

ON THE SYNCHRONISATION OF ELECTION DATES. THE SMALL *Vis-à-Vis*  
LARGE ECONOMIES CASE

*SOBRE LA SINCRONIZACIÓN DE LAS FECHAS DE ELECCIONES. EL CASO DE  
LAS PEQUEÑAS Y GRANDES ECONOMÍAS*

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ABSTRACT

The paper examines some of the issues related to the synchronisation of election dates between two economies. In particular, it analyses the circumstances in which a government of a single country, considered to be a *small* economy, has incentives (or not), to synchronise the domestic election dates with the election dates (not necessarily determined in an endogenous way) of a country performing the role of an 'anchor', considered to be a *large* economy. To achieve this purpose, the paper uses, as an illustration, an asymmetric version of the model in Miller and Salmon (1990) in order to derive the optimal domestic electoral period length, which, in this sense, can be considered to be endogenously determined. The paper then shows how elections should occur in the small economy in order to benefit from the performance of the large economy. As a particularly relevant result it is shown that the incentive to synchronise the election dates depends upon the inflation history of the economies.

*Keywords:* Election Dates; Electoral Business Cycles; International Policy Coordination; Mandates Duration; Synchronisation of Elections.

## RESUMEN

El trabajo examina algunas de las cuestiones relacionadas con la sincronización de las fechas de las elecciones entre dos economías. En concreto, analiza las circunstancias en las cuales un gobierno de un solo país, considerado una economía pequeña, tiene incentivos (o no), para sincronizar la fecha de sus elecciones con la fecha de la elección (determinada no necesariamente de una manera endógena) de un país que realiza el papel de un 'ancla', i.e. una gran economía. Para alcanzar este propósito, el trabajo utiliza como ilustración una versión asimétrica del modelo de Miller y Salmon (1990) para derivar la duración óptima del mandato electoral doméstico que, en este sentido, se puede considerar determinado de manera endógena. El trabajo demuestra entonces cómo las elecciones deben ocurrir en la economía pequeña para beneficiar del funcionamiento de la economía grande. Como resultado relevante se demuestra que el incentivo para sincronizar las fechas de las elecciones depende de la historia de la inflación en las economías.

*Palabras clave:* Fechas de elecciones; Ciclo electoral; Coordinación de políticas internacionales; Duración de mandatos; Sincronización de las elecciones.

*JEL Classification:* C73; E32; E61; F42.



## 1. INTRODUCTION<sup>1</sup>

Ten years after the beginning of the third stage of the Economic and Monetary Union (EMU), the cyclical evolution of certain European Union (EU) member-states, namely Portugal and also, to some extent, Spain, has confirmed the legitimacy of the concerns produced then about the synchronisation of the business cycles of the economies that were to enter in that (final) stage of the EMU.

For instance, on 17 November 1997, Prof. Mervyn King, in a lecture at the European University Institute on The Political Economy of EMU, stressed that the third stage of the EMU would show more pronounced business cycles even though cooperation was to be facilitated with synchronised cycles (King, 1998). The European Commission also recognised then that: *“If countries (...) experience de-synchronised business cycles, giving up national monetary policy may prove costly”*, in European Commission (1997:26).

The concern about business cycle synchronisation is still, and will always be, a relevant issue, predominantly for the EU member-states and, in particular, for those in the Euro area (see Böwer and Guillemineau 2006 for a study on the determinants of business cycle synchronisation across the euro area countries)<sup>2</sup>.

Despite this clear concern about the importance of business cycle synchronisation, little research has been undertaken on the importance of temporal horizons for business cycles synchronisation and, to the best of our knowledge, almost none has been done on the impact of the synchronisation of election dates on the synchronisation of business cycles between economies. Three exceptions are Sapir and Sekkat (1999), Kayser (2006), and Breuss (2008).

<sup>1</sup> The paper draws on a chapter of my Ph.D. thesis. Therefore I would like to thank the comments on that chapter that were made by Prof. Mark Salmon, in his position as my supervisor. I also would like to thank the remarks and suggestions of two anonymous referees. Any remaining errors and/or omissions are, of course, my own.

<sup>2</sup> It would be unfair not to mention also some relevant analyses that meanwhile were published in this journal (see, for instance, Rodríguez Ortiz 2002, 2007, Alonso Guinea and Cendejas Bueno 2006, Ballester et al. 2004, and Viñas 2006).

Sapir and Sekkat (1999) present a model where employment depends on a domestic inflation surprise, on the competence of the incumbent government, and also on the degree of openness of the economy. The model explores the situation where joint decisions may not be taken when players possess different electoral calendars. As, in the EU case, countries are economically interdependent –which causes coordination problems arising from spillover effects resulting from domestic-oriented electoral policies– but politically independent, the authors suggest the adoption of a single election date in the EU.

