How close are the New Member States to EMU? Evidence of a two-speed strategy

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Abstract

In this paper we apply two complementary empirical criteria to eight New Member States (NMS) of the European Union to determine which of them are ready for a fast adoption of the euro. In a first step, we recover demand and supply shocks for each country and for the euro area, and calculate the social losses implied by the two relevant exchange rate regimes, flexible rates and currency board. In a second step, we calculate the real exchange rates variability that these countries are currently experiencing and compare it to that of three Mediterranean countries during a similar period before they joined the EMU. Putting together the results of both tests, it follows that Estonia and Slovenia are the only countries that seem ready to adopt the Euro within the shortest period of time foreseen by the Mastricht criteria; that is, after the two mandatory years in the ERM2. The rest of the countries will probably still need some exchange rate flexibility to absorb external shocks in the coming years.

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1. Introduction

After entering the EU, the New Member States (NMS) must determine whether they are ready to join the European Monetary Union (EMU), upon meeting the required Maastricht criteria, or whether they have to postpone the adoption of the euro for some years[1]. The Convergence Programmes for 2004-2007 that each of these countries submitted to the European Commission in May 2004 set their own national strategies and timing for the adoption of the euro[2].

Setting aside public and official declarations, an external assessment of the extent to which these countries are ready for EMU might be revealing. This issue has already been extensively discussed using the most important criterion of the Optimum Currency Areas (OCA) literature: similarity in business cycles. This theory sets that if the business cycles of the different countries are highly synchronised, the cost of giving up the country's own currency, and consequently its monetary autonomy, is low and the common monetary policy is suitable to stabilise the whole area[3]. On the contrary, if business synchronisation is low, it seems appropriate to keep a flexible exchange rate and an independent monetary policy for macroeconomic stabilisation purposes.

Many empirical studies analyse the cyclical patterns in the Central and Eastern European Countries (CEEC) and their degree of similarity with that of the euro area. Although we should be cautious when interpreting the results of these studies –the series of reliable macroeconomic data for these countries are still too short– some common findings may be picked out. Most of them are reviewed and summarised in Fidrmurc and Korhonen (2004). On the basis of a meta-analysis to determine the main factors of business cycle synchronisation between the euro area and ten CEEC including Bulgaria and Romania, these authors concluded that: a) the NMS as a whole do not form part of an optimum currency area, as they have to cope with rather frequent asymmetric shocks and the results for individual countries are very heterogeneous; b) for the most advanced countries of the region, namely Hungary, Slovenia and Poland, the business cycles are almost as synchronised with the euro zone as some peripheral members. Some NMS also show evidence of similarity in output and inflation responses as compared to the EU as a whole; c) the Czech Republic and Slovakia surprisingly have low synchronisation with the euro area in their business cycles, but this result does not differ from that of some peripheral countries of the euro zone such as Greece, Ireland and Portugal; d) the Baltic countries –except for Estonia– have the lowest

[1] Like Sweden, and contrary to Denmark and the United Kingdom, the NEM cannot formally opt out of the euro indefinitely and are expected to become full members of the EMU sooner or later.
[2] In the group of fast entrants, Cyprus and Slovenia have announced 2007 as the target year for the adoption of the euro. Other have indicated that they will be ripe some year later: 2008 (Latvia), 2008-2009 (Slovakia), or 2009-2010 (the Czech Republic and Hungary). Other countries make less explicit statements: as soon as possible (Estonia), as soon as the convergence criteria are fulfilled (Malta), or no compromise at all: Lithuania and Poland.
[3] See, for instance, Mundell (1961). Other criteria that are considered in the OCA literature are: the mobility of labour, price and wage flexibility, economic openness, diversified production and consumption structures, trade structure similarity, similarity of inflation rates, fiscal integration and political integration. For a recent survey of the OCA literature, see Mongelli (2002).

correlation; d) finally, the studies that split shocks to the NMS into demand and supply origins, find that the first ones are generally less correlated with the euro area than the second ones.

These general results have been broadly confirmed by more recent studies that apply new methodologies. For instance, Traistaru (2004) and Von Hagen and Traistaru (2005) estimated correlation coefficients of the business cycles of the Central European NMS and some members of the euro area, using a Baxter-King (1999) filter to extract the cyclical component of the series. They found that the business cycles correlation between the NEM and the current euro area countries were lower than among the EMU members. Their analysis confirmed that Poland, Slovenia and Hungary are the most correlated with the euro members, while Lithuania, Slovakia and the Czech Republic are the least correlated.

Darvas and Szapáry (2004) extended the analysis in a dynamic setting, including the main expenditure and sectoral components of GDP. They used a dynamic factor model for the detrended data of five core EMU countries as a benchmark to measure synchronisation. They found an increasing and significant synchronisation of the GDP and industrial production cycles between Hungary, Poland and Slovenia, on the one hand, and the euro area on the other. However, their findings concerning consumption and investment cycles did not follow suit, probably due to the asymmetric demand shocks these countries have been exposed to in the last few years, and the reaction of private consumption and investment to them.

Babetskii (2004), following this dynamic perspective, used a Kalman filter to compute time-varying correlation coefficients for demand and supply disturbances. He found that whereas the correlation of demand shocks increased during the 1990s, the pattern of supply shocks was rather divergent. In addition, he showed that the increasing correlation of demand disturbances was linked to the growing trend in trade intensity.

Finally, Benczúr and Rátfai (2005) go beyond the analysis of co-movements and tackle other features of the business cycles such as variability and persistence of output and other major real and nominal variables. They do not find important novelties concerning correlations, but they get that fluctuations in CEECs are larger than in industrial countries, and similar to other emerging economies.

The empirical studies reviewed in the previous paragraphs concentrate on a specific criterion of the OCA theory that, although very relevant, only offers a partial assessment of the problem. There are other important characteristics, such as duration, height and shape of the cycles, which must be considered to get a comprehensive understanding of business cycles similarities[4]. Furthermore, there are another side of the analysis that is typically neglected by the literature on business cycle similarity. This is the size of idiosyncratic real shocks to which countries are exposed. In fact, when this kind of disturbance is prominent, flexibility in the nominal exchange rate is very useful for the authorities to stabilise the economy. The direct implication is that a comprehensive assessment of country's suitability to join a monetary union should contain some measurement of real exchange rate variability. To our knowledge, only the paper by Gros and Hobza (2003) applies this type of analysis to gauge whether the CEECs

[4] For instance, Camacho, Pérez Quirós and Saiz (2005) propose stationary bootstrap methods to uncover additional properties of business cycles from time series, but they have not applied this methodology to the NMS.

should join the euro. These authors compute the variability of the real exchange rates (RER) of these countries compared to the euro (or the ECU), using monthly and quarterly data of the period 1996-2001, and weigh it against the real exchange rate variability of the Club Med countries (Greece, Italy, Spain and Portugal) during the period 1990-1995. This methodology is rooted in Vaubel (1976 and 1978), and relies on the idea that asymmetric shocks require (equilibrium) real exchange rate adjustment. Since the easiest and less costly way of conveying such changes is through nominal exchange rate variation, real exchange rate variability is also an indication of the costs of adopting a fixed exchange rate or a common currency. An added advantage of this procedure is that it is based on readily available data.

A connected strand of analysis investigates the usefulness of the nominal exchange rate to absorb real external shocks. Canzonery, Vallés and Viñals (1996) found that, in a representative group of six EU members, the nominal exchange rate (NER) mainly served to dampen monetary and financial shocks and very little to cushion real disturbances. Their main conclusion was that these countries would not suffer very much if they gave up their exchange rate and were part of the common monetary policy.

This paper applies two empirical methodologies to get a more accurate assessment of the costs that the NMS countries would incur if they adopted the euro quickly. The first one consists of calculating the social losses implied by the adoption of the two relevant exchange rate regimes, the flexible exchange rate and the currency board. It goes beyond simple measurement of business cycles similarity, and takes into account the size of idiosyncratic shocks. The second one lies in the assessment of the real exchange rates variability that these countries are currently experiencing, compared to that of three Mediterranean countries during the eighties and nineties before they joined the EMU. Combining the results of both tests, we derive that Estonia and Slovenia are the only countries that seem ready to adopt the Euro within the shortest period of time foreseen by the Maastricht criteria; that is, after the two mandatory years in the ERM2. The remaining countries will probably still need some exchange rate flexibility to absorb external shocks in the coming years.

To calculate social losses we need to previously set an appropriate theoretical model, and derive loss functions for the two exchange rate regimes relevant for the present work. This is done in Section 2. Our theoretical model also serves to clarify the utility of the exchange rate as an absorber tool in the face of demand versus supply shocks, contributing to highlight some issues of a recent debate[5]. In section 3 we extract demand and supply shocks for each NMS and for the whole euro area, and we use their most relevant statistical moments to compute the social losses entailed by each exchange rate arrangement in each country. In section 4 we compute nominal and real exchange rate variability and compare its implications with those derived from the first methodology. Section 5 provides the main conclusions and some recommendations for economic policy.

[5] Thus, according to Frankel (2004), countries having adhered to a currency union are more vulnerable when they are affected by demand shocks, whereas Fidrmuc and Korhonen (2001) consider that supply shocks deserve prior attention because they have more permanent effects on output and exchange rates.

2. The model

The main lines of our theoretical approach follows Gerlach and Smets (2000) and Detken and Gaspar (2003), adapted to take into account the rigidities and the technological gap in the markets of the NMS and the possibility of different exchange rate regimes.

2.1 Flexible exchange rate regime

The model is composed of the following equations:

$$L = \frac{1}{2} E_t \left\{ \sum_{j=0}^{\infty} \beta^j \left[\pi_{t+j}^2 + \lambda (y_{t+j} - k)^2 \right] \right\} \tag{1}$$

$$\pi_t = \alpha y_t + \beta E_t \pi_{t+1} + \varepsilon_t \tag{2}$$

$$y_t = -\varphi [i_t - E_t \pi_{t+1}] + E_t y_{t+1} + \delta (s_t - p_t) + d_t \tag{3}$$

$$i_t = E_t s_{t+1} - s_t + \tau_t \tag{4}$$

Equation (1) is a standard central bank's intertemporal loss function that penalises deviations of inflation and output gap from their targets. The inflation differential, π_t, is defined with respect to the socially desired rate, while the (log of) output gap, y_t, is calculated with respect to the long run or potential level which is normalised to zero. In general, y_t is negative, indicating that the level of output is under the natural or potential level. To understand the meaning of the parameter $k \geq 0$, take into account the following considerations. The NMS are affected by markets distortions and technological gaps, compared to the euro area, that lead the authorities to think that the "actual" natural output (normalised to zero) is lower than the "desired" level, *DNO*, which is the natural output that the economy could obtain in the absence of rigidities. If the authorities believe that *DNO* can be achieved in the current year, the output gap relevant to calculate social losses will be (y_t – *DNO*). If, on the contrary, the authorities consider that the convergence gap (internal rigidities) must be filled gradually, the monetary policy will be concerned only by a fraction of it. In this case, the output gap relevant to estimate social losses would be (y_t – k) as reflected in equation (1), where k is a positive fraction of *DNO*. E_t is the rational expectations operator in period t, β is the discount factor and λ is the relative weight attached to output variability[6].

