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On the Electoral Dimension of International Policy Coordination

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***Abstract* - The paper formalizes some of the interactions between inter-national and inter-temporal problems of policy coordination through the analysis of the implications of the synchronization (or not) of election dates on international policy cooperation. This makes it possible the determination of the gains and losses of international policy coordination and to an analysis of how the synchronization of election dates may help (electoral) international policy coordination.**

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1. Introduction

The recent worldwide economic crisis has caused economic agents to be concerned with the design of institutions that, by their nature, will help overcome the problems that have affected many countries. In particular, the focus has been placed on how different countries can cooperate in putting into practice economic policies coordinated at international level in order to overcome the economic crisis.

As a matter of fact, despite some interest in the design of international institutions (Morales & Padilla, 1995; Schubert & von Wangenheim, 2006) and a considerable interest in the international coordination of economic policies (Miller & Salmon, 1990; Miller et al., 1991), the fact is that the electoral dimension in these matters was always an issue to which the literature has devoted little attention (Easaw & Garratt, 1996; Lohmann, 1993; Tabellini, 1990). This is a disconcerting fact as it corresponds to an ignorance of an issue, i.e. the time horizons of governments (Caleiro, 2009), which is obviously relevant in the international coordination of economic policies within the framework of participation in some kind of economic institution.

For instance, concerning the third stage of the Economic and Monetary Union, the European Commission (1997: 26) acknowledged at the time that giving up national monetary policy could involve costs if countries experienced de-synchronized business cycles. Despite this concern about the importance of business cycle synchronization, little research has been done on the importance of temporal horizons for business cycles synchronization and, to the best of our knowledge, almost none has been done on the impact of the synchronization of election dates on the synchronization of business cycles between economies. Some exceptions are Breuss (2008), Caleiro (2010), Kayser (2006), and Sapir & Sekkat (1999).[1]

In order to fill part of the gap in the literature, the paper formalizes some of the interactions between inter-national and inter-temporal problems of policy coordination through the analysis of the implications of the synchronization (or not) of election dates on international policy cooperation. In doing so, it is our objective also to help answering the following question: "Does international cooperation or coordination of economic policies become easier or harder when domestic elections across countries are synchronized?" (Caleiro, 1996: 11). Specifically, the paper adds to the literature by computing the cooperative and non-cooperative solutions in a model where governments face elections at possibly distinct moments of time. This leads us to the determination of the gains and losses of international policy coordination and to an analysis of how the synchronization of election dates may help (electoral) international policy coordination.

That said, the rest of the paper is structured as follows. Section 2 presents the two-country model that will be used throughout the paper. Section 3 presents the non-cooperative solution for the synchronized and non-synchronized elections cases. Section 4 presents the cooperative solutions for these two cases. Section 5 concludes by showing the circumstances under which is it better to have synchronized elections.

[1] Also, in Caleiro (2000) a difference games case was considered to study how distinct electoral period lengths may influence the benefits from international policy coordination.

2. The Two-Country Model

In order to analyze the possible consequences on international policy coordination of electorally-motivated governments, let us consider that voters take into account the evolution of output, which is controllable only in part by the domestic government. Formally,

$$y_t = am_t + bm_t^* + z, \quad (1)$$

where y_t is the output growth rate, m_t and m_t^* are, respectively, the domestic and foreign money growth rates, and z is a supply shock.[2] As a faster expansion of the domestic money supply is supposed to increase domestic output, the domestic monetary multiplier, a, is assumed to be positive (but less than 1). Also, due to the ambiguity of the monetary spillover effects, no sign will be imposed on the foreign monetary multiplier, b, though it will be assumed that, in absolute terms, it is less powerful than its domestic counterpart. To sum up, $0 \leq |b| < a < 1$.

