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ON THE ESTIMATED SIZE OF THE BALASSA-SAMUELSON EFFECT IN FIVE CENTRAL AND EASTERN EUROPEAN COUNTRIES

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Abstract

In this paper we try to summarise the size of the real appreciation driven by relative productivity differentials i.e. the Balassa-Samuelson (BS) effect in five Central and Eastern European (CEC5) countries, namely the Czech Republic, Hungary, Poland, the Slovak Republic, and Slovenia. Our approach is based on the use of two methods. Firstly, we create a common simple analytical framework for producing some stylised facts, and obtaining an estimate of relative price movements due to different sectoral productivity growth rates. Secondly, we try to summarise the econometric evidence available for the countries, both from individual country and panel estimates. It seems clear from the analyses, based on the alternative approaches, that the BS effect on CPI inflation vis-á-vis Germany does not exceed 2% per annum. The numbers obtained are somewhat different from those that one would obtain from the change in relative prices in the countries considered. This result might be explained by the fact, that in the past, other factors like change in the sectoral wage rates, pricing behaviour and intermediate product prices also contributed to the development of the nontradable and tradable price ratio. As these estimates are based on past data, when productivity differentials were higher than current figures, it is very likely, that as the catching-up proceeds, the magnitude of the BS effect will be even smaller. This would suggest that the real convergence should not endanger the fulfilment of the Maastricht Treaty inflation criterion.

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1. Introduction

The real exchange rate as an indicator of internal and external balances gives important information about the macroeconomic situation of a country. Real exchange rates might be used in assessing competitiveness and foreign inflationary pressures experienced by countries. They also provide information about the pass-through of nominal exchange rates into domestic prices. However these assessments cannot be properly completed, without having some information on the development of the equilibrium exchange rate.

As it is well known in international economics, Purchasing Power Parity (PPP) is a poor candidate for describing the behaviour of real exchange rates, if the country's underlying fundamentals are changing over time.[2] Rapidly changing economic fundamentals are one of the most important characteristics of transition economies, so the assessment of actual exchange rates compared to some equilibrium value is a very formidable task. for. Since some pioneering econometric evidence, we know that the equilibrium exchange rates are expected to appreciate as the transition proceeds. [3] However it is very difficult to give a precise estimate of the equilibrium appreciation.

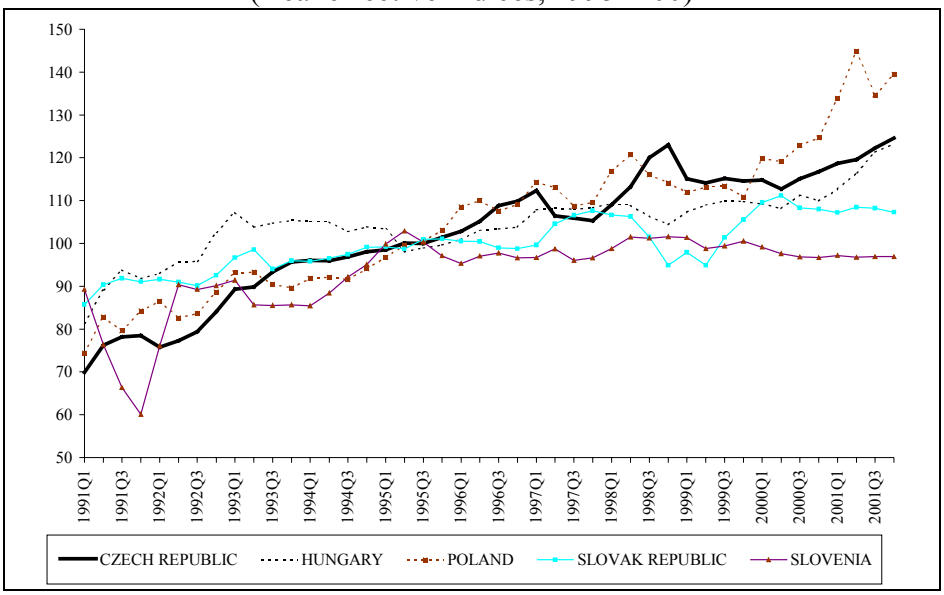
Looking at the figures (Figure 1-1) one can observe that trend appreciation has been a clear phenomenon in the Czech Republic, Hungary, Poland, the Slovak Republic and Slovenia (henceforth CEC5 countries) since the start of the transition. Between 1991 and 2001, all countries experienced around 2-6% real appreciation per annum. It is also obvious, that the first period of the nineties was accompanied by much larger appreciation tendencies than the second part of the decade. While between 1991-1993 the real appreciation ranged from 3.6 to 10.3%, after 1993 the annual rate had decreased to 1.4-5.3%.

[2] Williamson (1994)
[3] Halpern-Wyplosz (1997).

Figure 1-1

CPI based real exchange rate levels in CEC5*

(Real effective indices, 1995=100)



*Source: IFS, BoS

In the first period, special transition factors - like deregulation of goods and labour markets - dominated the process, while in the second phase – since the start of the catching-up period - the standard channels like productivity and demand shifts have started to gain importance.[4]

In this paper we try to summarise the importance of productivity based real appreciation i.e. the Balassa-Samuelson (henceforth BS) effect in the above mentioned countries as the BS effect is usually considered to be a standard channel of real appreciation during a catching-up process.[5] It is obvious, that the question is highly relevant from both the point of view of the fulfilment of the Maastricht Treaty criteria, and the assessment of sustainable external positions in CEC5 countries.

[4] See Coricelli-Jazbec (2001) for econometric evidence.

[5] It is important to note however, that the BS effect is not necessarily a theoretical result of the catching-up process. There are certain conditions that should be valid for the existence of the BS effect. Apart from wage equalisation between the tradable and nontradable sectors, it also required that the catching-up process should be driven by high tradable productivity developments compared to nontradable productivity in the home country, compared to the same foreign country variables. An additional requirement, that industry or manufacturing should be a significant determinant of the total economy, so that wage developments in it might effect the other parts of the economy. All of these conditions are not necessarily valid in the future for the most advanced CEC5 countries.

Table 1-1
Average CPI based real exchange rate appreciation and the estimated size of the BS effect for the 1990's vis-á-vis Germany
(annual averages, %)

	Actual annual real appreciation (1993-2001)	Estimated size of BS effect for the 1990's	
		From simple accounting	From econometric evidence
Czech Republic	4.9	1.6	0.1
Hungary	2.4	1.9	1.0-2.0
Poland	5.8	n.a	1.2-1.5
Slovakia	4.3	1.0-2.0	n.a.
Slovenia	2.2	0.7-1.4	1.0-2.0

Our approach is based on the use of two methods. Firstly, we create a common simple analytical framework for producing some stylised facts, and obtaining an estimate of relative price movements due to different sectoral productivity growth rates. Secondly, we try to summarise the econometric evidence available for the countries, both from individual country and panel estimates.
It seems clear from the analyses, based on the alternative approaches that the *BS effect on CPI inflation vis-á-vis Germany does not exceed 2% per annum*. (Table 1-1). The numbers obtained are somewhat different from that one would conclude from the change in relative prices in the countries considered. This result might be explained by the fact, that the BS hypotheses did not hold exactly in the past, other factors like change in sectoral wage rates, pricing behaviour and intermediate product prices also contributed to the development of the nontradable and tradable price ratio.
As these estimates are based on past data, when productivity differentials were higher than currently, it is very likely, that as the catching-up proceeds, the possible magnitude of the BS effect will be even smaller. This would suggest that real convergence should not endanger the fulfilment of the Maastricht Treaty inflation criterion.
The paper is set up as follows. In the next section we give a simple accounting framework of the real exchange rate, that we adopt for all of the five countries, so that we can produce comparable stylised facts. In section three we present the country evidence for the Czech Republic, Hungary, Poland, the Slovak Republic and Slovenia.

1. A simple accounting framework

For the assessment of the BS effect it is useful to apply a simple accounting framework of the real exchange rate.[6] The real exchange rate between two countries can be decomposed into two main components: the relative price of tradables between countries, and the relative price ratio of nontradables and tradables between the two countries. In the following we call them for simplicity external and internal real exchange rates[7]:

$$RER = \frac{P}{EP^*} = \frac{1}{E}\left(\frac{P_T}{P_T^*}\right)^{a}\left(\frac{P_N}{P_N^*}\right)^{1-a} = \left(\frac{P_T}{EP_T^*}\right)\cdot\left(\frac{P_N / P_T}{P_N^* / P_T^*}\right)^{1-a} \qquad (1)$$

where[8]

RER is the CPI based real exchange rate
E is the nominal exchange rate (home/foreign)
P^*_T, P_T are CPI tradable prices in the foreign and the home country
P^*_N, P_N are CPI nontradable prices in the foreign and the home country
α is the share of tradables in the CPI

The external exchange rate is usually dominated by nominal exchange rate movements and behaves in a stable manner in the long run.[9] The BS effect – as it is well known - is closely related to the internal real exchange rate: the differences in productivity developments in the two sectors are translated to trend increase in nontradable-tradable relative prices.

In price setting, we apply the usual assumption that prices are set as a mark-up over unit labour cost.[10] However this formula assumes, that the role of intermediaries is negligible in the period considered. This is clearly not the case for transition economies, where the whole production structure is changing over time, and the ratio of intermediate products to value added prices might contain significant trend. For this reason , we cannot neglect the role of intermediaries.

Instead of modelling explicitly the price setting with intermediaries, we simply assume, that there is a term "other factor", capturing the difference between value added deflators and final (CPI) prices. Consequently this term also contains the effect of indirect tax changes.
We can formalise our previous statements in the following equations:

The ratio of nontradable and tradable value added deflators are determined by the usual pricing formula:

---

[6] See Isard-Symansky (1996), Kovács-Simon (1998).
[7] Kovács-Simon (1998)
[8] As one can observe, in (1) we assume, that the composition of the CPI basket is similar in the home and foreign countries. Although empirically the CPI weights are different across countries, the magnitude of this difference is not large, so we can use this simplification without loosing too much information.
[9] See Rogoff (1996).
[10] This formula might be derived under mild theoretical assumptions.

$$\frac{P_N^{VA}}{P_T^{VA}} = \frac{m_N}{m_T} \frac{W_N / PROD_N}{W_T / PROD_T} \tag{2}$$

where

P_N^{VA}, P_T^{VA} are value added deflators in nontradables and tradables
m_N, m_T are mark-ups in nontradables and tradables
W_N, W_T are wage rates in nontradables and tradables
$PROD_N$, $PROD_T$ are labour productivity rates in nontradables and tradables.