Equation (2) is the aggregate supply in the spirit of the New keynesian Phillips curve with rigidity in price adjustments. It may be derived assuming, as in Calvo (1983), that firms maximise the difference between expected marginal revenue and unit costs, and that only a fraction of them is allowed to adjust prices each period. The assumption of price rigidity instead of wage rigidity seems justified for the CEECs since, according to von Hagen and Traistaru (2004) among others, in those countries wages are more flexible than in the EU, and act as an adjustment mechanism to region-specific shocks. Equation (3) indicates that the aggregate demand depends negatively on the real interest rate and positively on both the real exchange rate and the output expected for the next period. The domestic price level, p_t, and the nominal exchange rate, s_t, are measured in logs. The latter is defined as the price in domestic currency of a unit of foreign currency. The foreign price level and the foreign nominal interest rates are normalised to zero. The expected output in the aggregate demand is due to consumption smoothing reasons by households that maximise an intertemporal utility function under budget restrictions[7]. Equations (2) and (3) contain stochastic shocks which are assumed white noise processes. The supply shock is deemed to capture everything affecting marginal costs and/or changes in firms' productivity, and the demand shock represents shifts in autonomous private and public expenditures.

Equation (4) is the uncovered interest parity condition including a stochastic country risk premium, τ_t. The risk premium is assumed an uncorrelated i.i.d. variable.

Events develop as follows: private agents form expectations on prices taking into account the information available at that time. Then the output shock is realised, and the central bank utilises this information to set its monetary policy. It uses the interest rate as the policy instrument according to an optimal simple rule that we obtain solving the model, and the exchange rate adjusts endogenously. Assuming that the central bank cannot commit to a state-contingent rule of the inflation rate, and consequently takes expectations as given, the first order condition is obtained by minimizing the loss function with respect to the output gap and the inflation rate, subject to the aggregate supply:

$$\underset{\pi_t, y_t}{Min}\, Z = \frac{1}{2} E_t \left\{ \sum_{j=0}^{\infty} \beta^j \left[\pi_{t+j}^2 + \lambda \left(y_{t+j} - k \right)^2 \right] \right\} + l\left(\pi_t - \alpha y_t - \beta \pi_{t+1} - \varepsilon_t \right)$$

The result is.

$$y_t = \frac{-\alpha}{\lambda} \pi_t + k \tag{5}$$

[6] This weight is related conversely to the aversion to inflation variability.
[7] See, for instance, Fraga, Goldfajn and Minella (2003)

Substituting this expression in (2) and solving by forward iterations, we obtain:

$$\pi_t = \frac{\lambda}{\lambda + \alpha^2}\varepsilon_t + \frac{\lambda}{\lambda(1-\beta)+\alpha^2}\alpha k \tag{6}$$

$$y_t = \frac{-\alpha}{\lambda + \alpha^2}\varepsilon_t + \frac{\lambda(1-\beta)}{\lambda(1-\beta)+\alpha^2}k \tag{7}$$

These expressions indicate that there are two kind of factors, supply shocks and market rigidities that, in the short run, push inflation and the output gap out off their long run levels. Along time, the impacts of the supply shock are zero on average. In this framework we can talk of both inflation and output biases. The inflation bias increases with the weight attached to output stabilisation in the loss function and decreases with the slope of the aggregate supply. The output bias is also influenced positively by the weight on output variability, and negatively by the slope of the aggregate supply.

The influence of market rigidities on output is a new result compared to what we know from the Barro and Gordon (1983) model and can be explained taking into account the forward-looking nature of firms. When an exogenous supply shock hits the economy, rational agents, who know how national authorities react, revise their expectations and forecast correctly the new inflation rate of the next period. However, since forward-looking agents discount their expected value with the factor β (lower than one), a new gap is created between the current and the presently valued rate of inflation, leading firms to increase output as required by equation (2). As can be easily verified, if no discount were applied to inflation expectations ($\beta = 1$), market rigidities would not create any output bias and the inflation bias would reach a higher level.

Let us now find the equilibrium values of the nominal exchange rate and interest rate. For that purpose, take into account that in (3) p_t may be replaced by $(\pi_t + p_{t-1})$. Thus, introducing (6) and (7) in (3), we get:

$$(\varphi i_t - \delta s_t) = \left[\varphi\rho + \frac{\alpha}{\lambda} - \delta\right]\phi\varepsilon_t + d_t - \delta p_{t-1} - \psi\phi k \tag{8}$$

where $\phi = \dfrac{\lambda}{\lambda + \alpha^2} > 0$, and $\psi = [(1-\beta) - \lambda(\varphi - \delta)](1-\beta) \lesseqgtr 0$

Equation (8) is the locus of points (i_t , s_t) available to domestic authorities for achieving the desired level of output gap. To obtain the equilibrium values of these variables, equation (8) must be combined with equation (4). Therefore, we have a two-equations system with forward expectations in the exchange rate. Applying, for instance, the method of undetermined coefficients, we obtain:

$$s_t = \left[1 - \frac{\alpha}{\lambda(\varphi + \delta)}\right]\phi\varepsilon_t - \frac{1}{\varphi + \delta} d_t + \frac{\varphi}{\varphi + \delta}\tau_t + p_{t-1} - \frac{\psi\phi}{\delta} k \qquad (9)$$

$$i_t = \left[\frac{\alpha}{\lambda(\varphi + \delta)}\right]\phi\varepsilon_t + \frac{1}{\varphi + \delta} d_t + \frac{\delta}{\varphi + \delta}\tau_t \qquad (10)$$

As can be seen, market rigidities have an ambiguous effect on the nominal exchange rate because the sign of ψ is undetermined, unless we know the parameters of the model. However, market distortions do not have any influence on the nominal interest rate. It can also be verified that if β equals 1, the impact of k on the exchange rate disappears.

2.3 EMU or Currency board with the euro

Under this system, the nominal exchange rate of the NMS with respect to the euro countries is fixed, that is, $s_t = \bar{s}$, and the interest rate differential equals the risk country premium, $i_t = \tau_t$. The relationship between the domestic and foreign rates of inflation may be explained as follows. If we denote q_t the equilibrium level of the real exchange rate, in such a way that an increase in q_t indicates a real depreciation of the home currency, the domestic and foreign inflation rates are linked through the following relationship:

$$\pi_t = \pi_t^f - \hat{q}_t$$

This equation determines the domestic rate of inflation because both π_t^f and $\hat{q}_t$ are considered exogenous for each NMS country. We assume, indeed, that the variation of the real exchange rate is determined outside the model by real factors, among which Balassa-Samuelson effects are the most relevant, and that foreign inflation is also given because of the small country assumption that we apply to each NMS with respect to the euro area.

Therefore, using (6) with foreign parameters to determine π_t^f, and taking into account that for the euro countries $k = 0$, the current and expected inflation rates in NMS become equal to:

$$\pi_t = \frac{\lambda_f}{\lambda_f + \alpha_f^2}\varepsilon_t^f - \hat{q}_t \tag{6'}$$

$$E_t\pi_{t+1} = -E_t\hat{q}_{t+1}$$

As can be seen, under a currency board, inflation in the NMS depends on both the impact of shocks affecting the euro zone and real exchange rate variations mainly determined by the catching-up process. Inflation no longer depends on shocks hitting the domestic country. This result agrees with the idea that in a pure currency board regime domestic authorities cannot use their monetary policy to stabilise the economy.

Combining the last two equations with the domestic aggregate supply, the output gap equation for the NMS becomes:

$$y_t = \frac{1}{\alpha}\left[\frac{\lambda_f}{\lambda_f + \alpha_f^2}\varepsilon_t^f + \left(\beta E_t\hat{q}_{t+1} - \hat{q}_t\right) - \varepsilon_t\right] \tag{7'}$$

It follows that the domestic output gap depends on both foreign and domestic supply shocks, and on the expected variation in the real exchange rate changes.

Note that if supply shocks are symmetric $(\varepsilon_t = \varepsilon_t^f)$ and aggregate supplies have the same slope, i. e. $\alpha = \alpha_f$, the impact on inflation and output gap is the same as for the euro area, except for the variations introduced by real exchange developments. If supply shocks are only country-specific to NMS, inflation would no vary and the effects of those shocks on the domestic output gap would be equal to $1/\alpha$ times the size of the shock, ε_t.

In sum, both domestic inflation rate and output gap have strong dependence on foreign shocks and real exchange rate developments. If the latter are strong enough, complying with the inflation criteria could be in danger.

Equation (4) determines the nominal interest rate:

$$i_t = \tau_t \tag{4'}$$

This is an additional proof that the central bank cannot use the monetary policy for stabilisation purposes. As a result, national authorities must use fiscal policy to obtain the equilibrium output gap. The appropriate fiscal measure, g_t^F, could be derived from (3) and (7') by inserting that variable as an additional demand factor, and making $s_t = \bar{s}$ in those relationships.

