and Gärtner (1994), and Franzese (1999). However, empirical evidence also suggests caution about the size of these effects (see e.g. Woldendrop and Keman, 2006).

the gains for the unions were mainly political, i.e., easing the road for the construction of the European Monetary Union. In some way these types of social pacts were a substitute for centralized wage bargaining (Boeri *et al.,* 2001: 75).

Being a special case of issue linkage, we can repeat for political exchange what we said for issue linkages and side payments.

5. *Delegation of public functions to social partners* is another explanation of corporatist agreements. Organized interests (in particular, in our context, employers' associations and unions) are given the authority to perform functions typical of the state (managing the welfare system, defining and implementing labor standards, legal enforcement of collective agreements between employers' associations and unions).

This solution can be more stable than the previous one, since at least in some cases costs and benefits to each partner are synchronous, and each partner can control the implementation of the agreements.

The management of the welfare system by trade unions is rather common in many countries. This is the case, since the late nineteenth century, in Germany and Belgium.[26] This was also the case in Britain in the late nineteenth and early twentieth centuries. It also occurred in France, Italy, Scandinavian and other Continental Europe countries, Japan and the U.S. (at the enterprise level) after World War II (Crouch, 2000b: 77). *Erga omnes* clauses are entailed by French and Italian systems.

Also in this case the formal argument developed for side payments applies.

6. *Social pacts as a coordination device*. In a multiple-union context, as we said in the previous section, cooperation between the unions enables reaching the first best. A monopoly union can attain the same outcome as cooperating multiple unions and, as shown in section 3, cooperation between the monopoly union (or the cooperating multiple unions) and the government cannot lead to a better outcome. Even if the case of a multiple union leads to the same outcome as that of a monopoly union, there is however room for cooperating with the government, from the point of view of the implementation of the cooperative agreement between the unions.

[26] For instance in Belgium refunding of medical expenditures as well as unemployment benefits are directly managed by labor unions.

In fact, there may be a problem of defection, i.e. of a union having an incentive to defect from the agreement with other unions. In this case the intervention of the government can guarantee each union against defection by other unions.

6. Conclusions

In this paper we have analyzed macroeconomic stabilization policies as a game between the government and the trade union. We compared various cooperative and noncooperative solutions. We showed how a simple cooperative utilitarian solution can improve the economic performance by decreasing unemployment and reducing inflation. However, we have shown that this solution, notwithstanding its wide use in the literature, may be unacceptable for the trade union. This union will have no incentive to cooperate, even if output stabilization is a public good, i.e., a target of both the private and public sector. Cooperation will hurt the trade union. This result remains valid if we move to different cooperative solution concepts such as the Nash bargaining solution and the Kalai-Smorodinsky solution.

The difficulty to devise a cooperative solution which is beneficial to all partners involved has important implications for incomes policies and corporatism. We demonstrated that cooperation is possible only in more complex contexts where other strategic, economic and political considerations are relevant. This observation is confirmed by many practical cases of negotiations between governments and trade unions, which often involve threats, side payments, issue linkages, political exchange, and delegation of public functions to unions. In a second best fashion, incentives to cooperate between the union(s) and the government might also result from the existence of multiple distortions as in the case of externalities between more unions in a monopolistic goods market or taxation and public expenditures. Acocella *et al*. (2006b) consider a setting where both the union and the government create distortions, the union has also a preference for public expenditures and a monetary authority operates In this setting corporatism can cope with a number of externalities that are in noncooperative solutions.

Finally it is worth noting that we have not considered the case of an inflation-averse union, i.e., the case where inflation directly enters in the union's preferences as a

negative argument (see e.g. Cukierman and Lippi, 1999). When inflation is low, however, this case is rather unrealistic and can be hardly justified. It acquires relevance in cases of galloping inflation or hyperinflation, which, apart from efficiency considerations, usually are situations of social unrest and clashes. In this paper we have restricted our analysis to the traditional simple case of a monetary economy with a competitive good market.

We have not considered active behavior of employers' associations in our model. This would increase the possibility of side payments and issue linkages. However, it does not change our basic results in a substantive way. A more promising prospect could emerge in considering the cooperation between the firm and the union (with an efficiency wage solution), together with the cooperation between the union and the government.