From an empirical point of view, Kayser (2006) finds out that: (a) clusters of countries tend to hold elections in periods of international economic expansion, and that: (b) national election cycles, much like business cycles, have become more correlated over time, most prominently in Europe.

From a simulation point of view, Breuss (2008) tests for the Euro zone the hypothesis put forward by Sapir and Sekkat (1999) that a welfare improvement can result from the synchronisation of elections. Of particular relevance is the result that the alleged welfare improvement associated with the establishment of a single election date depends upon the relative importance of the several macroeconomic outcomes in the objective function of the governments and that it also depends on the model ruling the functioning of the economies.

In order to fill part of the gap in the literature, our paper formalises some of the interactions between inter-national and inter-temporal problems of policy coordination through the analysis of the implications of the synchronisation (or not) of election dates on international policy cooperation. In doing so, it is our objective also to help answering the following questions put by Caleiro (1996:11-12):

*“Does international cooperation or coordination of economic policies become easier or harder when domestic elections across countries are synchronised? Take, for instance, the usual way of determining a cooperative solution (between two countries). This is obtained through the minimisation of a global weighted loss function,  $V^c = wV + (1 - w)V^*$ , where  $V$  and  $V^*$  are the domestic loss functions and  $w$  and  $(1 - w)$  are weights that depend on the bargaining power of the governments. Clearly, when the (two) governments have distinct time horizons these weights can (cooperatively) evolve in time. Does this increase the probability of cooperation?”*

When considering a simplified model of Miller and Salmon (1990) it was already possible to determine, in Caleiro (1998), some *consequences* of the synchronisation of elections on international policy coordination, as follows. With synchronised elections, i.e. with elections taking place at the same moment in every country, cooperation on coordination will be easier most of the time, but very near the elections, the sharp changes in domestic policy will, almost certainly, not be compatible with the other player’s objectives unless, almost tautologically, those sharp changes help the other incumbent to win the elections, that is, act as external ‘disturbances’ but, fortunately, well correlated with the optimal solution paths for the domestic economy. Interestingly enough, one can quote Miller and Salmon (1990: 569):

*“coordination may or may not pay depending on the correlation of disturbances facing the two countries”.*

Furthermore, in Caleiro (2000) the discrete time case was considered, namely a difference games case to study how distinct electoral period lengths may influence the benefits from international policy coordination. In the current paper it is considered the continuous time case. In specific terms, the paper adds to the literature by analysing those issues, for that considering, as an illustration, a model *a la* Miller and Salmon (1990), where governments face elections at possibly distinct moments of time.

That being said, the rest of the paper is structured as follows. Section 2 considers an asymmetric version of the model in Miller and Salmon (1990). In this section it is offered the development of the full model such that, when the two economies are of equal size and structure, the model collapses into the model in Miller and Salmon (1990). After that, it is straightforward to introduce a difference in the size of the economies, which is done in section 3, in order to accommodate the case of a small economy vis-à-vis a large economy. Section 4 considers the optimal choice of the election date from the viewpoint of the home country considered to be a small economy where its government faces an endogenous timing of elections problem. Section 5 concludes by summarising the conclusions and pointing out directions for further research.

## 2. AN ASYMMETRIC VERSION OF MILLER AND SALMON (1990)'S MODEL

### 2.1. THE MODEL

In order to analyse the possible implications of different electoral term lengths, let us start by considering an asymmetric *finite horizon* version of the model discussed in Miller and Salmon (1990). The use of this model allows us to study the consequences for international policy coordination due to the fact that governments may have distinct time horizons, i.e. the implications of possibly non-synchronised national elections, which is the main goal of our paper.

Miller and Salmon (1990) consider a dynamic model where countries are linked by trade and perfectly mobile capital flows. Forward-looking private sector behaviour in the foreign exchange market and, in particular, in the government's future interest rate policies influences present outcomes. As such, the reaction of the forward-looking private sector may make it impossible to observe the welfare improvement that certainly results from cooperation on economic policies, that is, from the internalisation of the externalities generated by the (monetary) policies. This is the reason why coordination may not pay and, as shown in Miller and Salmon (1990), this happens when the initial core inflation rates are different and/or when the shocks affecting national policies are relatively uncorrelated.<sup>3</sup>

<sup>3</sup> In Miller et al. (1991), the influence of discounting on those results is studied. See also Miller and Salmon (1985).

Considering two possibly asymmetric economies, the model would be as follows. The home economy is described by

$$y = -\gamma r + \delta c + \eta y^* \quad (\text{Aggregate demand}) \quad (1)$$

$$i = \varphi y + \sigma \frac{dc}{dt} + \pi \quad (\text{Phillips curve}) \quad (2)$$

$$\pi = \xi \varphi z + \xi \sigma c \quad (\text{Core inflation}) \quad (3)$$

where:

$y$  is output measured from the 'natural rate';

$r$  is the real consumer rate of interest;

$c$  is the competitiveness of the economy, defined as the real price of foreign goods;

$y^*$  is the overseas output;

$i$  is the inflation rate;

$\pi$  is the 'core' inflation;

$z$  is the integral of past output, such that

$$\frac{dz}{dt} = y. \quad (\text{Accumulation})$$

$\gamma, \delta, \eta, \sigma$  and  $\xi$  are non-negative parameters.