The difference between CPI prices and value added deflators are simply captured by the so called "other" multiplicative factors.

$$\frac{P_N}{P_T} = \frac{o_N}{o_T} \frac{P_N^{VA}}{P_T^{VA}} \tag{3}$$

where

o_N, o_T are other effects in nontradables and tradables

Combining (1)-(2), one can obtain the following formula for CPI prices:

$$\frac{P_N}{P_T} = \frac{o_N}{o_T} \frac{m_N}{m_T} \frac{W_N / PROD_N}{W_T / PROD_T} \tag{4}$$

We assume that similar equations are valid for the home and foreign countries.

From (4) it is clear, that the change in the internal exchange rate is driven by four main factors between nontradables and tradables:

- the change in the difference between relative *value added prices and CPI prices*,
- the change in relative *mark-ups*,
- the change in relative *wages*,
- the change in relative *productivities*.

From these four factors, in a strict sense only *the fourth component is the BS effect*.[11]

[11] In fact in a strict sense the BS effect is related to total factor productivity, which might deviate from labour productivity, because of changes in capital intensity. Due to the lack of capital stock data, we use labour productivity measures. However as the capital intensity of the CEC5 is increasing during the catching-up period, with this methodology we might overestimate the BS effect

3. Country evidence

For assessing real appreciation due to the BS effect in the five countries, we used Germany as a benchmark country. One could have also used EU or Euroland, however for such aggregates detailed productivity and price series are not readily available. Choosing Germany we do not loose too much information, as the country is the largest economy in the EU and the most important trading partner of CEC5.[12] All country reports consist of three main parts: In the first section, stylised facts are presented, using the accounting framework discussed above. In the second part the econometric evidence is summarised, that might be relevant for the country. The third part gives a short country-specific conclusion.

3.1. The Czech Republic

Trend appreciation in real exchange rate is observed on the whole transition period in the Czech Republic (Figure 1-1). Movements in real exchange rate are attributed to various effects, therefore the simple formal framework established previously is used in section 3.1.1 to discriminate between them. Econometric evidence is then investigated in section 3.1.2.[13]

3.1.1. Czech evidence within a simple accounting framework

Prior to our proper empirical analyses we had to make a moderate adjustment in the headline consumer price index for administered prices. Their share amounts to approximately 20 % and one might view them as nontradable goods. However their development is far from being tied down to development of some reasonable fundamentals (productivity or factor cost), even in the long run. For purposes of this text we have replaced administered prices with their non-administered nontradable counterpart assuming the same dynamics in both. The share of nontradables in this new price index (called *QCPI* here) is then the sum of the administered and other non-tradables. *QCPI* thus plays the role of *P* in (1). The analyzed period spreads over 1994Q1 – 2001Q2, the reference country is Germany which has proved an appropriate proxy in similar analyses.

The percentage rate of change in the real exchange rate amounts to 4.4 % p.a. on the above mentioned sample period, of which 2.8 % p.a. is attributed to the external appreciation, while only 1.6% to the evolution of relative price differential (internal appreciation), see Figure 3-1 and Table 3-1.

[12] It is important to note, that the tradable-nontradable categorisation of sectors among the five countries are not necessarily similar. As there are not any such series produced by National Statistical Offices, in every case the series are constructed by the authors of the papers.

[13] The sources of the data used in the analyses were the following: All Czech data except for tradable / nontradable price sub-indices are from the Czech Statistical Agency. The tradable / nontradable price sub-indices are based on the CNB's own calculation by Monetary Policy and Statistics Department. The German figures are from the Deutsche Bundesbank Monthly Bulletin(s)

Table 3-1

Extent of external and internal movement in real exchange rate

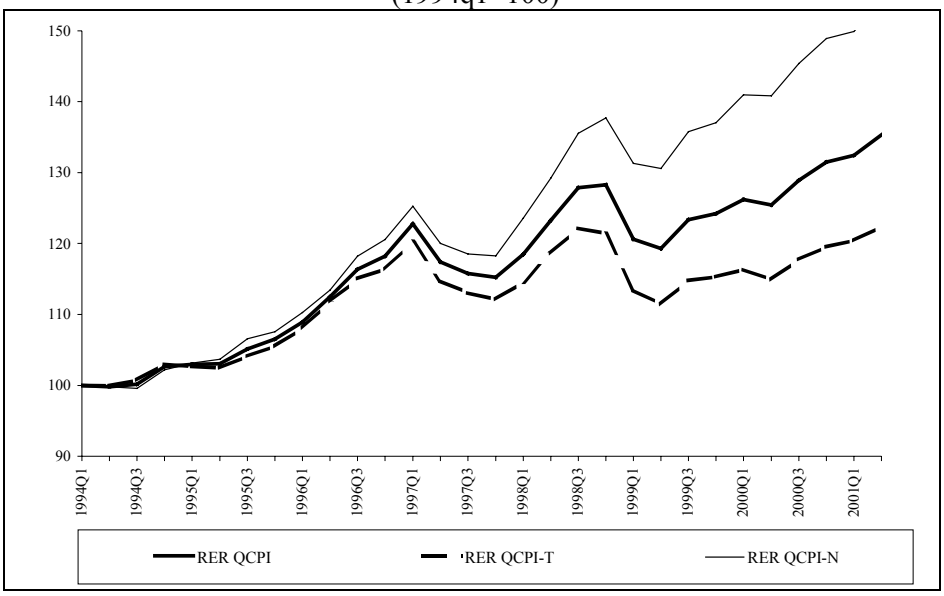
(Average percentage annual change)

Total	External	Internal
4.4	2.8	1.6

Figure 3-1

Real exchange rates based on QCPI, QCPI in tradables, and QCPI in nontradables

(1994q1=100)



The figure clearly confirms that the bulk of the real appreciation observed since 1994 is due to the evolution of relative prices of tradables (RER QCPI-T), while the evolution of non-tradable prices (expressed in a common currency – QCPI-N) was, at maximum, similar in both countries.

We suggest that the 1.6 % p.a. internal appreciation be a starting benchmark value for the BS effect. However, it follows from identity (2) that the total internal appreciation is by definition related to different factors behind relative nontradables-tradables prices in the Czech Republic and Germany. We could attribute the total internal appreciation purely to BS effect only if relative mark-ups, relative nominal wages and relative other effects in nontradables versus tradables remained constant (although different) in both countries.

Letting relative wages aside for a moment, we first investigate to what extent the relative mark-ups and other effects evolved in line with each other in both countries, which is done graphically in Figure 3-2, separately for both countries. If both these factors remained indeed constant, relative prices (nontradables-tradables) would exactly follow unit labour cost. This is apparently not the case in Germany, where mark-ups and other effects in tradables have been declining relatively to those in nontradables (since relative price of tradables has fallen more than relative ULC in tradables). This effect reaches somewhat more than 1 % p.a. On the other hand, there is almost no trend in relative mark-ups in Czech Republic, only a temporary deviation in mid 1990s. The sources of the departures (permanent in Germany, only temporary

in the Czech Republic) of relative prices from their ULC-viewed fundamentals lie primarily in 1) stickiness of nominal quantities, 2) indirect taxes and 3) development of other contributions to the true total unit cost, mainly import prices of intermediate inputs.

Figure 3-2

Relative prices and relative unit labour cost in tradables and nontradables Czech Rebublic (Cz), Germany (Germ)

(1994q1=100)

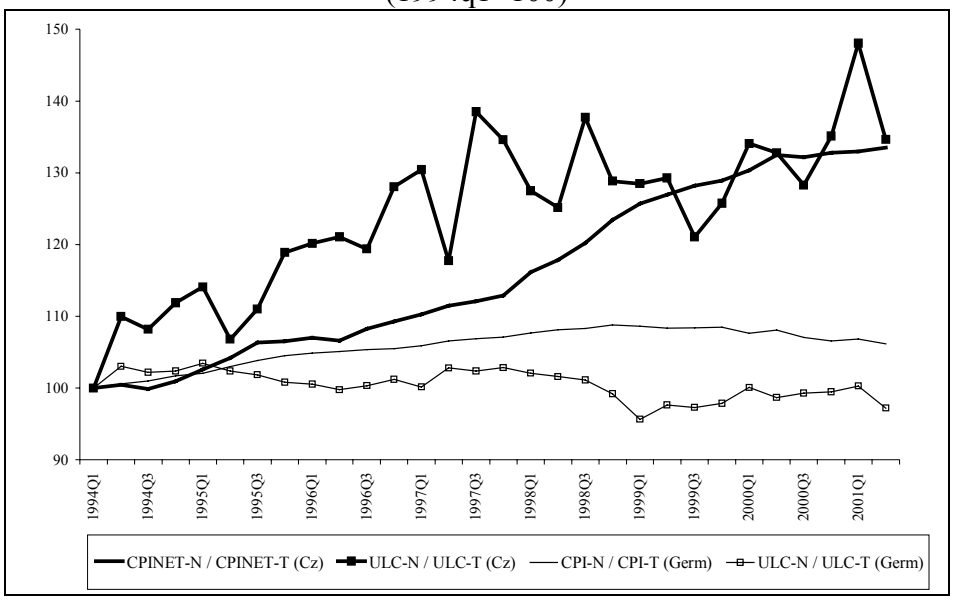


Table 3-2

Fundamentals of internal movement in real exchange rate

(Average percentage annual change)

Relative price	Relative ULC	out of which relative wage
Czech Republic		
5.8	4.8	2.3
Germany		
0.8	-0.4	N.A.

Table 3-2 summarises our discussion thus far by demonstrating that while ULC accounts for the bulk of the relative price movements in the Czech economy, in Germany the dominant forces lie in mark-ups and other (price index versus deflator) effects. There we also see that wages in tradables and nontradables in the Czech economy do not move in parallel as assumed by BS and account for almost the half of the observed relative price movements. Unfortunately, we lack the reliable wage data for German economy to perform a similar test there. Nevertheless, we can conclude that the relative evolution of ULC in Germany and the Czech economy does indeed account for about all of the internal real appreciation[14]. Hence, whatever is the relative evolution in mark-ups and other effects in the two countries, their total contribution to internal real appreciation must have canceled each other.