In order to compute the effects of each exchange rate arrangement on social losses, we substitute the endogenous values of the inflation spread and the output gap corresponding to each exchange rate arrangement into the loss function (equation (1)). The results are:

Flexible exchange rate

$$L_t = \frac{A^2}{2(1-\beta)}\left(1+\frac{\alpha^2}{\lambda}\right)\sigma_\varepsilon^2 + \frac{1}{2(1-\beta)}\left\{B^2\alpha^2 + \lambda\left[B(1-\beta)-1\right]^2\right\}k^2 \tag{11}$$

$$A = \frac{\lambda}{\lambda+\alpha^2}, \qquad B = \frac{\lambda}{\lambda(1-\beta)+\alpha^2}$$

EMU or currency board with respect to the euro

$$L_t = \frac{A_f\left(\alpha^2+\lambda\right)}{2\alpha^2(1-\beta)}\sigma_{\varepsilon^f}^2 + \frac{\lambda}{\alpha^2}\sigma_\varepsilon^2 - \frac{A_f\lambda}{\alpha^2(1-\beta)}\sigma_{\varepsilon,\varepsilon^f} + \frac{1+\lambda(1-\beta\mu)^2}{2\alpha^2\left(1-\beta\mu^2\right)}\hat{q}_t^2 + \frac{2\lambda k}{\alpha}\hat{q}_t + \frac{\lambda}{(1-\beta)}k^2 \tag{12}$$

$$A_f = \frac{\lambda_f}{\lambda_f+\alpha_f^2}$$

where f denotes the euro zone, and μ is the autocorrelation coefficient of $\hat{q}_t$

Equation (11) indicates that, under a flexible exchange rate regime, the social loss depends on the size (variance) of domestic supply shocks and on the magnitude of the internal market distortions. This system shelters the country from foreign shocks.

Equation (12) may be used to evaluate the extent to which OCA criteria take into account the determinants of social costs under a fixed exchange rate regime. As established by the OCA theory, if a country adopts the common currency, the covariance between domestic and foreign supply shocks has a negative impact on the domestic loss function. The direct and well known implication is that the system is more desirable if symmetric supply shocks are probable, whereas it poses a number of risks if asymmetric or country-specific supply shocks are thought to be likely. However, there are additional factors that may be relevant as well. First, the size (variances) of both shocks -domestic and foreign- influences the loss function. This is a natural result since the authorities that adopt this exchange rate regime cannot use monetary and exchange rate policies to smooth cyclical fluctuations. Second, internal distortions (and/or a technological gap) influence social costs as a result of their effect on the inflation bias.

Which is the role of demand shocks? These disturbances do not appear in equations (11) and (12) because their impact is absorbed by the exchange rate. Indeed, the adjustment of the exchange rate allows the authorities to choose the optimal combination of output and inflation regardless the size of demand shocks and its correlation with other disturbances. In case of a fixed exchange rate regime with a foreign area, the effect of demand shocks that hit the foreign area is cushioned by the adjustment of the exchange rate of the latter with respect to third currencies, and does not translate either to the home country. The relevance of specific real demand shocks, as a determinant of the cost involved in abandoning the flexibility of the exchange rate, may be evaluated indirectly through the variability that these shocks cause on the exchange rate. Tacking variances in expression (9) we obtain:

$$Var(s_t) = \left[1 - \frac{\alpha}{\lambda(\varphi+\delta)}\right]^2 \phi^2 Var(\varepsilon_t) + \frac{1}{(\varphi+\delta)^2} Var(d_t) + \frac{\varphi^2}{(\varphi+\delta)^2} Var(\tau_t) \qquad (13)$$

As can be seen, the higher the size (variability) of shocks, the higher the variability induced on the exchange rate, and the bigger the difficulty to adopt a fixed exchange rate regime.

Since the coefficient of $Var(\varepsilon_t)$ is:

$$\frac{1}{(\varphi+\delta)^2} \frac{\left[(\varphi+\delta)-\alpha\right]^2}{\left(\lambda+\alpha^2\right)^2} \,, \qquad (14)$$

the relative impact of each type of shocks on the exchange rate depends on the value of the second fraction of this expression. Depending on whether this fraction is higher or lower than unity, the coefficient of $Var(\varepsilon_t)$ will be bigger or smaller that the coefficient of $Var(d_t)$.

In order to evaluate the costs for each country of adopting the euro, in the following section we will give empirical content to equations (11) and (12).

3. Shocks and social losses

3.1 Identification of shocks and responses to them

Equations (11) and (12) are too complex to draw a rapid and simple diagnosis about the exchange rate system that suits better any given country. To make them operative, we need to estimate the variances and covariances of both domestic and foreign supply shocks, and assign values to the incumbent parameters.

To extract demand and supply shocks in the Euro Zone and in NMS countries we proceed to estimate a Structural Vector Autorregressive model (SVAR) applying the methodology of Bayoumi (1992), and Bayoumi and Eichengreen (1993a), (1993b), in the frame of our neo-keynesian aggregate supply and aggregate demand model. A structural bi-variate VAR decomposition allows to identify supply and demand shocks from the observable movements of output and prices.

Since we want to concentrate on a period that is devoid of the structural effects inflicted by the transition process, our observed sample is relatively short. To overcome this difficulty and dispose of series long enough to estimate our SVAR we use monthly observations starting in 1997:01 or in the first month after the date from which data is available. In order to compare our results with the performance of some Mediterranean countries during a similar pre-EMU period, we also apply the same methodology to Spain and Portugal using data of the period 1987:01 to 1994:12. For the Med countries, the benchmark is Germany. The seasonally adjusted Industrial Production Index (IPI) approximates the output variable, and the Harmonised Consumer Price Index (HCPI) is taken as the price index. Both data come from the *Cronos data*-base of Eurostat, and the length of samples varies slightly from one country to another depending on the starting and ending months for which data was available. The sample periods are: Cyprus (1999:04-2004:10), Czech Republic (1998:03-2004:09), Estonia (1999:02-2004:10), Hungary (1998:02-2004:09), Latvia (1997:02-2004:10) Poland (1997:02-2004:09), Slovak Republic (1999:06 2004:10), Slovenia (1998:07-2004:10), Germany, Spain and Portugal (1987:01-1994:12) and Euro Zone (1997:09-2004:10). The Akaike and the Schwartz Bayesian criteria were applied to derive the appropriate lag length of the variables. In the majority of our estimations the optimal length was eight months.

Figures 1 and 2, presented in the Appendix, depict the derived demand and supply shocks for each of the NMS, Spain and Portugal. Demand and supply shocks of Germany and the Euro zone are also presented for comparative purposes. The main descriptive statistics are reported in Table 1. As can be seen, there are noticeable differences among the countries. As a general rule, compared with the reference zone, the candidate countries of both periods behave better (lower variances) in supply shocks and worst (higher variances) in demand shocks. Furthermore, the Med countries have lower variances than the NMS for both kinds of shocks.

A more accurate analysis of shocks similarities between countries can be carried out comparing correlation coefficients between individual NMS and the euro zone, for the same type of shock. Tables 2 and 3 show the results for demand and supply shocks respectively. Concerning demand shocks, the link between individual NMSs and the EZ is rather weak, given that correlations are very low or even negative. The highest values correspond to Poland (0.33) and Slovenia (0.27). Regarding supply shocks, the correlation between NMS and the euro zone, presents a better picture: the values are generally higher than for demand shocks. The best figures are exhibited by Slovenia (0,36), the Czech Republic (0,28) and Cyprus (0,19). The Slovak Republic (-0.08) and Latvia (-0,10), demonstrate negative correlations with the euro area.

Table 1: Descriptive statistics: Demand and Supply shocks

Demand Shocks

	Mean	*Variance*
EZ	0.040	0.059
Cyprus	-0.012	0.181
Czech Republic	0.200	0.133
Estonia	0.210	0.206
Hungary	0.064	0.198
Latvia	0.052	0.192
Poland	0.193	0.170
Slovak Republic	0.154	0.132
Slovenia	-0.106	0.244
Germany	0.010	0.002
Portugal	0.13	0.016
Spain	0.12	0.076

Supply Shocks

	Mean	*Variance*
EZ	0.075	0.052
Cyprus	0.065	0.080
Czech Republic	0.042	0.034
Estonia	0.010	0.031
Hungary	0.041	0.042
Latvia	0.100	0.048
Poland	0.027	0.044
Slovak Republic	0.028	0.041
Slovenia	0.100	0.048
Germany	-0.03	0.040
Portugal	-0.12	0.011
Spain	0.19	0.016

These differences in behaviour between the two groups of the NMS mainly respond to internal structural factors, economic specialisation, and/or to the degree of economic integration with the euro zone. Thus, whereas Slovenia, the Czech Republic and Hungary are well advanced in establishing a market economy and restructuring their industrial sector –with the help of foreign ownership or participations- other countries such as Latvia and the Slovak Republic lay behind in the transition process. Incomplete transition increases the risk of adverse supply shocks and magnifies the effects of shocks on the domestic economy.

Table 2: Correlation coefficients of Demand Shocks

	EZ	*Cyprus*	*Czech Republic*	*Estonia*	*Hungary*	*Latvia*	*Poland*	*Slovak Republic*	*Slovenia*
EZ	1	-0.239	0.106	0.048	0.175	0.076	0.333	0.123	0.269
Cyprus		1	-0.123	0.055	0.157	0.041	-0.239	0.101	0.207
Czech Republic			1	0.131	-0.073	0.129	-0.201	-0.112	-0.072
Estonia				1	0.161	0.102	0.049	-0.241	-0.104
Hungary					1	0.071	0.065	-0.075	0.102
Latvia						1	0.127	-0.206	-0.063
Poland							1	-0.048	0.097
Slovak Republic								1	0.147
Slovenia									1

Table 3: Correlation coefficients of Supply Shocks

	EZ	*Cyprus*	*Czech Republic*	*Estonia*	*Hungary*	*Latvia*	*Poland*	*Slovak Republic*	*Slovenia*
EZ	1	0.187	0.276	0.001	0.097	-0.101	0.058	-0.083	0.363
Cyprus		1	-0.203	0.040	-0.131	-0.155	-0.040	-0.184	-0.054
Czech Republic			1	-0.087	0.097	-0.083	-0.234	0.020	0.355
Estonia				1	0.320	0.185	0.319	0.396	0.260
Hungary					1		0.391	0.431	0.372
Latvia						1	0.489	0.149	-0.001
Poland							1	0.064	0.135
Slovak Republic								1	0.459
Slovenia									1

As far as the correlation coefficients among shocks identified within the group of NMS are concerned, some clusters may be discerned. With respect to the demand side, Slovenia, for instance, exhibits ties with Cyprus (0.21), the Slovak Republic (0.15) and Hungary (0,10). Regarding the supply side, Slovenia has noticeable links with The Slovak Republic (0,46), Hungary (0,37) and the Czech Republic (0,36).

Our results go in the same directions as previous findings reviewed in the introduction of this article, although with quantitatively lower correlation coefficients due the fact that our observations are monthly instead of quarterly, and that we focus on industrial production and not on GDP. Although the figures are not prone to EMU, we should not draw a hasty conclusion from them. In fact, the NMS are generally doing better than the two Med countries, which demonstrate negative correlations with respect to Germany in both demand and supply shocks.