Equation (1) can be view as a reduced form equation of the interdependence between output and aggregate demand solved for  $y$ . Equation (2) explains inflation as the result of demand pressure, changes in the real exchange rate reflected in changes in competitiveness, and of some 'core' inflation. Equation (3) explains 'core' inflation as a weighted sum of a backward-looking component,  $z$ , and a forward-looking component,  $c$ .

The policy-maker aims to minimise an undiscounted stream of quadratic costs arising from fluctuations in output and core inflation through the choice of real interest rates, that is

$$\min_r V \equiv \frac{1}{2} \int_0^{\infty} (\beta \pi^2 + y^2) dt,$$

where  $\beta$  is a (non-negative) weight.

A similar framework is valid for the foreign economy such that

$$y^* = -\gamma^* r^* - \delta^* c + \eta^* y \quad (\text{Aggregate demand})$$

$$i^* = \varphi^* y^* - \sigma^* \frac{dc}{dt} + \pi^* \quad (\text{Phillips curve})$$

$$\pi^* = \xi^* \varphi^* z^* - \xi^* \sigma^* c \quad (\text{Core inflation})$$

where

$$\frac{dz^*}{dt} = y^*. \quad (\text{Accumulation})$$

The foreign policy-maker has the following objective

$$\min_{r^*} V^* \equiv \frac{1}{2} \int_0^{\infty} (\beta^* \pi^{*2} + y^{*2}) dt.$$

Besides the spillover effects at the demand level, an arbitrage condition establishing the connection between the two economies is assumed:

$$E \left[ \frac{dc}{dt} \right] = r - r^*.$$

In this problem there are three state variables  $z$ ,  $z^*$  and  $c$ , each one associated with a co-state variable  $\lambda_z$ ,  $\lambda_{z^*}$  and  $\lambda_c$ . As shown by Cohen and Michel (1988), the time consistent solutions can be obtained from the time inconsistent ones if the corresponding Hamiltonian does not include the co-state variable  $\lambda_c$ , as it is assumed that the real exchange rate  $c$  has a stable relation with the two other state variables  $z$  and  $z^*$  as follows:

$$c = \theta_1 z + \theta_2 z^*,$$

where  $\theta_1$  and  $\theta_2$  are to be chosen in a way that consistency is obtained.

The private sector rational expectations about the real exchange rate will depend upon the strength of policy response. In the symmetric case, if  $\chi$  designates a measure of the policy feedback of output in response to inflation, it can be shown that the rational expectation about the real exchange rate of  $\theta$  will be given by

$$\theta = \frac{1 + \eta}{\gamma + 2\delta\chi^{-1}}.$$

As we will later assume an asymmetric version of the model in which one of the economies is not influenced, at the domestic demand level, by the other economy's demand, a plausible game solution to be considered is the non-cooperative one. Thus, we proceed with the determination of the time consistent Nash solution. In this non-cooperative solution, the two policy-makers set policy independently. In fact, this is a plausible behaviour when one of them belongs to a country which is not influenced, at the demand level, by the other. This justifies our choice in what concerns the solution under analysis.

## 2.2. THE NASH TIME CONSISTENT SOLUTIONS OF THE ASYMMETRIC CASE

As mentioned above, time consistency is obtained dropping  $c$  from the Hamiltonians which, assuming the open-loop case, are then defined as follows –see Miller and Salmon (1990: 557):

$$H = \frac{1}{2}(\beta\pi^2 + y^2) + \lambda_z \underbrace{\frac{dz}{dt}}_y,$$

$$H^* = \frac{1}{2}(\beta^*\pi^{*2} + y^{*2}) + \lambda_{z^*} \underbrace{\frac{dz^*}{dt}}_{y^*}.$$

For this problem the first-order conditions can be expressed as (see the mathematical details, expressions (9) to (13), in the Appendix):<sup>4</sup>

$$\left[ \begin{array}{ccccc} \frac{dz}{dt} & \frac{dz^*}{dt} & \frac{dc}{dt} & \frac{d\lambda}{dt} & \frac{d\lambda^*}{dt} \end{array} \right]^T = A \left[ \begin{array}{ccccc} z & z^* & c & \lambda & \lambda^* \end{array} \right]^T \quad (4)$$

where

$$A = \begin{bmatrix} 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & -1 \\ 0 & 0 & \frac{\gamma^*\delta + \gamma\delta^*}{\gamma\gamma^*} & \frac{\gamma^* + \eta^*\gamma}{\gamma\gamma^*} & -\frac{\gamma + \eta\gamma^*}{\gamma\gamma^*} \\ -\beta\xi^2(\varphi + \sigma\theta_1)^2 & -\beta\xi^2(\varphi + \sigma\theta_1)\sigma\theta_2 & 0 & 0 & 0 \\ -\beta^*\xi^{*2}(\sigma^*\theta_2 - \varphi^*)\sigma^*\theta_1 & -\beta^*\xi^{*2}(\sigma^*\theta_2 - \varphi^*)^2 & 0 & 0 & 0 \end{bmatrix}.$$

