BEYOND THE BALASSA-SAMUELSON EFFECT IN SOME NEW MEMBER STATES OF THE EUROPEAN UNION

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Abstract

This paper analyses the Balassa and Samuelson hypothesis in two groups of European countries: six New Member States (NMS) and six advanced EU-15 economies. It is found that the second stage of the hypothesis, which relates relative sector prices with the real exchange rate, does not hold anywhere. In the NMS the main reasons are increased demand for domestic tradables stemming from positive differentials in economic growth, probably coupled with quality improvements in domestic tradable goods. In the EU-15, the explanatory factor is segmentation between national markets of tradables, caused by transportation costs, non-tariff barriers and imperfect competition between firms.

JEL Code: E31, F31, C15.

Keywords: Balassa-Samuelson effect, panel cointegration, economic transition, market segmentation, quality bias.

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1. Introduction[♥]

The currencies of the Central and Eastern European (CEE) countries have experienced strong and persistent real appreciations against those of the EU countries since the beginning of the 1990s. Graph 1 shows this phenomenon for six CEE countries that have recently joined the EU, on which we focus our analysis. As can be seen, the appreciating trend exists for the two real exchange rates, RER(C) and RER(D), that we obtain by deflating the nominal exchange rate of each country against Germany with national consumer price indexes and internal demand deflators, respectively. The accumulated appreciation in the RER(C), along the period 1995-I to 2004-III, goes from 25.2 % in the Czech Republic to 58.6% in Lithuania. Real exchange rate (RER) appreciations of this nature are usually considered stylised facts of transition economies and of countries involved in catching-up processes[1]. However, in the particular case of the CEE economies, this phenomenon acquires a new dimension as these countries have committed themselves to eventually adopting the euro. In fact, if variations in the RER are persistently above the equilibrium level, they will not only widen the current account deficits that these countries are presently running - making them not sustainable in the medium term – but will also make the Maastricht criteria more difficult to satisfy.

To assess the extent to which RER appreciations in CEE countries are the outcome of equilibrium, many works have tried to quantify the contribution of the Balassa and Samuelson (BS) effect to these real appreciations. As is well known, the BS hypothesis explains the appreciating trends in the RER as a result of relative productivity improvements in the tradable sector (with respect to the non-tradable one) of a specific country as opposed to another country or zone. If the BS effect is important, either because of the efficient use of the existing resources or because of the adoption of new technologies, RER appreciation will not cause macroeconomic problems.

Although the presence of BS effects is confirmed in most empirical studies[2], some recent estimations – particularly Égert (2002b), Mihaljek (2002), Kovacs (2002), Flek, Marková and Podpiera (2002), Mihaljek and Klau (2003), Blaszkierwicz et al. (2004) and Cincibuch and Podpiera (2004) - detect lower BS impacts (although always statistically significant) than the analysis performed during the first half of the 1990's.

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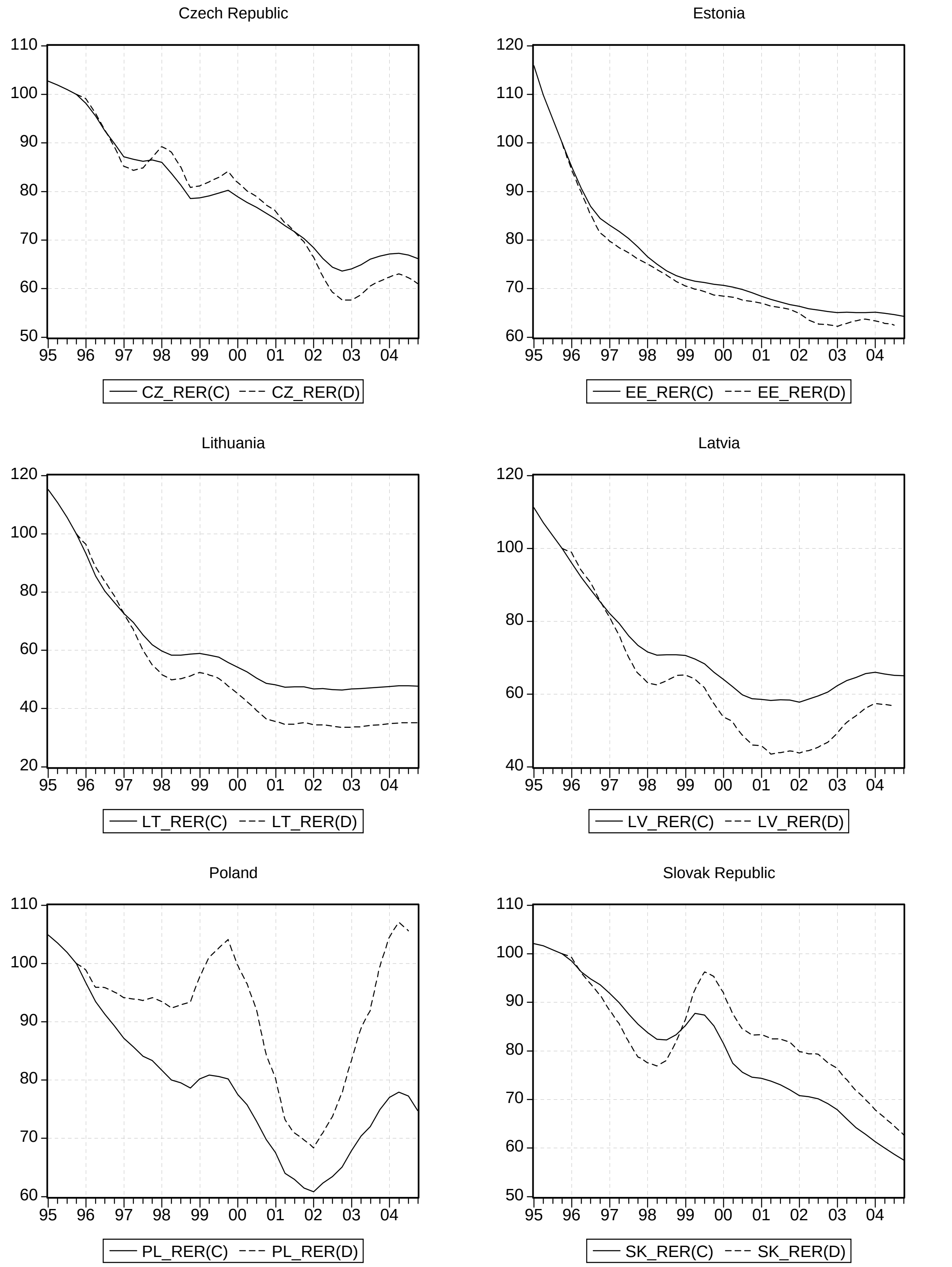
[1] See, for instance, Halpern and Wyplosz (1997), Krajnyak and Zettelmeyer (1998), Cincibuch and Vvra (2001) and Kovaks (2003). Halpern and Wyplosz (1997) consider that this feature exists in transition countries irrespective of their exchange rate regime. They stressed that the rate of equilibrium appreciation is higher the more complete the market system is and the faster capital is accumulated. Bulir and Smidkova (2005) found this common characteristic in four CEE countries with flexible exchange rate. In the annual Report on the economic transition of the CEE countries, the European Bank for Economic Development extends this feature also to Romania and Bulgaria.

[2] See, for instance, the surveys by Breuss (2003) and Blaszkiewicz et al. (2004)

Graph 1
Real exchange rates (RER(C) y RER(D)) of six New Member States of the EU with respect to Germany 1995-I - 2004-III



RER(C) : Real exchange rate calculated with CPI indices.
RER(D) : Real exchange rate calculated with internal demand deflators.

In accordance with the European Commission (2002), the higher values obtained in the earlier empirical analysis of the BS effect could be attributed to some institutional influences of the transition period. This implies that, in the post-transition period, there are other determinants playing an important role in RER appreciations of CEE countries.

