# Fundamental determinants of real exchange rate movements in the central and east European accession countries

In the years of reform and reconstruction, the currencies of all the EU accession countries in central and eastern Europe have appreciated in real terms. The relatively large increases in productivity during the economic catching-up process are the most common explanation given for this. In principle, however, other factors may also play a role in influencing shifts in the international price relationships between the advanced economies and countries that are catching up. This article first provides a brief overview of the real exchange rate movements in the central and east European accession countries and then, on the strength of this, reports on the results of an analysis of the underlying determinants. This reveals that the relatively large productivity increases which characterise the catching-up and development processes are the prime, but by no means the sole, cause of the real currency appreciation in those countries. The transmission mechanisms which lie behind this are, nevertheless, more complex than is sometimes assumed.

## Real exchange rate movements in the accession countries

The currencies of all the central and east European accession countries have shown a significant real appreciation over the past ten years. That has been the case both bilaterally in relation to the euro and on a weighted

*Real currency appreciation in all central and east European accession countries…*

47

### Real effective exchange rates * of the central and east European accession countries against the euro area

January 1993 = 100, monthly, log scale
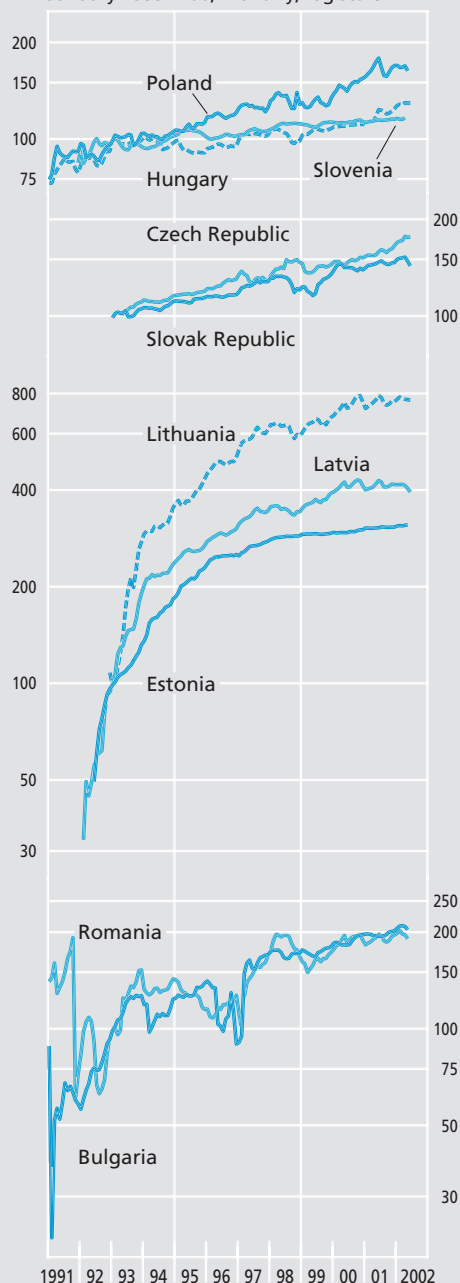


Source: IMF and Bundesbank calculations. — * Real effective exchange rates based on consumer price indices; before 1999: "theoretical" euro, see ECB, *Monthly Bulletin*, October 1999, April 2000 and March 2001.

Deutsche Bundesbank

average against the currencies of the major trading partners of the central and east European transition countries. (Among those trading partners, the west European industrial economies have become increasingly important during the transformation process). Even so, the extent of the real currency appreciation has varied considerably from one candidate country to another. Slovenia, the Slovak Republic and Hungary, for example, have recorded a real currency appreciation against the euro-area countries in the order of 30% to 50% in the past decade. During the same period, however, the real external value of the currencies of the Czech Republic, Romania and Poland have risen by around 80% and the real external value of Bulgaria's currency has gone up by nearly 180%. The rates of appreciation of the currencies of the Baltic states have been much higher still (500% to more than 600%).

In the majority of countries mentioned, the real currency appreciation was especially sharp in the early phase of transformation. As the catching-up process and macroeconomic stabilisation advanced, however, real upward pressure eased over time. The average real rates of appreciation since early 1996, for example, have been no more than around one-quarter of the mean figure for the three preceding years.