It is straightforward to verify that, when the two economies are symmetric such that  $\gamma = \gamma^*$ ,  $\delta = \delta^*$ ,  $\eta = \eta^*$ ,  $\beta = \beta^*$ ,  $\xi = \xi^*$ ,  $\varphi = \varphi^*$ ,  $\sigma = \sigma^*$  and  $\theta_1 = \theta$ ,  $\theta_2 = -\theta$ , the system (4) collapses into the one derived in Miller and Salmon (1990).

<sup>4</sup> To simplify the notation, let us use  $\lambda$  and  $\lambda^*$  to designate, respectively,  $\lambda_z$  and  $\lambda_{z^*}$ .



### 3. THE SMALL ECONOMY *VERSUS* THE LARGE ECONOMY CASE

Let us now suppose that the home country represents a small open economy while the foreign one is a large economy. If this is the case, it is plausible to assume that the home economy is of negligible size in what concerns its spillover effects on the foreign economy demand, i.e. that  $\eta^* = \mathbf{0}$ . Moreover, if one considers that in the EMU, the exchange rate of the single currency is completely predetermined independently of the domestic policy-makers actions, then  $\theta_1 = \theta_2 = \mathbf{0}$  is also a plausible hypothesis to be assumed – see Miller and Salmon (1985a: 194). In this context, the previous system (4) can be reduced to

$$\left[ \begin{array}{cc} \frac{dz}{dt} & \frac{dz^*}{dt} \\ \frac{dc}{dt} & \frac{d\lambda}{dt} \end{array} \right]^T = \mathbf{B} \left[ \begin{array}{cc} z & z^* \\ c & \lambda \\ \lambda & \lambda^* \end{array} \right]^T, \quad (5)$$

where

$$\mathbf{B} = \begin{bmatrix} 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & -1 \\ 0 & 0 & \frac{\gamma^* \delta + \gamma \delta^*}{\gamma \gamma^*} & \frac{1}{\gamma} & -\frac{\gamma + \eta \gamma^*}{\gamma \gamma^*} \\ -\beta \xi^2 \varphi^2 & 0 & 0 & 0 & 0 \\ 0 & \beta^* \xi^{*2} \varphi^{*2} & 0 & 0 & 0 \end{bmatrix}.$$

Let us then consider that (domestic) voters take into account the evolution of output,  $y_t$ , and inflation,  $\pi_t$ , such that the accumulated (net) popularity at the election date,  $T$ , is

$$V_T = -\frac{1}{2} \int_0^T (\beta \pi^2 + y^2) dt.$$

We may then formulate the optimal control problem of the domestic government as follows:

$$\max V_T = -\frac{1}{2} \int_0^T (\beta \pi^2 + y^2) dt,$$

subject to the economic model governing the two economies.

The foreign government possesses a similar programme, that is

$$\max V_{T^*} = -\frac{1}{2} \int_0^{T^*} (\beta^* \pi^{*2} + y^{*2}) dt,$$

where  $T^*$  corresponds to the foreign economy election date.

## 4. THE OPTIMAL DEGREE OF ELECTION DATES SYNCHRONISATION

That being said, one can now determine the optimal domestic electoral period length  $\tilde{T}$ , which, in this sense, can be said to be endogenously determined (see Balke 1991, Chappell and Peel 1979, Ellis and Thoma 1991, Ginsburgh and Michel 1983, and Lächler 1982). Taking into account that this corresponds to an *open final time problem* (see Takayama 1994: 464-465 and/or Léonard and Long 1992: 241), to solve for  $\tilde{T}$  it is required that

$$\sup_{\mathbf{H}} \left( y(\tilde{T}), \pi(\tilde{T}), \lambda(\tilde{T}), \tilde{T} \right) = \mathbf{0}, \quad (6)$$

where

$$\mathbf{H} = -\frac{1}{2}(\beta\pi^2 + y^2) + \lambda \underbrace{\frac{dz}{dt}}_y.$$

As the foreign demand  $y^*(t)$  trajectory will 'mirror' the co-state  $\lambda(t)$  trajectory, the fulfilment of the transversality condition will assure that, on the foreign economy election date  $T^*$ , the aggregate demand will be at its 'unconstrained' maximum, *i.e.*  $y^*(T^*) = 0$ . This result, in turn, will be obtained when the foreign interest rate is used such that

$$r(T^*) = -\frac{\delta^*}{\gamma^*} c(T^*), \quad (7)$$

that is, for a given domestic electoral period length, the foreign interest rate is uniquely determined by (7) as there are, by assumption, no spillover demand effects. Moreover, a possible incompatibility of this policy with a zero core inflation at  $T^*$  is excluded given that there is not necessarily an optimality in  $T^*$ .<sup>5</sup>