The main purpose of this paper is to assess the influence of the BS effect and other factors on the appreciating trend in the RER of the CEE countries during the last ten years, in order to ascertain to which degree these RER appreciations are an outcome of equilibrium. Our analysis focuses on six CEE countries that have recently joined the EU, for which homogeneous and harmonised data is available on quarterly basis: the Czech Republic, Estonia, Lithuania, Latvia, Poland and Slovak Republic. In order to evaluate the extent to which our results depend on the nature of the CEE countries included in the sample, we apply the same analysis to a group of six old members of the EU with a high degree of economic development and not affected by transition restructuring, and compare the results obtained in the two scenarios. The group of developed countries comprises Finland, France, Italy, Holland, Spain and Sweden.

In the empirical part of this paper, we follow a two-steps strategy. In the first one, we start by testing the BS model in two phases, and showing that whereas the first phase, which links productivity developments with internal relative prices, is clearly supported by the data in both groups of countries, the second phase, which relates inter-country productivities with RER developments, does not hold anywhere. The reason is that PPP estimated with prices of tradable goods (hereafter PPP(T)), fails in both areas, although for very different reasons in each case. For the CEE area, the reason is that the RER constructed with tradable prices follows an appreciating trend mainly caused by increasing stimulus in the demand for – clearly differentiated - domestic tradables. In the group of developed EU countries, PPP(T) is not satisfied because national markets of tradable goods remain segmented.

In the second step of our empirical analysis, we check for proxies of demand pressures and quality improvements in the tradable sector of CEE economies, and use them as additional determinants of the RER in CEE countries. Through an estimation of the enlarged BS model, the effects of both the productivity differential and the increased demand for tradables on the RER can be quantified. All in all, we find that the demand stimulus – fuelled by higher economic growth -, probably coupled with improvements in the quality of domestic tradables, are as much important as the productivity differential in explaining the remarkable appreciating tendency in the RER of the CEE countries during the last ten years.

The remaining of this paper is organised as follows. Section 2 presents the theoretical framework. In section 3 the fundamental variables are elaborated, and the fulfilment of the BS hypothesis is analysed in a descriptive way. Section 4 presents the results of our econometric analysis. Finally, section 5 summarises the main results and draws some policy prescriptions.

2. Theoretical framework

2.1 The Balassa and Samuelson model

Under the usual assumptions of the BS hypothesis, and considering two countries in the analysis, it is easy to derive the **first part of the BS model**, which is the equation that links the difference in productivities with the difference in prices of tradable (T) and non-tradable (N) sectors[3]:

$$dp = relp - relp^* = \frac{\beta}{\alpha}(a_T - a_T^*) - (a_N - a_N^*) \qquad (1)$$

where *relp* is the difference between the (logs of) prices of the two domestic sectors $(p_N - p_T)$; the coefficients β and α are the intensity of labour in the production function of sectors N and T, respectively. These elasticities are assumed equal in both countries, and, according to what is well established and demonstrated in the empirical evidence, we assume that $\beta > \alpha$. Finally, a_N and a_T are the (logs of) factors productivity in the domestic N and T sectors, respectively. The variables with a superscript refer to the foreign country.

Equation (1) establishes that the difference between the productivities of the tradable sectors and non-tradable sectors of two countries determines the difference between the relative prices of the two non-tradable sectors. Economies that have a particularly high productive tradable sector will exhibit a relatively high price of non-tradable goods, and a relatively high rate of inflation. The opposite will be true in countries where the productivity improvements take place in sector N.

The **second stage of the BS hypothesis** establishes a relationship between real exchange rates, measured both with CPI indices and with tradable-based price indices, and the difference in the relative price ratios:

$$q = (e + p_T^* - p_T) - \lambda(relp - relp^*) \qquad (2)$$

where *e* is the natural log of the nominal exchange rate defined as the price of the foreign currency in terms of the domestic one, and *q* is the natural log of the CPI-deflated real exchange rate; this value is given by the expression $q = e + p^* - p$, in such a way that a decrease (increase) in *q* indicates a real appreciation (depreciation) of the domestic currency. The coefficient λ is the weight of non-tradable

[3] For a detailed derivation of these expressions, see, for instance, García Solanes and Torrejón (2004), and Égert et al. (2005).

goods in the consumer's baskets of both the domestic and foreign countries. The first parenthesis in expression (2) stands for the natural log of the RER calculated with the prices of tradable goods, and is known as the external RER. By assuming that PPP holds in sectors T, as is accepted in the traditional derivation of the BS hypothesis, this parenthesis is equal to zero, and the second part of the BS may be written as:

$$q = -\lambda(relp - relp^*) \tag{3}$$

According to (3), there is a negative relationship between the difference in the relative price ratios and the CPI-deflated real exchange rate: an increase in the price differential causes a RER appreciation, which is more pronounced the biggest is the weight of N goods in the consumers' basket. It is worth noting that the second part of the BS hypothesis, as presented in equation (3), relies crucially on the fulfilment of PPP in the tradable sector.

Joining the two BS parts we obtain the **complete BS hypothesis**:

$$q = -\lambda\left[\frac{\beta}{\alpha}(a_T - a_T^*) - (a_N - a_N^*)\right] \tag{4}$$

It indicates that the real appreciation in the exchange rate should be equal to the increase of the productivity differential transmitted to the CPI via the non-tradable inflation pass-through.

2. 2 Failure of PPP in the tradable sector: the quality bias and market segmentation

As explained above, PPP in the tradable sector is an important pillar of the second stage of the BS hypothesis. Several studies provide evidence against PPP(T) using different statistical and econometric methods and different geographical samples[4]. As far as EEC countries are concerned, Égert et al. (2003) and Kovacs (2003) reported indirect evidence that PPP(T) does not hold in panels of EEC countries: their analysis showed, in fact, that the CPI-based real exchange rate and the PPI-based real exchange rate were cointegrated. Some authors rejected PPP(T) by applying direct tests: Égert (2002b) and Blaszkierwicz et al. (2004) obtained that RER(T) is not stationary, and Blaszkierwicz et al. (2004) showed that nominal exchange rates and national tradable-based price indices are not cointegrated.

[4] Canzoneri et al. (1999) found large deviations from PPP(T) when looking at US dollar exchange rates in a group of OECD countries. Wu (1996) rejected PPP(T) with data of Taiwan, and Ito et al. (1997) and Chinn (1997) did the same using data of several groups of Asian countries.

While several authors have identified serious departures from PPP in the tradable data of the CEE countries, to our knowledge, there is no paper that goes deeply into the likely sources of the problem. In a survey on the equilibrium exchange rates in transition economies, Égert et al (2005) reflected this concern and suggested analysing the sources of PPP(T) failure as a crucial way to extend the standard BS model.

To gain an insight into the issue, let us look at the broader framework of the New Open Economy Macroeconomics (NOEM), according to which the external RER can be split into three components following a simple accounting procedure[5]. Consider that domestic and foreign consumers buy tradable goods produced in each country. Consequently, in each country, the log of the tradable price index may be represented by the following weighted average formulas:

$$\begin{aligned} p_T &= \delta\, p_H + (1-\delta)\, p_F \\ p_T^* &= \delta^*\, p_F^* + \left(1-\delta^*\right) p_H^* \end{aligned} \qquad (5)$$

where subscripts H and F refer to tradable goods produced in the domestic and foreign country, respectively, and δ, (δ^*) is the share of domestic (foreign) tradable goods within the tradable basket of domestic (foreign) consumers.

The terms of trade are defined as:

$$\tau = p_F - p_H = p_F^* - p_H^* \qquad (6)$$

Introducing (5) into the expression that defines the external RER ($q_T = e + p_T^* - p_T$), and rearranging terms, it is easy to obtain:

$$q_T = \left(\delta + \delta^* - 1\right)\tau + \left(e + p_H^* - p_H\right) + \left(e + p_F^* - p_F\right) \qquad (7)$$

If, as pointed out by Obstfeld and Rogoff (2001), consumers of each country prefer home produced tradables compared to those produced abroad (home bias), both parameters δ, and (δ^*) will be bigger than ½ and the first parenthesis of the equation (7) will be unambiguously positive.