The outlined development in the accession countries' real exchange rates, however, is not due to a matching (nominal) higher valuation of their national currencies. On an average of the past ten years, most of the currencies under consideration in this article have

*…despite nominal depreciation in many countries…*

actually depreciated in nominal terms against the euro or its west European legacy currencies. Real currency appreciation has essentially been due to high rates of inflation, which also applies in the case of countries whose currencies have appreciated in nominal terms against the euro.

*...as a result of high inflation*

Especially in the early period of changeover from a centrally planned economy to a market system and the associated liberalisation of the price formation process, the transition economies had to contend with an intermittent acceleration in inflation. This was caused by pent-up demand for western industrial countries' goods combined with large "monetary overhangs" from the period of the planned economy and by the inevitable adjustments in price structures to conditions on the world markets. Especially in the first few years of transition, two or even three-figure inflation rates were recorded in all of these countries. In some cases, these were one-off surges in inflation due mainly to unavoidable adjustments in the price structure, which pushed up the cost of living, in particular. As the reform process was not supported by strict stability policy measures, however, none of the countries affected managed to bring inflation sufficiently under control in subsequent years when the structural price adjustments had largely been completed. In several cases, the rates of price increase remained far higher than in the economies of western Europe. Seen in that light, the resultant real currency appreciation is also a reflection of the exceptional stabilisation task facing the countries under consideration.

## Real exchange rate: definition and significance

The real exchange rate (R) of a country's currency against the euro is defined here as

$$R = E \left( P_{eu} / P_i \right)$$

where $P_{eu}$ denotes the general price level in the euro area, $P_i$ the general price level in the country concerned and E the bilateral nominal euro exchange rate of the currency of the country concerned expressed in units of the national currency per euro. The inverse of this bilateral real exchange rate is described as the real external value (Q) of the country's currency against the euro area

$$Q = 1 / R = (1 / E) \left( P_i / P_{eu} \right)$$

An increase in Q is tantamount to a real appreciation against the euro area. This can happen if the currency concerned appreciates in nominal terms against the euro (ie E falls and 1/E rises) and/or if inflation in that country exceeds inflation in the euro area.

While the nominal exchange rate and a corresponding nominal external value reflect the relative price of two currencies, the real effective exchange rate and the real external value represent the relative price between the baskets of goods in the two currency areas. A real currency appreciation in country i against the euro area may therefore also be regarded as a relative increase in prices in that country over prices in the euro area when expressed in the same currency. Such a change in the relative prices therefore worsens the price competitiveness of country i and thus also the sales prospects for its import substitution and export goods industries. [1]

**1** See also Deutsche Bundesbank, Real exchange rates as an indicator of international competitiveness, *Monthly Report,* May 1994, p 45-57.

Deutsche Bundesbank

## Inflation in the central and east European accession countries

Year-on-year change, monthly
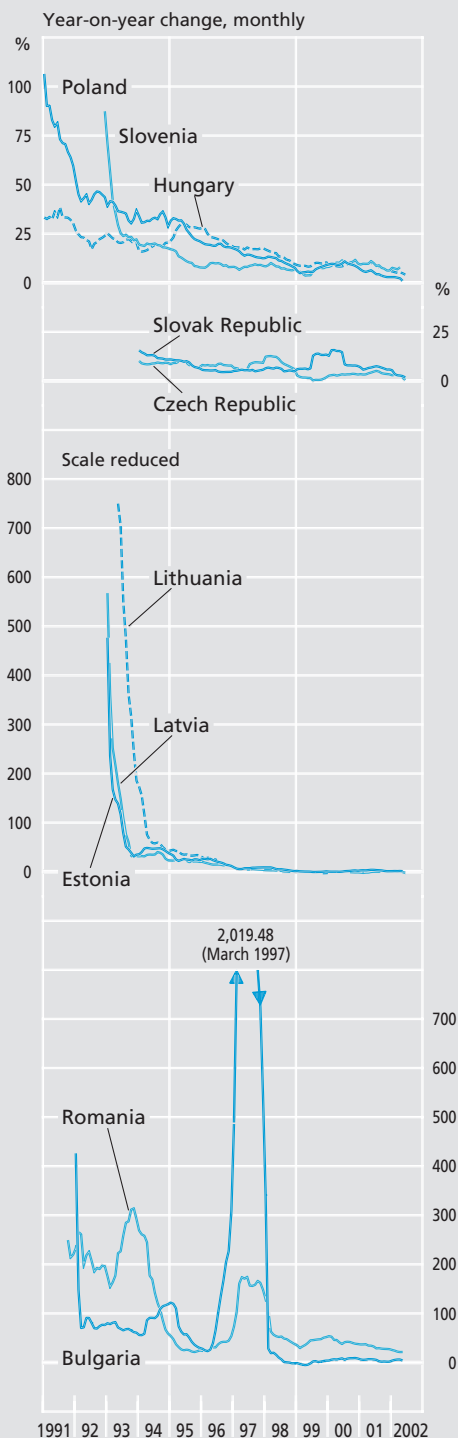


Source: IMF and Bundesbank calculations.

