

# EUI WORKING PAPERS

RSCAS No. 2004/18



Exchange Rate Strategies towards EMU for Accession  
Countries with Currency Boards

Margarita Katsimi



**EUROPEAN UNIVERSITY INSTITUTE**

Robert Schuman Centre for Advanced Studies  
Pierre Werner Chair on European Monetary Union

**EUI Working Paper RSCAS No. 2004/18**

**Margarita Katsimi, *Exchange Rate Strategies towards EMU for Accession Countries with Currency Boards***

The Robert Schuman Centre for Advanced Studies carries out disciplinary and interdisciplinary research in the areas of European integration and public policy in Europe. It hosts the annual European Forum. Details of this and the other research of the centre can be found on:  
<http://www.iue.it/RSCAS/Research/>.

Research publications take the form of Working Papers, Policy Papers, Distinguished Lectures and books. Most of these are also available on the RSCAS website:  
<http://www.iue.it/RSCAS/Publications/>.

The EUI and the RSCAS are not responsible for the opinion expressed by the author(s).

**EUROPEAN UNIVERSITY INSTITUTE, FLORENCE**  
**ROBERT SCHUMAN CENTRE FOR ADVANCED STUDIES**

*Exchange Rate Strategies towards EMU for Accession Countries with Currency  
Boards*

**MARGARITA KATSIMI**

EUI Working Paper **RSCAS** No. 2004/18  
**BADIA FIESOLANA, SAN DOMENICO DI FIESOLE (FI)**

All rights reserved.

No part of this publication may be reproduced, distributed or utilised in any form or by any means, electronic, mechanical, or otherwise, without the prior permission in writing from the Robert Schuman Centre for Advanced Studies.

Download and print of the electronic edition for teaching or research non commercial use is permitted on fair use grounds—one readable copy per machine and one printed copy per page. Each copy should include the notice of copyright.

Permission for quotation should be addressed directly to the author(s).  
Source should be acknowledged.

ISSN 1028-3625

© 2004 Margarita Katsimi

Printed in Italy in October 2004  
European University Institute  
Badia Fiesolana  
I – 50016 San Domenico di Fiesole (FI)  
Italy

<http://www.iue.it/RSCAS/publications/>

## **Robert Schuman Centre for Advanced Studies**



### **Pierre Werner Chair on European Monetary Union**

The Pierre Werner Chair on European Monetary Union is funded by the Luxembourg Government and based in the Robert Schuman Centre for Advanced Studies. A programme of research is being developed around the Pierre Werner Chair, and some of the results are published in this series of working papers. The series aims to disseminate the work of scholars and practitioners on European monetary integration.

*For further information:*

Pierre Werner Chair on European Monetary Union  
Robert Schuman Centre for Advance Studies  
European University Institute  
Via delle Fontanelle, 19  
I-50016 San Domenico di Fiesole (FI)

Fax : + 39 055 4685770

Email: [laetitia.jespers@iue.it](mailto:laetitia.jespers@iue.it)

<http://www.iue.it/RSCAS/Research/Economy/PierreWerner.shtml>



## **Abstract**

This paper investigates the transition of the EU candidate countries with a currency board arrangement (CBA) to the euro-zone. The arguments for and against retaining a CBA while participating in the Exchange Rate Mechanism of the EU (ERMII) are discussed. Then, we show in the framework of a signalling model that abandoning a CBA and allowing the exchange rate to fluctuate within the bands of ERMII can signal to markets the sustainability of nominal convergence and, hence, diminish uncertainty in the pre-accession period and increase the probability of being accepted into the euro-zone.

**JEL-Classification:** E42, E50, C70

**Keywords:** Currency board arrangements, ERMII, accession countries, signaling games.

## **Acknowledgments**

I am grateful to A. Philippopoulos, H.C. Wolf, P. De Grauwe, M. Artis, W. Buiter as well as to the participants of the CESifo Area Conference on Macro, Money and International Finance, February 2003 and of the EUI Workshop on Enlargement and EMU organized under the Pierre Werner Chair Programme, October 2003, for valuable comments and suggestions.

Margarita Katsimi is affiliated with the Athens University of Economics and Business and CESifo.

Margarita Katsimi  
Athens University of Economics and Business  
Department of International and European Economic Studies  
76, Patision Avenue  
10434 Athens, Greece  
tel: 003010 8203461  
fax: 003010 8214122  
email: mkatsimi@aueb.gr

# 1 Introduction

Joining the euro-area is an important challenge for new EU member states. Upon accession, these countries will participate in the third stage of EMU as Member States with a derogation from the adoption of the euro.<sup>1</sup> Since ERMII is not open to non-members, these countries will need at least two years after accession in order to satisfy all convergence criteria.<sup>2</sup> The obligation to participate in ERMII before joining the euro-area allows for several exchange rate strategies<sup>3</sup> : Countries with flexible exchange rates such as the Czech Republic, Poland, Romania, and Slovakia will gradually tighten their exchange rate regime by first participating in ERMII and then in the euro-area, following a path similar to the one followed by the current euro-area Member States. On the other hand, countries with fixed exchange rate arrangements such as Bulgaria, Estonia and Lithuania will have to move to a more flexible exchange rate arrangement like the target-zone regime of ERMII before irrevocably fixing their exchange rate to the euro. This path entails elements of instability since the temporary relaxation of the exchange rate regime may leave the economies more vulnerable to speculative attacks and capital inflows related to the convergence play. One possibility for these countries would be to retain their Currency Board Arrangement (CBA) while participating in ERMII.<sup>4</sup>

Existing literature in this area emphasizes several advantages of retaining a CBA during ERMII participation such as discouraging speculative attacks (Sinn, 1999), preserving the credibility of monetary policy and avoiding the cost of introducing new instruments (Begg et al., 2001). Without

---

<sup>1</sup> It is a common understanding that an opt-out clause such as the one granted for the UK and Denmark will not be granted to the candidate countries. This implies that joining the euro-area is not an option for the new EU countries but a final target. Once nominal convergence is achieved, these countries will become members of the euro-area.

<sup>2</sup> The six convergence criteria concern the level of the budget deficit/GDP ratio, the debt/GDP ratio, the long-term interest rate, the inflation rate as well as exchange rate stability and the independence of the Central Bank.

<sup>3</sup> Buiter and Grafe (2001), however, argue that accession countries can avoid the two-year ERM membership period before euro-area participation without violating the Maastricht Treaty.