To get a broader understanding of the consequences of shocks for the desired exchange rate system of a country or set of countries with respect to a more advanced economic area, it is important to investigate the way as different economies respond to the same type of shocks. If responses of output and prices, and/or their velocity of adjustment, are markedly different in each economy, even a symmetric shock may cause important disequilibria between countries and therefore call for flexibility in the exchange rate. For this reason it is important to analyse the dynamics of the adjustments in the NMS and in the euro area. To perform this analysis, we computed impulse-response functions for a positive one-unit demand and a positive one unit supply shock.

Tables 4 and 5 show the correlation coefficients of the output responses to demand and supply shocks, respectively, in the NMS countries and the euro area. The calculations reveal that whereas the output responses to demand shocks are poorly, or even negatively, correlated with the euro area, except for Cyprus, the responses to supply shocks exhibit very high positive correlations except for Slovenia. In any case, the synchronisation between the responses to supply shocks in the NMS and in the euro zone looks much better than between Portugal and Germany during the nineties.

Table 4: Correlation coefficients of Impulse Response Functions of Output response to Demand Shocks

	EZ	*Cyprus*	*Czech Republic*	*Estonia*	*Hungary*	*Latvia*	*Poland*	*Slovak Republic*	*Slovenia*
EZ	1	0.735	-0.249	-0.122	-0.136	0.167	-0.944	-0.185	0.398
Cyprus		1	0.022	0.219	0.359	0.543	-0.765	-0.316	-0.097
Czech Republic			1	0.944	0.819	0.830	0.313	0.065	-0.266
Estonia				1	0.911	0.921	0.192	-0.001	-0.370
Hungary					1	0.923	0.155	-0.017	-0.420
Latvia						1		-0.103	-0.302
Poland							1	0.127	-0.417
Slovak Republic								1	0.378
Slovenia									1

Overall, the degree of synchronisation between the NMS and the Euro area in the dynamic responses to shocks is higher than that of shocks themselves, especially in the supply side. Here, all of the NMSs show a better performance than Portugal.

Figures 3 and 4 in the Appendix show the response of output to demand and supply shocks, respectively. Figures 5 and 6 depict the responses of prices. They are in accordance with the basic theoretical assumptions of our model, except for Slovakia and Slovenia. As far as output responses are concerned, demand disturbances typically have a hump-shaped effect on output; the effect peaks after a variable number of months and vanishes after three or more years. In general, the effect of supply shocks on output increases steadily over time, to reach a peak after two years and a plateau after 40 months, except for Hungary where the increasing phase seems longer. Regarding price responses, it seems that they satisfy the 'over-identifying' restriction, in the sense that they are positive for demand shocks and negative for supply shocks.

Table 5: Correlation coefficients of Impulse Response Functions of Output response to Supply shocks

	EZ	*Cyprus*	*Czech Republic*	*Estonia*	*Hungary*	*Latvia*	*Poland*	*Slovak Republic*	*Slovenia*
EZ	1	0.929	0.778	0.980	0.912	0.974	0.929	0.480	0.053
Cyprus		1	0.964	0.932	0.872	0.951	0.883	-0.651	-0.261
Czech Republic			1	0.956	0.951	0.960	0.947	0.973	0.968
Estonia				1	0.950	0.984	0.966	-0.500	-0.028
Hungary					1		0.998	-0.414	-0.007
Latvia						1	0.911	-0.560	-0.095
Poland							1	-0.426	-0.007
Slovak Republic								1	0.430
Slovenia									1

3.2 Social losses

In order to compute social losses for the each NMS country, and for each exchange rate arrangement, we assign here numerical values to the parameters k_i, α_i, and λ_i. The calculus is carried out following the same procedure as Ca'Zorzi and De Santis (2003), and the results are reported in Table 6.

Our data are monthly, and come from *New Cronos* of Eurostat. Malta and Lithuania were excluded due to a lack of recent data for these countries. The period of analysis is not uniform across countries; it varies according to data availability, but in most cases ranges from 1997-01 till 2004-10. Therefore, it covers a phase that is devoid of the main transformations and structural reforms of the transition episode, which are not representative of the current situation. Taking averages over almost eigth years gives a representation of the supposedly starting equilibrium values.

The first column of Table 6 shows the average annual rate of real appreciation of the currency of each country with respect to the euro. We will assume that these rates reflect equilibrium changes responding not only (although mostly) to Balassa-Samuelson effect, but also to other real factors, such as industrial shifts between sectors. The expected real exchange-rate changes for the coming years are obtained by applying an autoregressive coefficient equal to 0.8 to the values of column 1, under the assumption that real exchange rate developments of these countries with respect to the euro area vanish as the catching up process goes ahead.

Table 6. The baseline scenario

	$\hat{q}_i$	*Rate of Output growth*	*Rate of Inflation*	k_i	*Inflation bias*	*α=0.31* λ_i	*α=0.62* λ_i	*α=1.24* λ_i
Cyprus	-1.24	3.30	3.22	0.5	1.72	1.16	2.18	4.25
Czech Republic	-4.11	2.98	2.46	1.1	0.96	0.28	0.55	1.09
Estonia	-2.90	6.48	3.22	0.9	1.82	0.85	1.70	3.40
Hungary	-4.21	3.88	6.98	0.8	5.48	2.73	4.77	8.99
Latvia	-4.12	7.26	3.36	1.4	1.86	0.43	0.84	1.67
Poland	-3.72	3.20	4.30	1.4	2.80	0.66	1.28	2.52
Slovak Republic	-3.41	3.86	7.38	1.3	5.88	1.64	3.02	5.82
Slovenia	-1.12	3.28	6.80	0.5	5.30	4.99	7.93	14.37

The second and third columns display the average output growth and inflation rate of the NMS over the indicated sample. We will consider that these two sets of values correspond to the initial equilibrium rate of potential output growth and inflation, respectively. The forth column shows the value of k which, as explained above, measures the internal market distortions of each country that matters for monetary policy, and is computed in the same manner as in Ca'Zorzi and De Santis (2003). First, we assume that the index of market distortions that lead the authorities to desire an extra natural output, *DNO*, may be approximated by the gap between the rate of growth, which would bring about a rapid convergence with the euro area, and the trend growth presented in column two. Also we define rapid growth as the rate necessary to catch up by 20 percent per capita GDP with respect to per capita GDP of the euro area in the next ten years[8]. Second, we assume that $k = 0.5DNO$.

The fifth column shows the inflation bias obtained as the difference between the equilibrium inflation rate and the inflation rate that would prevail in the case of no distortions. We will assume that the latter is 1.5 percent for each NMS as well as for the euro zone.

In the sixth column we have computed the weight attached to output stabilisation (λ) for three possible slopes of the aggregate supply. Recent empirical studies for the euro zone point out that, for a horizon between two and three years after the shock it seems reasonable to assume that the slope of the

[8] This assumption implies that in the absence of distortions, the poorer countries would grow faster in order to achieve convergence in GDP per capita with the euro area, and consequently this is in accordance with the general statement of the β-convergence theory.

aggregate supply is α = 1/1.6, indicating that output is more responsive than prices along this horizon in the euro area[9]. Since no comparable evidence exists for the NMS, we decided -as Ca'Zorzi and De Santis (2003)- to conduct a sensitivity analysis by considering three alternative values for the aggregate supply slope: the same value as in the euro area (α = 0.62), twice this value (α = 1.24) and half (α = 0.31). For each of these values, λ can be derived endogenously –for countries having a flexible exchange rate regime- from the expression corresponding to the inflation bias in formula (6). Thus,

$$\lambda = \frac{I\alpha^2}{\alpha k - I(1-\beta)},$$ where I is the inflation bias.

For Estonia we have applied an alternative methodology to obtain the value of λ since the exchange rate regime of this country has been a currency board. In that case, we have computed the value of this parameter by tacking the relative variance between output and inflation during the sample period.

According to the above expression, the larger the internal distortions, the more conservative (lower value of λ) the central banker needs to be to obtain a certain inflation rate. It also indicates that, all other things constant, higher inflation biases are associated with central bankers more concerned about stabilising output (higher value of λ). Thus, the high values of λ in Hungary, Slovenia, and Slovak Republic can be attributed partly to high levels of the inflation bias, and partly to the fact that real shocks affecting output have been very variable in these three countries.

In order to compute social losses for each NMS country and for each exchange rate regime, we introduce the values of parameters from table 6, and the values of variances and covariances of supply shocks obtained from our estimated structural VAR, into the formulas (11) and (12). We assume $\alpha_f = 0.62$ and $\lambda_f = 0.6$, in accordance to some recent estimates in the empirical literature. We consider that the parameter β equals 0.99. This discount value is compatible with a real rate of interest of 1 percent. The results are presented in table 7 for the three slopes assigned to domestic aggregate supplies[10].

[9] See Ca'Zorzi and De Santis (2003), p. 25, and the references cited there.
[10] We made similar calculations with β equal to 0.98, and obtained almost the same assignment of exchange rate regimes to each NMS. The results are available upon request.

Table 7. Social losses

Country	*Exchange rate system*	*Scenario 1*	*Scenario2*	*Scenario3*
Cyprus	Flexible Ex. Rate	**61.20**	**54.54**	**62.65**
	Currency Board	137.82	107.83	119.92
Czech Republic	Flexible Ex. Rate	**37.66**	**44.05**	**59.03**
	Currency Board	86.56	108.64	168.82
Estonia	Flexible Ex. Rate	163.78	201.09	323.03
	Currency Board	**132.23**	**161.41**	**210.67**
Hungary	Flexible Ex. Rate	457.22	678.96	812.05
	Currency Board	**257.22**	**425.56**	**648.68**
Latvia	Flexible Ex. Rate	**107.92**	**123.25**	165.90
	Currency Board	142.30	125.87	**117.99**
Poland	Flexible Ex. Rate	**208.83**	**250.28**	**301.57**
	Currency Board	210.24	306.45	537.39
Slovak. Republic	Flexible Ex. Rate	719.16	868.64	**1041.78**
	Currency Board	**430.77**	**598.13**	1042.20
Slovenia	Flexible Ex. Rate	417.9	558.62	681.26
	Currency Board	**228.98**	**378.04**	**458.11**

As can be seen, the results are robust to different values of aggregate supply slopes in each country. The optimal exchange rate arrangement appears very clear-cut for each country independently of the scenario assumed, except for Latvia and the Slovak Republic where the solution might be different for a very steep aggregate supply (scenario 3). For Cyprus, Poland and the Czech Republic the best choice is a flexible exchange rate regime, while for Hungary, Slovenia and Estonia the best solution seems the currency board with respect to the euro. In the case of Latvia, the flexible exchange rate is advised for scenarios where the aggregate supply is not very flat. The opposite situation is observed in the Slovak Republic, where the most general solution is a currency board.