Assuming that home bias is present in both countries, the first term in the right of equation (7) will transmit the implications of **non-homogeneity** between home produced and foreign produced tradables. Indeed, non-homogeneity between tradables allow for variations in the terms of trade over time, which affect the RER(T): improvements of the terms of trade $(\Delta\tau < 0)$ will lead to appreciations in the external RER, and the converse will be true if the terms of trade deteriorate. The second and third terms in

[5] See, for instance, Benigno and Thoenissen (2003) and Lee and Tang (2003).

the right-hand side of equation (7) reflect the consequences of **market segmentation**. For instance, the fact that the second parenthesis is different from zero would indicate that the tradable goods produced in the domestic country have different prices at home and abroad.

Let us now apply expression (7) to analyse the factors that are most likely to cause trend RER(T) appreciations in the CEE countries.:

(i) Consider, first, variations in RER(T) stemming from the fact that domestic and foreign **tradables are not homogeneous.** According to Cincibuch and Podpiera (2004), continuous improvements in quality of tradables with respect to foreign countries generate an appreciating trend in the terms of trade that are transmitted to steady appreciations in the RER(T). They believe that this is applicable to the CEE countries with respect to the euro zone as a result of the process of quality convergence between the tradables of the two areas. Indeed, Breuss (2003) and Backé et al. (2002) emphasise that at the beginning of the transition process in the CEE countries, locally produced tradable goods were initially of poor quality and poorly marketed, a legacy of central planners that gave priority to mass industrial production to the detriment of quality standards. However, as firms started to learn how to operate in world markets and to manufacture new products according to market preferences – with the help of foreign direct investments - quality began to improve and domestic prices of tradable goods began to increase, converging towards the levels of the EMU countries. The process is likely to continue in coming years since the quality gap is still wide and the difference in prices is still large[6]. Note that for the quality bias to affect the terms of trade it is necessary that the statistical bodies charged to elaborate price indices do not readjust market prices to accomodate quality variations.

Some recent investigations by Égert, et al. (2004) show that productivity increases in the open sector tend to lead to an appreciation of the external RER in transition economies and emerging market economies[7]. Benigno and Thoenissen (2003) also found that productivity improvements lead to appreciation in the terms of trade in the case of UK economy. To the extent that productivity increases in the open sector go hand in hand with quality improvements of tradable goods, the results of Benigno and Thoenissen (2002) and Égert et al (2004) are complementary of those of Cincibuch and Podpiera (2004).

Additional explanations of the appreciating trend in the terms of trade of CEE countries rely on the increases in the regulated prices of non-tradable components of tradable goods (Rawdanowicz (2004)) and improvements in the distribution sector (MacDonald and Ricci (2001)).

Our contention is that an important share of the upwards pressure on the terms of trade in CEE countries comes from the demand side. We join, in this respect, the hypothesis of MacDonald and Wojid (2004) and Arghyron et al. (2005), according to which in CEE economies the expansion of the internal demand,

[6] According to the estimations of Maier (2004), by 2004 tradable price levels in these countries were still 50% lower than in the euro area.

[7] These authors also find that this positive connection between productivity increases and appreciation in the RER(T) does not exist in small open OECD countries that are not affected by catching-up processes.

steered by higher levels of income and wealth is not biased towards the demand of services – as suggested by the Baumol-Bowen effect – but instead towards the demand for tradable goods. One likely explanation is that the consumers of the CEE countries react in the face of income increases by purchasing this type of goods after being deprived of qualified tradable goods during several decades of central planning. Since the characteristics of tradables in CEE countries still differ markedly from those of the old UE members, the result is an important bias that improves the terms of trade of the former with respect to the latter countries.

(ii) We now examine the causes and effects of **market segmentation**, which is the second group of factors that may create variations in RER(T). In fact, if regional distance, imperfect competition and/or institutional factors preclude perfect integration between regional and/or national markets, the same national tradable goods cannot be sold at the same price across markets. This means that the law of one price (LOOP) is not satisfied. In terms of expression (7), this circumstance is reflected by the fact that the second and third parentheses are significantly different from zero. Market segmentation may be due to two broad causes: a) the lack of perfect competition, and or b) the fact that arbitrage restrictions, such as transportation costs remain in place.

Under imperfect competition, firms endowed with market power have incentives to create frictions and discriminate in prices between different groups of consumers. The policy of "pricing-to-market", stressed by Krugman (1987), correctly reflects this behaviour. According to this strategy, firms that sell their products in several countries do not fully translate nominal exchange rate movements into prices expressed in local currency. The bulk of exchange rate variations are absorbed by the profit margins of the firms, and prices in local currency remain relatively sticky[8].

As regards arbitrage frictions, Rogoff (1996) showed that the primary determinants are transportation costs, but there are other factors that cannot be ignored. For example, information costs and non-tariff barriers created by differences in national regulations – referred, for instance, to presentation of goods and consumer protection. The result of factors a) and b) is that differences in prices of identical goods sold in two countries can move within a certain range without triggering arbitrage transactions; in that case, adjustment towards the LOOP, which lies at the centre of the bands, is slow. However, when prices drift outside the range, arbitrage profits emerge and the ensuing transactions push prices quickly back towards the LOOP. Maier (2004) stressed the fact that the width of the non-arbitrage bands increases with exchange rate variability.

According to the preceding paragraphs, it is easy to understand that factors (i) and (ii) inflict different trajectories to the RER(T). If continuous quality improvements and/or demand pressures on tradables are the steering force, the result is an appreciating trend in the RERE(T). However, when market

[8] For an explanation of other sources of "pricing-to-market" policies, see Chari et al. (2000) and the survey by Goldberg and Knetter (1997).

segmentation is the factor that cause variations in tradable prices, the likely results are random adjustments in the RET(T) within two non-arbitrage bands.

In the following two sections we perform an empirical analysis of what has been discussed so far in this section.

3. Sector classification, measurement of variables and descriptive analysis

3.1. Data sources and sector classification

The data set used in this study consists of quarterly data presented on an annual basis. We calculate productivities of labour, sectoral prices and real exchange rates for the period studied (1995-I to 2004-III). All the series are transformed into natural logarithms, and then converted into indices, with the fourth quarter of the year 1995 being the base. The panel data set covers two groups of countries: 6 New Member States (NMS) of the EU (Czech Republic, Estonia, Latvia, Lithuania, Poland and the Slovak Republic) and 6 members of the EU-15 (Finland, France, Italy, Netherlands, Spain and Sweden). Germany is always taken as the benchmark foreign country, since all the above countries have substantial economic exchanges with this country. The source of data is the same in all cases: the New Cronos of Eurostat.

In order to calculate productivity and relative prices, it is crucial to correctly classify the economic branches into tradable (open) and non-tradable (sheltered) sectors. The task is not straightforward because no consensus exists on this issue. As stressed by Nuti (2001), it is very difficult to make the distinction since many tradable goods (T) are inputs in the non-tradable sector (N). The way followed is frequently conditioned by the availability of data sources. Fortunately, the data base that we use in this work allows us to achieve a higher degree of disaggregation and rigour than is commonly obtained in the literature[9].

The tradable sector includes all the tradable economic activities established in the statistics of the United Nations. As in many other empirical analyses, we exclude agricultural activities from the classification in both groups of countries for two broad reasons: a) since the share of the agricultural trade of each country with Germany is relatively small, the bulk of exports corresponds to industrial goods; b) the exchanged volumes of agricultural goods are biased by the distortions created by the Common Agricultural Policy of the EU-15, and by the protectionist and subsidy policies, which are still in force in the NMS.

The non-tradable sector includes the construction industry and five categories of private services, and excludes public services because of the lack of data on production and/or employment for those activities.

[9] The details of previous classifications are explained in Égert et al. (2002a) and García Solanes and Torrejón (2004).