<sup>4</sup> This scenario is not ruled out by the Council, the Commission and the ECB but no formal decision can be made before the specific country applies for ERMII participation. According to the current EU position, a CBA could be compatible with ERMII only on a case by case basis while the ECB should agree about the central rate

ignoring the validity of these arguments, the aim of this paper is to emphasize an important benefit from abandoning the CBA at the beginning of ERMII participation. It is well-known that entry into the euro-area requires proper policy adjustment and economic reforms in the accession countries so that sustainable nominal convergence has been achieved. Thus, abandoning an existing CBA can signal to markets the sustainability of nominal convergence and, hence, improve the prospects of joining the euro-area by reducing market uncertainty. The benefit of this positive signal is important since the country's success will crucially depend on markets' expectations about future economic performance. For example, markets' expectation of a failure to join the euro-area will reverse the process of interest rate convergence and make the satisfaction of the convergence criteria more difficult.<sup>5</sup>

We will show in the framework of a simple signaling model that abandoning an existing CBA within ERM can signal to markets the country's improved macroeconomic fundamentals. It is assumed that the accession country's output depends positively on all economic reforms that allowed the fulfillment of the convergence criteria. However, markets do not know with certainty the magnitude of this economic adjustment shock. In other words, markets do not know whether the country is 'competent' enough to be accepted to the euro-area. One can show that the cost of abandoning the commitment environment (CBA) for a more discretionary environment (ERMII) will be lower for the country that has significantly improved economic fundamentals. Therefore, the policymaker of such a 'competent' country will have an incentive to abandon the CBA in order to signal this successful economic adjustment to the markets. This would diminish uncertainty in the pre-accession period and increase the probability of being accepted into the euro-area.<sup>6</sup>

The remainder of the paper is as follows: Section 2 reviews the main arguments for and against abandoning CBA arrangements during ERMII participation. The basic model is developed in

---

<sup>5</sup> According to the convergence criteria, the long-term interest rate should not exceed the average rate of the three best performing EU Member States in terms of inflation by more than two percentage points.

<sup>6</sup> One could argue that a country could retain the CBA and signal competence through a lower budget deficit. However, signalling by the deficit level is more difficult. Data are less frequent and less reliable since annual deficit figures are finalized with a long time delay.

section 3. Section 4 analyzes the signaling incentives of a country that has the option to retain a CBA within ERM. The last section concludes.

## 2 Pros and cons of retaining a CBA within ERMII

According to its economic characteristics and the state of reforms, candidate countries are following a variety of exchange rate regimes from relatively free floats to currency board arrangements. Specifically, CBAs exist in Bulgaria, Estonia and Lithuania while Latvia also has a currency-board-like system. A currency board arrangement is a fixed exchange rate arrangement in which the monetary base is backed by foreign reserves and the coverage ratio is very high. This implies automatic convertibility and the prohibition of domestic credit creation by the central bank: money supply and inflation become endogenous.

Several arguments have been proposed for retaining a CBA during the ERMII participation period. Firstly, abandoning a CBA for an exchange rate mechanism with relatively wide fluctuation bands such as ERMII implies moving to a more discretionary environment in which the credibility of monetary policy might be seriously tested. Bringing down inflation has been the main target of countries establishing a CBA. Ghosh et al. (2000) argue that the majority of modern currency boards has been remarkably successful in achieving lower inflation and price stability. This implies that credible CBAs reduced the inflationary bias related to the time inconsistency problem of monetary policy (Barro and Gordon, 1983).<sup>7 8</sup>

Secondly, an obvious advantage of retaining a CBA is saving the cost of introducing institutions and policy instruments that will only be used during ERMII participation (e.g. inflation targeting) as suggested by Begg et al. (2001). Although there are no exact estimates of this cost, it is difficult to argue that operating without a CBA within ERMII will be a costless switch for transition

---

<sup>7</sup> De Haan et al. (2001) examine whether the same result could have been achieved by granting independence to the Central Bank.

<sup>8</sup> Although discussing the benefits and costs of a CBA in a general framework is beyond the scope of this paper, it should be noted that accession to the EU resolves an important disadvantage of modern CBAs namely the lack of a predefined exit strategy.

countries.

Finally, retaining a CBA is also considered as a way to cope with the risk of speculative attacks. Sinn (1999) argues that currency boards are appealing exchange rate regimes even for potential EMU entry countries currently without CBAs. Backing their monetary base by euros according to an exchange rate prescribed by law will protect currencies from speculative attacks and will allow capital inflow at low interest rates. The risk of contagion in the presence of financial instability in the area creates a stronger case for retaining a CBA arrangement. However, Ghosh et al. (2000) note that even CBAs may become subject to speculative attacks if markets believe that policymakers will not be willing to retain the arrangement in presence of a severe asymmetric shock. Irwin (2004) emphasizes the importance of incomplete information about the devaluation cost and the presence of labour markets rigidities for the occurrence of a currency crisis in a currency board.

Restricting exchange rate fluctuations by retaining a CBA within ERMII will, however, have the following drawbacks: Firstly, allowing the exchange rate to fluctuate within the bands of ERMII could restrict the inflationary consequences of capital inflows in the period before joining the euro-area. Two main forms of capital inflows will threaten price stability: On the one hand, inflation will be affected by capital inflows resulting from an expected convergence play due to the coexistence of open capital markets, fixed exchange rates and still declining interest rates in that period. These inflows will increase money supply, decrease interest rates, increase inflation and will have a negative impact on competitiveness. In that context, wage and price flexibility as well as further fiscal tightening are important for coping with the inflationary consequences of capital inflows (Begg et al., 2001). However, in some cases exchange rate fluctuation within the ERMII bands may be a more appropriate response.<sup>9</sup> On the other hand, capital inflows may correspond to longer term investment. To the extent that foreign direct investment leads

---

<sup>9</sup> For example, the Bank of Greece responded to capital inflows by allowing the Greek drachma to remain above its central rate by up to 9%. This created expectations for a devaluation before the euro-area participation with a negative impact on capital inflows (Gibson and Tsakalotos, 2001). Moreover, fiscal tightening may restrict public investment in economies with a need for building a public capital stock.

to an increase in productivity and growth, real appreciation of the currency may be the result of the catch-up process of the transition economies according to the Balassa-Samuelson effect.<sup>10</sup>

Begg et al. (2001) find empirical evidence in favour of a strong Balassa-Samuelson effect in the accession countries. In fact, they argue that transition countries will experience significant real appreciations, possibly extending after participation in the euro-area.<sup>11</sup> This implies that, although in the framework of ERMII there will be a dilemma between price stability and exchange rate stability, in the framework of a CBA the inflationary consequences of the Balassa-Samuelson effect cannot be partly offset by exchange rate policy. Therefore, choosing to retain a CBA may jeopardize the satisfaction of the price stability criterion and harm the credibility of the system.

Secondly, an argument against retaining the CBA is that in such an arrangement exchange rate stability and the appropriateness of the central rate cannot be tested. This is important since ERM central rates have been corrected in several occasions: For example, the Greek drachma entered ERM after a devaluation of 12% which has been partly cancelled in a subsequent realignment. Nevertheless, there are other ways of testing the appropriateness of the central rate apart from exchange rate stability in a CBA (Gulde et al., 2000). The inappropriateness of the exchange rate will prohibit interest rate convergence in an environment of free capital mobility since long term interest rates will contain a risk premium for the lack of readiness for EMU (Begg et al., 2001). Hence, an argument against a CBA is that the cost of re-adjusting the central rate in a CBA is by construction higher than a realignment within ERMII.

A final important issue is how the coexistence of a CBA and ERMII affects markets' perception about the country's prospect to enter the euro-area. CBAs have been introduced by countries in a vulnerable period of their economic development. Exiting may indicate a substantial improvement

---

<sup>10</sup> According to the Ballassa-Samuelson effect, fast-growing countries are characterized by higher productivity growth in the traded sector compared to the non-traded sector. If wage developments in the two sectors are similar, inflation in the non-traded sector will be higher than inflation in the traded sector leading to real exchange rate appreciation.