We also consider that the government cannot freely manipulate its policy instruments without costs, which we assume are taken into account by the electorate, and, thus, will be viewed as popularity costs. In fact, as considered in Dolado et al. (1994), if $m_t = \pi_t$, it is reasonable to assume the following voters' period t utility stream:

$$v_t = -\frac{1}{2}\left(\beta y_t^2 + \pi_t^2\right),$$

where β is a positive constant measuring the relative importance of both variables in the voters' welfare.[3]

The economy of the foreign country has an identical framework, so that:[4]

$$y_t^* = am_t^* + bm_t + z, \quad (2)$$

and

$$v_t^* = -\frac{1}{2}\left(\beta^* y_t^{*^2} + \pi_t^{*^2}\right).$$

Following the definition of Cooper & John (1988), the strategic effects are then:[5]

$$\frac{\partial^2 v_t}{\partial m_t \partial m_t^*} = -a\beta b,$$

$$\frac{\partial^2 v_t^*}{\partial m_t^* \partial m_t} = -a\beta^* b.$$

This means that, when $b > 0$ (resp. $b < 0$), the monetary policies are strategic substitutes (resp. complements), since an increase in the foreign money supply growth rate decreases (resp. increases) the marginal payoff of domestic money supply growth rate and therefore weakens (resp. reinforces) the effect of the domestic monetary policy. [6]

In accordance to Gärtner (1994; 2000), let us assume that election periods (E) and non-election periods (N) alternate such that, when t = E, $t - 1$ = N, $t - 1$ = E, *etc.*, and that election results depend on the present and previous voter utility streams as follows:

$$V_t = v_t + \mu v_{t-1} \quad (3)$$

$$V_t^* = v_t^* + \mu^* v_{t-1}^*, \quad (4)$$

where V_t is the government vote share, and μ can be associated with the rate of decay of voters' memory.

Given this set-up, it is obvious that a perfect synchronization of elections will occur when election periods (E) correspond to the same value of t for both economies; otherwise non-synchronized elections will occur. This issue plays no special role in the non-cooperative solutions as will be shown in the following section.

3. The Nash solutions

As is well known, in the non-cooperative solution, each player optimizes her/his own objective function taking as given the reaction of the other player, *i.e.* both maximize their objective functions (3), (4), subject to equations (1), (2) but without considering the other government's instrument as

[2] Relation (1) is borrowed from Dolado et al. (1994). Another possible formulation could be $y_t = am_t + bm_t^* + \theta\bar{y}$, where $\bar{y}$ is the rate of growth of natural output (Canzonery & Gray, 1985).

[3] For simplicity, it will be assumed that y_t and π_t are measured from the most desirable values.

[4] Both economies are to be structurally identical, except in what concerns voters' output-inflation preferences and voters' memory. Straightforwardly, an asymmetric and/or a n-country version of the model can be considered.

[5] Strategic complementarity (resp. substitutability) corresponds to the case where an increase in the actions of all players except player i increases (resp. decreases) the marginal return to player i's action.

[6] Taking into account (1) and (2), this also means that, in case of a positive (resp. negative) monetary spillover effect, monetary policies can be substitutes (resp. complements) since an increase in the foreign money growth rate will induce, by itself, an increase (resp. decrease) in domestic output growth, which will be compensated by a decrease (resp. increase) in the domestic money growth rate (Bulow et al., 1985).

either under its own control or independent of its own policy. Hence, if we assume that both governments want to maximize their vote share at the election period by a non-cooperative procedure, the optimal reaction functions can be derived as follows.

Let us consider that, for the domestic economy, t = E. In this case, the two-period monetary policy that maximizes popularity at t = E is given by:[7]

$$m_{t-1} = -\frac{\beta ab}{1+\beta a^2} m^*_{t-1} - \frac{\beta a}{1+\beta a^2} z, \qquad (5)$$

and

$$m_t = -\frac{\beta ab}{1+\beta a^2} m^*_t - \frac{\beta a}{1+\beta a^2} z. \qquad (6)$$

In a similar way we can derive the reaction functions for the foreign government as:

$$m^*_{t-1} = -\frac{\beta^* ab}{1+\beta^* a^2} m_{t-1} - \frac{\beta^* a}{1+\beta^* a^2} z, \qquad (7)$$

and

$$m^*_t = -\frac{\beta^* ab}{1+\beta^* a^2} m_t - \frac{\beta^* a}{1+\beta^* a^2} z. \qquad (8)$$