3.2 Price differentials and productivity measurements

We define the relative price of non-tradables with respect to tradables as the ratio of the two corresponding sectoral GDP deflators. To obtain deflator indices we first measured the aggregate production, which, for each sector is the value added (*VA*) taking into account the items *(j)* of each category:

$$VA_i = \sum_j VA_i(j) \qquad i = T, N \qquad (8)$$

We measured each added value in both nominal *(CVA)* and real terms *(BVA)*, using current prices and the prices of the base year (1995), respectively, and then we calculated the price deflators, P_T and P_N, according to the following expressions:

$$P_i = \frac{CVA_i}{BVA_i} \qquad i = T, N \qquad (9)$$

To obtain the average productivities of labour, we first computed total labour employment in each sector, EM_T and EM_N, respectively, according to the following formula:

$$EM_i = \sum_j EM_i(j) \qquad i = T, N \qquad (10)$$

Then, we calculated average productivities (PRL_T and PRL_N) with these expressions:

$$PRL_i = \frac{BVA_i}{EM_i} \qquad i = T, N \qquad (11)$$

3.3 Descriptive analysis.

As explained above, the BS hypothesis postulates that the currencies of the faster growing countries will tend to appreciate in real terms with respect to the currencies of other, slowly growing economies[10]. To verify in a descriptive way whether this relationship exists, we calculate the correlation coefficients between the difference in GDP growth and the variation of the CPI-based real exchange rate of each individual country with respect to Germany during the period covered by this study, in the NMS and the EU-15 countries, respectively. Since real appreciations are reflected in negative real-exchange rate variations, we should expect negative correlations between the two variables if the BS hypothesis is satisfied.

The results are presented in Table 1 and confirm our first impressions: the correlations are positive in all cases except for Estonia. Consequently, at first sight there is no sign that the complete BS hypothesis holds in any of the groups of countries considered in this study.

Table 1
Correlation between GDP growth-differentials (DG) and real-exchange rate variations of each country with respect to Germany.
Six NMS and six EU-15 countries
1995-IV - 2004-III

NMS			EU-15
Czech Republic	0.08	0.43	Spain
Estonia	-0.09	0.12	Finland
Lithuania	0.31	0.69	France
Latvia	0.48	0.17	Italy
Poland	0.27	0.48	The Netherlands
Slovak Republic	0.14	-0.02	Sweden

4. Econometric analysis

In this section, we apply recent panel stationary and cointegration techniques to test the two stages of the BSH in the two areas under study, since we believe that this methodology, based on pooled observations, increases the reliability of the estimates when the observed period is relatively short. Panel and cross section techniques have already been applied by Halpern and Wyplosz (2001), De Broeck and Slok (2001) and Égert et al. (2002a), among others, in the context of Central and Eastern European transition

[10] Note that economic growth is usually pushed by innovations and productivity increases in the tradable sector.

countries, and by Drine and Rault (2003a) and García Solanes and Torrejón (2004) using data from a large group of Latin American countries.

Before performing the cointegration tests, we applied panel unit-root tests to the following variables measured in natural logs:

*dp =relp-relp**	*e*
$daT = a_T - a_T*$	$dpT = p_T - p_T*$
$daN = a_N - a_N*$	*(dp + daN)*

In order to solve the problems arising from possible contemporaneous correlations between the series, we corrected the data by subtracting the cross average in each year from each original gross value, and applied our tests to both gross and corrected series. The empirical results from executing the Levin and Lin (1993) and Im, Pesaran and Shin (2002) tests did not enable us to reject the null hypothesis of nonstationarity for both series in first differences. This would suggest that each of the six variables contains one unit root in the two panels of our study[11], which justifies further investigation into whether the variables maintain the long run relationships derived from our model. In the following lines we apply cointegration tests and estimate the cointegration vectors when justified.

4.1 The first stage of the BS hypothesis. Cointegration tests

The equation to be tested is:

$$dp_{it} = \theta_0 + \theta_T da_{T_{it}} - \theta_N da_{N_{it}} + \varepsilon_{it} \qquad (12)$$

Given that the theoretical model postulates that the coefficient of $(a_N - a_N*)$ (equation (1)), is equal to minus one, we include the restriction that $\theta_N = 1$ in our tests and, consequently, estimate the relationship between the composed variable $(dp + da_N)$ and da_T. Since equation (1) also indicates that $\frac{\beta}{\alpha} > 1$, the coefficient of da_T should be positive and higher than unity. We consider two alternative cases: in the first one, we assume that all panel members share the same parameters (homogeneous model); in the second, we will assume that each individual country has its own (differentiated) parameters, which we will derive from the estimation results (heterogeneous model).

[11] The results may be obtained from the authors upon request.

Although, for reasons of space, we only report here the results obtained with **heterogeneous panels**, it is worth mentioning that in the case of homogeneous panels the first part of the BS model holds in both groups of countries, with the particularity that the estimated value of $\hat{\theta}_T$ tends to be higher in the group of NMS countries than in the EU-15 economies[12].

Under heterogeneous panels, estimations incorporate the possibility that the parameters adopt different values between countries. Thus, the relationship that we estimate is:

$$(dp + daN)_{i,t} = \theta_{0,i} + \theta_{T,i} daT_{i,t} + \varepsilon_{i,t} \tag{13}$$

Table 2 shows the panel cointegration results for the Pedroni (1997, 1999) statistics, which are specially suited for this kind of model. The null hypothesis is that the residuals of all panel members are not stationary, i. e. there is no cointegration between the two variables, compared with the alternative hypothesis that the panel is stationary with only one autoregressive parameter. As far as the NMS group is concerned, the null hypothesis is rejected with almost all the statistics for the standard model (with no constant or tendency). Moreover, the most relevant statistics *Group-t* with the parametric version and *Panel-v-* allows us to reject the null hypothesis at 10% and 1% significance, respectively, when the model includes one trend.

Table 2
BS-1: cointegration test of Pedroni (1997,1999)
Heterogeneous model: $(dp + da_N)_{i,t} = \theta_{0,i} + \theta_{T,i} da_{i,t} + \varepsilon_{i,t}$
(1995-IV-2004-III)

		NMS			EU-15		
Statistics		Standard	Constant	Trend	Standard	Constant	Trend
Panel-ν	$T^2 N^{3/2} Z_{\hat{\nu}_{NT}}$	0..818	-0.010	2.031*	-0.505	-0.464	3..191*
Panel-ρ	$T\sqrt{N} Z_{\hat{\rho}_{NT}-1}$	-1.413***	- 0.147	1.485	0.484	0.532	0.168
Panel-t	$Z_{t_{\hat{\rho}_{NT}}}$	-1.781**	0.028	1.800	0.220	0.595	-0.189
Panel-t Par.	$Z^*_{t_{\hat{\rho}_{NT}}}$	-2.068**	-1.724**	1.001	0.079	-1.337***	-3.518*
Group-ρ	$TN^{-1/2} \tilde{Z}_{\hat{\rho}_{NT}-1}$	0.027	0.899	1.551	1.332	0.454	1.085
Group-t	$N^{-1/2} \tilde{Z}^*_{t_{\hat{\rho}_{NT}}}$	-1.927**	0.915	1.677	0.254	0..289	0.352
Group-t Par.	$N^{-1/2} \tilde{Z}^*_{t_{\hat{\rho}_{NT}}}$	-2.897*	-1.607**	-1.397***	-0.450	-2.833*	-4.032*

1. The first statistics set follow a typical right-tail normal distribution The remaining statistics follow a typical left-tail normal distribution.
2. Level of significance: 1%(*), 5%(**) y 10%(***).
3. H_0: there is no cointegration between the two variables.
4. Cointegration tests for one explanatory variable.

[12] The detailed results are available from the authors upon request.

According to Pedroni (1997), these two statistics are powerful when the time sample is relatively short. This makes our empirical results especially valuable. The result of no-cointegration is also rejected at 5% with the statistics *Group-t* with the model that includes one constant. Concerning the group EU-15, the null hypothesis can be rejected at 1% with the same statistics and according to the models with one constant and with one constant and one trend.

For these reasons, we are not allowed to reject cointegration between the variables $(dp + da_N)$ and da_T and, as a result, we accept a long-term relationship between them in the two areas, each country having its own specific parameters. Furthermore, this relationship seems stronger in the group of NMS countries. Consequently, the following step is to estimate the corresponding cointegration vectors.