4. Exchange rate variability

The other side of the empirical analysis conducted in this paper consists of evaluating the utility of the exchange rte as shock absorber. The more the nominal exchange rate needs to adjust as a consequence of external shocks, the more useful will be for a country to maintain flexibility in the exchange rate. In principle, the computation of this variability could be preformed with the help of equation (13). However, to make this equation operative, we need the values of two additional parameters for each country, namely the elasticities of demand for domestic goods with respect to the real interest rate (φ), and with respect to the real exchange rate (δ), respectively. Since there are no available data –or estimated values- for each of the countries concerned, we decided to carry out a related analysis based on the variability of the real exchange rate. According to this criterion, rooted in Vaubel (1976, 1978), the degree of real exchange rate variability that a country is experiencing at present is a good measure of its capability and desirability to join a currency area. The rationale is that, since prices and/or nominal wages are sticky in the short run, the adjustment of the RER, needed to accommodate external real shocks, may be accomplished, in an easier and less costly way, through variations in the nominal exchange rate. Consequently, the higher the variability of the RER, the more useful will be the nominal exchange rate to stabilise the economy.

In this section we compute bilateral nominal and real exchange rate variability for the NEM and for the three Med countries, following the methodology of Gros and Hobza (2003). The nominal and real exchange rates of the candidate countries are calculated vis-á-vis the euro. In the case of Greece, Portugal and Spain, the DM is used as the standard. The variability is computed for the RER and also for each of its components, which are the NER and the bilateral index of domestic/foreign prices. We measure the variability each year by the standard deviation of twelve monthly changes in the natural logarithm of the bilateral exchange rates and relative prices, and then we compute the average of the annual values of the period 1997-2004 (1987-1994 for the Med countries). This methodology allows us to extract the exchange rate variability which is essentially caused by real factors.

The results are presented in Table 8. The three columns of the table indicate the variability of the RER, NER and of relative prices, respectively. Inspection of those values permits to draw the following features:

a) There is a high correlation between nominal and real exchange rate variability. In Table 9 we report the correlation between variations in the nominal exchange rate and in the real exchange rates, on the one hand, and between exchange rate variations (nominal and real) and relative prices. The figures of column 1 indicate that, in general, there is an important co-movement between RER and NER, except for Estonia as a result of the fixity imposed to the nominal exchange rate of this country. The very low or negative correlations presented in column 3 reveal that nominal exchange rates and relative prices are disconnected because they are essentially substitutes in adjusting the RER.

b) The variability of both nominal and real exchange rates is relatively low in the members of the Med club, despite to the fact that the observed period for this countries includes the turbulences created by the EMS crisis during the first part of the 1990s. The exchange rate of the Spanish peseta exhibits an astonishing low nominal variability.

c) Among the NMS, Cyprus, Estonia and Slovenia have already now achieved a level of real and nominal exchange rate variability that is almost the same as that of the three Med countries during the nineties[11]. In fact, these six countries compose a very differentiated group in Figs 5 and 6, with variabilities that are markedly small and near to each other. The RER variability of Slovenia is even lower than that of the club Med.

d) For half of the NMS countries (Poland, the Czech Republic, Latvia and Estonia) the variability of the RER is bigger than that of the NER, and the converse is true for the rest of the NMS. However, for the group as a whole, it is apparent that an increase in the variability of RER goes with an smaller increase in the variability of NER. It seems then that, for those countries, exchange rates behave more as shock absorbers than originators of shocks.

e) The variability if the relative price levels is much lower than that of either nominal or real exchange rates, except for Estonia, as expected given the exchange rate system of this country. This means that, in the short run, adjustments of the RER are almost accomplished through NER variability. In other words, in the face of shocks, the required RER adjustment is obtained by the way of NER adjustment.

Figures 7 and 8, also shown in the Appendix, plot the relative (compared to the euro area) variability of demand and supply shocks of the NMS against the variability of the RER of the same countries. According to the slope of the adjusted line, an increase in the relative variability of demand shocks has a higher impact on the RER variability than an increase in the relative variability of supply shocks. This result confirms the predictions of our theoretical model derived from equations (13) and (14). Furthermore, in Slovenia, Cyprus and Estonia, the two kind of shocks have a much lower effect on RER variability than in the rest of the NMS countries, which is also in line with the other results explained above.

[11] The variability of the nominal exchange rate of Estonia was very low but not zero, as should be the case for a fixed exchange rate arrangement, because, along some years of the sample, its currency board was linked to the DM and not to the euro.

Table 8. Exchange rate and relative prices variability

	RER	NER	Relative prices
Cyprus	1.20	1.81	1.36
Czech Republic	6.08	5.36	1.76
Estonia	1.46	0.32	1.46
Hungary	4.39	6.43	2.50
Latvia	7.65	7.18	1.32
Poland	10.54	8.29	4.17
Slovak Republic	4.71	5.23	2.57
Slovenia	0.87	1.28	1.07
Greece	1.22	1.08	0.75
Portugal	1.88	1.57	1.43
Spain	1.39	0.49	0.12

Table 9. Correlation between changes in exchange rates and relative prices

	(RER, NER)	(NER, Relative prices)	(Relative prices, NER)
Cyprus	0.57	0.88	0.11
Czech Republic	0.96	0.51	0.25
Estonia	0.00	1.00	0.00
Hungary	0.86	0.09	-0.43
Latvia	0.98	0.26	0.09
Poland	0.92	0.60	0.25
Slovak Republic	0.85	0.31	0.76
Slovenia	0.56	0.14	-0.74
Greece	0,67	0.58	-021
Portugal	0.79	0.48	-0.16
Spain	0.93	0.38	0.02

Table 10 reports the countries selected to join the euro quickly according to the two main groups of tests we have performed in this work. The first row indicates the countries for which adopting the euro provides a social loss clearly lower than that caused by a flexible exchange rate, and the second row includes the countries having the lowest variability in the RER with respect to the euro area. The NMS that match very well both criteria are Estonia and Slovenia.

Table 10. The NMS best prepared for EMU

	Cyprus	Estonia	Hungary	Slovak Rep.	Slovenia
Currency board provides lower social losses		X	X	X	X
Low RER variability	X	X			X

5. Conclusions

In this article we have analysed the extent to which the NMS are prepared to adopt the euro. We have applied two complementary criteria in order to quantify the results: the first one consists of calculating the social losses involved in the process, as opposed to maintaining flexibility in the exchange rate, and the second one lies in measuring real and nominal exchange rate variability in each country with respect to the whole euro area during the sample period, and comparing it to that –with the same length- experienced during the eighties and nineties by some current Mediterranean members of the euro area.

As far as the first methodology is concerned, we believe that calculating social losses using relationships derived from a theoretical model is a more comprehensive methodology than simply assessing the degree of business cycles symmetry, as commonly done in the incumbent literature, for at least three reasons: a) the calculus of social losses requires knowing not only the covariances of shocks but also their size; this, in turn, permits the evaluation of both the costs of adopting a common currency and the advantages of retaining flexibility in the exchange rate, which is a feature frequently forgotten in the related literature; b) this methodology takes into consideration the structural characteristics of each country; c) finally, it allows discerning the relative importance of demand and supply shocks as determinants of exchange rate variability, which is a controversial issue in many recent contributions.

As part of this methodology, our analysis of covariances of shocks and co-movements of responses to them are, at first sight, not very encouraging, as usually found in many other empirical works. In fact, most countries exhibit very low, or even negative covariances, especially in the demand side. However, this should not be a source of concern as the NMS are now performing better -in this respect- than

Portugal and Spain during the eighties and nineties. Furthermore, since cyclical correlation of shocks is endogenous to some extent, we should expect the common currency to bring about higher synchronisation after joining EMU. As shown by Frankel and Rose (1997, 1998), the presence of a common currency raises openness and trade, which, in turn leads to higher business cycles correlation.

Our calculus of social losses indicates that the leading countries for joining the EMU are Estonia, Slovenia, and Hungary. This result is consistent and very clear-cut for all of the three scenarios we have considered, and for two different but credible values of the discount factor. A fixed exchange rate with respect to the euro is also the system advised for the Slovak Republic, except for the case where the aggregate supply of this country is very flat. For the other NMS, the flexibility in the exchange rate offers lower social costs under the current circumstances[12].

As indicated above, our model permits to clarify the impact of demand and supply shocks on exchange rate variability from a theoretical point of view. However, since the parameters of some multipliers are unknown, the empirical application to obtain this effect from our theoretical model seems unfeasible. This is the reason why we have chosen to analyse the variability of the real exchange rate regardless of the disturbances that cause it, and to provide only indirect evidence of the contribution of each kind of shocks to that variability. This is our second empirical methodology. We obtain that the real and nominal exchange rates of the currencies in Cyprus, Estonia and Slovenia, behave same way as the ones of Greece, Portugal and Spain during the 1980s and 1990s, which were found ready to join the euro as part of the initial group. However, the RER of the remaining NMS countries behave very differently, that is, with much higher variability, indicating that they still need flexibility in exchange rate to dampen external shocks.

Putting together the results of the two kinds of tests, we realise that there are two countries that simultaneously meet both criteria, Estonia and Slovenia. Consequently, they are advised to adopt the euro as soon as possible. In fact, they have already taken the first necessary step in this process, namely its participation in the ERM2. Both countries joined this system on June 30, 2004 although with a different exchange rate strategy. Estonia maintained its currency board with respect to the euro, the system in force in this country since 1992. Slovenia followed the more conventional way of defining a central parity protected by two wide bands around the euro (± 15%). Our prescription for Slovenia goes along the analysis of Bulíř and Smídková (2005), who obtained that the exchange rate of this country, with respect to the euro, is essentially in equilibrium since the beginning of the 2000s[13].

Our empirical evidence indicates that Cyprus, Hungary and the Slovak Republic lag behind Estonia and Slovenia because they do not satisfy one of our empirical test. For one reason or another, they probably still need the flexibility in the exchange rate to cushion external real shocks. The other countries are even further away in the process.