[14] As a matter of fact, it sums to 5.2 % out of 5.0 % relative price differential in both countries.

The sources of relative price movements in the Czech economy deserve a closer look though, see Figure 3-3 and Table 3-3. Firstly, while the relative value added deflators and price indices moved in parallel in the first half of the sample, later the relationship broke down. This is clearly attributable to the drift in other effects, namely indirect taxes since 1997. Secondly, the contribution of relative mark-ups was thoroughly negative in both periods: mark-ups in tradables rose relative to non-tradables[15]. This may reflect cyclical behavior, but also, by construction, the evolution in other value added price determinants, such as relative costs of intermediate inputs. Thirdly and most importantly, although relative productivity movements (the source of the proper BS effect) account for almost 40 % of the relative price movements over the whole sample, their contribution in the latter half was negative! Hence we observe quite a dramatic structural shift in factors accounting for the internal real appreciation on the Czech side, which implies that the influence of the proper BS (relative productivity) effect has greatly diminished recently.

Figure 3-3

Decomposition of relative price movements in the Czech economy

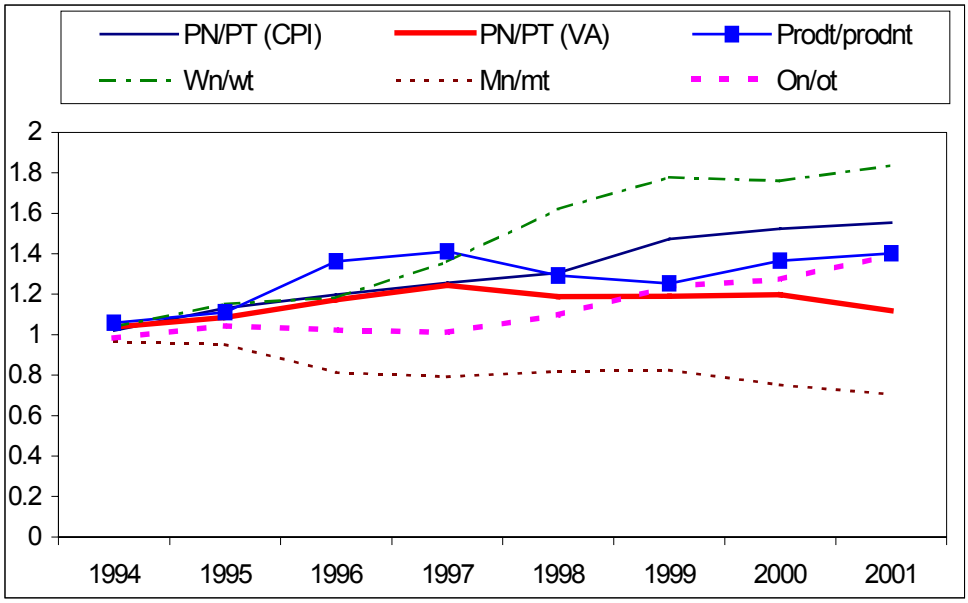


Table 3-3

Decomposition of relative price movements in the Czech economy
(Average percentage annual change)

	PN/PT (CPI)	On/ot	PN/PT (VA)	Prodt/prodnt	Wn/wt	Mn/mt
1994-1997	5.84	-0.33	6.19	6.77	4.72	-5.03
1998-2001	5.80	6.45	-0.61	-2.46	2.06	-0.16
1994-2001	5.84	4.07	1.69	2.44	2.33	-2.99

3.1.2. Econometric evidence in the Czech Republic

[15] The combined effect of mark-ups and other factors, though, displays similar behaviour as in Germany: tradables decline relative to non-tradables.

Unfortunately, there is currently no econometric-based literature focused on or related to the empirical BS effect in the Czech economy. Nevertheless we attempted to estimate a very simple three-variable transfer function with distributed lags to statistically evaluate the quantitative effect of relative (tradables-nontradables) productivity shocks into relative prices and relative nominal wages. Keeping relative productivity strictly exogenous with respect to other variables and considering its development to be random walk (with its first difference being proxy for productivity shocks in other words) we estimate the following versions of the transfer function model

a) $A(L)\begin{bmatrix} p_t \\ w_t \end{bmatrix} = B(L)\ z_t + U_t$ $\qquad$ b) $A(L)\begin{bmatrix} \Delta p_t \\ \Delta w_t \end{bmatrix} = B(L)\ \Delta z_t + U_t$

$z_t = z_{t-1} + e_t$ $\qquad$ $\Delta z_t = e_t$

i.e. both on levels and first differences. In the above notation, *p* is relative (T-N) price, *w* is relative (T-N) nominal wage rate, and *z* is relative (T-N) labour productivity (average product of labour), *U* is residual vector, and *A(L)*, *B(L)* are matrices of polynomials in lag operator.

Using estimated matrices *A, B*, we calculate the long-run (asymptotical) response of relative price and relative wage to the unit *e* shock, which is easily

$A(1)^{-1}\,B(1)$

in both cases, where $A(1)$ denotes polynomial matrix *A* evaluated at the point $L = 1$.

The outcome we have arrived at is rather discouraging – the long-run responses to the unit shock amount to less than 0.1 in the absolute value (with correct signs). The explanation is straightforward and relies upon technical properties of time series under question. Even a superficial investigation of relative price and relative productivity times series (which are roughly obtained from Figure 3-2 after adjusting *ULC* for rather negligible wage movement) proves an evident disproportion in variances of both. This is in turn the main determinant of estimated parameters. On the other hand, it is obvious from the same Figure 3-2 that even without any rigorous tests we can accept hypothesis that both non-stationary series are driven by common stochastic trends (cointegrated). Further, a unit change in relative productivity reflects itself in a unit change in the sum of the relative price + the relative nominal wage rate in the long run (asymptotically).

3.1.3. Conclusion

We may summarise that a benchmark estimate for the BS effect in real CZK appreciation over the 1994-2001 period amounts to about 1.6 percent per annum. This movement is ascribed to gradual change in relative ULC and not purely to that in relative productivity, with a significant trend in relative nominal wage rate. This notwithstanding, the chief factors behind the real appreciation lie in the relative evolution of tradable prices. Hence, the investigation of the external contribution to real appreciation should have at least the same importance from the monetary policy view as the BS effect.

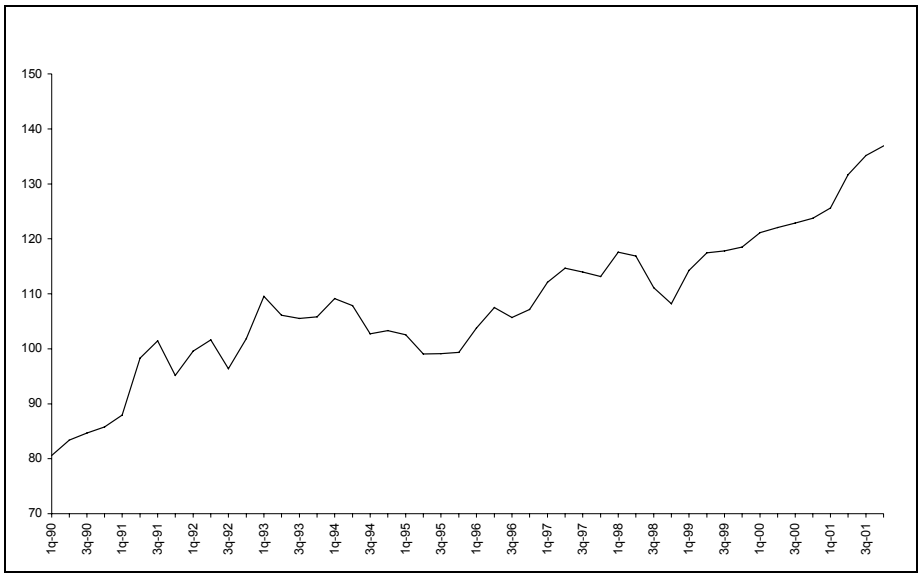
Decomposing the internal price movements into two sub-periods reveals that most recent trends defy the importance of the BS effect altogether. The predominant source of the relative price movements since 1997 has been the rise in the non-tradable

indirect taxes, while the components of the value added relative prices, such as relative mark-ups and wages, showed hardly any trend, and the contribution of productivity was negative.

3.2. Hungary

The trend appreciation of the real exchange rate in Hungary has been a clear phenomenon since the start of the transition. Between 1990 and 2001 the CPI based real exchange rate vis-à-vis Germany appreciated by an average 4.7% per annum. (Figure 3-4) Nevertheless in this paper we argue , that the BS effect is not the only source of medium term real exchange rate movements experienced in the country. Special transition factors such as price, wage and trade liberalisation had played an important role, especially in the first part of the nineties. As the transition effects are not important from the point of view of real-convergence, we leave aside them in the preceding discussion.[16]
The BS effect is not the only source of real exchange rate movements even under non-transition circumstances. Changes in the relative price of traded goods compared to competitors, changes in pricing behaviour within sectors and other factors (such as intermediate prices, indirect tax rates) also might play a prominent role.

Figure 3-4
Real exchange rate vis-à-vis Germany, based on consumer prices for Hungary
(1995=100)



Source: NBH

In this survey we briefly summarie the empirical results on the BS effect for Hungary. In section 3.2.1, we discuss what might be concluded from analysing the Hungarian data. Section 3.2.2 briefly summarises the results of econometric estimations that might be relevant for our country, while 3.2.3 concludes.

[16] See Kovács (1998) on this issue.

3.2.1. Hungarian evidence within a simple accounting framework

Looking at the Hungarian figures our first task is to decompose the change in the real exchange rate into the external and internal components. As throughout the whole paper, we used the Hungarian real exchange rate vis-à-vis Germany for decomposition.[17]

3.2.1.1.Data and methodology

We used similar methodology as in Kovács-Simon (1998).[18] Manufacturing was classified as tradable, and nontradables were defined as the sum of the following categories: market services, construction, retail trade, transport and telecommunication. The state sector was neglected from the analyses because of two main reasons. Firstly prices of this sector are largely distorted by discretionary policies of the government. Secondly the measurement of the output in the state sector is based on artificial assumptions about productivity, instead of observing real output. Energy and agriculture were also excluded, as in both cases the role of government in determining prices is non-negligible.