<sup>11</sup> Capital inflows can reinforce the Balassa-Samuelson effect. Begg et al. (2001) show that foreign direct investment raises productivity more in the traded sector than in the non-traded sector, although this bias is reversed in the long term.

in the fundamentals. Similarly, retaining the CBA can be perceived as a lack of confidence in the robustness of the economy. The period before euro-participation will be characterized by markets' uncertainty about the ability of the candidate country to join the euro-area. In that respect, the government of the transition country will have an information advantage by being in a better position to know and evaluate the magnitude of planned and realized economic reforms. Since markets' reaction in that final stage may crucially affect the final outcome, i.e. satisfaction of the convergence criteria and entrance into the euro-area, the government of the candidate country will have an incentive either to signal the success of economic adjustment or to hide its 'incompetence'.<sup>12</sup> The next section shows formally how a more flexible exchange rate regime such as ERMII without a CBA may allow the candidate country to signal its ability in order to increase the probability of its acceptance in the euro-area.

### 3 The decision to retain a CBA within ERMII

#### 3.1 The model

We will use a simple Barro-Gordon type model in order to investigate the choice of the exchange rate regime of a candidate country aiming at being accepted in the euro area. We assume that the world lasts three periods. The pre-ERM period, the ERM period and the final period in which the country may enter the euro-area. In the first period the exchange rate regime followed is a CBA. As shown in Figure 1 the country has two options in the second period: participation in ERMII without a CBA or entrance to ERMII while retaining the CBA. In period 3, the country will adopt the euro with probability  $\varphi$ . For simplicity, we assume that if the country is not accepted in the euro-zone it will suffer a credibility loss resulting in a free floating exchange rate regime in the third period.<sup>13</sup>

---

<sup>12</sup> For example, markets' disappointment on the economic prospects of the candidate country may lead to higher interest rates and threaten the satisfaction of the convergence criteria.

<sup>13</sup> This is a helpful assumption since abandoning the CBA in the final period is the only cost assumed from failing to adopt the euro. The main results of the paper would still be valid by relaxing this assumption as long as one introduces some other cost for the country that is not accepted to the euro area.

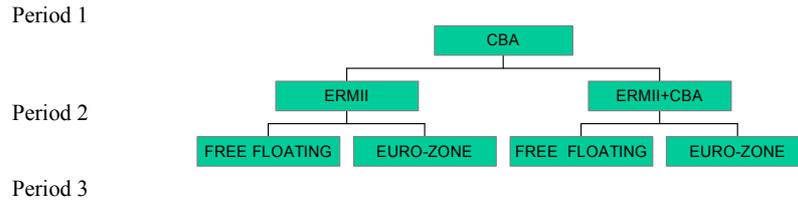


Figure 1: Exchange rate regimes

The deviation of employment from the ‘natural level’,

is given by the following Lucas supply function:

$$n_t = a(\pi_t - \pi_t^e) + u_t \tag{1}$$

where,  $\pi$  stands for inflation, superscript  $e$  denotes the expectations operator and subscript  $t$  denotes the time period. We assume that  $u$  is a random variable which for simplicity equals zero in the first and the last period. In the second period,  $u$  is a competence shock that reflects the country’s ability to implement successfully appropriate economic reforms. The level of economic adjustment undertaken by a candidate country will affect the natural rate of employment of the country as in Persson and Tabellini (1990).<sup>14</sup> This assumption implies that, despite the several surveillance processes and the satisfaction of the convergence criteria, there is still a random

---

<sup>14</sup> The assumption that  $u$  reflects the competence level of the policymaker is a similar with the one made by Persson and Tabellini (1990). They develop a signalling model where the incumbent with a high  $u$  has an incentive to signal his/her competence level to the voters in order to get re-elected. Katsimi (1999) presents a signalling game in which a policymaker with electoral motives signals competence through fiscal policy.

element in the ability of the country for successful economic performance. In light of the rapid pace of economic reforms undertaken in these countries, we assume that there is some uncertainty regarding the sustainability of improved economic performance. In other words, economic performance captured by the level of employment may improve or deteriorate by  $u$  reflecting the competence of the government to face emerging economic problems. This competence is random because the nature of economic problems the policymaker faces changes randomly. Specifically, it is assumed that  $u_2$  takes only two values: a high value,  $u_2 = u^h$  with probability  $\rho$ , if economic adjustment has been successful and a low value,  $u_2 = u^l$  with probability  $1-\rho$ , if the government of the transition country has been unsuccessful in implementing the appropriate reforms, where  $E(u) = \rho u^h + (1-\rho)u^l = 0$ .<sup>15</sup> Information about this competence shock between the government of the candidate country and the private sector is asymmetric in the sense that its value is known only by the government in the current period.

Assuming purchasing power parity, a country's inflation rate will be determined by the foreign inflation rate,  $\pi_t^f$ , and the rate of depreciation of the currency,  $\Delta e_t$ :

$$\pi_t = \pi_t^f + \Delta e_t \quad (2)$$

The level of the domestic interest rate is determined by the level of the foreign interest rate and the expected rate of depreciation, in line with the interest parity condition:

$$i_t = i_t^f + E(e_{t+1} - e_t) \quad (3)$$

Finally, money supply is given by the following LM equation:

$$m_t - p_t = \lambda n_t - \gamma i_t \quad (4)$$

As in the majority of Barro-Gordon type models, the government of the candidate country

---

<sup>15</sup> The competence shock differs from the economic shock included in most Barro-Gordon type models. It mainly reflects uncertainty about the robustness of the specific economy which in turn depends on the success and the sustainability of the country's reforms and the improvement in economic fundamentals.

minimizes the following standard quadratic loss function in each period:

$$L_t = \frac{1}{2} E_t [\pi_t^2 + b(n_t - n_t^*)^2] \quad (5)$$

where  $b$  is the relative weight the policymaker (or the national central bank) attributes to the employment target and  $n^*$  is the government's target level for employment. We assume that, when deciding on economic policy the policymaker knows the value of  $u$ , while the private sector observes the competence shock with a lag after the realization of employment.

**Table 1**

<b>Period 1</b>	<b>Period 2</b>	<b>Period 3</b>
<ul style="list-style-type: none"> <li>- Wages are set</li> <li>- Money supply, <math>m_1</math> is set</li> <li>- <math>i_1</math> is observed</li> <li>- Employment, <math>n_1</math> is determined by <math>\pi_1</math> and <math>\pi_1^e</math></li> <li>- <math>\pi_1</math> is observed</li> </ul>	<ul style="list-style-type: none"> <li>-Wages are set</li> <li>- <math>u_2</math> is observed by the government</li> <li>-The decision to participate in ERMII and to retain the CBA is made</li> <li>-Money supply, <math>m_2</math> is set</li> <li>-<math>i_2</math> is observed</li> <li>-Employment, <math>n_2</math> is determined by <math>\pi_2</math>, <math>\pi_2^e</math> and <math>u_2</math></li> <li>-<math>\pi_2</math> is observed</li> </ul>	<ul style="list-style-type: none"> <li>-Wages are set</li> <li>- <math>u_2</math> is observed by the private sector</li> <li>- EU decides if the country will be accepted in the euro-area</li> <li>- Money supply, <math>m_3</math> is set</li> <li>- <math>i_3</math> is observed</li> <li>- Employment, <math>n_3</math> is determined by <math>\pi_3</math> and <math>\pi_3^e</math></li> <li>--<math>\pi_3</math> is observed</li> </ul>

The timing of events is presented in Table 1. In each period, the sequence of events is typical of a non-stochastic Barro-Gordon type model in the sense that money supply is set after wage determination. We assume that the level of the interest rate is determined after the money supply has determined but before observing inflation. In the second period, the realization of  $u$  is observed by the policymaker before deciding on the exchange rate regime. Given wages and the exchange

rate regime, the money supply is set by the government. Employment is determined by equation (1) in each period.