In what concerns the domestic economy, the aggregate demand  $y(t)$  trajectory will also 'mirror' the co-state  $\lambda(t)$  trajectory. Given the transversality condition  $\lambda(T) = 0$ , expression (6) will then be fulfilled if  $\pi(\tilde{T}) = \mathbf{0}$ . In words, the optimal election date will then be the one where the domestic government achieves also the best 'unconstrained' value for the core inflation. This, in turn, implies that  $z(t)$  has to follow a trajectory such that

$$z(\tilde{T}) = -\frac{\sigma}{\phi} c(T). \quad (8)$$

The combination of (7) and (8) gives the optimal domestic period length  $\tilde{T}$  as a function of the foreign electoral period length  $T^*$  in an *implicit form*

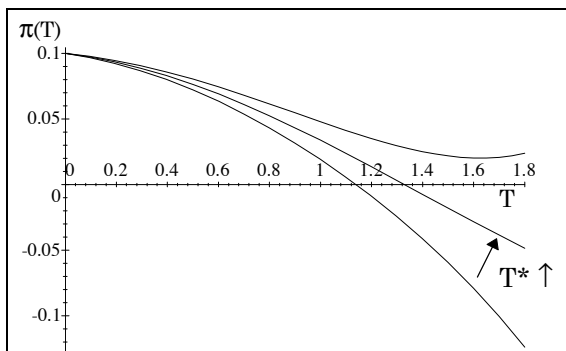
<sup>5</sup> The case where  $T^*$  is also chosen as an optimal electoral period length is to be analysed in further studies.

resulting from the solution of the system (5). In order to illustrate this, let us consider next the same (symmetric) parameterisation as considered in Miller and Salmon (1990), that is  $\beta = \varphi = \xi = 1, \gamma = \delta = \frac{1}{2}, \eta = \frac{1}{3}, \sigma = \frac{1}{10}$ .

The solution of (5), given the transversality conditions  $\lambda(T) = \lambda^*(T^*) = 0$ , produces quite cumbersome expressions, especially the solution for the real exchange rate trajectory (see the Appendix). Despite this difficulty, it is, however, straightforward to see that the higher initial accumulation  $\mathbf{z}_0$  the higher will be  $z(t)$  at the election date, while an increase in the electoral period length results in a decrease in  $z(T)$ . In fact, as  $T$  goes from 0 (continuous elections case) to  $\infty$  (social welfare case),  $\mathbf{z}(T)$  goes from  $\mathbf{z}(0)$  to 0.

Let us proceed with the consideration of a balanced initial situation characterized by relative competitiveness  $\mathbf{c}_0 = \mathbf{1}$  and an equal initial inflation, e.g.  $\pi_0 = \pi_0^* = 10\%$ . Figure 1 gives us the relation between the domestic inflation rate, at the election date, as a function of the domestic electoral period length  $T$  for distinct values of the foreign electoral period length  $T^*$ .

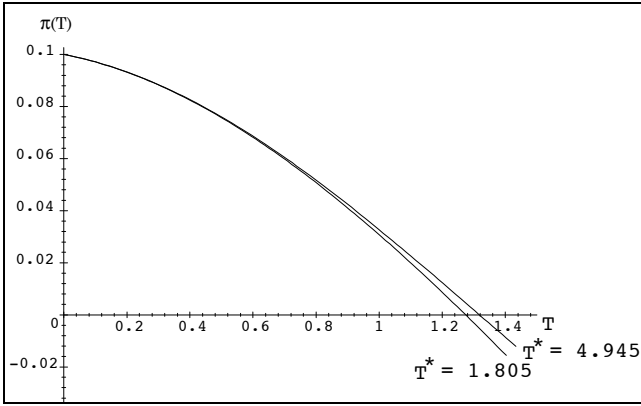
FIGURE 1: INFLATION ON THE ELECTION DAY



An increase in the foreign electoral period length leads to an increase in the domestic inflation rate on the election day. This is so because an increase in the foreign electoral period length will create, *via* (8), an increase in the time response needed to 'remove' the effect of an appreciated real exchange rate at the core inflation. Hence, for a *limited* increase in the foreign electoral period length,  $T^*$ , the domestic policy-makers would find it optimal to increase the domestic electoral period length  $T$  in order to make it possible to obtain a zero inflation at the election date. However, for a sufficiently higher  $T^*$ , it may be not possible to obtain a zero level of inflation at the election date, as the previous figure also shows. This amounts to saying that, for  $T^*$  belonging to certain intervals, there is no first-best domestic electoral period length. However, given the periodic characteristics of the solutions, it may be possible

to obtain, again, a (first-best) optimal electoral period length for higher values of the foreign electoral period lengths. In fact it is possible to obtain a zero domestic inflation level at a given election date  $\tilde{T}$  for distinct values of  $T^*$  –see Figure 2.