[13] These authors also find that the Hungarian forint, and the Polish zloty should undergo certain devaluation, in order to bring their central parity with respect to the euro close to equilibrium before entering the ERM2. They do not analyse the case of Estonia.

Some analysts, such as Buiter and Grafe (2002) disregard this kind of analysis based on the structural characteristics of countries, and rely instead heavily on the endogeneity argument to recommend the immediate adoption of the euro to all the candidate countries. However, endogeneity effects take a long time to manifest, as the convergence process is very slow even in the frame of EMU[14]. In the meantime, most of the NMS –especially those for which we suggest a lower speed- are exposed to important asymmetric shocks. Consequently, we believe, in the same line as Frankel (2005), that a wise strategy for the NMS countries –except for Estonia and Slovenia- would be waiting four or five years before embarking in the EMU venture.

[14] Camacho et al (2004) found that the degree of synchronisation that the euro countries have achieved during the EMU years is not higher than obtained in some periods of the recent history.

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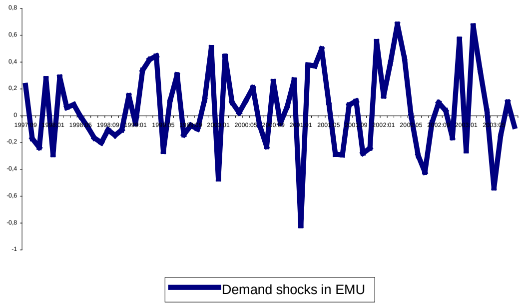
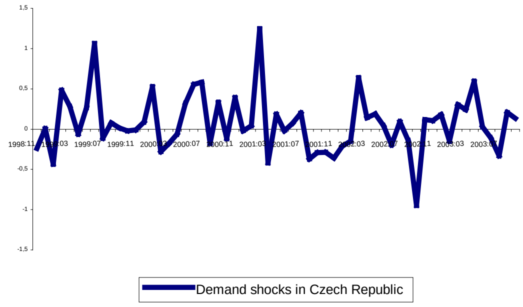
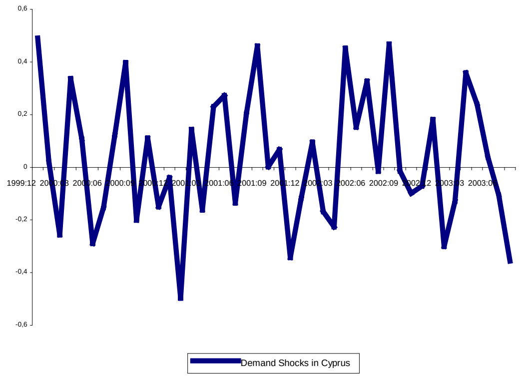
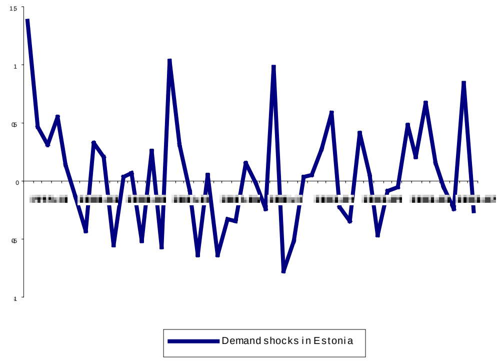
APPENDIX

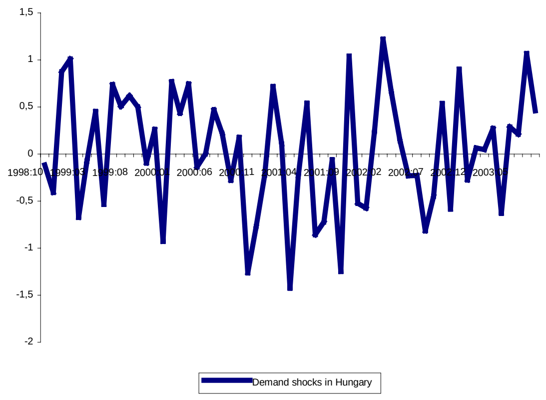
Figure 1: Demand Shocks in EMU, NME, Spain and Portugal

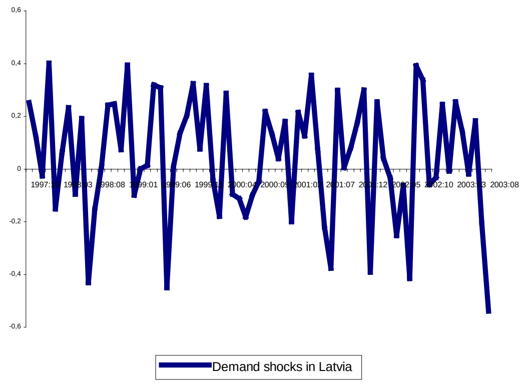




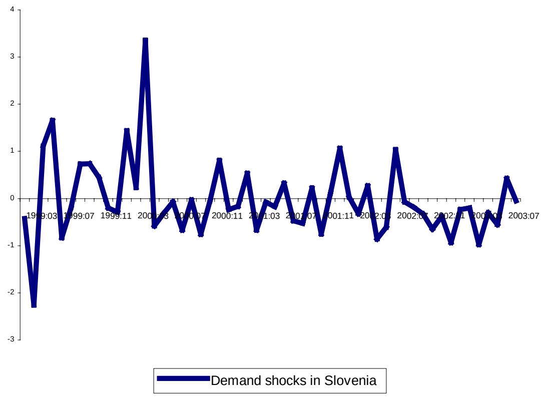


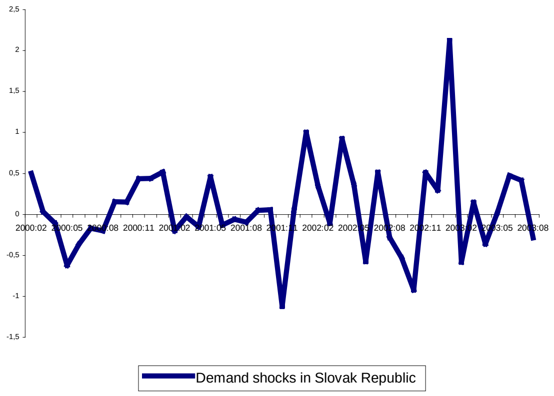


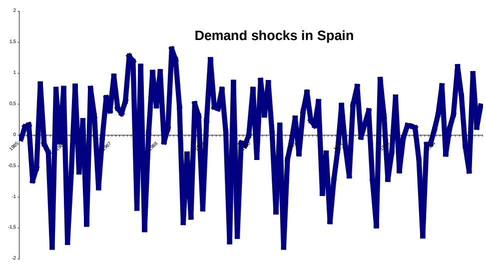





Demand shocks in Poland


Demand shocks in Slovenia


Demand shocks in Slovak Republic


Demand shocks in Spain

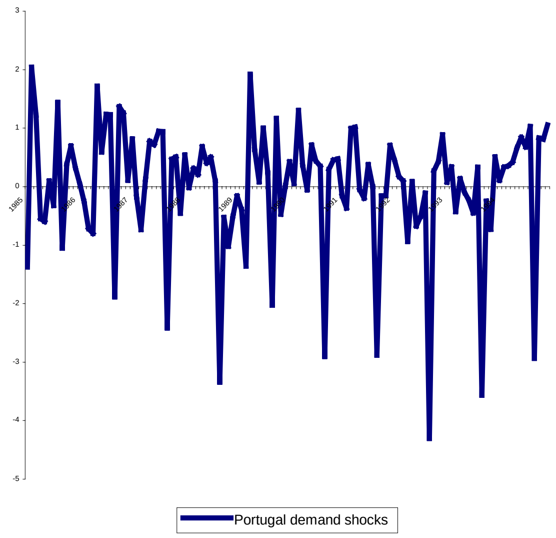
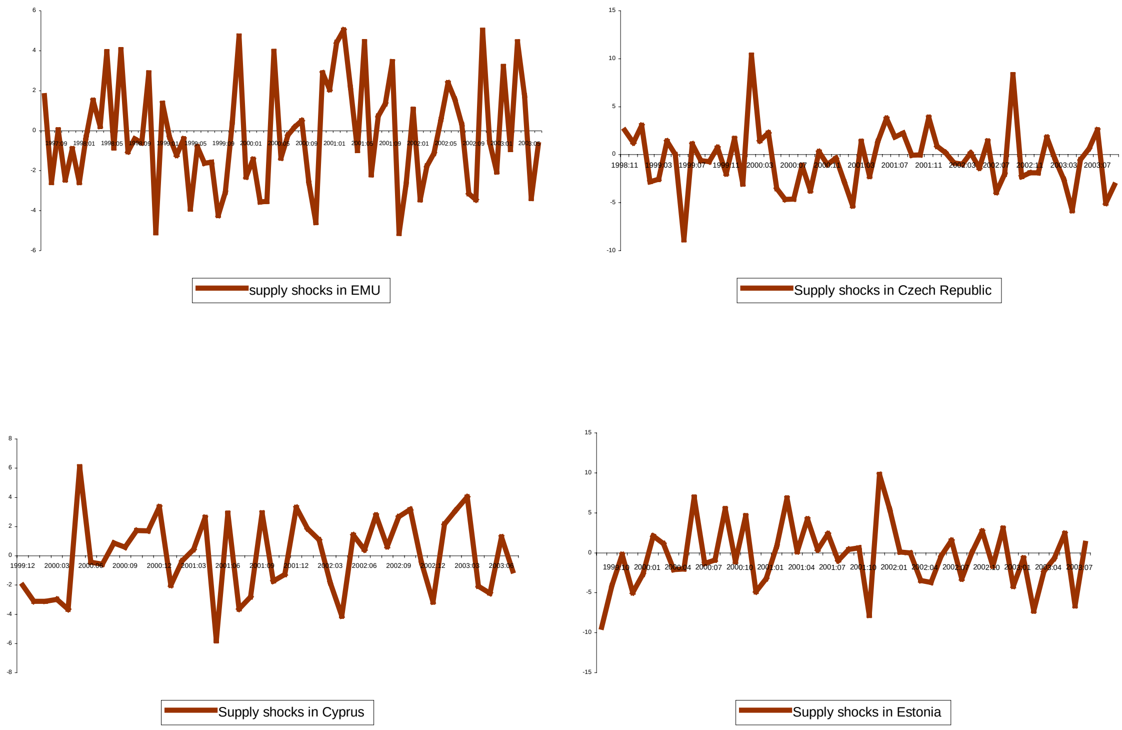
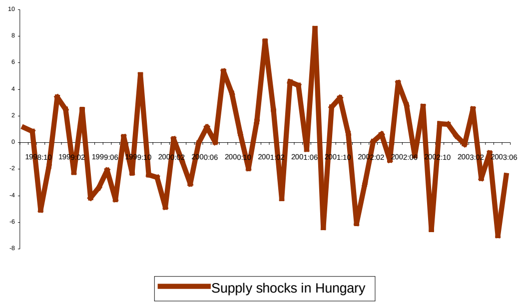
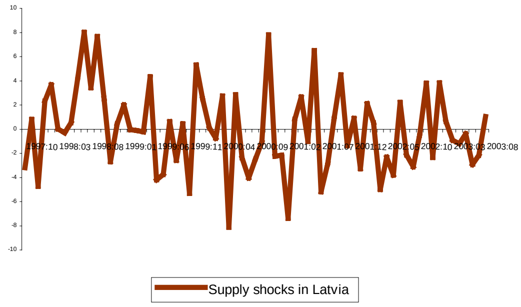