Deutsche Bundesbank

After achieving initial success in combating inflation, several countries suffered acute setbacks. This was the case, albeit to quite a varying extent, in Bulgaria, the Czech Republic, Hungary, Romania and the Slovak Republic, for example. A lack of resolve in implementing stability policy measures played a part in this as did delays in privatising large state-owned industries and long-deferred price liberalisation, especially in the consumer services sectors. In some cases, inflation ran almost entirely out of control, with the result that soaring inflation rates led to a sharp depreciation in the exchange rates of the currencies concerned. This, in turn, strengthened domestic inflation – a vicious circle that, in Bulgaria, for example, could only by broken by monetary reforms and the strict monetary discipline of a currency board.

*Difficult stabilisation process*

Currency boards have been used successfully to stabilise prices in other, smaller central and east European economies, too. The best-known example of this is Estonia, which in 1992 was the first of this group of countries to embark on the reform process with a pegging of its currency to the Deutsche Mark. In 1994, Lithuania, following a period of indecisive and, ultimately, unsuccessful experimentation, also switched to a similarly strict exchange rate pegging to the US dollar. Lithuania likewise made striking stability progress in the ensuing period.

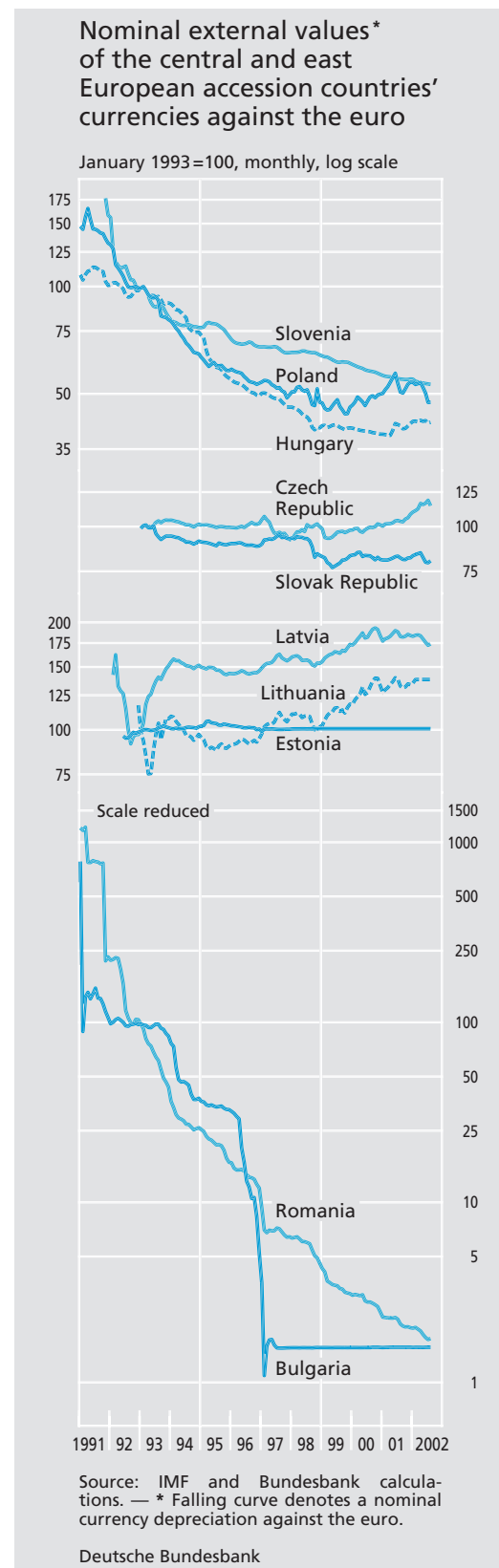*Exchange-rate pegging as an instrument for stabilising prices*

However, these examples should not be taken to imply that the introduction of currency boards is in itself a guarantee of anti-inflation policy success. Ultimately, the form in which a small country pegs its currency to

a stable anchor currency is less important than its determination to reinforce the external stabilisation constraints imposed by the peg with fiscal and wage policies supporting the same objective. Without that willingness, even a currency board is doomed to failure, as was vividly illustrated by the example of Argentina early this year.