FIGURE 2: (ALMOST) THE SAME DOMESTIC INFLATION FOR DISTINCT FOREIGN MANDATES



The previous fact is also evident from figures 3 and 4, which show the implicit relation between the optimal electoral period length,  $\tilde{T}$ , and the foreign one,  $T^*$ .

FIGURE 3: THE DOMESTIC OPTIMAL VS. THE FOREIGN ELECTORAL PERIOD LENGTHS (CASE 1)

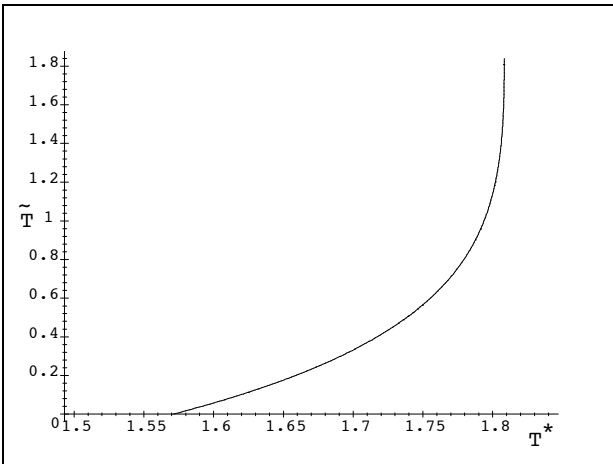
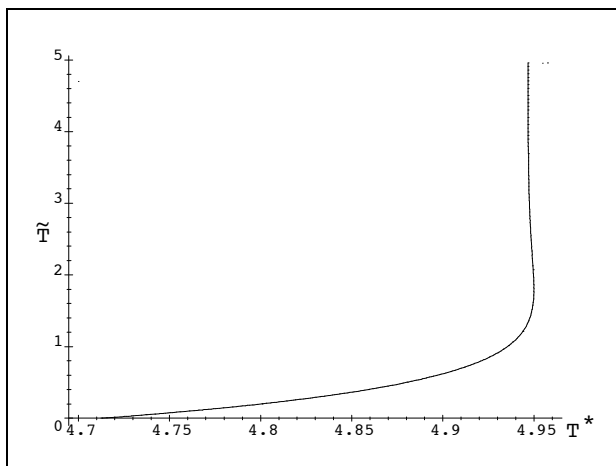


FIGURE 4: THE DOMESTIC OPTIMAL VS. THE FOREIGN ELECTORAL PERIOD LENGTHS (CASE 2)



As is obvious, as  $T^*$  decreases there is a rapid increase in the optimal electoral period length such that the perfect synchronisation of election occurs when  $\tilde{T} = T^* \cong 2$  or  $\tilde{T} = T^* \cong 5$ .

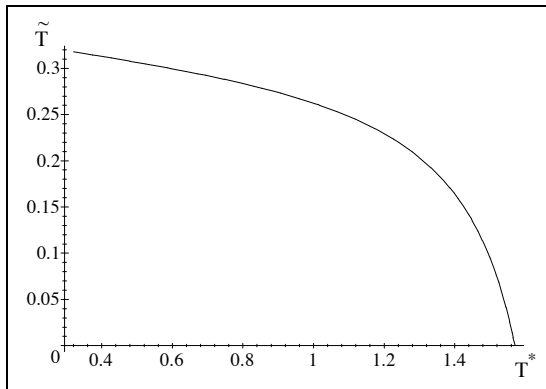
To sum up, for a given foreign electoral period length,  $T^*$ , within a certain interval, an increase in the optimal domestic electoral period length,  $\tilde{T}$ , should be observed as  $T^*$  also increases. This direct/positive relationship between  $\tilde{T}$  and  $T^*$  can be explained by the augmented time response of domestic policy needed in order to obtain the first-best optimal core inflation value on the domestic election day. Naturally, the fact that the initial core inflation values are the same for both countries is, to a certain extent, crucial. In fact, one should confirm that this direct relationship between the electoral period lengths in both countries should be observed once *the initial core inflations in both countries are of the same sign*. Hence, let us proceed to consider a case where  $\pi_0 = -\pi_0^* = -10\%$ . This case is illustrated by Figure 5.