Portugal demand shocks

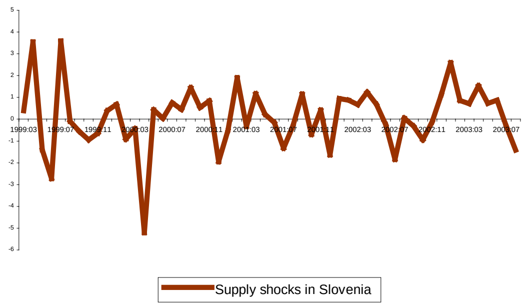
Figure 2: Supply Shocks in EMU, NME , Spain and Portugal

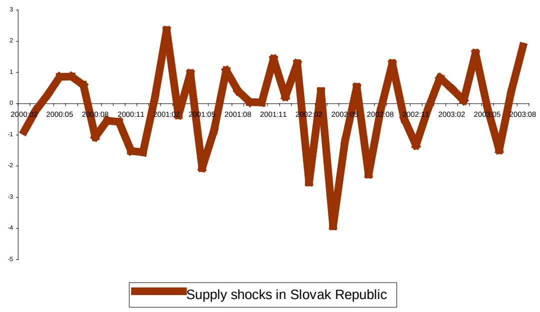


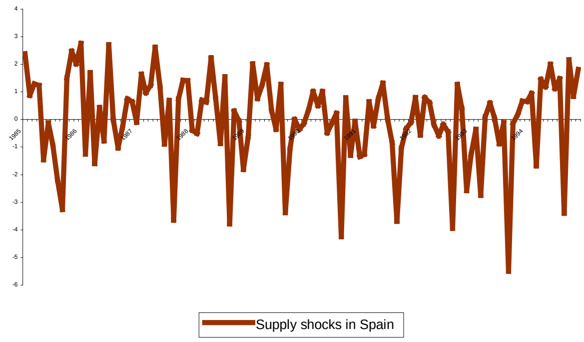

Supply shocks in Hungary


Supply shocks in Poland


Supply shocks in Latvia


Supply shocks in Slovenia


Supply shocks in Slovak Republic


Supply shocks in Spain

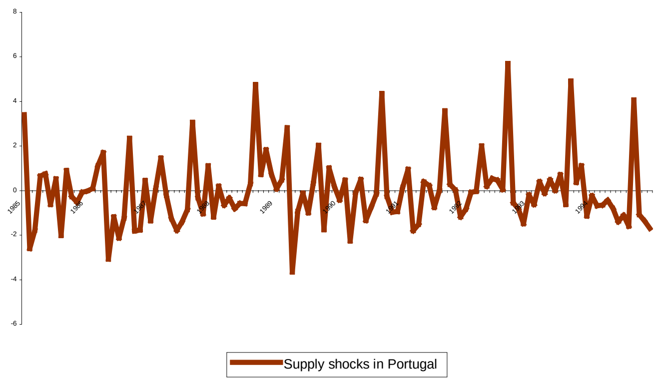

Supply shocks in Portugal

Figure 3A: Impulse Response function: Output response to a demand shock

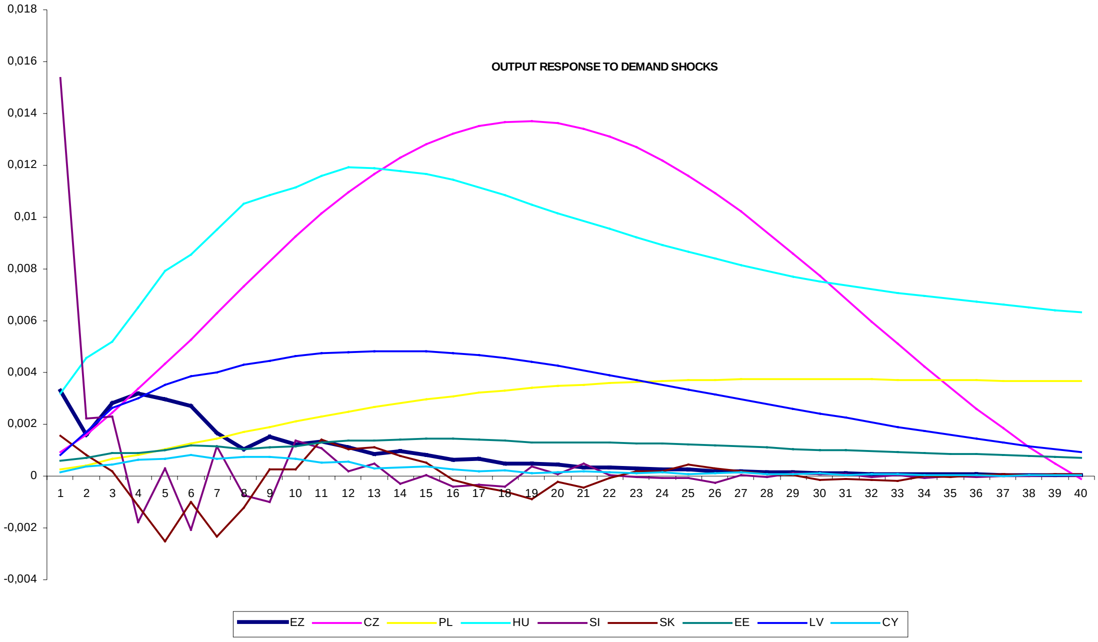


Figure 3B: Impulse Response function: Output response to a supply shock

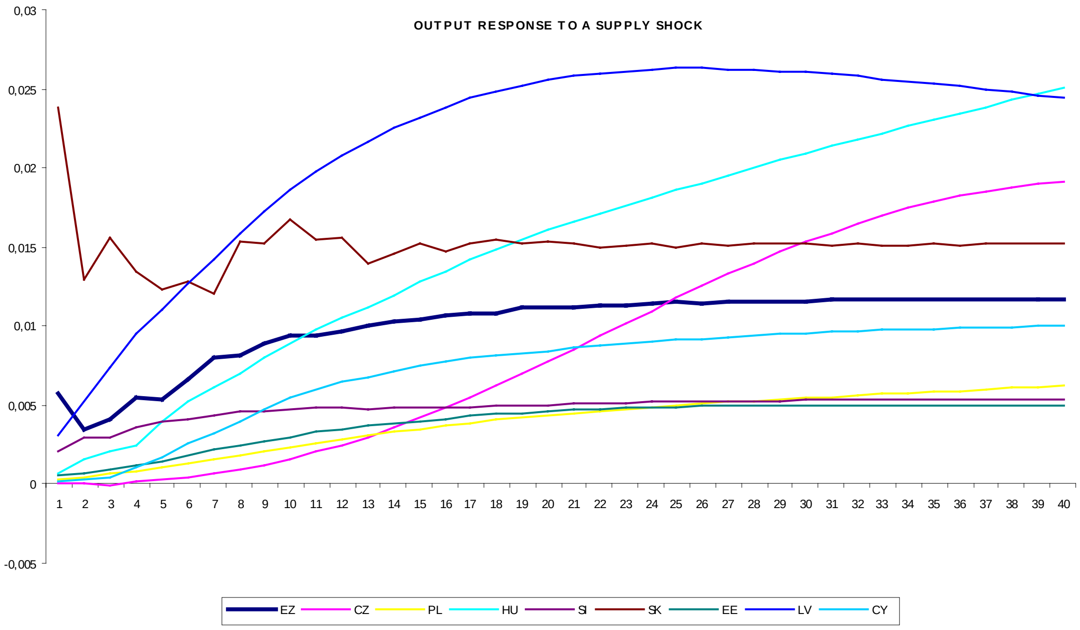