Conversely, this also means that smaller countries which peg their exchange rates less rigidly than in a formal currency board may likewise make use, in their anti-inflation policy, of the disciplining effects of fixed exchange rates against stable anchor currencies. One instance of this is the third Baltic state, Latvia. Although it has not introduced a currency board, since launching the lats Latvia has strictly geared its monetary policy to the goal of stable exchange rates against a basket of major currencies.

What is crucial is not only the strategic framework within which a country pursues it stabilisation policy objectives but also its willingness to take just as much account of what is required in other policy areas. That fact is demonstrated, finally, by recent experience in a number of transition countries, such as the Czech Republic, which, following severe setbacks, have achieved gratifying success in terms of stability policy on the basis of flexible exchange rates.

Hungary is pursuing its own course. With the introduction last year of a target zone system against the euro with fluctuation bands of ±15%, it *de facto* unilaterally adopted the exchange rate arrangements of the European



Nominal external values* of the central and east European accession countries' currencies against the euro

January 1993=100, monthly, log scale

Source: IMF and Bundesbank calculations. — * Falling curve denotes a nominal currency depreciation against the euro.

Deutsche Bundesbank

Exchange Rate Mechanism (ERM II), albeit without formally joining the system, which would require membership of the European Union.

## Possible causes of real currency appreciation

The real trend currency appreciation observed in all central and east European transition economies appears, at first glance, to contradict the widespread notion that the development of the nominal exchange rates should, in the long run, at least approximately offset international inflation differentials. Given the validity of the purchasing power parity theory, the real exchange rate would, strictly speaking, have to be constant or at least stationary, ie the temporary deviations of the exchange rate from its purchasing power parity would eventually trigger corrective movements, resulting in the real exchange rate being approximately constant on a long-term average and showing no trend. It therefore seems obvious to ask why it was possible for the observed real currency appreciation to occur. In this connection, a whole series of arguments are cited.[1]

*Correction of an undervaluation*

The real trend currency appreciation of the past few years may have been a correction of an undervaluation with which the countries concerned entered the transition process – partly on grounds of competitiveness or as a result of market overreactions. With the abandonment of the centrally planned economy in the early 1990s, several of the currencies came under considerable downward

pressure. In many cases, this led to nominal depreciations which, following the initial successes in stabilisation, had to be seen as exaggerated. An often, at first, comparatively expansionary monetary policy, the pent-up excess demand for foreign goods and assets as well as the flight out of the domestic currency after years of economic mismanagement and the loss of savings undoubtedly played a major part in the – in some cases, dramatic – slump in the external value of the central and east European currencies. The economic literature, however, is unanimous in assuming that the real currency appreciation in the ensuing period cannot be explained solely as a correction of earlier instances of exaggerated depreciation. Such counter-movements were indeed a factor initially, but the underlying imbalances are likely to have been largely overcome in the second half of the 1990s.[2]

*Balassa-Samuelson effect*

Alternatively, the real currency appreciation may be explained *inter alia* by the Balassa-Samuelson effect. This second explanatory approach is cited fairly often in this connection.[3] According to this approach, the relatively sharp increase in productivity in the industrial sector of the transition economies

**1** Most of these arguments already appear in L Halpern, and C Wyplosz (1997), *Equilibrium exchange rates in transition economies*, IMF Staff Papers 44, p 430-461.
**2** See D Begg, L Halpern und C Wyplosz (1999), *Monetary and exchange rate policies, EMU and Central and Eastern Europe,* CEPR Forum Report of the Economic Policy Initiative, No 5, p 32.
**3** See, for example, UN, Economic Commission for Europe (2001), *Economic transformation and real exchange rates in the 2000s: the Balassa-Samuelson connection,* Economic Survey of Europe 2001, p 227-239; M De Broeck, and T Sløk (2001), *Interpreting real exchange rate movements in transition countries,* IMF Working Paper, No 01/56; A J Richards, und G H R Tersman (1996), *Growth, nontradables, and price convergence in the Baltics,* Journal of Comparative Economics 23, p 121-145.