Given the particular form of (5), (6), (7), and (8), the Nash solution for any period t, regardless of whether it is an election period for either of the countries, will be as follows:

$$\begin{bmatrix} m_{\mathbf{E}} \\ m^*_{\mathbf{E}} \end{bmatrix} = \begin{bmatrix} m_{\mathbf{N}} \\ m^*_{\mathbf{N}} \end{bmatrix} = \begin{bmatrix} -\frac{1+a\beta^*(a-b)}{1+a^2\left(\beta\beta^*\left(a^2-b^2\right)+\beta+\beta^*\right)} a\beta z \\ -\frac{1+a\beta(a-b)}{1+a^2\left(\beta\beta^*\left(a^2-b^2\right)+\beta+\beta^*\right)} a\beta^* z \end{bmatrix}. \qquad 9)$$

Clearly, non-cooperative monetary policies, (9), will be such that the existence of negative (resp. positive) supply shocks induces monetary expansions (resp. depressions).

The combination of the spillover and strategic effects clearly identifies the usual non-internalization of those effects when governments assume non-cooperative behavior. In fact, for negative (resp. positive) monetary spillover effects – which correspond also to strategic complementarity (resp. substitutability) – the non-cooperative policies will over (resp. under)-react to negative (resp. positive) supply shocks.

Straightforwardly, the non-cooperative monetary policies (9) lead to:

$$\begin{bmatrix} y_{\mathbf{E}} \\ y^*_{\mathbf{E}} \end{bmatrix} = \begin{bmatrix} y_{\mathbf{N}} \\ y^*_{\mathbf{N}} \end{bmatrix} = \begin{bmatrix} \frac{1+a\beta^*(a-b)}{1+a^2\left(\beta\beta^*\left(a^2-b^2\right)+\beta+\beta^*\right)} z \\ \frac{1+a\beta(a-b)}{1+a^2\left(\beta\beta^*\left(a^2-b^2\right)+\beta+\beta^*\right)} z \end{bmatrix}, \qquad (10)$$

which means that non-cooperative monetary policies will never fully sterilize output growth from supply shocks.[8]

Concerning the non-cooperative solutions (9) and (10), it should be noted that:

1) If z = 0, i.e. in case of no conflict between domestic objectives, π_t, π^*_t, and international ones, y_t, y^*_t, this solution should coincide with the cooperative solution characterized by $m_t = m^*_t = 0$. No gains from cooperation would arise. This would be the case because: (a) if each government only cares about its own domestic objectives, π_t, π^*_t, they would establish $m_t = m^*_t = 0$ and this, in turn, would also be the most convenient policy for international objectives, y_t, y^*_t; and (b) if each government would only care about y_t, y^*_t they would establish $m_t = m^*_t = 0$ and this, in turn, would also be the most convenient policy for domestic objectives π_t, π^*_t.
2) If $\beta = \beta^* = 0$, i.e. when both governments would have only domestic objectives, in the sense that voters only take into account π_t and π^*_t, then, once again, no gains from cooperation are to be obtained.

[7] Note that in the reaction functions (5) and (6), m_t and m_{t-1} are, by construction, the values corresponding to the election and to the non-election periods, respectively; each depending on the monetary policy that the foreign government will implement during t and t – 1, i.e. m^*_t and m^*_{t-1}, which, in turn, correspond to the other country's election and non-election policies *only if* elections are synchronized. In other words, while $m_t = m_{\mathbf{E}}$ and $m_{t-1} = m_{\mathbf{N}}$, the same does not happen necessarily for m^*_t and m^*_{t-1} appearing in equations (6) and (5). In the case of election periods synchronization, $m^*_t = m^*_{\mathbf{E}}$ and $m^*_{t-1} = m^*_{\mathbf{N}}$; otherwise, $m^*_t = m^*_{\mathbf{N}}$ and $m^*_{t-1} = m^*_{\mathbf{E}}$.