As expected, the optimal electoral period length for the domestic economy is inversely related to the foreign electoral period length. One would tentatively argue that, as in Miller and Salmon (1990), the equality or not (in our case, in terms of the signs) of initial core inflation values is shown to be of decisive importance. In fact, also as happens with Miller and Salmon (1990)'s conclusions about when coordination pays, one has to admit that, *at first sight*, it may seem quite unsatisfactory to obtain conclusions about the degree of electoral synchronisation which depend on some specific initial conditions. However, as Miller and Salmon (1990) clearly point out, this 'dependence' is simply a reflection of the deterministic nature of the analysis. Using some results

obtained by Levine and Currie (1987), it is, in fact, possible to generalize the obtained conclusions by performing a stochastic interpretation of the results.<sup>6</sup>

In that sense, the situation where both countries start with the same rate of core inflation –as illustrated in Figures 3 and 4– corresponds to stochastic inflation shocks perfectly (and positively) correlated whereas the situation where one country starts with a rate of core inflation that is symmetric to the one corresponding to the other country’s initial rate of core inflation –as illustrated in Figure 5– corresponds to stochastic inflation shocks perfectly (and negatively) correlated; see Miller et ál. (1991: 153).

FIGURE 5: A CASE WITH DISTINCT INITIAL INFLATION RATES



To sum up, one may tentatively add to Miller and Salmon (1990)’s conclusion that “*coordination may or may not pay depending on the correlation of the disturbances facing the two countries*” by saying that this correlation is also decisive for inferring the (optimal) degree of electoral synchronisation in the sense that the way stochastic shocks impinging on inflation are correlated is also the way the small economy electoral period length should be correlated with the electoral period length of the other economy.

## 5. CONCLUSION

The purpose of the paper was to analyse how the government of a *small* open economy can determine the optimal degree of its election dates synchronisation with those existing in a *large* economy. To achieve this purpose, the paper used an asymmetric version of Miller and Salmon (1990)’s

<sup>6</sup> In technical terms, this is based on the fact that for some deterministic environment characterised by a set of initial conditions, it is possible to consider an appropriate correlation matrix for stochastic shocks leading to the same expected cost.

model in order to derive the optimal domestic electoral period length,  $\tilde{T}$ , which, in this sense, can be considered to be endogenously determined. This being said, the analysis performed in this paper should be viewed as relevant to the study of the circumstances in which a government of a single country (taken as a representative agent) has incentives (or not) to synchronise the domestic election dates with the election dates (not necessarily determined in an endogenous way) of a country performing the role of an 'anchor'.

As a first conclusion, the paper has shown how crucial are the initial conditions in what concerns inflation to the determination of the kind of relationship that should exist between the domestic election period length,  $\tilde{T}$ , and the foreign one,  $T^*$ . This direct/positive relationship between  $\tilde{T}$  and  $T^*$  can be explained by the augmented time response of domestic policy needed in order to obtain the first-best optimal core inflation value on the domestic election day. At first sight, it may seem unsatisfactory to obtain conclusions about the degree of electoral synchronisation which depend on some specific initial conditions. However, as Miller and Salmon (1990) clearly point out, this 'dependence' is simply a reflection of the deterministic nature of the analysis.

Using results obtained by Levine and Currie (1987), one could tentatively generalise the obtained conclusions by performing a stochastic interpretation of the results. In this sense, the situation where both countries start with the same rate of core inflation corresponds to stochastic inflation shocks perfectly (and positively) correlated, whereas the situation where one country starts with a rate of core inflation that is symmetric to the one corresponding to the other country's initial rate of core inflation corresponds to stochastic inflation shocks perfectly (and negatively) correlated.

We would like to continue the analysis by considering that the foreign government also determine its election dates in an optimal way, this leading to a differential game played by the two incumbents from which incentives to totally synchronise the election dates may result (see section 4 in Caleiro 2006). In this case, it is expected that the goals of both economies in what concerns the existing electoral period length in the other economy are not always compatible, which is due to the evolution of the exchange rate. This is not to say that there is no possible electoral period length corresponding to the optimal one for *both* economies. In fact, it is expected to be able to verify in what circumstances both economies would find it optimal to possess the same national electoral period lengths.

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## APPENDIX – MATHEMATICAL DETAILS

From the equations expressing the domestic demands,

$$y = -\gamma r + \delta c + \eta y^*$$

$$y^* = -\gamma^* r^* - \delta^* c + \eta^* y,$$

one can obtain

$$y = -\frac{\gamma}{1-\eta\eta^*} r - \frac{\eta\gamma^*}{1-\eta\eta^*} r^* - \frac{\delta + \eta\delta^*}{1-\eta\eta^*} c$$

$$y^* = -\frac{\gamma^*}{1-\eta\eta^*} r^* - \frac{\eta^*\gamma}{1-\eta\eta^*} r - \frac{\delta^* - \eta^*\delta}{1-\eta\eta^*} c.$$