### 3.2 The last period

If the country *adopts the euro* in the last period, the price level is given by PPP:

$$p_3^E = e^E + p_3^f \quad (6)$$

where  $e^E$  is the irrevocably fixed exchange rate to the euro.<sup>16</sup> In this case the domestic interest rate equals the euro-area rate. Substituting equation (6) in (1) indicates that employment will equal its natural rate in this period,  $n_3 = 0$ . Substituting for employment, interest rates and the price level in the LM equation (4) gives the money supply in the last period.

Substituting for  $\pi_3 = e^E + p_3^f - p_2$  in equations (1) and (5) we get the expected loss in the euro-area:

$$L_3^E = \frac{1}{2} E_3 [(e^E + p_3^f - p_2)^2 + b(-n_3^*)^2] \quad (7)$$

If the country fails to adopt the euro, both *ERMII and the CBA* are being abandoned so that the policymaker minimizes equation (5) under discretion. We first include the interest parity condition (3) in the LM equation (4). We then solve the LM equation for  $p_3$  :

$$p_3 = m_3 - \lambda n_3 + \gamma i_3^f \quad (8)$$

Next, we take expectations of equation (8) and by substituting (8) and its expected value in the supply equation (1) we get:

$$n_3 = \frac{a}{1 + a\lambda} [m_3 - E(m_3)] \quad (9)$$

By including the supply curve (1) in the price equation and taking expectations, the price equation becomes:

---

<sup>16</sup> For simplicity we assume  $e^E$  to be exogenous.

$$p_3 = \frac{1}{1+a\lambda}m_3 + \gamma^f_3 + \frac{a\lambda}{1+a\lambda}E(m_3) \quad (10)$$

In line with Barro-Gordon type models, wage formation is based on rational inflation expectations. Thus,  $E(m_3)$  is given by the FOCs resulting from minimizing (5) subject to equations (9) and (10).

Rational expectations imply that optimal inflation for the government is given by

$$\pi_3^D = abn_3^* \quad (11)$$

Substituting equation (11) into (1) and then into (5) gives the expected loss in the third period under discretion.

$$L_3^D = \frac{1}{2}E_3[(abn_3^*)^2 + b(-n_3^*)^2] \quad (12)$$

Although comparing welfare in the two environments is beyond the scope of this paper, one can observe that welfare in the euro-area is higher than under discretion,  $L_t^D > L_t^E$  if  $abn_3^* > e^E + p_3^f - p_2$ .<sup>17</sup> The exchange rate in period 3 under discretion will equal:

$$e_3^D = -p_3^f + p_2 + abn_3^* \quad (13)$$

### 3.3 The second period

If in the middle period the country *retains a CBA*, then, by following the same steps of the previous section, we can derive the expected loss in that period:

$$L_2^{CBA} = \frac{1}{2}E_2[(e^C + p_2^f - p_1)^2 + b(u_2^i - n_2^*)^2] \quad (14)$$

---

<sup>17</sup> De Haan et al. (2001) compare welfare between a currency board and an independent central bank.

where  $e^C$  is the fixed exchange rate of the CBA that is determined in the first period.<sup>18</sup> On the other hand, if in the second period the country *participates in ERMII without a CBA*, the price equation (8) will depend on the probability of adopting the euro in the next period,  $\varphi$ , the irrevocable exchange rate,  $e^E$ , and the expected exchange rate if the country fails to adopt the euro in the next period,  $e_3^D$ .

$$p_2 = m_2 - \lambda n_2 + \gamma[i_2^f + \varphi e^E + (1 - \varphi)E_2(e_3^D) - E_2(e_2)] \quad (15)$$

where  $E_2(e_3^D)$  is given by the expected value of equation (13).

By solving the PPP equation for  $e_2$ , taking expectations and substituting in equation (15) for  $E(e_2)$ , we can write the price equation as:

$$p_2 = \frac{1}{1 + a\lambda}(m_2 - \lambda u_2^i) + \frac{1}{1 + \gamma\varphi}[\gamma\varphi e^E - (1 - \varphi)E(p_3^f) + (1 - \varphi)\gamma abn_3^* + \gamma E(p_2^f) + \gamma E(i_2^f)] + \frac{(a\lambda - \gamma\varphi)}{(1 + a\lambda)(1 + \gamma\varphi)}E(m_2) \quad (16)$$

Thus the governments expected loss function in ERMII is given by equation (5) after substituting for  $p_2$  from equation (16) and  $n_2$  from equation (1).

We assume that the government follows the following rule for the money supply,  $m = M + \mu u$ . Expectations on money supply and inflation are derived under discretion from minimizing the loss function with respect to  $m_2$  subject to the constraint for the exchange rate implied by the ERMII regime:

$$0 \leq E(e_2) \leq s \quad (17)$$

where  $s$  is the upper band of ERMII and zero is the normalized lower bound of the exchange rate.

Then the government sets  $m_2$  so that  $0 \leq e_2 \leq s$ .<sup>19</sup>

<sup>18</sup> We assume that all exchange rate regimes are credible.

<sup>19</sup> For a more sophisticated dynamic Barro-Gordon type model incorporating a target-zone exchange rate regime see Philippopoulos and Coles (1997).

If both the optimal exchange rate and its expected value lay within the band of the target zone, rational expectations imply that optimal inflation for the government is given by:<sup>20</sup>

$$\pi_2^{ERM} = \frac{ab}{1 + \gamma\varphi} [(1 + \gamma)n_2^* - \gamma(1 - \varphi)n_3^*] - \frac{ba}{1 + ba^2} u_2^i \quad (18)$$

We obtain more than one optimal values for  $m_2$ ,  $\pi_2$  and  $n_2$  depending on whether  $e_2$  and  $E(e_2)$  lay within or at the margins of the bands defined by the target-zone. Table 2 presents the resulting level of inflation and output in all combinations of  $e_2$  and  $E(e_2)$  that satisfy the constraint of the target zone.