Table 3 offers the individual estimates of the parameter $\hat{\theta}_T$ for the members of the two areas. As regards the NMS group, the results are significant at lower than 10% in each case and for all countries. The results are favourable with each of the three regressions we have performed: OLS, DOLS(1) and DOLS(2). In addition, the estimations have the correct sign, and their values are generally higher than one.

For the EU-15 group, we find similar positive results in three countries: Finland, France and Sweden. However, estimations are not statistically significant in Italy and The Netherlands, and show an incorrect sign in Spain.

Table 3
BS-1: estimation of the cointegration vector
Heterogeneous restricted model: $(dp + da_N)_{i,t} = \theta_{0,i} + \theta_{T,i} da_{i,t} + \varepsilon_{i,t}$
(1995-IV-2004-III)

	NEM			UE-15			
	OLS	DOLS(1)	DOLS(2)	OLS	DOLS(1)	DOLS(2)	
$\hat{\theta}_{Ni}$	1	1	1	1	1	1	$\hat{\theta}_{Ni}$
$\hat{\theta}_{Ti}$							$\hat{\theta}_{Ti}$
Czech Republic	0.923 (0.00)	1.374 (0.00)	1.551 (0.00)	-2.095 (0.00)	-2.694 (0.00)	-2.871 (0.00)	Spain
Estonia	1.011 (0.00)	0.989 (0.00)	1.006 (0.00)	1.622 (0.00)	1.555 (0.00)	1.516 (0.00)	Finland
Lithuania	1.096 (0.00)	1.156 (0.00)	1.196 (0.00)	1.147 (0.00)	1.125 (0.00)	1.066 (0.00)	France
Latvia	1.936 (0.00)	1.999 (0.00)	2.061 (0.00)	0.026 (0.71)	0.0259 (0.76)	-0.108 (0.24)	Italy
Poland	1.329 (0.00)	1.325 (0.00)	1.337 (0.00)	-0.593 (0.10)	-1.350 (0.03)	-2.016 (0.01)	The Netherlands
Slovakia	0.821 (0.00)	0.714 (0.00)	0.662 (0.00)	1.068 (0.00)	1.038 (0.00)	1.039 (0.00)	Sweden
$\bar{R}^2$	0.932	0.993	0.994	0.898	0.998	0.998	$\bar{R}^2$

1. Figures between brackets indicate p-values.
2. Estimations were performed with fixed effects. The estimations with DOLS include one and two leads and lags.

In order to ascertain the extent to which individual panel members have point estimates of the parameter $\hat{\theta}_T$ equal or higher than unity, as specified in the first part of the BS model, we perform the following test:

$$H_0: \quad \theta_{T,i} \geq 1$$
$$H_1: \quad \theta_{T,i} < 1 \qquad (14)$$

The results for the NMS and EU-15 groups are reported on the left and right-hand sides, respectively, of Table 4. Columns 1 and 5 contain the *t* statistic under the null hypothesis. In the case of the NMS, the values of the *t* statistic do not generate significant *p-values* (values within brackets), except for Slovakia, indicating that the null cannot be rejected in five countries. The 95% intervals of confidence for the parameter $\hat{\theta}_T$ of each country are reported in the third column. In the case of the Czech Republic, for instance, the DOLS(1) estimation of $\hat{\theta}_T$ is 1.37 (see Table 3), and has a confidence interval equal to (1.19-1.55). In this country, an increase in the productivity differential (with respect to Germany) leads to a rise of 1.37% in the differential of relative prices.

In the particular case of Slovakia, the fact that the estimated value of $\hat{\theta}_T$ is lower than unity might indicate that the T sector is more labour intensive than N sector.

Table 4
The first part of the Balassa and Samuelson hypothesis

Heterogeneous model: $H_0: \theta_C \geq 1$, $H_1: \theta_C < 1$

(1995-IV-2004-III)

NMS	t_{NT-K}	H₀ of C.2	IC Al 95%	First part of BS	t_{NT-K}	H₀ de C.2	Confidence interval at 95%	First part of BS	EU-15
Czech Republic	*4.06* (0.99)	NRH_0	1.19181 1.55524	*Holds*	*-8.76* (0.00)	RH_0	-3.52711 -1.86194	*Not holds*	Spain
Estonia	*-0.40* (0.34)	NRH_0	0.93720 1.04143	*Holds*	*10.43* (0.99)	NRH_0	1.45011 1.66031	*Holds*	Finland
Lithuania	*4.01* (0.99)	NRH_0	1.07920 1.23259	*Holds*	*2.42* (0.99)	NRH_0	1.02306 1.22705	*Holds*	France
Latvia	*8.35* (0.99)	NRH_0	1.76345 2.23579	*Holds*	—	—	—	—	Italy
Poland	*7.58* (0.99)	NRH_0	1.24070 1.41001	*Holds*	*-3.77* (0.00)	RH_0	-2.57964 -0.12043	*Not holds*	The Netherlands
Slovakia	*-2.16* (0.02)	RH_0	0.45364 0.97492	*Not holds*	*2.02* (0.99)	NRH_0	1.00087 1.07571	*Holds*	Sweden

1.Values in italics correspond to the quantiles of the distribution t_{NT-K}. The proof was performed using the results of the estimation DOLS(1). The proof was not realised for Italy because the estimation is not significant in this country.
2. Values within parentheses are the p-values of the corresponding quantiles.
3. The test is left tail..
4. .If the null hypothesis $H_0: \theta_T \geq 1$ is not rejected, there is no reason to reject BS-1 under the heterogeneous restricted model.
5. Intervals of confidence are built with a coefficient of 95%. The corresponding cells indicate the upward and downward limits, respectively.

In the EU-15 group, the results are positive for Finland, France and Sweden, for all of which the estimated coefficient for $\hat{\theta}_T$ is equal or higher than unity.

To sum up, we find evidence that the first stage of the BS hypothesis is more easily satisfied in the NMS group than in the EU-15 area of our sample, which may partially be explained by the fact that, during the observed period, the NMS experienced very high rates of growth mostly driven by innovations in the tradable sectors. The underlying catching-up process towards Germany, in per capita real income, did not take place in the EU-15 countries of our sample.

4.2 The second stage of the BS hypothesis. Cointegration and unit root tests

As explained above, the PPP hypothesis in the tradable sector is the corner stone of the BS-2. To verify whether this relationship is satisfied, we perform two direct methodologies: cointegration tests on the one hand, and unit-root and stationary tests on the other. As regards the first one, we check for cointegration between the domestic and the German price indices of national tradable sectors, both of them denominated in domestic currency. If cointegration exists, we test, in a second step, whether the cointegration vector is not statistically different from [1, 1].

We will consider the following equations:

$$e_{i,t} = \gamma_0 + \gamma_p dp_{T_{i,t}} + \varepsilon_{i,t} \tag{15}$$

$$p_{T_{i,t}} = \gamma_0 + \gamma_1 \left(e_t + p^*_{T_{i,t}} \right) + \varepsilon_{i,t} \tag{16}$$

These equations include a homogeneity restriction. In equation (15) the coefficients of prices are restricted to be the same values, while in equation (16) the nominal exchange rate and the foreign price are constrained to have the same coefficient. We adopt these restrictions in order to secure a sufficient number of degrees of freedom. In equation (15) the dependent variable is the nominal exchange rate. Although the theoretical framework of the PPP model does not specify which variable should be dependent, in the case of the NMS it seems appropriate to assign this role to the nominal exchange rate because for these countries, during the observed period, flexibility in the exchange rates wioth respect to Germany has been more frequent than strong peg systems. However, for the EU-15, it is justified to use the internal price level as dependent variable because fixed exchange rates and/or the single currency have almost been the rule during the years studied. If PPP holds, the two variables of each equation should be cointegrated, and coefficients γ_p and γ_1 should not be statistically different from unity.

In order to obtain more reliable results, we approximate prices of the tradable sectors by the index of industrial production, which has been calculated on harmonised basis by Eurostat for all countries of our sample since December 2000[13]. We use the two versions provided by this data base: the index that excludes the prices of energy (IPI), and the index that includes the energy prices (IPI(E)). We look at monthly data for the period going from December 2000 to May 2006.