## The standard model for the Balassa-Samuelson effect

The hypothesis of Balassa and Samuelson is usually derived in the context of the following standard model.[1] A model economy produces two goods, tradeables, T, and non-tradeables, N. Each sector uses a linear homogeneous Cobb-Douglas function with capital, K, and labour, L, as inputs

$$(1) \qquad Y_i = \theta_i\, K_i^{\alpha_i}\, L_i^{1-\alpha_i}$$

where $Y_i$ denotes output and $\theta_i$ total factor productivity in sector i with i = T, N. Profit maximisation and the formation of growth rates, denoted by a ^, result in

$$(2) \qquad \hat{r} = \hat{p}_i + \hat{\theta}_i + (\alpha_i - 1)\,(\hat{K}_i - \hat{L}_i) \text{ and}$$

$$(3) \qquad \hat{w} = \hat{p}_i + \hat{\theta}_i + \alpha_i\,(\hat{K}_i - \hat{L}_i)$$

Both factors are intersectorally mobile, which implies that the factor returns, ie nominal wages, w, and interest, r, equalise across sectors. Goods and factor prices thus have the following relationship to each other

$$(4a) \qquad \hat{p}_T = -\hat{\theta}_T + \alpha_T\,\hat{r} + (1 - \alpha_T)\,\hat{w} \text{ and}$$

$$(4b) \qquad \hat{p}_N = -\hat{\theta}_N + \alpha_N\,\hat{r} + (1 - \alpha_N)\,\hat{w}$$

where $p_i$ denotes the price of good i. In line with the circumstances of the central and east European accession candidates, the model economy is assumed to be small on the world goods and capital markets. This means that the price of tradeables, $p_T$, and – since capital is assumed to be internationally mobile – also interest, r, are set for the model economy exogenously by the world market. Since labour, by contrast, is assumed to be internationally immobile, wages are determined endogenously in the model. Equation

$$(5) \qquad \hat{p}_N = \frac{1 - \alpha_N}{1 - \alpha_T}\,\hat{\theta}_T - \hat{\theta}_N$$

which results from combining (4a) and (4b) for $\hat{p}_T = \hat{r} = 0$, illustrates the Balassa-Samuelson effect. If total factor productivity in the tradeables sector increases, the price of non-tradeables rises, which corresponds to a real currency appreciation.[2] Equations (4a) and (4b) show that this result is due to the fact that, with a given price of tradeables and a given rate of interest, wages have to rise, and this effect is transferred, owing to the assumed intersectoral mobility of labour, to the non-tradeables sector.

Furthermore, equation (5) illustrates one of the standard model's main implications, ie an increase in total factor productivity in the non-tradeables sector results in a reduction in the price of non-tradeables, ie a real currency depreciation. This is due to the fact that wages – as shown in equation (4a) – are already set by the tradeables sector and thus remain unaffected by the disturbance referred to here. Given unchanged factor costs, prices have to fall if productivity increases.

Since the price of non-tradeables is unambiguously defined by equation (5), it also illustrates a second implication of the standard model: output, $Y_N$, has no impact on the price of non-tradeables in this model. As a consequence, demand-side disturbances do not affect the real exchange rate either, which is due to the implied completely price-elastic supply of non-tradeables.

**1** See B Balassa (1964), *The purchasing-power parity doctrine: a reappraisal,* The Journal of Political Economy 72, p 584-596, and P A Samuelson (1964), *Theoretical notes on trade problems,* The Review of Economics and Statistics 46, p 145-154. The standard model may be found, for example, in K A Froot and K Rogoff (1995), *Perspectives on PPP and long-run real exchange rates,* in G M Grossman and K Rogoff (eds), Handbook of International Economics Vol III, Amsterdam, p 1647-1688. — **2** This, of course, assumes that the external parameters do not change. The ability simply to equate an increase in the price of non-tradeables with a real currency appreciation is due to the fact that, given the validity of the law of one price for tradeables, this price component is the only one within the domestic price index that can change in relation to the external price index. For a detailed account of the relationship between the price of non-traded goods and the real external value, see Deutsche Bundesbank, Overall determinants of the trends in the real external value of the Deutsche Mark, *Monthly Report,* August 1995, p 21.

Deutsche Bundesbank

pushed up the general wage level and thus also the prices of the other goods and services in which these economies were unable to make comparable productivity gains. The resulting surge in inflation in the case of goods mostly not traded internationally was reflected, according to this theory, in a real currency appreciation.