**Table 2**

	$e_2=0$	$0 < e_2 < s$	$e_2=s$
$E_2(e_2)=0$	$\pi_2 = p_2^f - p_1$ $n_2 = u_2^i = 0$	$\pi_2 = s + p_2^f - p_1 - \frac{abu_2^i}{1+a^2b}$ $n_2 = \frac{u_2^i}{1+a^2b}$ $e_2 = s - \frac{abu_2^i}{1+a^2b}, u_2^i < 0$	$\pi_2 = s + p_2^f - p_1$ $n_2 = u_2^i + as$ $u_2^i < 0$
$0 < E_2(e_2) < s$	$\pi_2 = p_2^f - p_1$ $n_2 = \frac{u_2^i}{1+a^2b}$ $u_2^i > 0$	$\pi_2 = abn_2^* - \frac{abu_2^i}{1+a^2b}$ $n_2 = \frac{u_2^i}{1+a^2b}$ $e_2 = -p_2^f + p_1 + abn_2^* - \frac{abu_2^i}{1+a^2b}$	$\pi_2 = s + p_2^f - p_1$ $n_2 = \frac{u_2^i}{1+a^2b}$ $u_2^i < 0$
$E_2(e_2)=s$	$\pi_2 = p_2^f - p_1$ $n_2 = u_2^i - as$ $u_2^i > 0$	$\pi_2 = p_2^f - p_1 - \frac{abu_2^i}{1+a^2b}$ $n_2 = \frac{u_2^i}{1+a^2b}$ $e_2 = -\frac{abu_2^i}{1+a^2b}, u_2^i > 0$	$\pi_2 = s + p_2^f - p_1$ $n_2 = u_2^i = 0$

Assuming that the government's employment target is the same in each period  $n_2^* = n_3^* = n^*$ , employment deviation from the natural rate will equal:

$$n_2 = \frac{u_2^i}{1 + ba^2} \quad (19)$$

<sup>20</sup> Note that the effect of the expected euro conversion rate on the current rate is captured by the money supply since the optimal level of money supply set by the government will decrease with  $e^E$ . De Grauwe (1996) and De Grauwe et al. (1999) examine the exchange rate dynamics in the period between the announcement of euro adoption and the conversion date.

In that case, the government's loss from participating in ERMII in the second period without a CBA will be:

$$L_2^{ERM} = \frac{1}{2}E_2[(abn_2^* - \frac{ba}{1+ba^2}u_2^i)^2 + b(\frac{u_2^i}{1+ba^2} - n_2^*)^2] \quad (20)$$

### 3.4 The first period.

In the first period, the exchange rate regime is a CBA. This implies that the price level is given by:

$$p_1^{CBA} = e^C + p_1^f \quad (21)$$

where  $e^C$  is chosen by the government that minimizes the following loss function with respect to  $e$ :<sup>21</sup>

$$L_1^{CBA} = \frac{1}{2}E_1[(e^C + p_1^f - p_0)^2 + b(-n_1^*)^2] \quad (22)$$

This implies that  $e^{CBA} = p_0 - p_1^f$  so that  $p_1^{CBA} = p_0$ . Employment in the first period will not deviate from its natural rate:

$$n_1 = 0 \quad (23)$$

Substituting for the optimal exchange rate in the LM equation, we get the money supply in the first period:

$$m_1 = (1 + \gamma)p_0 - \gamma[p_1^f + i_t^f + E(e_2)] \quad (24)$$

Table 3 summarizes the values of the main variables in the three periods.

---

<sup>21</sup> In order to avoid having a negative exchange rate we assume that at the beginning of the world the price level equals  $p_0$ .

Table 3

	Period 1	Period 2		Period 3	
Reg.	CBA	CBA+ERM	ERM	Euro-area	Free-floating
$\pi_t$	0	$\pi_2^f$	$abn^* - \frac{abu^i}{1+a^2b}$	$e^E + p_3^f - p_1 - \pi_2$	$abn^*$
$e_t$	$p_0 - p_1^f$	$p_0 - p_1^f$	$-p_2^f + p_1 + abn^* - \frac{abu^i}{1+a^2b}$	$e^E$	$-p_3^f + p_2 + abn^*$
$n_t$	0	$u^i$	$\frac{u^i}{1+ba^2}$	0	0

In the analysis that follows we will assume that  $e^E$  is such that even a country that retains the CBA in the second period will benefit from lower inflation if it participates in the euro area in the last period,  $\pi_2^f \geq \pi_3^E$ .

**Proposition 1** *If the possibility of retaining the CBA within ERMII does not exist, then only a country with a high level of competence and/or a low ‘inflationary bias’ will benefit from participating in ERMII.*

**Proof.** *Assume that a country can decide on ERMII participation in period 2. If the country participates in ERMII, then the expected loss is given by  $L_2^{ERM} + \varphi L_3^E + (1 - \varphi)L_3^D$ . If a country remains in a CBA, then the expected loss is given by  $L_2^{CBA} + L_3^{CBA}$ . A CBA country will abandon the CBA in order to participate in ERMII if*

$$X = L_2^{ERM} + \varphi L_3^E (p_2^{ERM}) + (1 - \varphi)L_3^D - L_2^{CBA} - L_3^{CBA} < 0.$$

For  $n_2^* = n_3^* = n^*$  we get that

$$X = -\frac{abu_2^i}{1+ba^2} \left[ \frac{abu_2^i(1+ba^2-\varphi)}{2(1+ba^2)} + \varphi(abn_3^* - k) \right] + (abn_3^*)^2 - \varphi k abn_3^* + \frac{1}{2} [\varphi k^2 - (\pi_2^f)^2 - (\pi_3^f)^2]$$

where  $k = e^E + p_3^f - p_1$ ,  $\partial X / \partial u \leq 0$ . ■

## 4 Signaling competence through ERMII participation

Let us now consider the case where the actual probability of entering to the euro-zone is not exogenous but a negative function of the interest rate differential to the euro area in the second period  $\varphi = 1 - f(i_2 - i^f)$ ,  $\partial \varphi / \partial i_2 < 0$ . This assumption is consistent with the existing criteria for euro-area participation specified in the Maastricht Treaty.<sup>22</sup> According to our model, the private sector in the second period expects that if a country fails to adopt the euro, the exchange rate will

<sup>22</sup> Including the inflation differential in the convergence criteria is also possible.

depreciate in the next period,  $E_2(e_3 - e_2) > 0$ . We assume that the euro exchange rate,  $e^E$ , is such that,  $E_2(e^E - e_2) < E_2(e_3^D - e_2) = 0$ . By the interest parity condition, expectations about exchange rate depreciation affect the level of the domestic interest rate. Given that the level of the domestic interest rate is determined before observing  $u$ , the private sector attaches an equal probability to both types of government so that  $\varphi^I = 1 - f(i_2 = i^f + 0.5E_2(e_3^D - e_2) + 0.5E_2(e_3^E - e_2))$ .