3.2.1.2. Results

The decomposition in (1) for the period of 1992-2001 for Hungary can be found in Table 3-4. Our first observation is, that the non-food and non-regulated appreciation (in our case tradable + nontradable) was 0.9% smaller, than the total CPI appreciation. (2.3% compared to 3.2%) This result is attributable to the fact, that regulated prices on average increased more, than any of the other components of CPI . Looking at the external and internal components, it is clear, that both of them contributed to the real appreciation on average. However by splitting the sample it becomes clear, that the earlier part of the transition was accompanied by real depreciation in the external component, rather than real appreciation. This phenomenon was due to the fact that exchange rate policy had a very strong focus on external balance.[19] The stability of external balance was mainly achieved via maintaining strong external competitiveness with the help of exchange rate policy i.e. by depreciating external real exchange rate. It is also noticeable , that while the variability of the external component was significant, there seemed to be a rather stable internal appreciation on all horizons, amounting to around 1.5%.

[17] Using trade weighted foreign variables would not alter the result substantially, see Kovács (2001).
[18] The sources of Hungarian data were the CSO national accounts publications and the CPI categorisation of the NBH. German data series are from the OECD Annual National Accounts, EUROSTAT and the German Statistical Office homepage.
[19] See Kovács (1998).

Table 3-4

Components of the real exchange rate between 1992-2001*
(Percentage average growth rate per annum)

	Exter-nal	Internal	Weights**	Total (excl. reg+food)	Total
1992-1996	-0.3	1.3	-0.3	0.6	1.5
1996-2001	2.1	1.6	-0.2	3.6	4.5
1992-2001	1.0	1.5	-0.2	2.3	3.2

* Based on consumer price statistics, positive numbers refer to appreciation

** The component due to differences in the composition of Hungarian and German consumption basket.

It is tempting to take this latter value as the first estimate of the BS effect for the period. However, as it is clear from (4), this number also contains the effect of changing relative wages, mark-ups and other effects.

From Table 3-5 one can conclude, that relative prices increased quite closely with relative productivity in both countries, Hungary and Germany. In case of Germany the relationship is almost one for one, while in Hungary prices systematically increased slightly less than might have been projected from productivity.

Table 3-5

Nontradable over tradable prices and tradable over nontradable productivity

Tradable/nontradable productivity			
	Hungary	Germany	Relative
1992-1996	6.6	1.6	4.9
1996-2001	5.8	0.8	5.0
1992-2001	6.2	1.2	4.9
Nontradable/tradable prices			
	Hungary	Germany	Relative
1992-1996	5.3	2.0	3.3
1996-2001	5.1	1.0	4.1
1992-2001	5.2	1.4	3.7

From (4) it is obvious that all, the divergence in sectoral wage rates, the differences in mark-ups and the differences in other effects might explain this latter phenomenon.

In Table 3-6 and Figure 3-5 the decomposition of the nontradable-tradable price ratio for Hungary is presented.[20] It is perceptible , that the value added measure of the relative price ratio increased slightly more, than the CPI measure, consequently the on/ot terms decreased over time. This can be explained by the fact that both services and industrial goods in CPI contain both tradable and nontradable components. This means, that if there is a trend increase in the value added content of services compared to industrial goods, the effect is dampened on final (i.e. CPI) prices.

[20] Unfortunately we have official data for value added deflators only until 1999. This also means that the mark-up and other effects cannot be computed for the last two years. In the calculation presented in Table 3-6 below, we assumed constant relative mark-up for 2000-2001.

One can also notice , that not surprisingly the relative wage and mark-up terms were quite stable in the observed horizon, so clearly the trend change in relative prices was due to productivity differentials.

Table 3-6

The decomposition of the nontradable-tradable price ratio for Hungary

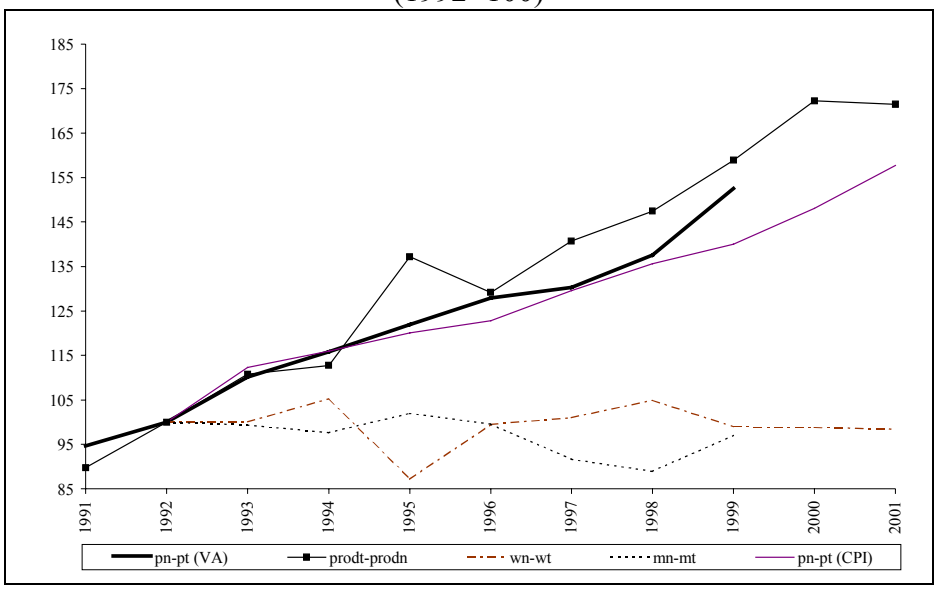
Hungary	PN/PT (CPI)	PN/PT* (VA)	Prodt/prodnt	Wn/wt	Mn/mt*	On/ot*
1992-1996	5.3	6.3	6.6	-0.1	-0.1	-1.0
1996-2001	5.1	5.0	5.8	-0.2	-0.5	0.1
1992-2001	5.2	5.6	6.2	-0.2	-0.3	-0.4

- CSO data available only until 1999. See footnote 20.

Figure 3-5

Decomposition of the nontradable-tradable price ratio in Hungary

(1992=100)



Thinking about the BS effect in a strict sense one can say that it effected the nontradable/tradable price ratio by the amount of productivity differential: 6.2% in Hungary, and 4.9% between Hungary and Germany per annum. In order to recalculate it's effect on annual CPI inflation differential between Hungary and Germany, one has to weight the productivity differential by the role of nontradable sector in CPI. According to the categorisation of the NBH, the share of market nontradables in Hungary is around 20%. Assuming also that regulated nontradable prices are affected by the price development of market nontradables, one should add another 20%. This latter seems to be a reasonable assumption, as regulated prices cannot differentiate from market prices in the longer term. Taking into account all of these assumptions, the estimated BS effect in the CPI is around *1.9%*, which seems to be a quite stable result for the past.[21]

This calculation is strictly based on separating the BS effect. In the past the observed internal appreciation was smaller (1.5%), especially due to the trend divergence in

[21] See also Kovács-Simon (1998) and Kovács (2001).

value added and CPI prices, while the effect of wage differential and mark-ups seemed to be insignificant.
As for the future the trend divergence in value added prices and CPI figures might remain. We do not have a clear view on mark-ups and relative wages, but projecting from the past, they does not seem to play a major role in relative price changes

3.2.2. Econometric evidence for Hungary

As it is readily obvious from the previous paragraphs, the empirical analyses of the BS effect requires highly disaggregated data for prices, output, employment and wages. At this level of disaggregation, output figures for Hungary are only available at an annual frequency with considerable time lag. This fact has naturally withheld exact empirical analyses . So far there has been very few formal econometric tests of the BS effect, i.e. a test of sectoral productivity ratio effecting sectoral price ratio for Hungary. The only exceptions are Jakab-Kovács (1999), Halpern-Wyplosz (2001) and Coricelli-Jazbec (2001). Jakab-Kovács (1999) estimate a sectoral SVAR model for testing the BS effect. Their results suggest that sectoral productivity shocks help to explain most of the movements in the nontradable/tradable price ratio, which indicates the importance of the BS effect. However they do not give a numerical estimate on the size of the effect. Halpern-Wyplosz (2001) estimate a sectoral regression for the service to industrial goods ratio on a panel of 9 formerly centrally planned economies. Starting from the regressions, they also give an estimate of the productivity effect on the nontradable/tradable price ratio, amounting to 3% per annum. Weighting this effect by the share of nontradable prices, we get 1.2% for the total CPI. Coricelli-Jazbec (2001) also estimated sectoral regressions between prices and productivity and other variables on a larger panel of 19 transition economies. Substituting the relative productivity numbers, we presented in section 3 into their equations, one can get a 1.6% effect on total CPI.
Most of the other studies in this field also used panel estimation[22] and regressed nation-wide productivity on the total real exchange rate[23] or sectoral productivity on the total exchange rate.[24] As these numbers are usually distorted by movements in the external component of the real exchange rate, regulated price effects and the differences in relative and aggregate productivity, they cannot be seen as a formal test of the BS hypothesis.
To sum up the results of econometric studies, relying mainly on the results of sectoral econometric methods – which is supposed to give a more accurate picture of the question-, one might conclude, that the most probable range of the BS effect is around 1-2% annually.

3.2.3. Conclusion

As a conclusion from the analyses presented above, one can state the following results: Firstly, the simple accounting exercise suggests a BS effect around 1.9% per annum for Hungary. Secondly, the econometric studies in this field would predict the BS effect in the range of 1-2% . Since all of these estimates are based on historical data, as the catching-up process proceeds and productivity differentials moderate,

[22] The only exception is Darvas (2001).
[23] Halpern – Wyplosz (1997, 1999), Krajnyák - Zettelmeyer (1997), Oblath (1997) and Dobrinsky (2001).
[24] Darvas (2001) and De Broeck-Slok (2001).

these numbers can give an upper estimate for the potential future size of the BS effect. Thirdly, among other sources of relative price movements, which require consideration in analysing the real exchange, only "other factors" had a slight permanent role, by decreasing the effect of productivity differentials on final prices. The role of relative wages and mark-ups were negligible. If the effect of "other factors" remains in the future, there are good reasons for expecting slightly smaller numbers for the inflation differential, than predicted previously.