In terms of the interest rates,

$$r = -\frac{y - \delta c - \eta y^*}{\gamma}$$

$$r^* = -\frac{y^* + \delta^* c - \eta^* y}{\gamma^*},$$

such that the arbitrage condition  $E\left[\frac{dc}{dt}\right] = r - r^*$  can be expressed as

$$\frac{dc}{dt} = -\frac{\gamma^* + \gamma\eta^*}{\gamma\gamma^*} y + \frac{\gamma + \gamma^*\eta}{\gamma\gamma^*} y^* + \frac{\gamma^*\delta + \gamma\delta^*}{\gamma\gamma^*} c,$$

or

$$\frac{dc}{dt} = \frac{\gamma^* + \gamma\eta^*}{\gamma\gamma^*} \lambda - \frac{\gamma + \gamma^*\eta}{\gamma\gamma^*} \lambda^* + \frac{\gamma^*\delta + \gamma\delta^*}{\gamma\gamma^*} c$$

given that

$$y = -\lambda$$

and

$$y^* = -\lambda^*.$$

From the equations concerning the core inflations,

$$\pi = \xi\varphi z + \xi\sigma c$$

$$\pi^* = \xi^*\varphi^* z^* - \xi^*\sigma^* c,$$

one can obtain

$$\pi = \xi(\varphi + \sigma\theta_1)z + \xi\sigma\theta_2z^*$$

$$\pi^* = \xi^*(\varphi^* - \sigma^*\theta_2)z^* - \xi^*\sigma^*\theta_1z,$$

given that

$$c = \theta_1z + \theta_2z^*.$$

The corresponding Hamiltonians are therefore given by:

$$H = \frac{1}{2}(\beta\pi^2 + y^2) + \lambda_z \underbrace{\frac{dz}{dt}}_y,$$

$$H^* = \frac{1}{2}(\beta^*\pi^{*2} + y^{*2}) + \lambda_{z^*}^* \underbrace{\frac{dz^*}{dt}}_{y^*}.$$

Hence

$$\frac{\partial H}{\partial r} = (y + \lambda_z) \left( -\frac{\gamma}{1 - \eta\eta^*} \right) = 0,$$

$$\frac{\partial H^*}{\partial r^*} = (y^* + \lambda_{z^*}^*) \left( -\frac{\gamma^*}{1 - \eta\eta^*} \right) = 0.$$

The previous first-order conditions can be expressed equivalently as<sup>7</sup>

$$\frac{\partial H}{\partial y} = y + \lambda = 0 \Rightarrow y = -\lambda,$$

$$\frac{\partial H^*}{\partial y^*} = y^* + \lambda^* = 0 \Rightarrow y^* = -\lambda^*.$$

As  $\frac{dz}{dt} = y$  and  $\frac{dz^*}{dt} = y^*$  we have

$$\frac{dz}{dt} = -\lambda, \quad (9)$$

$$\frac{dz^*}{dt} = -\lambda^*. \quad (10)$$

<sup>7</sup> To simplify the notation, let us use  $\lambda$  and  $\lambda^*$  to designate, respectively,  $\lambda_z$  and  $\lambda_{z^*}^*$ .

Moreover

$$-\frac{d\lambda}{dt} = \frac{\partial H}{\partial z} = \beta\xi(\varphi + \sigma\theta_1)\pi \Rightarrow$$

$$\frac{d\lambda}{dt} = -\beta\xi^2(\varphi + \sigma\theta_1)^2 z - \beta\xi^2(\varphi + \sigma\theta_1)\sigma\theta_2 z^*; \quad (11)$$

$$-\frac{d\lambda^*}{dt} = \frac{\partial H^*}{\partial z^*} = \beta^*\xi^*(\varphi^* - \sigma^*\theta_2)\pi^* \Rightarrow$$

$$\frac{d\lambda^*}{dt} = -\beta^*\xi^{*2}(\sigma^*\theta_2 - \varphi^*)^2 z^* - \beta^*\xi^{*2}(\sigma^*\theta_2 - \varphi^*)\sigma^*\theta_1 z. \quad (12)$$

Finally,

$$\frac{dc}{dt} = \frac{\gamma^* + \gamma\eta^*}{\gamma\gamma^*}\lambda - \frac{\gamma + \gamma^*\eta}{\gamma\gamma^*}\lambda^* + \frac{\gamma^*\delta + \gamma\delta^*}{\gamma\gamma^*}c. \quad (13)$$

The parameterisation considered in Miller and Salmon (1990) results in the following system of differential equations:

$$\frac{dz}{dt} = -\lambda$$

$$\frac{dz^*}{dt} = -\lambda^*$$

$$\frac{dc}{dt} = 2c + 2\lambda - \frac{8}{3}\lambda^*$$

$$\frac{d\lambda}{dt} = -z$$

$$\frac{d\lambda^*}{dt} = z^*,$$

which, after considering the transversality conditions  $\lambda(T) = \lambda^*(T^*) = 0$  and the initial conditions  $z(0) = z_0$ ,  $z^*(0) = z_0^*$ ,  $c(0) = c_0$ , can be solved using traditional methods.