[8] In fact, the following relations are valid: $m_{t=\mathbf{E},\mathbf{N}} = -a\beta y_{t=\mathbf{E},\mathbf{N}}$ and $m^*_{t=\mathbf{E},\mathbf{N}} = -a\beta^* y^*_{t=\mathbf{E},\mathbf{N}}$. Hence, sign y_t = sign $y^*_t \neq$ sign m^*_t = sign m_t.

3) Obviously, the inexistence of monetary spillover effects, i.e. $b = 0$, will make non-cooperative solutions equivalent to possible cooperative ones.
4) In any other situation, there is a potential for gains from cooperation. In particular, acting non-cooperatively, governments do not even explore the strategic dynamics resulting from both periods. As $V_{\mathbf{E}} = V_{\mathbf{N}}$ and $V_{\mathbf{E}}^* = V_{\mathbf{N}}^*$, there is no distinction between election and non-election periods. More precisely, one should expect (electoral) gains from cooperation if governments internalize the spillover and strategic effects, whether the distinction between election and non-election periods is exploited or not. This leads us to the analysis of cooperative solutions which, due to the dynamic structure of the situation, assume an interesting form.

4. The Cooperative Solutions

It is in the cooperative solutions that the synchronization of election periods becomes important. In fact, as it will be shown below, the difference in the dynamic behavior of the economies resulting from a coincidence (or not) of election periods can be decisive in the determination of those solutions and in their specific form according to the two possible situations: synchronized and staggered elections (Cahuc & Kempf, 1997). We first consider the synchronized elections case.

4.1. The Synchronized Elections Case

In this case, at some moment *t*, both governments face the same kind of period. Assuming that the maximization of votes at t = E continues to be the objective, the cooperative solutions for the optimal policy for t and $t - 1$ are derived from the maximization of a weighted global vote share function as follows:

$$V_t^{CS} = wV_t + (1-w)V_t^*.$$

If we assume that t = E, the optimal cooperative policies are given by the solutions of the following systems of two equations:

$$\begin{aligned} -w(\beta a y_{\mathbf{E}} + m_{\mathbf{E}}) - (1-w)\beta^* b y_{\mathbf{E}}^* = 0, \\ -w\beta b y_{\mathbf{E}} - (1-w)(\beta^* a y_{\mathbf{E}}^* + m_{\mathbf{E}}^*) = 0; \end{aligned} \quad (11)$$

and

$$\begin{aligned} -w\mu(\beta a y_{\mathbf{N}} + m_{\mathbf{N}}) - (1-w)\mu^*\beta^* b y_{\mathbf{N}}^* = 0, \\ w\mu\beta b y_{\mathbf{N}} - (1-w)\mu^*(\beta^* a y_{\mathbf{N}}^* + m_{\mathbf{N}}^*) = 0. \end{aligned} \quad (12)$$

Given these solutions, it is straightforward to see that in the case where the domestic government's objectives were ignored, i.e. when $w = 0$, the solution would be:

$$\begin{bmatrix} m_{\mathbf{E}} \\ m_{\mathbf{E}}^* \end{bmatrix} = \begin{bmatrix} m_{\mathbf{N}} \\ m_{\mathbf{N}}^* \end{bmatrix} = \begin{bmatrix} -\frac{1}{b}z \\ 0 \end{bmatrix} \Rightarrow \begin{bmatrix} y_{\mathbf{E}} \\ y_{\mathbf{E}}^* \end{bmatrix} = \begin{bmatrix} y_{\mathbf{N}} \\ y_{\mathbf{N}}^* \end{bmatrix} = \begin{bmatrix} \frac{b-a}{b}z \\ 0 \end{bmatrix},$$

which corresponds to the use of the domestic control variable, m_t, in order to obtain the other government's objective for y_t^*, while this also would be compatible with the best possible policy for the other government, i.e. $m_t^* = 0$. At the other extremity, i.e. $w = 1$, the solution would be:

$$\begin{bmatrix} m_{\mathbf{E}} \\ m_{\mathbf{E}}^* \end{bmatrix} = \begin{bmatrix} m_{\mathbf{N}} \\ m_{\mathbf{N}}^* \end{bmatrix} = \begin{bmatrix} 0 \\ -\frac{1}{b}z \end{bmatrix} \Rightarrow \begin{bmatrix} y_{\mathbf{E}} \\ y_{\mathbf{E}}^* \end{bmatrix} = \begin{bmatrix} y_{\mathbf{N}} \\ y_{\mathbf{N}}^* \end{bmatrix} = \begin{bmatrix} 0 \\ \frac{b-a}{b}z \end{bmatrix},$$

which now would be the best possible situation for the domestic country.[9] This just serves to demonstrate that cooperation will always be refused by one of the players if the weight w is not intermediate enough. In fact, unless one assumes extreme cases like $\beta = 0$, $\beta^* = 0$, or $z = 0$, it is always possible to obtain sustainable cooperative solutions given that there exists an intermediate weight leading to welfare gains to both governments.

Given the above-discussion it is possible to precisely determine what cooperative solutions superiority over non-cooperative solutions will mean for monetary policy. Let us consider the cooperative first-order conditions given by (11) and (12) evaluated at the Nash solutions given by (9) and (10):

$$\begin{aligned} \left.\frac{\partial V_{\mathbf{E}}^{CS}}{\partial m_{\mathbf{E}}}\right|_{Nashsolutions} &= -(1-w)\beta^* b\underbrace{(am_{\mathbf{E}}^* + bm_{\mathbf{E}} + z)}_{y_{\mathbf{E}}^*} \\ \left.\frac{\partial V_{\mathbf{E}}^{CS}}{\partial m_{\mathbf{E}}^*}\right|_{Nashsolutions} &= -w\beta b\underbrace{(am_{\mathbf{E}} + bm_{\mathbf{E}}^* + z)}_{y_{\mathbf{E}}} \\ \left.\frac{\partial V_{\mathbf{E}}^{CS}}{\partial m_{\mathbf{N}}}\right|_{Nashsolutions} &= -(1-w)\mu^*\beta^* b\underbrace{(am_{\mathbf{N}}^* + bm_{\mathbf{N}} + z)}_{y_{\mathbf{N}}^*} \\ \left.\frac{\partial V_{\mathbf{E}}^{CS}}{\partial m_{\mathbf{N}}^*}\right|_{Nashsolutions} &= -w\mu\beta b\underbrace{(am_{\mathbf{N}} + bm_{\mathbf{N}}^* + z)}_{y_{\mathbf{N}}} \end{aligned} \quad (13)$$

[9] Note that, contrary to the non-cooperative solution, the *sign* of the monetary spillover effects would matter for the *signs* of the (domestic) monetary policy and domestic output growth.

Given that the existence of positive (resp. negative) supply shocks, *z*, imply monetary depressions (resp. expansions) accompanied by positive (*resp*. negative) output growth, (13) makes it possible to confirm that:

For the case where positive monetary spillovers, $b > 0$, are associated with positive supply shocks, $z > 0$, governments acting non-cooperatively would decrease money supply less than if they cooperate, this resulting in an over-expansion of output.

1. For the case where positive monetary spillovers, $b > 0$, are associated with negative supply shocks, $z < 0$, governments acting non-cooperatively would increase money supply less than if they cooperate, this resulting in an over-depression of output.
2. For the case where negative monetary spillovers, $b < 0$, are associated with positive supply shocks, $z > 0$, governments acting non-cooperatively would decrease money supply more than if they cooperate, this resulting in an under-expansion of output.
3. For the case where negative monetary spillovers, $b < 0$, are associated with negative supply shocks, $z < 0$, governments acting non-cooperatively would increase money supply more than if they cooperate, this resulting in an under-depression of output.

Plainly, the previous conclusions were taken assuming non-zero parameter values.[10] Note, however, that from (13) one can confirm what was said before about the $b = 0$, $\beta = \beta^* = 0$, $w = 0$, and $w = 1$ cases. Concerning the parameters μ and μ^* the following discussion is relevant.