In the second period, a country within ERMII will decide to abandon the CBA if the expected loss in the second and third period is lower than in the case of retaining the CBA:

$$L_2^{ERM} + \varphi^I L_3^E(p_2^{ERM}) + (1 - \varphi^I)L_3^D < L_2^{CBA} + \varphi^I L_3^E(p_2^{CBA}) + (1 - \varphi^I)L_3^D$$

**Proposition 2** *If the possibility of retaining the CBA within ERMII exists, then the net benefit of abandoning the CBA will increase with the level of competence of the country.*

**Proof.** *A country will retain the CBA in the second period if:*

$$Z = L_2^{CBA} - L_2^{ERM} + \varphi^I[L_3^E(p_2^{CBA}) - L_3^E(p_2^{ERM})] < 0 \quad (25)$$

After some algebra we get that

$$\begin{aligned} Z = & \frac{abu_2^i}{1 + ba^2} \left[ \frac{abu_2^i(1 + ba^2 - \varphi^I)}{2(1 + ba^2)} + \varphi^I(abn_3^* - k) \right] + abn_3^*(\varphi^I k - \frac{ab(1 + \varphi^I)n_3^*}{2}) - \\ & - \varphi^I k \pi_2^f + \frac{1}{2}(1 + \varphi^I)(\pi_2^f)^2 \end{aligned}$$

where  $\vartheta Z / \vartheta u \geq 0$ . ■

Figure 2 depicts Proposition 2. Other things being equal, a country with a competence level above  $u^*$  will abandon the CBA during the ERM period.

Next, we want to use the model developed above to show that it may be optimal for the policymaker of a country which participates in a currency board to abandon this arrangement in order to signal its competence and to reap the benefits of euro-area participation. If the currency board arrangement is abandoned, then private agents employ this information in order to draw inference concerning the government's competence,  $u$ . Private agents' beliefs regarding the competence of the government affect the probability of entering the euro-area through the level of the interest rate. Therefore, inferring the competence level of the government will affect the probability of an exchange rate depreciation in the next period, thereby affecting the interest rate

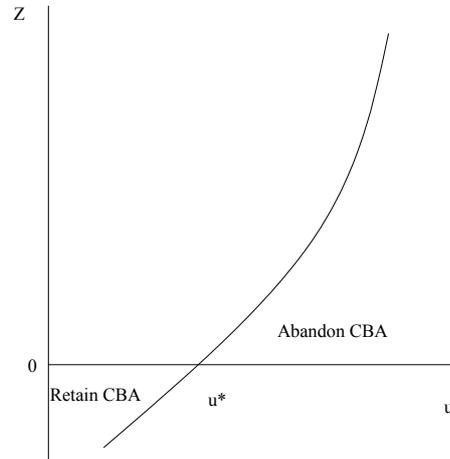


Figure 2: ERM participation and CBA

and the probability of entering the euro-area. Let us assume that there are two types of countries: a high-ability ('strong') country and a low-ability ('weak') country. The 'strong' country has an incentive to abandon the CBA in order to make the private sector believe that it has a high level of competence ( $u=u^h$ ) thereby securing entrance to the euro-area.<sup>23</sup> Similarly, the 'weak' country may have an incentive to mimic this behaviour.

Inequality (25) allows three possible cases: both types of countries retain the CBA, both types abandon the CBA or the 'strong' country abandons the CBA and the 'weak' country retains the arrangement.<sup>24</sup> We will first assume that the competence level of both types is such that both choose to retain the CBA: Inequality (25) does not hold for any type.

There is a multiplicity of sequential equilibrium, including both a separating and a pooling equilibrium. We restrict our attention to equilibria in pure strategies. In the *separating equilib-*

<sup>23</sup> We assume that inflation is the only policy instrument available to the government. One could argue, however, that the government could retain the CBA and use fiscal deficit as a signal. We think that deficit is a less appropriate instrument for signalling since reliable deficit figures are available only with considerable time lags.

<sup>24</sup> Since  $u^h > u^l$  it is not possible that  $L_2^{CBA} < L_2^{ERM}$  for the h-type and not for the l-type.

*rium*, the exchange rate regime decision of the country perfectly reveals the country's type to the private sector. This implies that the 'strong' country convinces the private sector of its true type, in which case we assume that  $\varphi^h = 1 - f(i_2 = i^f) = 1$ . On the other hand, for simplicity we assume that  $\varphi^l = 1 - f(i_2 = i^f + E_2(e_3^D - e_2)) = 0$ .

If  $\rho$  is the probability that the country is 'strong', private sectors' beliefs can be described by  $\rho=1$  if the country abandons the CBA in the second period and  $\rho=0$  if the CBA is retained. In this equilibrium, the 'strong' country signals its identity by abandoning the CBA and the 'weak' country does not attempt to mimic. This implies that the low-ability country retains the CBA. The necessary and sufficient conditions for this equilibrium are:

$$L_2^{CBA} - L_2^{ERM} \geq L_3^E(p_2^{ERM}) - L_3^D \quad (26)$$

for the country with high  $u$ , and

$$L_2^{CBA} - L_2^{ERM} < L_3^E(p_2^{ERM}) - L_3^D \quad (27)$$

for the country with low  $u$ . The first inequality implies that for the 'strong' country the expected gain from signaling exceeds the cost whereas the second inequality states that for the 'weak' country the cost of mimicking exceeds the expected benefit.

**Proposition 3** *There is a nonempty set of separating equilibria which is characterized by*

$$S = L_2^{CBA} - L_2^{ERM} - L_3^E(p_2^{ERM}) + L_3^D \geq 0$$

*for the 'strong' country and  $S < 0$  for the 'weak' country.*

**Proof.** The conditions for a separating equilibrium are satisfied given that

$$\vartheta S / \vartheta u = \frac{ab}{1 + ba^2} \left[ \frac{a^3 b^2 u_2^i}{(1 + ba^2)} + (abn_3^* - k) \right] \geq 0$$

■

Figure 3 depicts the separating equilibrium. If the choice of the exchange rate regime in the second period cannot affect private sector's beliefs about the country's competence level, both

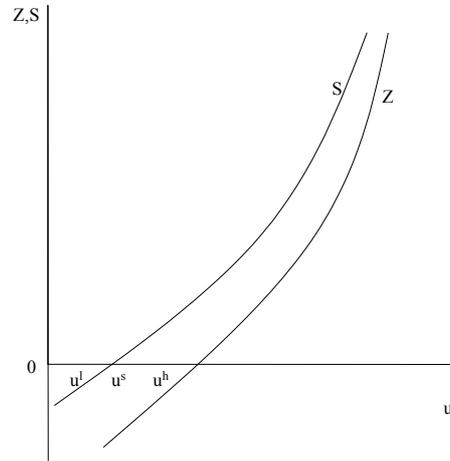


Figure 3: Separating equilibrium

types will retain the CBA within ERMII since  $Z(u^h) < 0$  and  $Z(u^l) < 0$ . Under signaling, the ‘strong’ country will have an incentive to abandon the CBA as long as its competence is higher than  $u^s$ . The ‘weak’ country will not have an incentive to mimic the exchange rate strategy of the ‘strong’ one as long as its competence is below  $u^s$ .

The country’s competence level  $u$  has two effects on the benefit of abandoning the CBA in the second period: On the one hand a high  $u$  implies a lower inflationary bias in ERMII from equation (20) so that  $\vartheta(L_2^{ERM} - L_2^{CBA})/\vartheta u < 0$ , (domestic credibility effect) and on the other hand, it also decreases the benefit of participating in the euro area in terms of lower inflation. The latter effect occurs since prices in ERMII are lower for the h-type,  $p_2^{ERM}(u^l) > p_2^{ERM}(u^h)$  so that for a given price level in the euro-area,  $p_3^E$ , inflation within the euro area will be higher for the ‘strong’ country (borrowed credibility effect). Propositions 2 and 3 imply that the first effect is stronger than the latter so that  $Z$  and  $S$  have a positive slope. By comparing  $Z$  with  $S$  we can see that  $S$  crosses the vertical axis at a higher point and that the slope of  $S$  is lower than the slope of  $Z$ . The lower slope of  $Z$  results from a stronger borrowed credibility effect in the case of signaling since

the probability of entering the euro area is now  $\varphi = 1$ . However we can show that  $S-Z > 0$  for all levels of  $u$  compatible with our reasonable restrictions so that the possibility of signaling implies a change in the optimal exchange rate strategy for country's with competence  $u^s < u < u^*$ .