3.3. Poland

The BS effect is one of the key supply-side factors driving relative price changes in transition economies. Nevertheless, it may be expected that the overall impact of the BS effect on relative prices is in general smaller than the sole differences in rates of technological progress across sectors would predict. This is due to the fact that changes in relative prices lead through the general equilibrium effects to demand side responses. The overall effects of impulses that originate on the supply side and lead to relative price increases are typically curtailed. Consumers, in the face of the relative price increase, normally shift their demand towards the good that became less expensive. The shift in fact accommodates in part the impulse from the supply side and reduces the equilibrium increase in the price level.

Empirical verification of the BS effect and estimation of the impact of the BS effect on the relative price movements are very formidable tasks. Any attempt must rely on several judgement calls. In particular, the degree of openness of each sector must be defined, i.e., goods must be grouped into tradables and non-tradables. Moreover, the openness must account not only for actually observed exchange of goods but also for trade that could potentially take place. Furthermore, relative price changes can be an outcome of other processes than the BS effect, such as change in preferences, which further obscures the analyses. Therefore, any empirical findings on the actual magnitude of the BS effect must be viewed with caution.

3.3.1. Polish evidence within a simple accounting framework

Real exchange rates calculated in NBP are based on four basic deflators: consumer prices, producer prices in manufacturing, export prices, and unit labour cost. The indexes are trade-weighted with eight of the most important currencies in foreign trade: US dollar, German mark, French and Swiss franc, British pound, Austrian shilling, Dutch guilder and Italian lira.

Due to the lack of tradable and non-tradable price series for all included countries, the index with CPI component is treated as a proxy for non-tradable prices and the index based on PPI as an approximation of tradable sector prices.

Polish RER data for 1990 – 2001 reveals continuing appreciation of the zloty. Average real appreciation was around 10% per annum for the index based on relative CPI and 4% based on relative PPI. Similarly to other countries, the appreciation was much higher in the first five transition years. Between 1990-1995 Poland experienced around 20% (CPI-deflated) average real appreciation per year and almost 8% (PPI-deflated) real appreciation, whereas, in the recent years the pace of zloty strengthening has significantly decreased (to 6% and 2%).

Table 3-7

Extent of external and internal movement in real exchange rate (Average percentage annual change)*

Total	External	Internal
+ 5,3	+ 1,6	+ 3,7

*"+" indicates appreciation

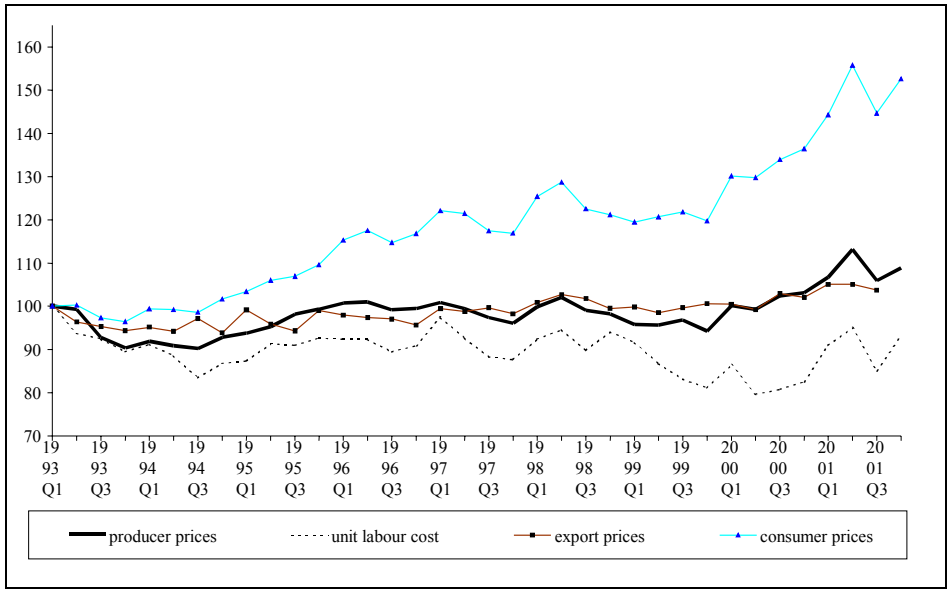
High real appreciation of the Polish currency in the initial stage of transition period was strictly connected to changes in economic system associated with colossal transformation of fundamentals. Among others, the most important alteration was the launch of the privatisation process with foreign participation in the Polish economy. Foreign investors besides capital brought expertise, which allowed industry to improve productivity rapidly. Therefore, the first years of the transition period were characterised by high productivity growth rates in tradables and non-tradables as well relative to the external productivity growth.

However, during the last two years in both tradable and non-tradable sectors the long-term trends have shown a tendency to real appreciation, which appears to be unrelated to the BS effect. Current situation of continued appreciation of the Polish zloty is not caused by changes in fundamentals, but is rather the result of speculation, connected to interest rate cuts, on the domestic market. Along with the introduction of more and more flexible, from fixed to freely floating, exchange rate systems and dropping inflation rate, at present close to that of our trading partners, nominal exchange rate has a higher impact on the real exchange rate of the zloty. The important observation in this respect is that, if a real exchange rate depreciation is to take place, it is much more easily achieved through nominal depreciation than through a decline in relative prices and costs. This is because, in practice, wages and other costs of production adjust only slowly to changing circumstances, particularly in the downward direction, and even more slowly in low inflation environments. An important reduction in wages and other unit costs require large and costly doses of high unemployment. Such economic conditions have just taken place in Poland – increasing unemployment rate aids to reduce wage growth and in consequence to maintain a quite stable level of unit labour costs since 1999 (with a slight tendency towards diminishing). This limited growth of ULC in Poland does not allow RER based on relative unit labour cost to mount above the reference period.

Figure 3-6 empirically confirms the appearance of the BS effect in Poland. Data show more significant real appreciation in the real exchange rate of the zloty deflated by CPI than PPI and ULC. This means that faster relative growth of marginal labour productivity in tradables (RER deflated by PPI and ULC) causes higher real appreciation of currency expressed through relative prices of non-tradables.

Figure 3-6

Real effective exchange rates of zloty, 1993 – 2001*



*based on: export prices, consumer prices, producer prices and unit labour cost in manufacturing; quarterly data (I 1993 = 100)

3.3.2. Econometric evidence for Poland

Some of the empirical findings on the magnitude of the BS effect in Poland are presented in Table 3-8. Due to significant differences in the applied methodologies, the underlying assumptions together with the obtained results have to be thoroughly explained before eventual policy prescriptions are formulated.

Both first and second methodologies focus on the minimum (equilibrium) inflation rate, i.e. the price dynamics predicted by productivity differentials between tradable and nontradable sector. Three caveats apply. First, the questionable assumption on the perfect transmission of supply-side impulses leading to full intersectoral wage equalisation is made (an upward bias). In other words, no segmentation in the labour market is assumed. Secondly, to calculate the shares of both sectors authors use aggregate value added instead of CPI basket (a significant upward bias). Thirdly, agriculture is included in the tradable sector (a downward bias). The latter is tantamount to the questionable assumption that wages in nontradables and agriculture move in synch.

The third assessment is very similar to the above ones and is based on the search for price differentials between the two sectors under analysis as predicted by sectoral productivity differentials. Again, the respective shares in gross value added are used and, consequently, the contribution of the BS effect to the GDP deflator is calculated. Since manufacturing is used as a proxy for tradable sector, this methodology yields much higher results than those derived under the former two approaches.

Table 3-8

Empirical findings of the Balassa-Samuelson effect in Poland

	Authors	Methodology	Time series	BS effect
1.	Sinn-Reutter (2001)	Minimum inflation rate as a function of productivity differential and the shares of tradable and non-tradable sector in gross value added	1994-1997	4,16%[b)]
2.	Jankowiak-Chwiejczak-Garbarczyk (2001)	Minimum inflation rate as a function of productivity differential and the shares of tradable and non-tradable sector in value added	1992-1999	3,7% [b)]
3.	Schardax (2001)[)]	Predicted (by productivity differentials) inflation differential between tradables/nontradables, weighted by the share in the GDP deflator [c)]	1992-1998	9,38% [b)]
4.	Dudek(2001)	CPI elasticity with respect to relative price changes in tradable and nontradable sector	1994-2000	1,2%[a)]
5.	Cipriani (2000)	Structural econometric model, in which price differentials are explained by productivity differentials	1995-1999	1,5%[a)]

[a)] Empirically assessed CPI contribution of the BS effect
[b)] Minimum (equilibrium) inflation rate, resulting from the BS effect
[c)] The derivation of the applied formula has been presented in Rotter P. C., *The impact of productivity differentials on inflation and the real exchange rate: an estimation of the BS effect in Slovenia*.

The fourth approach attempts to evaluate the impact of relative price changes on the CPI. The paper finds elasticities between the rate of price increase and the change in relative prices. The elasticities then can be used to establish the impact of the relative price changes on the CPI. The approach takes into account all potential causes of relative price changes and its focus goes beyond the standard BS effect analysis.

The fifth assessment rests on the structural econometric model linking productivity differential between tradable and nontradable sector with the relevant price differentials as an endogenous variable. The unquestionable merits of this method are a more plausible division into the tradable and nontradable sectors (the former embraces industry and construction, the latter contains market services) and clear focus on empirical rather that theoretical impact and calculation of the CPI contribution of the BS effect.

3.3.3. Conclusions

It is easily noticeable that two of the aforementioned studies based on empirical rather than theoretical assessment of the magnitude of the BS effect in Poland produce the results significantly lower than derived in the remaining ones. According to them, the "real" CPI contribution of the BS effect in Poland should stand at a level practically identical with the permissible deviation from the three best inflation performers envisaged in the Maastricht Treaty. However, this conclusion has to be confirmed once HICP for Poland is constructed.