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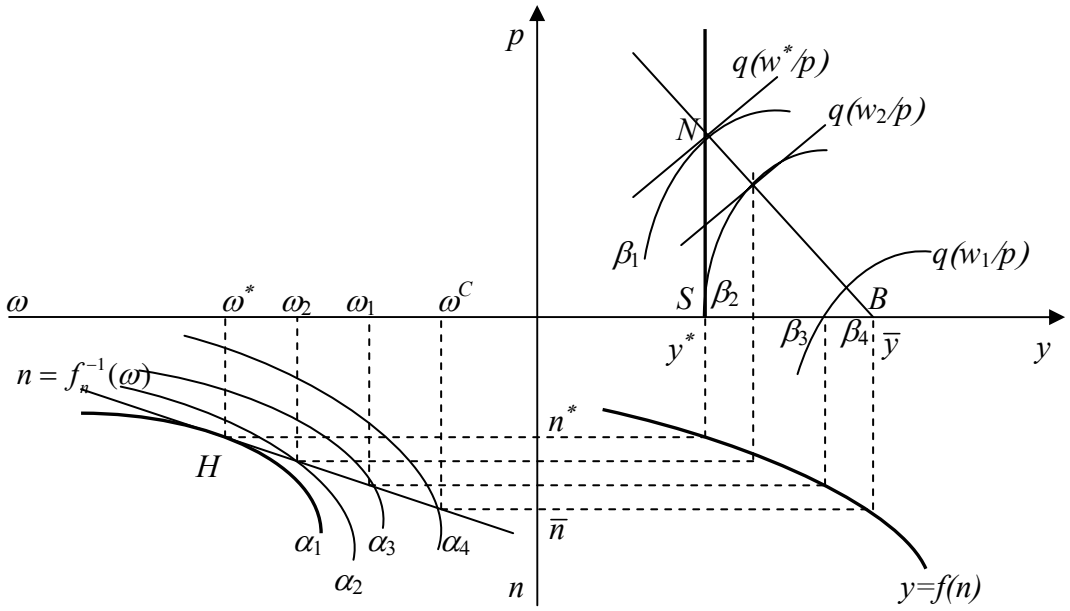


Figure 1

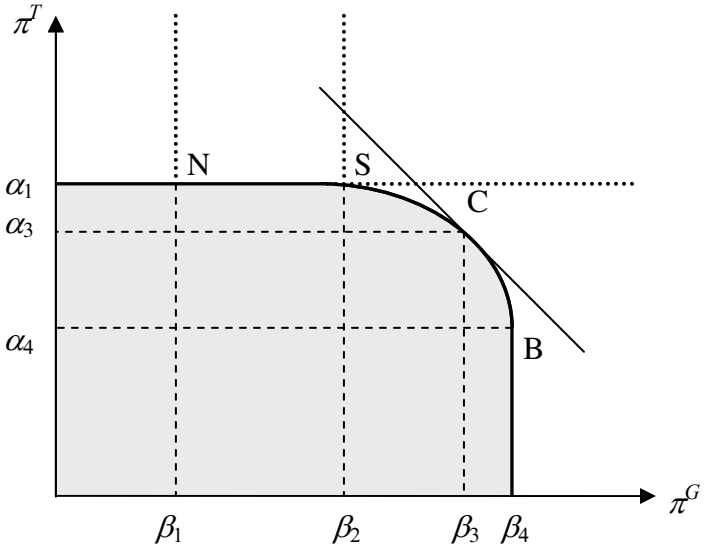
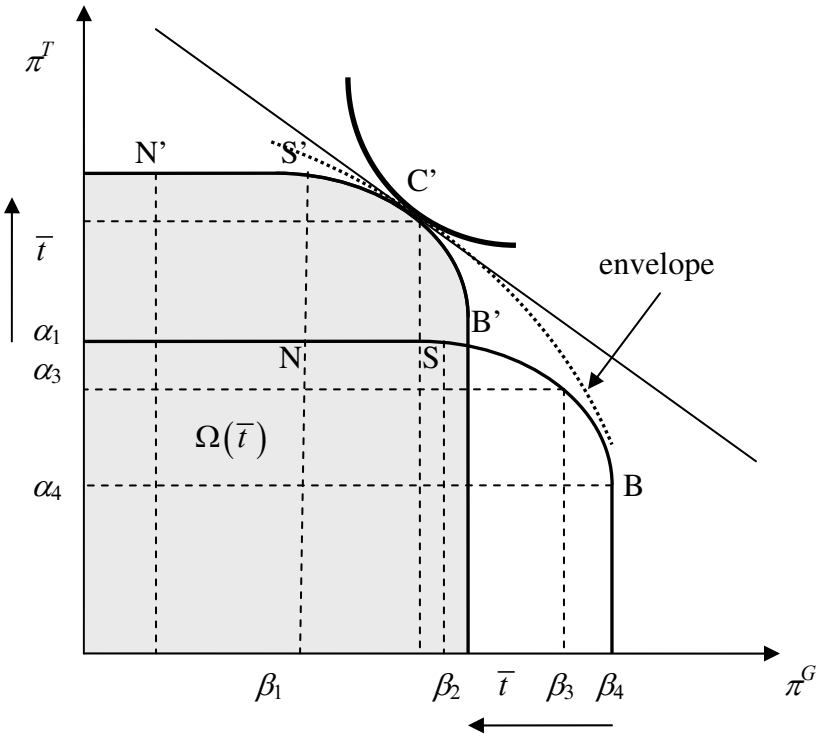


Figure 2


π^T
N'
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envelope
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α_1
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β_1
β_2
$\bar{t}$
β_3
β_4
π^G

Figure 3