Note that eliminating weakly dominated strategies does not eliminate a pooling equilibrium in which both types of countries choose to abandon the CBA. In this case, as shown in the Appendix the 'strong' country abandons the CBA and so does the 'weak' one. However, by using the intuitive criterion of Cho and Kreps (1987) we can rule out pooling equilibria.

In our analysis we assumed that ERMII participation is a unilateral decision of the candidate country, thereby ignoring the euro-area's incentives to accept a currency in ERMII. Modeling ERMII participation as a bilateral decision could allow us to investigate some further signaling channel of abandoning the CBA since by accepting a candidate country in ERMII the euro-area offers a positive signal for the expected macroeconomic performance of the specific country. This is the case because ERMII participation implies some cost-sharing: If a currency is attacked by speculators, the ECB must intervene at the margins in order to defend the currency unless price stability is threatened. Moreover, markets' confidence in the common currency may be affected. This signal is stronger the more costly it is for the Eurosystem to accept in ERMII a currency of a country with insufficient convergence. Clearly, the ECB will be reluctant to accept a currency in ERMII if the cost is significant. In that respect, ERMII participation is an indication of high 'competency'. If a CBA is retained, it will be less costly for the ECB to accept the currency in the ERM and therefore the positive signal to the markets will be weaker. This signaling benefit of ERMII participation is more important for an emerging country for which market's information is limited or less credible.

## 5 Other sources of uncertainty

In our analysis we assumed that the decision to participate in ERMII depends on various observable factors such as employment and inflation and one unobservable factor, the level of competence.

In this framework, the country's decision to retain a CBA within ERM signals the level of the unobservable variable and there is no signal extraction problem. However, if this decision will depend on more than one unobservable factors the public may not be able to infer with certainty whether the exchange rate regime decision of the government is due to high competence or due to other unobservable factors.<sup>25</sup> CBAs have been generally introduced by countries in crisis. For example establishing a CBA has often been proposed as a solution to the time inconsistency problem of monetary policy in high-inflation countries. What guarantee do markets have that abandoning the CBA will not bring back old problems and reduce the chances of entering the euro-area because inflation becomes too high. One possible source for having a high level of inflation in the pre-CBA period could be the combination of a discretionary environment with a relatively low preference of the monetary authorities for price stability. In our model this preference is captured by the relative weight the monetary authority attaches to the employment target in equation (5),  $b$ . Equation (18) implies that in a discretionary environment the inflationary bias will increase with  $b$  which reflects the relative weight the policymaker attributes to reducing the gap between current employment and the target level of employment,  $\partial\pi_2^{ERM}/\partial b \geq 0$ . Therefore, it would be legitimate to assume that before establishing the CBA the monetary authority of the accession countries had a high level of  $b$  whereas the public does not know if, as a result of important economic reforms, this structural parameter has been decreased or not. In particular we will assume that the government's preference for low inflation reflected by the level of  $b$  cannot be observed by the private sector in period 2. In line with Vickers (1986), we further assume that  $b$  can only take two values a low and a high value,  $0 < b^l < b^h < \infty$  and that  $b$  is uncorrelated with the competence shock,  $u$  whereas we call the policymakers with a high (low) level of  $b$  as 'wets' ('drys').<sup>26</sup>

---

<sup>25</sup> This signal extraction problem is investigated by the literature on limit pricing under uncertainty. See Mathews and Mirman (1983).

<sup>26</sup> Other models that assume uncertainty about the weights attached to inflation and unemployment in the policymaker's objective function are Vickers (1986) and Persson and Tabellini (1990).

The new setup implies that if the CBA is abandoned the private sector does not know to what extend the inflation level and the exchange rate regime choice depend on the value of  $b$  or on the value of the competence shock  $u$ . For example it is possible that  $\pi_2^{ERM}(u^h, b^h) = \pi_2^{ERM}(u^l, b^l)$ . We already know from Proposition 1 that if the possibility of retaining the CBA within ERMII does not exist, then the net benefit from participating in ERMII decreases with the level of  $b$ . In this framework the separating equilibrium defined in the previous section exists if the net gain from signalling defined by inequality (26) is positive for the ‘strong’ country whereas the net gain from mimicking defined by inequality (27) is negative for the ‘weak’ country for any level of  $b$ ,  $S(u^h, b^i) \geq 0$ ,  $S(u^l, b^i) < 0$ ,  $i = h, l$ .

Introducing uncertainty about the policymaker’s inflation aversion has two important implication for the separating equilibrium: Firstly, the gain from signalling depends positively on  $b$  because the benefit from joining the euro area in terms of lower inflation will be higher for the country with the higher inflationary bias. This implies that a ‘strong’ country will have a stronger incentive to signal its identity and a ‘weak’ country will have a stronger incentive to mimic if the policymaker is ‘wet’. Secondly, the cost of signalling also depends positively on  $b$  because the higher the inflationary bias, the higher the loss from abandoning a CBA for a more discretionary environment. Compare to the first effect this second effect works in the opposite direction since it implies that a ‘strong’ country will have a stronger incentive to signal its identity and a ‘weak’ country will have a stronger incentive to mimic if the policymaker is ‘dry’. Given that the first effect does not depend on the level of competence whereas the second effect becomes stronger as  $u$  increases, we can show that, if the competence differential of the two types is not very small, the first (second) effect will be dominant for the ‘weak’ (‘strong’) country. This implies that  $S(u^h, b^l) \geq S(u^h, b^h) \geq S(u^l, b^h) \geq S(u^l, b^l)$  so that a separating equilibrium exists where the strong country will abandon the CBA for every policymaker type,  $S(u^h, b^i) \geq 0$ , while the weak country will retain the CBA,  $S(u^l, b^l) \leq S(u^l, b^h) < 0$ .<sup>27</sup>

---

<sup>27</sup> Another source of uncertainty could be the presence of an economic disturbance from the supply side,  $v$ .

## 6 Conclusions

As suggested by recent literature on the accession countries, participation in ERMII may not imply a smooth transition to the euro-area for countries which currently follow fixed exchange rate regimes such as a CBA. Relaxing the exchange rate regime by abandoning the CBA entails the cost of a temporary institutional change and the inflationary cost of moving to a more discretionary environment. Moreover, the new environment could make the economies more vulnerable to speculative attacks due to weak fundamentals or contagion effects. On the other hand, the relatively wide fluctuation bands of ERMII may allow restricting the inflationary consequences of short-term capital flows due to an expected convergence play as well as due to the existence of a strong Balassa-Samuelson effect and it will also allow testing the appropriateness of the central rate. Without undermining the important advantages of retaining a CBA within ERMII, the paper emphasized another aspect of that choice namely its effect on markets' expectations. Participation in ERMII without a CBA may allow the candidate country to signal its ability for sustainable nominal convergence to the markets, thereby increasing the probability of future participation to the euro-area.