Should the obtained results be viewed as a realistic reflection of the actual magnitude of the BS effect in Poland it would mean, that given the roughly estimated share of tradables (mainly products) in the CPI basket (65,3% in 2001), the nominal appreciation of the exchange rate, necessary for compliance with nominal convergence criterion on price stability, would not have to be significant. This

appreciation would also be entirely feasible within a wide (+-15%) fluctuation band. In consequence, the ERM II participation and subsequent introduction of the euro in Poland would not be tantamount to a sizeable fall in external competitiveness and as such would not slow down the process of real convergence. This conclusion does not preclude, however, the need for reassessing the magnitude of the BS effect in the future, possibly with the application of other methodologies.

3.4. The Slovak Republic

BS effect, as the result of sectoral productivity differentials is now discussed more intensively in Slovakia. Reason for discussion is two-folds:

- Nominal convergence (Maastricht) criteria, namely CPI inflation. The question is inflation differential towards respective EMU countries,
- Real convergence and price competitiveness. The question is appreciation of both the real and the nominal exchange rate.

The above mentioned questions are interrelated.

3.4.1. Slovak evidence within a simple accounting framework

We concentrate on the second type of the question in this note. Following Kovács-Simon (1998) we use decomposition of the RER into internal and external real exchange rates. To allow comparison of our estimate to other candidate countries we use Germany as the representative of "foreign" region.

That selection may be questioned. Slovakia, because of common history, has been interconnected with the Czech Republic by intensive trade (and other relations). As Figure 3-7 depicts, real appreciation was more intensive with respect to other (than CR) countries. When thinking about the real exchange rate this observation may be important for some candidate countries, including Slovakia.

When only Germany and value added deflators are taken for computation of RER we get following decomposition on the "internal" and the "external" part for the period 1995-2000[25].

Table 3-9

Extent of external and internal movement in real exchange rate (Average percentage annual change)

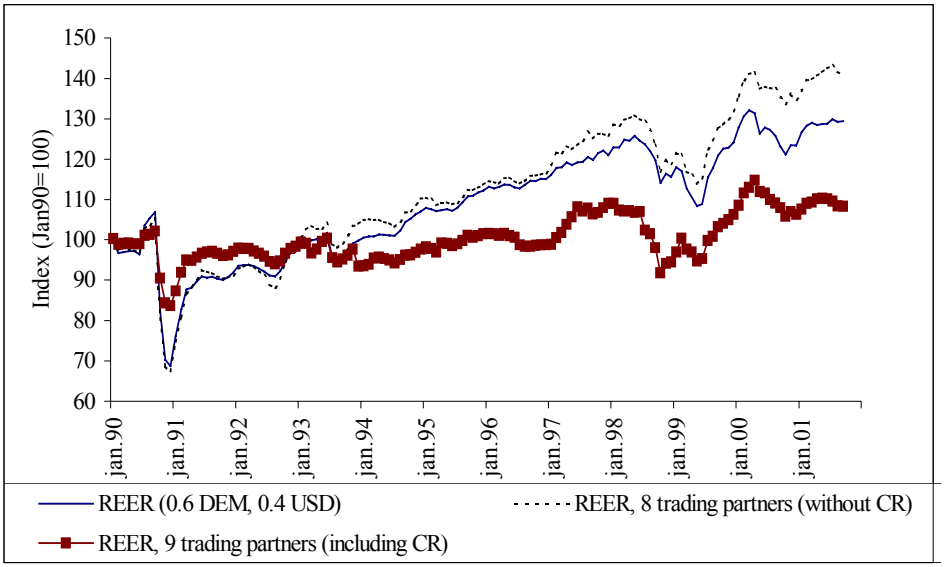
Total	External	Internal
4.3%	2.7%	1.8%

"+" indicates appreciation

[25] Non-market services were excluded, weight of market services has increased during the respective time period from the 44,4% to the level of 49.6% (on the value added after exclusion). We do not have respective data on weights for Germany, so we have assumed they have not changed.

Figure 3-7

RER CPI for Slovakia



3.4.1.1. Potential for the BS effect

Strictly speaking, BS effect is only that (part of) inflation differential and real exchange rate appreciation, which is caused by productivity differential. From Figure 3-8 it is evident that the developments of both relative productivity (Tradable/Nontradable[26]) and relative price (value added deflators) coincide in the period 1995-2000 for Slovakia, with average per year growth rate of 3.3% for both of them. The same Figure 3-8 shows, that it was not true for relative ULC.

[26] Tradable sector – manufacturing, Nontradable sector – market services. The SNA data are from the Statistical Office (Selected Indicators of Economic Development of The Slovak Republic for 1991-2000, November 2001, Statistical Office of SR)

Figure 3-8

Potential for the BS effect in Slovakia

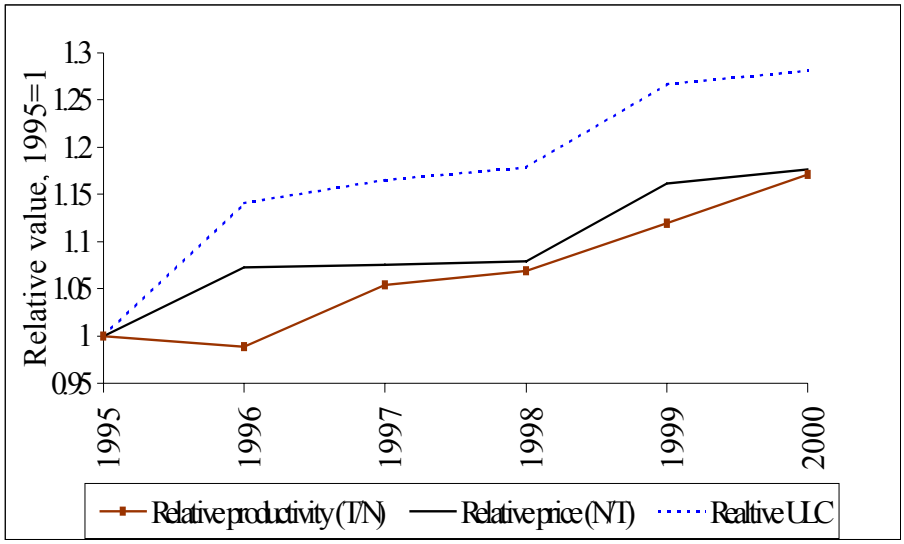


Figure 3-9

Wage development and wage relation

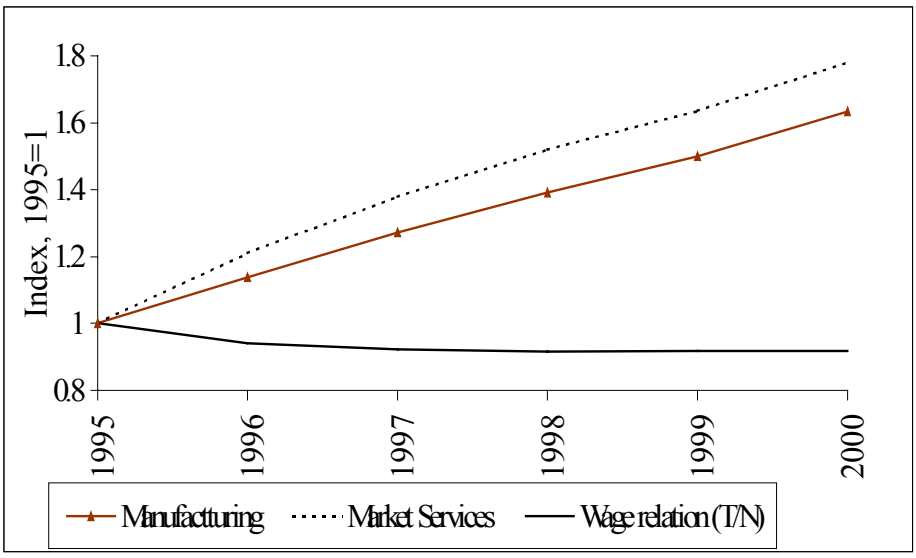


Figure 3-9 provides explanation for that "strange" observation. It shows, that wages in the nontradable sector grew faster at the beginning of the period concerned. There may be various explanations for that observation. The most plausible is the "competitiveness" argument. At the beginning of transition and also after Slovakia was established, the service sector was underdeveloped and was sheltered by the state from liberalisation (both on current and capital accounts). "Full" convertibility on the current account (Oct. 95), removal of the payment agreement with CR (Oct. 95), the gradual liberalisation of transactions on capital account and development of more competitive financial (banking) sector, FDI inflows into the service, especially financial and trade sectors – all those factors were relevant in the process of wage setting in the nontradable sector. As evident from the Figure 3-9, relative wage has stabilised starting from 1997-98.

The other evidence from Figure 3-8 is, that "other" factors (taxes, mark-ups) played a compensating role towards wage setting process in the period concerned.

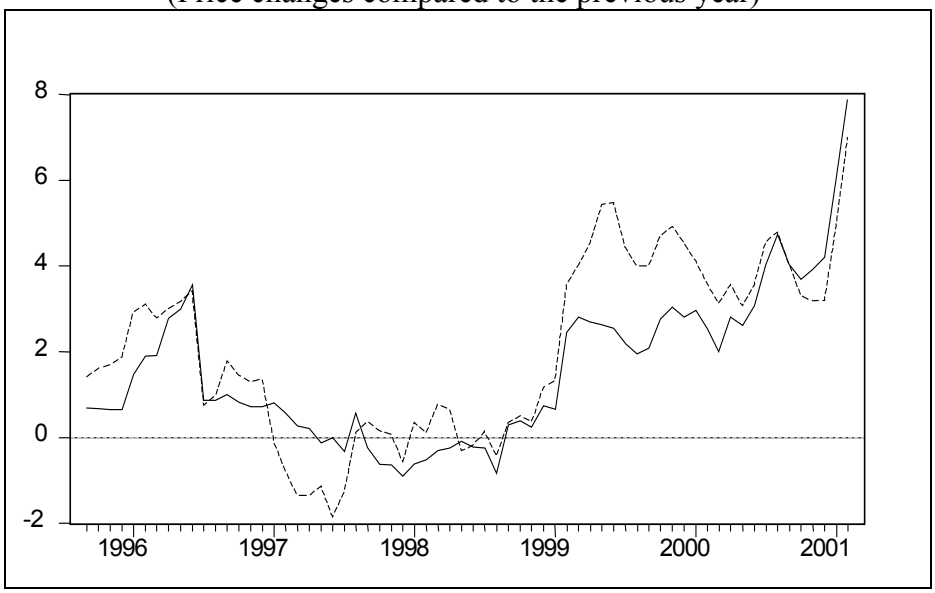
3.4.1.2.Dual inflation and CPI inflation

There is difference between the potential and the actual manifestation of BS effect in the CPI inflation. Figure 3-10 gives guess for assessment of dual inflation[27].