Table 5 shows the Pedroni (1995) cointegration statistics for homogeneous panels. Numbers with bold type represent the results obtained with IPI, and numbers with cursive writing reflect the results calculated with IPI(E). It is apparent that, for both groups of countries, the null hypothesis of non-cointegration cannot be rejected. Consequently, we may not assert that there is a long-term relationship between the prices of tradable goods (industrial products) in the studied panels, which indicates that PPP(T) is not supported by the data of our sample in none of the groups.

Table 5
Cointegration test of the BS-2 with the Pedroni (1995) method for panel data
Homogeneous model for NMS: $e_{i,t} = \gamma_0 + \gamma_p dp_{T_{i,t}} + \varepsilon_{i,t}$

Homogeneous model for UE-15: $p_{T\,i,t} = \gamma_0 + \gamma_{p_{T*}+e}(p_{T*} + e)_{i,t} + \varepsilon_{i,t}$

(2000-12-2006-5)

Statistics	**NEM**			**UE-15**		
	Standard	Constant	Trend	Standard	Constant	Trend
$T\sqrt{N}(\hat{\rho}_{NT}-1)$	1.103	0.425	0.459	-0.447	-0.353	1.642
	1.116	*1.116*	*1.105*	*0.758*	*0.410*	*2.265*
$\sqrt{NT(T-1)}(\hat{\rho}_{NT}-1)$	1.094	0.423	0.460	-0.443	-0.349	1.629
	1.106	*1.106*	*1.094*	*0.751*	*0.406*	*2.244*

1. The two statistics are standardised, and follow a typical left-tail normal distribution.
2. Level of significance: 1%(*), 5%(**) y 10%(***).
3. Statistics are obtained from the OLS residuals of three different models.
4. H_0: there is no cointegration between the two variables.
5. Cointegration tests for one explanatory variable.

As far as the second methodology is concerned, we apply unit root and stationarity tests to both IPI and IPI(E), using three alternative methods to obtain additional evidence that the RER(T) is not stationary in levels. For the Levin, Lin and Chu (2002) test, the null hypothesis is that all members of the panel have a unit root, and for the Im, Pesaran and Shin (2003)), the null hypothesis is that some members of the panel have a unit root. However, for the Hadri (2000) test, the null hypothesis is the converse of that of Pesaran and Shin (2003), i.e. some members of the panel are stationary. It is obvious that for a result to be completely reliable, it should simultaneously comply with the verdict derived from each of the three methods.

[13] We performed the same tests with the quarterly series of tradables that we obtained by deflacting the value added in the tradable sector, as explained in section 3. We obtained very similar results to those presented in Tables 12 and 13, which are available upon request.

The results are presented in Table 6. The common verdict with Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003) tests is that the null hypothesis is not rejected, which implies that each member in both panels has a unit root. This result fully satisfies that of the Hadri method with a constant, according to which the null of stationarity is clearly rejected at 1% of significance. Furthermore, it agrees with the results of the cointegration test presented in Table 5. In conclusion, the RER elaborated with IPI does not converge towards a long-run equilibrium value in any country of both samples, which in turn indicates that industrial prices and nominal exchange rates do not support the PPP rule in none of the groups studied.

Table 6
Unit root tests applied to the real exchange rate calculated with industrial price indices. (2000-12-2006-5)

	NEM		UE-15	
Statistics	Standard	Constant	Standard	Constant
Levin Lin and Chu (t*)	-0.579	-1.748**	0.469	-2.427*
	-1..227	*-0.818*	*0.740*	*-1.983**
IPS (W)		-0.292		0.477
		1.334		*0.176*
Hadri (Z)		8.369*		11.826*
		*11.164**		*7.337**

1. For the Levin and Chu test, the H_0 is: unit root (common unit root process)
2. For the IPS test, the H_0 is: Unit root (individual unit root process)
2. For the test of Hadri, the H_0 is: not unit root (individual unit root process)
3. Level of significance: 1%(*), 5%(**), and 10%(***)

The direct implication is that the real exchange rate of T sector (RER(T)) does not converge towards a long-run equilibrium value in any of these areas. However, the statistical properties and the likely time path of the RER(T) may be different in each group of countries. The next section examines this possibility.

5. Beyond the BS hypothesis: the real exchange rate of tradable goods

In order to identify which factors drive the movements in the RER(T) in both groups of countries, for convenience we reproduce here equation (7):

$$q_T = \left(\gamma + \gamma^* - 1\right)\tau + \left(e + p_H^* - p_H\right) + \left(e + p_F^* - p_F\right) \tag{7}$$

As is apparent in this equation, the tradable-based real exchange rate may appreciate a) either because the terms of trade improve (τ decreases) or b) because the same traded goods –those produced at home and/or those produced abroad- achieve higher prices in the domestic market than in the foreign one (market segmentation). In turn, increases in the terms of trade may be due to improvements in quality of the domestic tradable goods (Cincibuch and Podpiera (2004)), to productivity increases of the domestic country (Benigno and Thoenissen (2002) and (Égert and al (2004)) and to demand pressures on differentiated domestic tradables. While factors a) inflict an appreciating trend on the RER(T), which is usually the case in countries experiencing a catching-up process, factors b) add volatility to the variations of the RER(T) within two non-arbitrage bands. The results that we obtained testing the BS-2 lead us to suspect that the determinants of RER(T) changes are very different in each group of countries. Let us then analyse them separately.

5.1 NMS area

It is worth noting that the quality of T goods has improved steadily in the NMS since the beginning of the transition period, as documented by Filer and Hanousek (2001) and Mikulcová and Starvev (2001), among others. The reason is that the variety and quality standards of these goods have evolved positively since the end of the communist era. During several decades of communist regimes, uniform standards in tradable goods were imposed on domestic consumers who, in addition, were affected by repressed tastes and very low purchasing power. Once these economies started their restructuring process towards market economies at the beginning of the 1990s, the quality of T goods started to increase at the same pace as convergence of GDP made its course. As a result, if statistical bodies do not take into account this influence, their estimations of consumer price indices and inflation rates on the basis of the new T goods will be biased upwards and the RER(T) will push up as quality improves. At the same time, it seems clear that the continuous increase in the relative demand of domestic tradables also push up the terms of trade of these countries.

In order to capture the influence of factors a) on the RER(T) we suggest to enlarge the basic BS equation with two alternative candidates. The first one is a deterministic trend, on the basis that quality and demand pressures increase steadily in catching-up economies; the second one is the per capita GDP differential on the grounds of two considerations. First, continuous increases in relative income and wealth stimulate the relative demand for domestic (differentiated) tradable goods and lead domestic firms to improve the quality of domestic tradables. Second, the “agents heterogeneity” effect stressed by Helpman (1999) operates in the NMS in the following way: as wealth increases, the heterogeneity of agents widens and differences in the consumer patterns become more pronounced. This phenomenon requires a new composition in the consumer basket that gives a higher weight to T goods in the NMS, contributing to push the RER(T) further upwards.

In graph 2 we draw the evolution of the terms of trade (TT) and the per capita real income differential (RID) of each NMS with respect to Germany. As can be seen, the real income –or GDP- differential and the TT follow an opposite trend in each country. Since a downwards-sloped TT means a real appreciation, this evolution provides the first – visual - confirmation of our hypothesis.

To test econometrically whether RER(T) is led by a deterministic trend and/or by RID, we estimate the following two equations with panel data of the NMS group:

$$q_{T_{i,t}} = \delta_0 + \delta_T T_{i,t} + \upsilon_{i,t} \qquad (17)$$

$$q_{T_{i,t}} = \delta_0 + \delta_y (y - y^*)_{i,t} + \upsilon_{i,t} \qquad (17')$$

where q_T is the natural log of RER(T), T is a deterministic trend, and $(y - y^*)$ is the real income differential, measured as the difference between the natural logs of the per capita real GDP indices of each NMS and Germany. If our hypothesis is correct, the estimated values δ_T and δ_y should be negative.