As we know from the non-election periods cooperative solutions (12), one should note that it is precisely through these solutions that the parameters concerning voters' memory, μ and μ^*, exert their influence, which does not happen in the non-cooperative solution. This result is, by itself, important, given that it highlights the decisive role of voters' memory in the determination of the possible gains from cooperation and, therefore, in the sustainability of cooperative solutions. To shed more light on this issue, note that, if voters in the domestic economy have no memory, i.e. when $\mu = 0$, it is optimal to implement, in the non-election periods, the following policy:

$$\begin{bmatrix} m_{\mathbf{N}} \\ \\ m^*_{\mathbf{N}} \end{bmatrix} = \begin{bmatrix} -\frac{1}{b} z \\ \\ 0 \end{bmatrix},$$

which is quantitatively the same determined for the election periods when $w = 0$ – *mutatis mutandis* for $w = 1$ and $\mu^* = 0$ – but qualitatively different given that, because domestic voters only take into account what happens in t = E, the domestic government will not be, in principle, worse off.[11] It is thus apparent that voters' memory can be used to benefit (more) a particular government at a particular moment in time and *both* governments agree on that cooperative exploitation of voters' memory. This is certainly true if elections are synchronized, but much more explicit if elections are non-synchronized, as will be shown in the following section.

4.2. The Non-Synchronized Elections Case

It is probably illuminating if we start the study of this situation by pointing out that, although election periods in one country overlap non-election periods in the other country, their non-synchronized position in time can be irrelevant if voters possess perfect memory. In fact, if $\mu = \mu^* = 1$, each government will have to consider non-election periods as equally important as election periods, if maximizing the number of votes is the economic policy objective.[12] In this case, the sustainable non-synchronized elections cooperative solution coincides with the synchronized elections solution and, as we have seen, this can be welfare-improving for both governments.

To continue emphasizing the importance of voters' memory, let us assume the other extreme

[10] If, on the contrary, for example $b = 0$, then (13) would all be zero, that obviously meaning that the Nash solutions would be as good as the cooperative ones.

[11] Note that if $\mu = 0$ then $v^*_{\mathbf{N}} = 0$. This means that the foreign government achieves the best possible result in all non-election periods. Thus, on the one hand, this government would want its own voters not to forget its performance easily and, on the other hand, the foreign government can use that high(est) level of popularity to relax during the election periods and deliberately induce an electoral defeat of the domestic government if a change in the other player of the game is seen to be a better alternative. In this case, in the election periods, there would be an increased probability of non-cooperative solutions. Also note that by proceeding in this manner the foreign government would be using a *satisficing approach* – to ensure the re-election but not necessarily maximizing votes – in order to maximize the expected length in power (Frey & Ramser, 1976).

[12] From (11) and (12) it is obvious that the optimal policies for moment t = E would be the same as for the previous moment t = N.

point, i.e. μ = μ* = 0, which we can associate with the zero memory situation. In this case, both governments would prefer to have non-synchronized rather than synchronized elections because, through policy coordination, one government can use the other country's policy to win its own elections. In a sense, one can say that this would be the most favorable case for electorally-induced international policy coordination between governments that, at a domestic level, implement electorally-induced national policies. To confirm this line of reasoning let us derive the corresponding cooperative solution analytically.

Assume that, for the domestic economy, t = E, while for the other economy, t = N. In this period, both instruments m_t and m_t^* can be used to achieve the two objectives for inflation and output growth of the domestic government. Thus, electorally-induced policy cooperation between the two governments can be expressed by the following assignment of instruments to targets:

$$m_t \overset{\text{assigned to}}{\rightarrow} \hat{\pi} = 0$$
$$m_t^* \overset{\text{assigned to}}{\rightarrow} \hat{y} = 0,$$

given that

$$\left.\begin{array}{l} \frac{\partial V_{\mathbf{E}}}{\partial m_t} = 0 \\ \frac{\partial V_{\mathbf{E}}}{\partial m_t^*} = 0 \end{array}\right| \begin{array}{l} m_t = 0 \\ m_t^* = -\frac{1}{b} z \end{array}.$$