Figure 3-10

Dual inflation

(Price changes compared to the previous year)



We define dual inflation as a difference between the inflation of market services and inflation of "other" tradables (dashed line) or (as an alternative) difference between the inflation of market services and "other " tradables + foodstuffs (full line).

According to what Figure 3-10 says, there was no dual inflation (or even negative one) in the period 1997-98. Dual inflation started to be relevant after the change of the exchange rate regime and start of stabilisation and restructuring process. It seems to be relevant inflationary factor nowadays (approaching 6-8%). The weight of market services is relatively low (current weight is cca 16%) and has been gradually decreasing in the consumer basket in Slovakia. The reason for that is two-folds:
low level of average income and increasing income differentiation, which cause that use of services is rather depressed,
importance of deregulation for price inflation (when starting from the beginning of transformation process, different type of administered price changes (including "shock" price liberalisation, tax changes and deregulations) were responsible for approximately 2/3-rd of price inflation. Those price changes substantially depressed effective demand for market services

[27] The definition of dual inflation is based on the decomposition of CPI, in which , in the case of Slovakia, four components are important: regulated prices, foodstuffs, other tradables, market services.

There is no reason in current situation in Slovakia to treat inflation, coming from deregulations the same manner as inflation of market services (and, potential BS effect). Even when there will be full liberalisation (or more cost-based price setting) one cannot treat current regulated goods and services as they were nontradables. Only part (less than half of current weight of goods and services with regulated prices) are nontradables (the estimate is 8%[28]). It means, that the weight of nontradables will be approximately 25% in the consumer basket of Slovakia.

3.4.2. Econometric evidence for the Slovak Republic

There is no econometric evidence available specific for Slovakia, concerning the BS effect. Research of the topic has been just started based on the econometric modelling of sectoral productivity.

3.4.3. Conclusion and "guesstimates"

Potential for the BS effect and its actual size was low in Slovakia. As regards potential, we found 3.3% for the relative productivity differential[29] and 4.4% for relative price differential – in yearly average. This gives 1.75 % in yearly average (potentially) and 2% in yearly average as revealed in relative price differential. That "guesstimate" is comparable to what "dual inflation" adds to headline inflation, 1-2%.

As for the future, we expect that two tendencies will evolve. First, FDI inflow into the tradable sector will increase productivity growth and differential of tradable sector towards the nontradable one and compared to the relevant "foreign" countries. Second, productivity growth in the nontradable sector will be relatively (to "foreign") fast, too, but the growth of productivity in the nontradable sector will fall behind that in the tradable sector. Gradually – after deregulations will end eventually – the weight of market services will increase the contribution of "dual" inflation to the headline inflation.
As for the future, our "guesstimate" of BS effect for Slovakia is 1-2%. 3% is possible in the future in case of accelerated FDI inflow into manufacturing sector.

[28] Expert estimate of the Monetary division of NBS
[29] It is important to note however, that our time span is different from that of Germany.

3.5. Slovenia

3.5.1. Slovenian evidence within a simple accounting framework

3.5.1.1. Data and assumptions

For the purpose of our analysis the sectors are defined as: The tradable sector is manufacturing, and the nontradable sector construction and the following service industries: wholesale and retail, hotels and restaurants, transport and communication, financial services and real estate and renting services. The state sector, energy and agriculture were not included because of the difficulties in measuring their output as well as the non-negligible role of government in wage and price determination process in these sectors.

Another assumption made for simplification is that the prices of tradables are the prices of goods and prices of nontradables are the prices of services. Furthermore, in the CPI for Slovenia a modification has been made: because of a large share of administered prices in CPI (on average amounting to 21% in 1992-2001 period) a new price index has been constructed (CPIA). In this new price index only the dynamics of non-administered prices is considered; the share of tradables in this new index the share of non-administered goods and the share of nontradables the share of non-administered services. With this modification the shares of services and goods change only very little compared to their shares in the original CPI. Also the dynamics of CPI and CPIA is similar, with the major differences observed in the first sub-period.

The price level in Slovenia is a geometric average of tradables and nontradables prices, with weights α and (1- α), where

α -the share of tradables in the CPI is the share of goods in CPI, the share of nontradables (1-α) is the share of services in CPI.

Measure of productivity is output per employee.

The analysed period extends from 1992 to 2001, data used are yearly data and the reference country is Germany.

The data sources for Slovenia: Bank of Slovenia, Statistical Office of the Republic of Slovenia. The data source for Germany: Deutsche Bundesbank, German Statistical Office

3.5.1.2. Real exchange rate decomposition

In this analysis the two components of the real exchange rate (the external and internal) are computed as well as the relative productivity and prices between Slovenia and Germany. The real exchange rate (RER) movements were analysed for the period 1992-2001 as well as for two sub-periods, 1992-1996 and 1996-2001.

Table 3-10

Components of the real exchange rate
(positive numbers indicate appreciation)
(Average annual percentage growth)

	External	Internal	Weights*	Total (CPIA)	Total (CPI)
1992-1996	0.2	1.2	0.5	2.0	1.0
1996-2001	0.5	0.6	0.8	1.8	1.9
1992-2001	0.4	0.9	0.7	1.9	1.5

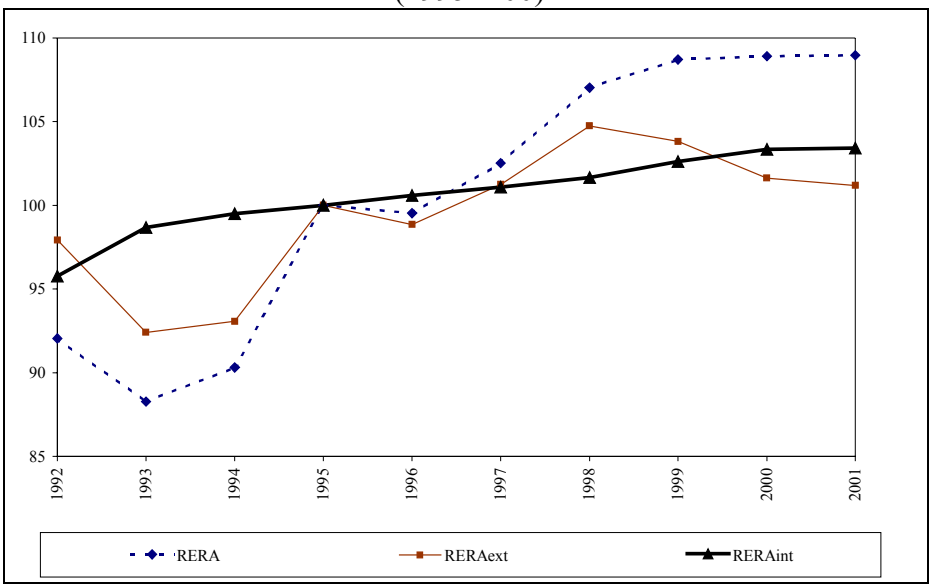
*The component due to differences in the composition of the consumption baskets in Slovenia and Germany

The real exchange rate appreciation over the entire period computed with new price index (CPIA) is higher than the one computed with original CPI. The difference can be explained with slower growth of administered prices compared to overall index in 1992-1996. In the second period administered prices rose faster and so does the real exchange rate computed with original CPI.

As it can be seen from Table 3-10 over the whole period both the external and internal component contributed to real exchange rate appreciation. Overall average appreciation of internal component amounts to 0.9% p.a. and of external component to 0.4 % p.a. Though in the later period the appreciation of internal exchange rate was less pronounced it still explains more RER movements than the external component. The internal real exchange rate growth rate, which indicates faster growth in relative prices (nontradabes to tradables) in Slovenia than in Germany, on average amounted to 1.2% p.a. in 1992-1996 and to 0.6% p.a. in 1996-2001.

Figure 3-11

Real exchange rate and its components in Slovenia against Germany
(1995=100)



Looking at the external component of RER, which indicates the external competitiveness of a country, we find that its appreciation was small (on average

0.4% p.a.). This means faster growth in prices of tradables in Slovenia compared to Germany (in common currency) by 0.4% annually. Relatively modest appreciation of the external exchange rate could be explained by monetary policy interventions in the foreign exchange market. Based on this indicator the external competitiveness of Slovenia has not deteriorated, especially over the last three years, when the external real exchange rate depreciated.

The internal real exchange rate is strongly connected with BS effect, but its value cannot be simply taken as the BS effect. This is clear by looking at (4). It indicates that the difference in relative prices between the countries is influenced not only by different relative productivity, but also by relative nominal wages, other factors and mark-ups in tradable and nontradable sector. Therefore, in order to estimate the BS effect, we look closer at relative productivity and prices in the two sectors between the countries. International differences in productivity growth may have an impact on relative international prices, that is, on real exchange rate[30].
We observe a rising trend in national price ratios of nontradables to tradables in Slovenia and Germany, however in Slovenia it is much more pronounced. Furthermore, in both countries labour productivity growth in nontradables has been lower than in tradables (a rising trend in national ratios of productivity in tradables to nontradables, but again more pronounced in Slovenia). This was expected and is all according to theory (see e.g. Obstfeld and Rogoff, 1996).

[30] This is one of the arguments for the failure of the PPP theory (which predicts, in its relative form, that changes in national price levels tend to equality in the long run).