The results, for the homogeneous model, in which it is assumed that the coefficients δ_T and δ_y are the same for each country, are reported in Tables 7 and 8. Table 7 shows the results using two versions, linear and hyperbolic, for the deterministic trend. In both cases, the slopes are statistically significant and have the appropriate sign. They indicate that the RER(T) follows a decreasing (appreciating) path.

Table 7
The real exchange rate built with prices of the tradable sector
Homogeneous model

$$q_{T_{i,t}} = \delta_0 + \delta_T T_{i,t} + \upsilon_{i,t}$$

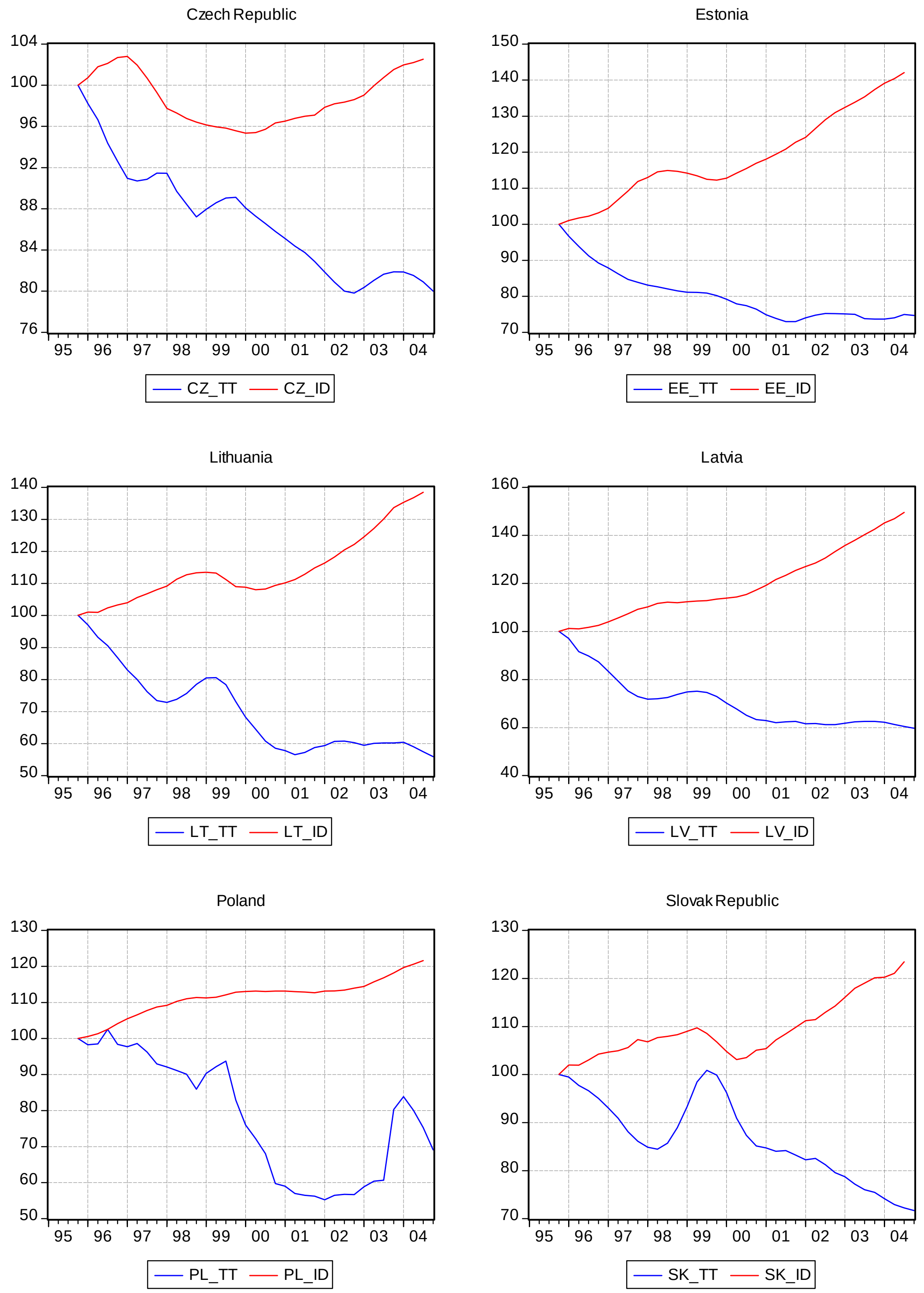
$$q_{T_{i,t}} = \delta_0 + \delta_T \frac{1}{T_{i,t}} + \upsilon_{i,t}$$

New Member States of the EU
(1995-IV-2004-III)

	NMS (OLS)	
	Linear trend	Hyperbolic trend
$\hat{\delta}_T$	-0.011 (0.00)	0.494 (0.00)
Trend slope	-0.011	-0.494/T^2
$\bar{R}^2$	0.126	0.072

1. p-values within brackets.
2. OLS estimations were performed with a constant.

Graph 2
Terms of trade (TT) and income differential (ID) of six NMS with respect to Germany
1995-I - 2004-III



TT: Terms of trade calculated with price exportation indexes of individual NMS and Germany.
ID: Difference between real GDP's of individual NMS and Germany

In Table 8 the GDP differential is used as a determinant of the appreciating trend. We verify that the estimations are highly statistically significant with each of the three methods employed, and that the sign of δ_y is always the expected one. These results show that a one percent increase in the relative income of a NMS country with respect to Germany gives rise to an average appreciation in its RER(T) of approximately the same amount.

Table 8
The real exchange rate built with prices of the tradable sector
Homogeneous model : $q_{T_{i,t}} = \delta_0 + \delta_y (y - y^*)_{i,t} + \upsilon_{i,t}$
New Member States of the EU
(1995-IV-2004-III)

	NMS		
	OLS	DOLS (1)	DOLS (2)
$\hat{\delta}_1$	-1.017 (0.00)	-1.001 (0.00)	-1.082 (0.00)
$\bar{R}^2$	0.695	0.776	0.807

1. p-values within brackets.
2. OLS estimations were performed with a constant. DOLS estimations include one and two leads and lags.

An additional proof of our hypothesis consists of estimating the complete BS model that we obtain when (17) and (17') are introduced in (2). Taking into account that the differential of relative prices (the second parenthesis in the equation (2)) is explained by the productivity differentials between sectors of each country, the econometric model for the homogeneous case will be:

$$q_{i,t} = \delta_0 + \delta_T T_{i,t} + \delta_a \left[\hat{\theta}_{T,i} (a_T - a_T^*)_{it} - (a_N - a_N^*)_{i,t} \right] + \upsilon_{i,t} \tag{18}$$

$$q_{i,t} = \delta_0 + \delta_y (y - y^*)_{i,t} + \delta_a' \left[\hat{\theta}_{T,i} (a_T - a_T^*)_{it} - (a_N - a_N^*)_{i,t} \right] + \upsilon_{i,t} \tag{18'}$$

where $\hat{\theta}_{T,i}$ stands for the values we have estimated before (Table 7) using three different techniques. According to what has been explained in the preceding paragraphs, it is expected that: $\hat{\delta}_T < 0$, $\hat{\delta}_a < 0$, $\hat{\delta}_y < 0$, $\hat{\delta}_a' < 0$

The results of these estimations are reported in Tables 9 and 10.