Obviously, this solution would be the same as in the synchronized elections case if only the interests of the domestic government were taken into account but now will be acceptable by the other country's government if there is a commitment that in the next period – when elections take place in the other country – the situation is reversed,[13] i.e.,

$$m_t^* \overset{\text{assigned to}}{\rightarrow} \hat{\pi}^* = 0$$
$$m_t \overset{\text{assigned to}}{\rightarrow} \hat{y}^* = 0,$$

given that

$$\left.\begin{array}{l} \frac{\partial V_{\mathbf{E}}^*}{\partial m_t} = 0 \\ \frac{\partial V_{\mathbf{E}}^*}{\partial m_t^*} = 0 \end{array}\right| \begin{array}{l} m_t = -\frac{1}{b} z \\ m_t^* = 0 \end{array}.$$

Clearly, those solutions are (extreme) cases of the general solution that follows. The cooperative solution for the non-synchronized case will thus result from the following program:

$$\max V^{CN} = wV + (1-w)V^*,$$

where

$$V_{\mathbf{E}} = v_{\mathbf{E}} + \mu v_{\mathbf{N}},$$
$$V_{\mathbf{E}}^* = v_{\mathbf{E}}^* + \mu^* v_{\mathbf{N}}^*,$$

and[14]

$$v_{\mathbf{E}} = -\frac{1}{2}\left(\beta y_{\mathbf{E}}^2 + \pi_{\mathbf{E}}^2\right) = -\frac{1}{2}\left(\beta\left(am_{\mathbf{E}} + bm_{\mathbf{N}}^* + z\right)^2 + m_{\mathbf{E}}^2\right)$$
$$v_{\mathbf{N}} = -\frac{1}{2}\left(\beta y_{\mathbf{N}}^2 + \pi_{\mathbf{N}}^2\right) = -\frac{1}{2}\left(\beta\left(am_{\mathbf{N}} + bm_{\mathbf{E}}^* + z\right)^2 + m_{\mathbf{N}}^2\right)$$

and

$$v_{\mathbf{E}}^* = -\frac{1}{2}\left(\beta^* y_{\mathbf{E}}^{*^2} + \pi_{\mathbf{E}}^{*^2}\right) = -\frac{1}{2}\left(\beta^*\left(am_{\mathbf{E}}^* + bm_{\mathbf{N}} + z\right)^2 + m_{\mathbf{E}}^{*^2}\right)$$
$$v_{\mathbf{N}}^* = -\frac{1}{2}\left(\beta^* y_{\mathbf{N}}^{*^2} + \pi_{\mathbf{N}}^{*^2}\right) = -\frac{1}{2}\left(\beta^*\left(am_{\mathbf{N}}^* + bm_{\mathbf{E}} + z\right)^2 + m_{\mathbf{N}}^{*^2}\right).$$

The first-order conditions are:

$$\begin{aligned} -w\mu(\beta a y_{\mathbf{N}} + m_{\mathbf{N}}) - (1-w)\beta^* b y_{\mathbf{E}}^* = 0, \\ -w\mu\beta b y_{\mathbf{N}} - (1-w)(\beta^* a y_{\mathbf{E}}^* + m_{\mathbf{E}}^*) = 0, \end{aligned} \quad (14)$$

$$\begin{aligned} -w(\beta a y_{\mathbf{E}} + m_{\mathbf{E}}) - (1-w)\mu^*\beta^* b y_{\mathbf{N}}^* = 0, \\ -w\beta b y_{\mathbf{E}} - (1-w)\mu^*(\beta^* a y_{\mathbf{N}}^* + m_{\mathbf{N}}^*) = 0. \end{aligned} \quad (15)$$

The cooperative solution is, then, the solution $\{m_{\mathbf{N}}, m_{\mathbf{E}}, m_{\mathbf{N}}^*, m_{\mathbf{E}}^*\}$ of the above system. Clearly, the extreme cases for the solution will not be possible to implement since:

[13] A possible solution to the temptation to defeat, hence non-credible commitments, can be obtained using the infinitely repeated interaction argument. If (infinite) non-cooperation follows after some defeat this will certainly constitute enough reason for governments to respect the commitment and always choose to cooperate.