If accession countries are given the option to retain a CBA until euro area participation, this choice should be based on an evaluation of all arguments mentioned above by the countries concerned. If economic reforms have altered significantly the conditions that led to the establishment of a CBA, then the cost of abandoning the arrangement (e.g. higher inflation) may not be significant. In such an environment the decision to join ERM without a CBA can have a positive impact on markets' expectations. If, however, there is a risk that abandoning the CBA will bring back the problems responsible for its establishment in the first place, then retaining the arrangement is clearly optimal. Future research in this area may also emphasize further aspects of asymmetric information. Allowing the ERMII participating country to retain its CBA may also imply moral hazard issues if information about economic performance between the country and

---

However, even in this case one can show that a separating equilibrium will exist if  $S(u^h, v^l) \geq S(u^l, v^l)$ .

the euro-area is to some extent asymmetric: the coexistence of a CBA and ERMII will reduce the fear of speculative attacks due to poor fundamentals so that countries may apply for ERMII participation even if their economic fundamentals are not adequately solid yet.

### Appendix

In the pooling equilibrium the private sector can learn nothing about the competence of the country from the exchange rate regime choice so that  $p=1/2$  if the CBA is retained (and, thus,  $\varphi = \varphi'$ ). A pooling equilibrium requires that for the 'weak' type the cost of mimicking is smaller than the benefit. This implies that the following inequality holds for the incompetent type:

$$L_2^{ERM} + \varphi L_3^E(p_2^{ERM}) + (1 - \varphi)L_3^D < L_2^{CBA} + L_3^D \quad (28)$$

Figure 4 depicts the pooling equilibrium. If we reformulate inequality (27) as  $P > 0$ , it is straightforward to show that  $Z - P < 0$  and that  $\partial Z / \partial u = \partial P / \partial u$ . This implies that although in the absence of signaling an l-type country with a competence level below  $u_0$  will not abandon the CBA,  $Z < 0$ , the incentive to mimic the h-type will induce the country to abandon the CBA since  $P > 0$

However, by using the intuitive criterion of Cho and Kreps (1987) we can rule out pooling equilibria. The equilibrium exchange rate strategy of both types abandoning the CBA in the second period is unintuitive if the 'strong' country would prefer to abandon the CBA if it could convince the markets of its true type whereas the 'weak' country would prefer to retain the CBA even if  $\varphi=1$ . This implies that the following condition holds for the two types:

$$L_2^{ERM} + L_3^E(p_2^{ERM}) < L_2^{CBA} + (1 - \varphi)L_3^D + \varphi L_3^E(p_2^{CBA}) \quad (29)$$

for the 'strong' country and

$$L_2^{ERM} + L_3^E(p_2^{ERM}) > L_2^{CBA} + (1 - \varphi)L_3^D + \varphi L_3^E(p_2^{CBA}) \quad (30)$$

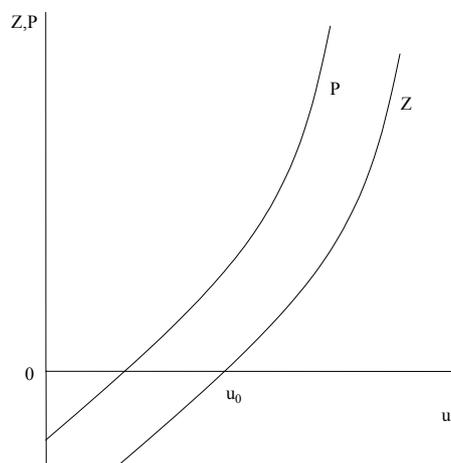


Figure 4: Pooling Equilibrium

for the 'weak' country.

We can write the two conditions as  $C > 0$  for the h-type and  $C < 0$  for the l-type. Under the reasonable assumption that  $\varphi'$  is close to 0.5, one can show that  $C - P < 0$ . This implies that the pooling equilibrium is unintuitive for all  $u < u''$  (Figure 4).

## References

- R. Barro, and D. Gordon, (1983) 'Rules, Discretion and Reputation in a Model of Monetary Policy ', *Journal of Monetary policy*.
- D. Begg, B. Eichengreen, L. Halpern, J. von Hagen and C. Wyplosz, (2001) 'Sustainable Regimes of Capital Movements in Accession Countries ' *CEPR Report*.
- Buiter and Grafe, (2001), 'Anchor, Float or Abandon Ship: Exchange Rate Regimes for the Accession Countries ', *Banca Nazionale del Lavoro Quarterly Review*, 221, 111-141 .
- I.K. Cho and D. Kreps, (1987) 'Signaling Games and Stable Equilibria ', *The Quarterly Journal of Economics* 102, 179-222.
- A. R. Ghosh, A-M. Gulde and H.C. Wolf, (2000) 'Currency Boards: More than a Quick Fix? ', *Economic Policy*, 270-335.
- H. Gibson and E. Tsakalotos, (2001) 'The Euro, EU Enlargement and ERMII 'Presented on the CESifo-Delphi conference on Managing EU Enlargement.
- P. De Grauwe, Hans Dewachter and Dirk Veestraeten, (1999), 'Price Dynamics under Stochastic Process Switching: Some Extensions and an Application to EMU ' *Journal Of International Money and Finance*, 18, 195-224.
- P. De Grauwe, (1996) 'How to fix Conversion Rates at the Start of EMU' *Discussion Paper No. 1530, CEPR*.
- A-M. Gulde, J. Kahnkonen and P. Keller, (2000) 'Pros and Cons of Currency Boaed Arrangements in the Lead-up to EU Accession and Participation in the Euro Zone ' *IMF Policy Discussion Paper 00/1*.
- J. de Haan, H. Berger. and E. van Fraassen, (2001) 'How to Reduce Inflation: An Independent Central Bank or a Currency Board? The Experience of the Baltic Countries ' *Emerging Markets Review* 2, 218-243.
- G. Irwin, (2004) 'Currency Boards and Currency Crises', *Oxford Economic Papers* 56, 64-87.
- M. Katsimi, (1999) 'Elections and the Size of the Public Sector' , *European Journal of Political Economy* 15, 441-462.
- S. Matthews and L. Mirman (1983) 'Equilibrium Limit Pricing: The Effects of Private Information and Stochastic Demand' , *Econometrica*, 52, 981-996.
- T. Persson and G. Tabellini, (1990) *Macroeconomic Policy, Credibility and Politics*. Harwood Academic Publishers.
- A.Philippopoulos amd M. Coles, (1997) 'Are Exchange Rate Bands Better than Fixed Exchange Rates? The Imported Credibility Approach', *Journal of International Economics* 43, 133-153.
- H.-W Sinn, (1999) 'Currency Board for the New EU Member States', *ifo Viewpoint* 10.
- J. Vickers, (1986) 'Signalling in a Model of Monetary Policy with Incomplete Information', *Oxford Economic Papers* 38(3), 443-455.