Figure 4A: Impulse Response function: Price response to a demand shock

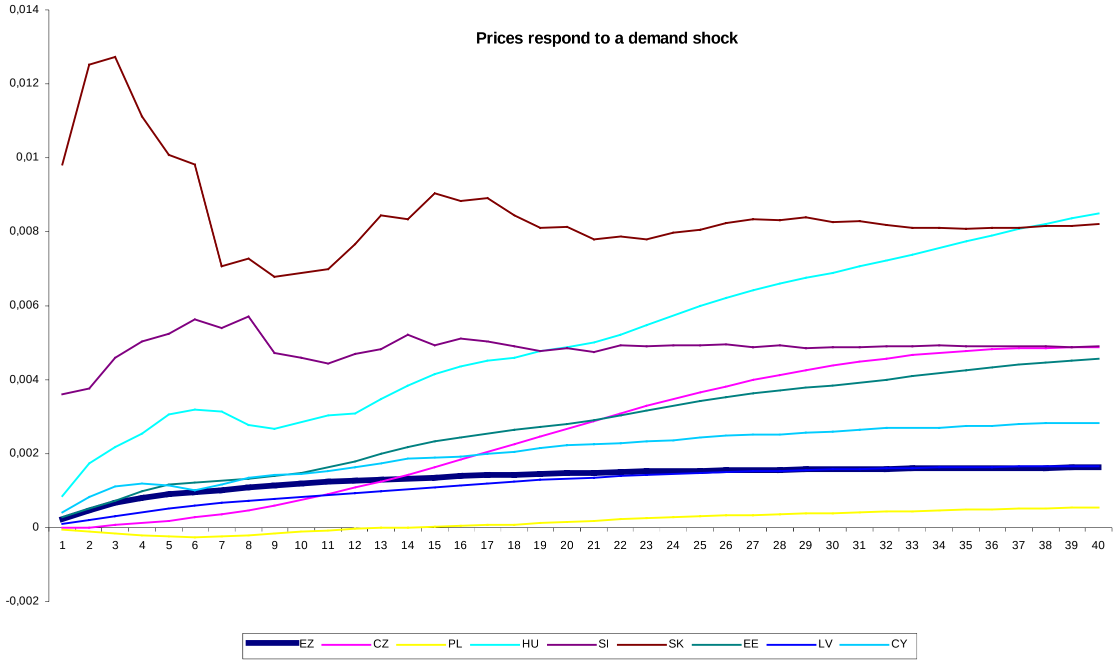


Figure 4B: Impulse Response function: Price response to a supply shock

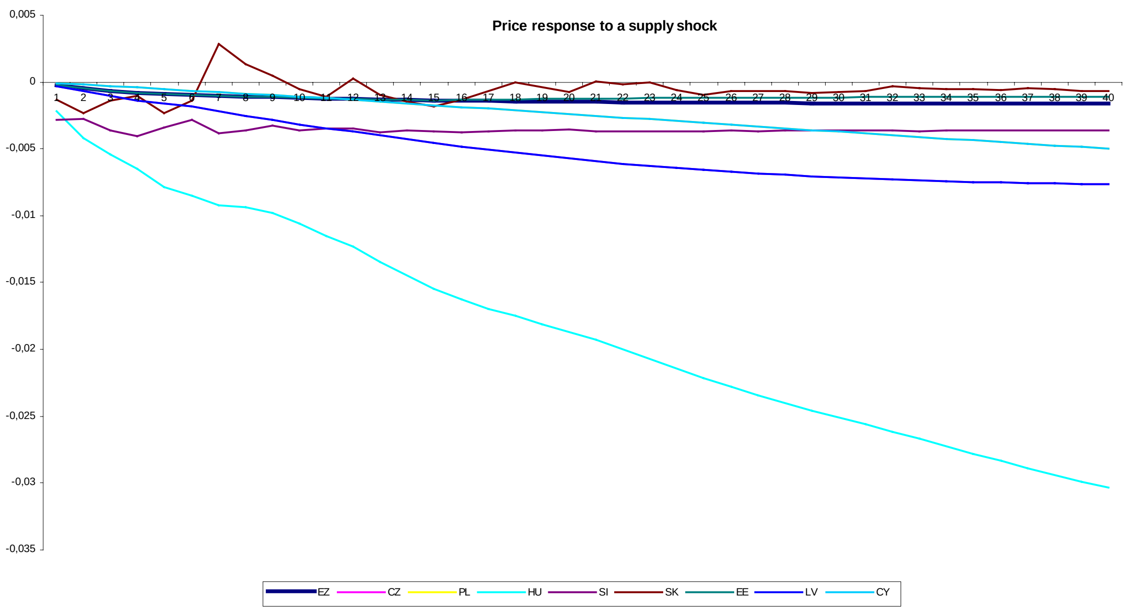


Figure 5: Bilateral exchange rate variability

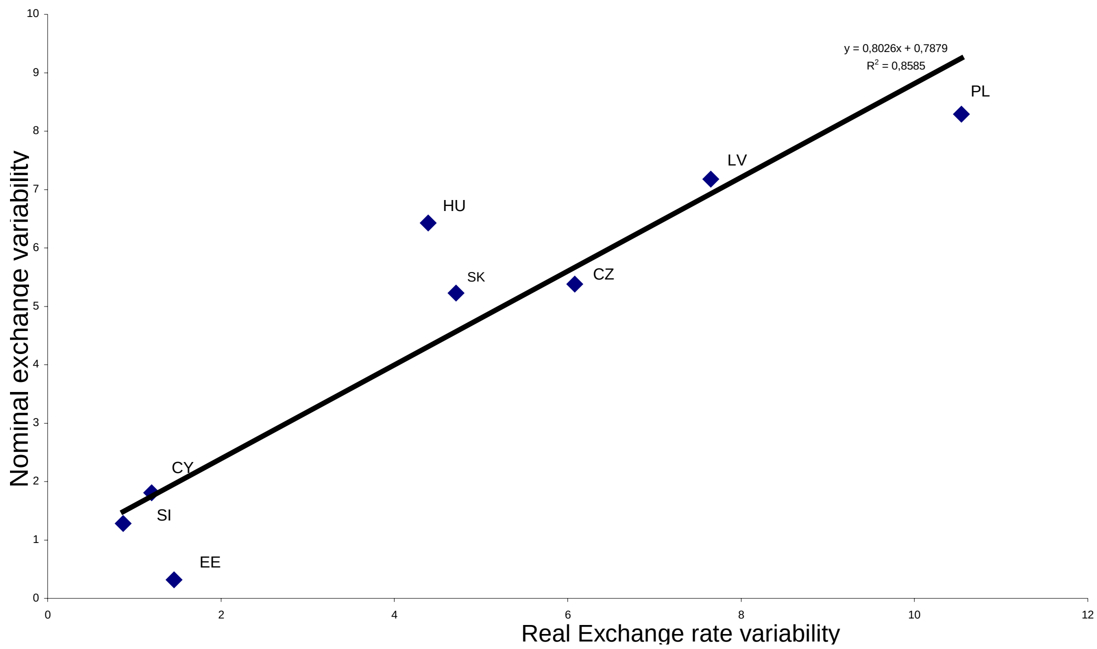


Figure 6: Bilateral exchange rate variability (Spain and Portugal included)

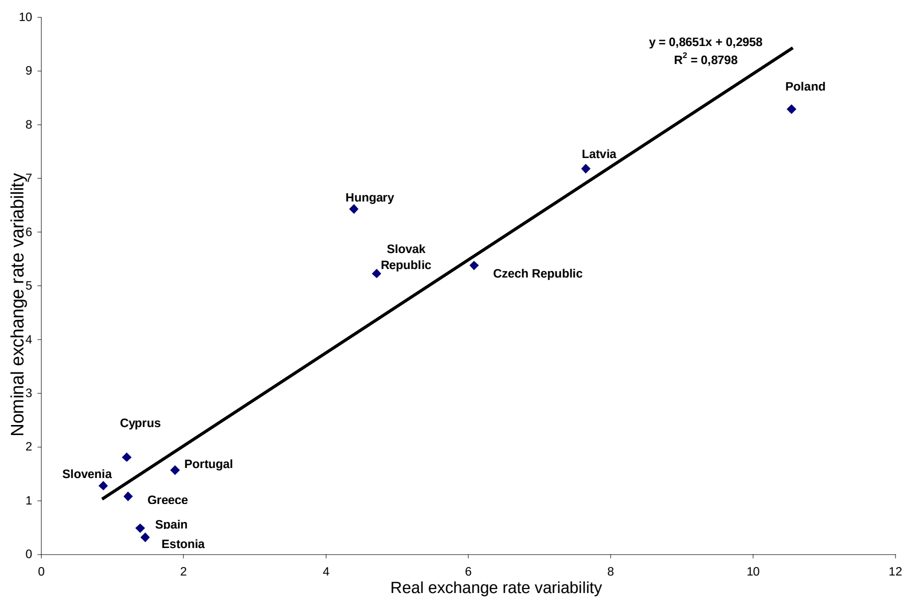


Figure 7: Relative dispersión of demand shocks with respect to Euro-Area and RER variability

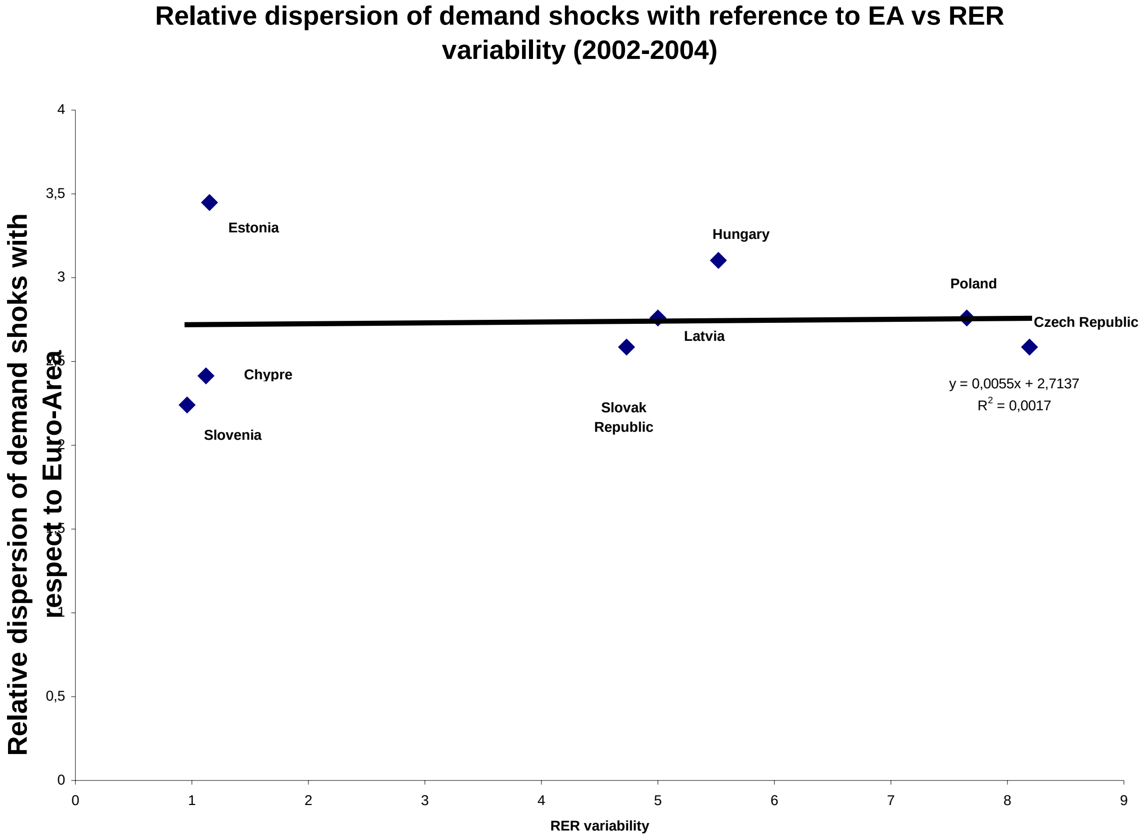


Figure 8: Relative dispersión of supply shocks with respect to Euro-Area and RER variability