[14] Note that, because the non-synchronized elections case is being analysed, when one economy is facing a period of type E (resp. N) the other will be facing a period of type N (resp. E); therefore, for example $m_{\mathbf{E}}$ and $m_{\mathbf{N}}^*$ are monetary policies implemented at the same time.

1) When w = 0, i.e. when the objectives of the domestic government would be completely ignored, we would have $m_{\mathbf{N}} = m_{\mathbf{E}} = -\frac{1}{b}z$ and $m^*_{\mathbf{N}} = m^*_{\mathbf{E}} = 0$. In this case, the domestic government would not, in general, accept this solution.
2) When w = 1, i.e. when the objectives of the foreign government would be completely ignored, we would have $m_{\mathbf{N}} = m_{\mathbf{E}} = 0$ and $m^*_{\mathbf{N}} = m^*_{\mathbf{E}} = -\frac{1}{b}z$. In this case, the foreign government would not, in general, accept this solution.

5. Conclusion

As we have seen, from the comparisons between non-cooperative solutions and synchronized elections cooperative solutions, it results in the importance of monetary spillover, *b*, and of supply shocks, *z*, effects. Naturally, in the comparison of cooperative solutions between the synchronized and non-synchronized elections cases, voters' memory plays the major role. In fact, as above mentioned, in the case of perfect memory, μ = μ* = 1, the synchronized elections solutions are equivalent to the non-synchronized elections case.[15] At the other extremity, when μ = μ* = 0, having non-synchronized elections is always better for electorally-motivated governments.

That said, one then can question the possibility of an absolute preference to have synchronized elections. To clarify this issue, let us consider the first-order conditions corresponding to the two cases, i.e. (11), (12) and (14), (15). Putting in pairs the adequate first-order conditions, one can easily conclude that:

$$m_{\mathbf{E}} = \mu m_{\mathbf{N}}$$
$$y_{\mathbf{E}} = \mu y_{\mathbf{N}}$$
$$m^*_{\mathbf{E}} = \mu^* m^*_{\mathbf{N}}$$
$$y^*_{\mathbf{E}} = \mu^* y^*_{\mathbf{N}}$$

are the sufficient conditions for the equivalence between the two set of solutions. Using these conditions as thresholds in a reasoning similar to the one used above to compare the Nash solutions with the synchronized elections counterparts, one can infer, after some algebra, that:[16]

1) If, for one or both of the economies, voters remember election periods as well as non-election periods, governments will be indifferent between the decision to synchronize or stagger elections.
2) If, in both economies, voters forget the past, then both governments will be better off in the case of non-synchronized elections.
3) If, in both economies, voters happen to consider non-election periods more important than election periods for their voting decisions then, once again, both governments will prefer to have non-synchronized elections.
4) If, in one of the economies, voters consider non-election periods more important than election periods, whereas, in the other economy, the opposite is true, then both governments will prefer to have synchronized elections.

To sum up, there are, in general, gains from cooperation, no matter the degree of synchronization between elections. Moreover, and more important, if elections are non-synchronized, there may be scope for both governments to cooperate neglecting their domestic interests at non-election periods in order to benefit electorally the other country which is facing an election period. This may be viewed as a strategic use/evolution of the welfare weights (Caleiro, 1996: 12).

Among possible refinements of the model under consideration, one can reconsider voters' behavior, i.e. assume some prospectiveness and/or strategic voting by an experienced electorate, and/or even assume asymmetries concerning supply shocks, *z*, and/or spillover effects, *b*, or even in what concerns the size of the economies.[17] These may constitute interesting avenues for future research.

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[15] And, in particular, if β = β* = 0, and/or *b* = 0, and/or *z* = 0, there is coincidence also with the non-cooperative solutions.

[16] Note that the following conclusions can easily be accommodated to various other cases, for example the study of benevolent governments which attribute (possibly distinct) importance weights to the realization of two economic periods.

[17] As clearly recognized in Jensen (1994), almost all the literature on international policy coordination adopted models representing two equally-sized economies (or even symmetric ones). There are, nevertheless, a few exceptions which consider two economies with different sizes (Caleiro, 1997; 2010).

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