Table 9
The BS hypothesis without PPP in the tradable sectors

Homogeneous model: $q_{i,t} = \delta_0 + \delta_T T_{i,t} + \delta_a \left[\hat{\theta}_{T,i} (a_T - a_T^*)_{it} - (a_N - a_N^*)_{i,t} \right] + \upsilon_{i,t}$

$$q_{i,t} = \delta_0 + \delta_T \frac{1}{T_{i,t}} + \delta_a \left[\hat{\theta}_{T,i} (a_T - a_T^*)_{it} - (a_N - a_N^*)_{i,t} \right] + \upsilon_{i,t}$$

New Member States of the EU
(1995-IV-2004-III)

	NMS					
	Linear trend			Hyperbolic trend		
	OLS	DOLS (1)	DOLS (2)	OLS	DOLS (1)	DOLS (2)
$\hat{\delta}_T$	-0.0098	-0.0123	-0.0121	0.382	0.730	1.070
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\hat{\delta}_a$	-0.356	0.074	0.079	-0.655	-0.571	-0.528
	(0.00)	(0.47)	(0.52)	(0.00)	(0.00)	(0.00)
Trend slope	-0.0098	-0.0123	-0.0121	$-0.382/T^2$	$-0.730/T^2$	$-1.070/T^2$
$\bar{R}^2$	0.508	0.870	0.879	0.438	0.845	0.872

1. p-values within brackets.
2. OLS estimations were performed with a constant. DOLS estimations include one and two leads and lags.

Table 9 shows the results of a panel regression of the CIP-based real exchange rate on a deterministic trend and the productivities differential. Results are reported for the two versions of the deterministic trend - linear and hyperbolic. The estimations with DOLS (1) and DOLS (2) indicate that the linear trend is perhaps an excessively strong assumption that removes statistical significance from the productivity differential. However, the hyperbolic trend fits conveniently with the data, allowing both the trend and the productivity differential to be significant and with the correct signs. Taking, for instance, the results obtained with the DOLS (1) method, it turns out that a one percentage point increase in the productivity differential leads to a real exchange rate appreciation equal to 0.57 per cent.

As can be seen, the estimated parameters have the expected sign and are highly statistically significant with all three estimation techniques applied. It is interesting to note that the marginal effect of an increase in the productivity differential is higher in this model than in the other ones in which quality is proxied by a deterministic trend. According to the results of Table 10, a one percentage point increase in the productivity differential causes an appreciation in the RER equal to 0.74% and, as a result, leaves less room for the appreciating role of quality. This circumstance might indicate, in turn, that the increases in quality are more thoroughly captured by the deterministic hyperbolic trend.

Table 10 presents the results that follow when the GDP differential takes the place of the deterministic trend.

Table 10
The BS hypothesis without PPP in the tradable sectors

Homogeneous model: $q_{i,t} = \delta_0 + \delta_y(y - y^*)_{i,t} + \delta_a^{'}\left[\hat{\theta}_{T,i}(a_T - a_T^*)_{it} - (a_N - a_N^*)_{i,t}\right] + \upsilon_{i,t}$

New Member States of the EU
(1995-IV-2004-III)

	NMS		
	OLS	DOLS (1)	DOLS (2)
$\hat{\delta}_y$	-0.399 (0.00)	-0.531 (0.00)	-0.642 (0.00)
$\hat{\delta}_a^{'}$	-0.806 (0.00)	-0.738 (0.00)	-0.756 (0.00)
$\bar{R}^2$	0.394	0.735	0.790

1. p-values between brackets.
2. OLS estimations were performed with a constant. DOLS estimations include one and two leads and lags

Summarising, the results obtained with both proxies indicate that quality and demand pressures derived from increasing purchasing power are as important as the traditional productivity differential in explaining the remarkable appreciation of the RERs of the NMS countries during the last ten years. The range of values for $\hat{\delta}_a$ applied to productive differentials gives rise to BS effects between 0.7% (Estonia) and 2.9% (Polonia) per year, which are in line with the recent estimations of the BS external mechanism.

1.1 EU-15 area

In the group of six EU-15 countries, the RER of individual countries does not follow generalised steady trajectories. This may be verified by performing the same regressions (17) and (17') with data of these economies. The results are not reported here, but they indicate that the estimated values are not statistically significant. For these reasons, we argue that divergences in the prices of national tradable goods – expressed in the same currency - are caused by market segmentation. In turn, this situation may potentially be explained by several factors, including transportation costs (Rogoff (1996)), "pricing-to-market" policies (Krugman (1987)) and non-competition practices. It is well known that these determinants create two non-arbitrage bands, and inside these fringes there are variations in the prices of T goods that are not totally offset by adjustments in the nominal exchange rates.

In the EU-15 area, the "pricing-to-market" policies were probably important during the years preceding EMU (January 1, 1999), that is, when each country had its own currency. The most frequent example of these practices emerged when the adjustments in prices in local currency were costly, and foreign producers (selling their products in the local market) absorbed the variations in the nominal exchange rate by adjusting their mark-ups (Chari et al. (2000)[14]). However, this situation is less likely during the EMU era for countries sharing the euro, because variations in bilateral nominal exchange rates are no longer allowed. At present, the factors responsible for market segmentation in the EU are, indeed, related to transportation costs, non-competition practices and commercial frictions in a wide spectrum of tradable goods. The most frequent are information costs and non-tariff barriers, such as the diversity in national classifications and standards for the same goods (example: differences in national regulations concerning the presentation of goods and the protection of consumers), etc.

6. Conclusions

The real exchange rates of the New Member States of the EU have experienced strong appreciations against the currencies of the EU countries since the beginning of the 1990's. Many empirical estimations of the Balasa-Samuelson effect in the context of the NMS show that, although the differential of productivities is an important and significant determinant of internal dual inflation (the link that we name BS-1), its power to explain the evolution of the real exchange rate –which is known as the external transmission mechanism of the BSH- is lower than previously stated. In order to discover the additional forces that push up the RER in these countries, we have performed independent estimations of each part of the BS hypothesis, using quarterly data of six NMS, and taking Germany as the foreign benchmark. After verifying that the BS model fails in the second step because PPP does not hold in the tradable sector, we focus on the determinants of the external RER, that is, the RER calculated with prices of the tradable sectors as deflators.

The sample period begins in 1995, purposely omitting several years in which data for the NMS countries were distorted by important transition problems. To check the extent to which our results are specific to the NMS included in our sample, we apply the same analysis on a set of six EU-15 countries, which have already achieved a high degree of economic development and are, therefore, not affected by transition structuring or catching-up processes. For comparative purposes, we use the same source of data and sample period.

Our main results may be summarised as follows: 1) the first part of the BS hypothesis –which relates the productivities differential with the internal dual inflation- holds very well in each group of countries, but the results are more statistically significant in the NMS area; 2) however, the second part of the BS model is not fulfilled in any group of countries due to PPP failure in the tradable sectors; 3) the RER(T) clearly follows an upward trend in the NMS countries, but in the case of the EU area this variable does not show any steady trajectory; in fact, it exhibits a more volatile path than in the NMS set of countries. It therefore seems that: a) the trend appreciation of the external RER in the NMS countries is caused by a continuous

[14] For an explanation of other sources of the "pricing-to-market" policies, see the survey by Goldberg and Knetter (1997).

improvement in the quality and an increasing demand for their tradable goods, linked to the increase in their relatively increased purchasing power with respect to Germany and the euro area in general, and that b) the divergences in the prices of T goods in the EU-15 area probably obeys market segmentation which, in turn is caused by transportation costs, non-tariff barriers and non-competition practices.

Our findings suggest three main policy implications. First, RER appreciation in the NMS group as a whole is basically an equilibrium phenomenon, since the explanatory factors are productivity increases, higher economic growth and quality improvements in the T sector. On average, the equilibrium level of the RER in the CEE countries increases about 3.4 percent annually as a result of equilibrating forces from the supply and demand sides of the economy. Obviously, this appreciation will lose strength as the quality standards and productivity levels become more similar to those of the most advanced EU countries. Second, taking into account this appreciation, once the NMS countries will decide to join the ERM, they are advised to enter the system with the maximum permitted exchange rate flexibility, that is, taking advantage of the wide ±15% stipulated band[15]. Furthermore, they should carefully determine the central parity and limit their stay within the system to the required two-year period, in order to avoid destabilising pressures triggered by short term and reverting capital flows. Third, within the EU-15, additional measures are necessary to dismantle the barriers that create important segmentation between national markets. In particular, it is crucial to foster both competition in domestic markets and the mobility of goods and services between countries in order to achieve a true single European market.

[15] These policy recommendations apply to those NMS that have still not joined the ERM2, which in the group of our sample at the date of December 2006 are: the Czech Republic, Poland and the Slovak Republic.

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