Figure 3-12

Relative prices, productivity and wages in Slovenia and Germany

(1992=100)

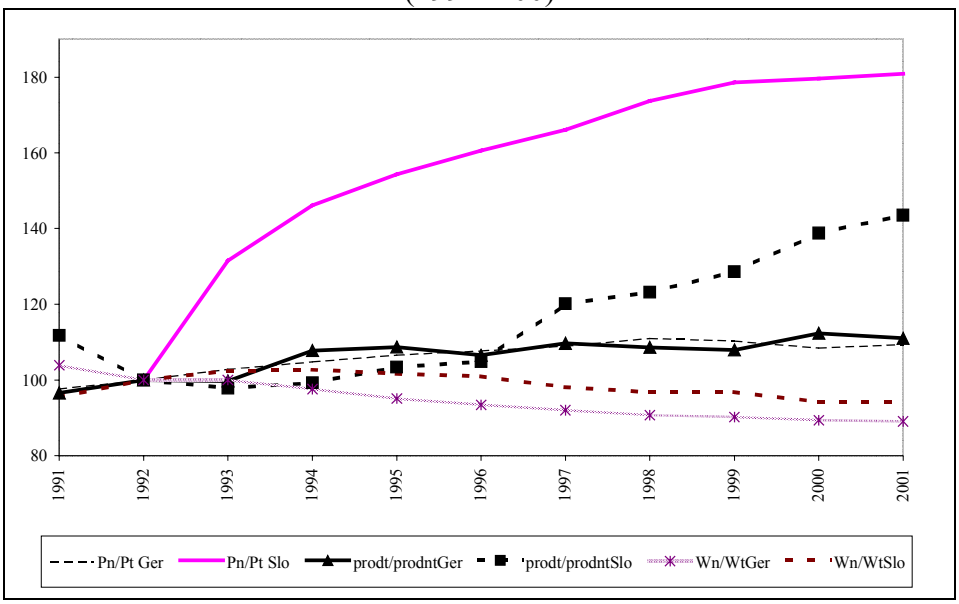


Table 3-11 shows that relative prices (nontradables to tradables) in Slovenia increased more than relative productivity (tradable to nontradable sector), but only in the first sub-period. This was due to the fast growth in prices and labour productivity in service industries at the beginning of the transition period. The relative price differential between Slovenia and Germany rose in average by 5.8% and the relative productivity differential between Slovenia and Germany by 2.9%. This implies that price of nontradables increased more than just as what can be attributed to the BS effect and that the mark-ups (determined mainly by distribution sector) and other factors (determining the difference between actual (CPI) prices and value added deflators) also contributed to higher growth in relative prices

Table 3-11

Relative prices, productivity and wages in Slovenia and Germany

Nontradable/tradable prices (CPI) (average annual percentage growth rate)	1992-1996	1996-2001	1992-2001
Slovenia	12.6	2.4	6.8
Germany	1.9	0.3	1.0
Slovenia/Germany	**10.5**	**2.1**	**5.8**
Tradable/nontradable productivity (average annual percentage change)			
Slovenia	1.2	6.5	4.1
Germany	1.6	0.8	1.2
Slovenia/Germany	**-0.4**	**5.7**	**2.9**
Nontradable/tradable wages (average annual percentage change)			
Slovenia	0.2	-1.4	-0.7
Germany	-1.7	-1.0	-1.3
Slovenia/Germany	**1.9**	**-0.4**	**0.6**

3.5.1.3.Analysis of mark-ups and other factors

From Table 3-11 (and Equation 4) it can be seen that mark ups and other factors played more important role in determining real exchange rate in Slovenia in the first part of the sample period suggesting that BS effect became more important after 1996. Though relative price of nontradables increased more in the first half of the period (indicating potential value for BS effect of 1.2% p.a.) there is no estimated BS effect in this period. The reason for this is much more equal productivity growth in the sectors than in the period after 1996.

In Table 3-12 the more detailed analysis of mark-ups and other factors obtained from (2) and (3) is summarised. As already seen from Table 3-11 in period 1992-1996 the most influential estimated source of relative price movements (nontradable to tradable prices) in Slovenia are other factors, followed by mark-ups. On contrary in 1996-2001 the first is relative productivity - the mark-ups and other factors increased more in tradable than in nontradable sector, so that they did not contribute to internal real exchange rate appreciation according to this analysis. Such developments originate in steady productivity growth in manufacturing whereby the productivity growth in service industries slowed down substantially after 1996. Consequently that led to higher productivity growth differential between the tradable and nontradable sector in the later period.

Table 3-12

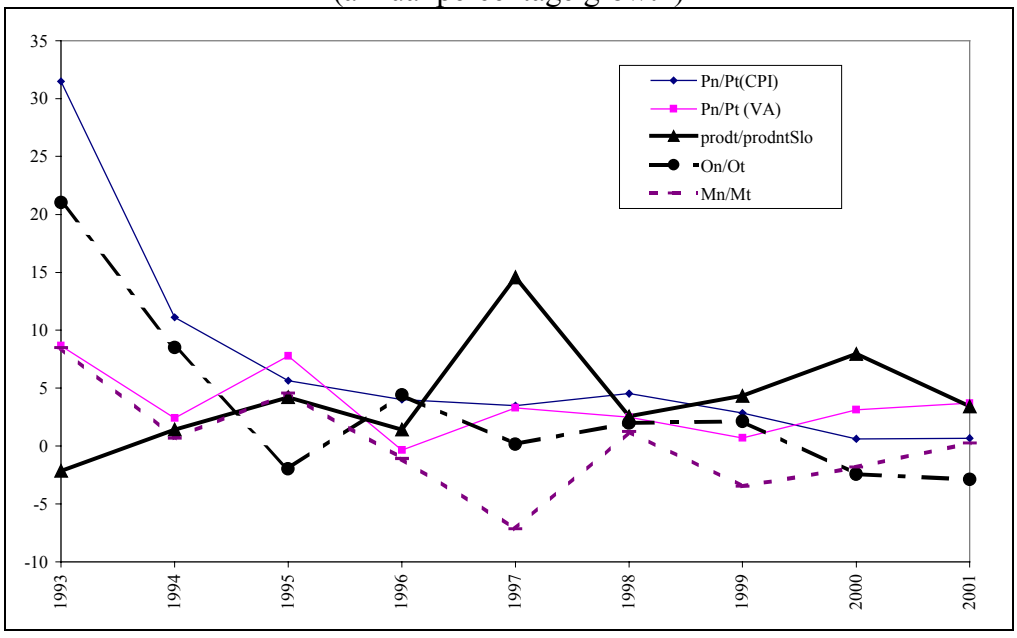
Relative mark-ups and other factors Slovenia and Germany

Relative CPI prices (nontradables/tradables) (average annual percentage growth rate)	1992-1996	1996-2001	1992-2001
Slovenia	12.6	2.4	6.8
Slovenia/Germany	**10.5**	**2.1**	**5.8**
Relative value added prices (nontradables/tradables) (average annual percentage growth rate)			
Slovenia	4.6	2.7	3.5
Slovenia/Germany	**3.5**	**2.0**	**2.6**
Mark-ups (nontradables/tradables) (average annual percentage growth rate)			
Slovenia	3.2	-2.2	0.1
Slovenia/Germany	**2.0**	**-3.1**	**-0.9**
Other factors (nontradables/tradables) (average annual percentage growth rate)			
Slovenia	7.7	-0.3	3.2
Slovenia/Germany	**6.8**	**0.1**	**3.1**

Figure 3-13

Relative mark-ups, other factors, relative prices and productivity in Slovenia

(annual percentage growth)



3.5.1.4.Estimation of the BS effect

To estimate the BS effect on CPI inflation differential between Slovenia and Germany the relative productivity differential between the countries is weighted by the amount of share of nontradables in CPI (average share in period 1992-2001 was 19%). The obtained estimated BS effect in the CPI over the whole observation period is *0.7%* per annum**.** This is the amount by which the equilibrium inflation was above the German level. Furthermore we look in greater detail of how the estimated BS effect developed over time. Inferring to the simple accounting framework used in the above analysis the estimated BS effect in the period 1992-1996 is 0.0% and 1.4% in the 1996-2001 period. This suggests that the BS effect became more significant as the transition process evolved[31].

3.5.2 Econometric evidence for Slovenia

There has been some theoretical and empirical research done on this topic[32] from which we can derive the following conclusions:

- They all support the Balassa-Samuelson hypothesis for Slovenia.

- The structural factors are becoming less important determinant of the real exchange rate path as the transition process is progressing (Jazbec, 2001). The trend real exchange rate appreciation in Slovenia today seems to be attributed mainly to the BS effect and the demand factors may be argued to be of a short run nature as the prices are very flexible in transition economies and quickly adjust to their equilibrium levels.

- Most empirical studies estimated annual BS effect in Slovenia between 1 to 2 percentage points per annum over the past few years. The BS effect in the future is expected to be substantially smaller because of the slowdown in catching-up process as Slovenia is approaching in its per capita income level the more developed countries (in 2000 amounting to 71% of the EU average). The productivity gains in tradable sector have been to large extent achieved very soon after transition process started, while the productivity in non tradable sector is expected to rise as a result of the reforms that should be implemented. Such developments will consequently close the gap in productivity growth rates between the sectors and the countries.

- In comparable studies that estimated BS effect it was a usual finding that real exchange rate appreciation in Slovenia was one of the smallest among the transitional and accession countries. This is in accordance with a relatively high development starting point in comparison to other transitional countries.

[31] The conclusions do not defer from those obtained if all sectors of the economy are included.
[32] Halpern and Wyplosz (1997), IMF (2000), Dobrinsky (2001), Jazbec (2001).

3.5.3. Conclusion

Using a simple accounting framework the estimated BS effect in Slovenia over the 1992-2001 period was 0.7% p.a. Even if one may predict that BS effect was larger at the beginning of the transition period (stronger appreciation of internal component of real exchange rate) with a more detailed analysis of factors determining relative price movements in Slovenia turns out that other factors than relative productivity induced such movements. By splitting the sample we obtain that BS effect became an important determinant of the real exchange rate between Slovenia and Germany not until the second part of the analysed period, when the estimated BS effect was 1.4% p.a. This estimate implies for 1.4 percentage points per annum higher equilibrium inflation rate in Slovenia than Germany (1996-2001 yearly average). Our result is in line with other econometric estimations that would predict the BS effect in the range of 1 to 2 percentage points annually for Slovenia.

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