*Rise in private and public consumption*

It is also conceivable that the rising demand of households and general government, which accompanied the rapid growth of the economy as a whole, drove up the prices of goods not traded internationally. Both an increase in the level of consumption demand and a shift in its structure in favour of non-tradeables are conceivable as the cause, particularly as it is generally assumed that the productivity gains in this sector lag significantly behind the growth in the industrial output of goods that are traded in fairly large volumes internationally.[4]

*General government deficits, real interest rates and privatisation*

There is another hypothesis which argues that rising general government deficits, which had to be financed via the capital market, put up real interest rates in the candidate countries, thereby causing real currency appreciation. Conversely, the low rates of real interest on the world financial markets have at times also been identified as the reason for the net capital inflows into this region and for the associated trend real currency appreciation in those countries. At all events, the comparatively small original capital stock would seem to suggest a relatively high marginal productivity of capital and attractive yield opportunities. Moreover, given the demand for investment, opportunities for investment are increased by privatisation, and this, in turn, favours capital inflows.

*Price liberalisation*

In principle, the price liberalisation implemented in the transition process may have had an impact on real exchange rates in either direction. While price increases may be expected over the medium term in the case of goods which used to be priced below the comparable market level, the emergence of price competition should have the long-term effect of dampening the general price level in the economy as a whole. If mainly services, ie non-tradeables, used to be sold below market prices in the centrally planned economies, price liberalisation may also lead in the long run to a real currency appreciation.[5]

*Quality and marketing of export products*

Finally, it is also argued that the opening of markets to the West improved the quality and marketing of the transition countries' export products, thus improving their terms of trade.

## A panel-econometric analysis

*Estimation procedure and data*

The impact of the various potential determinants on the real exchange rates of the accession countries' currencies may, in general, be analysed by using econometric estimation methods. However, such calculations are

---

**4** The impact of such demand-side developments on the real exchange rate in transition countries is stressed, for example, by F Coricelli, and B Jazbec (2001), *Real exchange rate dynamics in transition economies,* CEPR Discussion Paper, No 2869.
**5** F Coricelli and B Jazbec (2001), *op cit,* model this by assuming that a disproportionately large share of labour input was allocated to the tradeables sector in the era of the centrally planned economy.

made more difficult by the fact that the time series available for this purpose are still relatively short. This means that traditional methods of analysing time series may be applied only subject to considerable qualifications. That is all the more true if the data used are available only as annual figures, as in the case of sectoral productivities, for example. Under these conditions, an outlet is provided by panel-econometric estimations. These represent a combination of time-series and cross-sectional analytical methods, thus reducing the problem of short data series. The findings presented below are therefore based on this type of econometric analysis.[6] Even so, the resulting panel with annual data on all central and east European accession candidates was comparatively small. For this reason, a simple fixed effects estimation approach was used.

*Determinants of real exchange rates*

Specifically, in the relevant econometric estimations an attempt is made to explain the real effective external value of the candidate countries' currencies by the following determinants:

– labour productivity in the industrial, services and agricultural sectors;

– general government consumption or, alternatively, aggregate (private and public) consumption, expressed as a share of gross domestic product (GDP) in each case.

As is done when calculating the effective real exchange rate, each of the above-mentioned variables for each candidate

country is expressed as a share of the trade-weighted average of the corresponding variables from more than 20 OECD countries.

– In addition to the explanatory variables mentioned, the estimations use a measure representing real interest rates in the global capital market and approximated by the unweighted average of real interest rates in the United States and Germany as a determinant of the real exchange rates and

– the terms of trade of each candidate country or, as an alternative, a commodities prices index deflated by the US producer price index.

*Results*

The estimations are summarised in the table on page 56. It should first be noted that there is generally a perceptible increase in the quality of the estimated parameters and, by extension, the quality of the related results if Bulgaria and Romania – two countries commonly held to be less far advanced in the transition process than the other accession candidates – are left out of the estimation. Evidently, the differing stages reached in the transition process do indeed have an influence on the type of reaction to changes in the respective determinants of real trend currency appreciation. However, the main point confirmed by the calculations is that an increase in (relative) labour productivity in one of the candidate countries leads to a sig-

**6** See C Fischer, (2002), *Real currency appreciation in accession countries: Balassa-Samuelson and investment demand,* Deutsche Bundesbank, Economic Research Centre, Discussion paper, No 19/02.

<table>
<tr><td colspan="3">

**Determinants of the real effective exchange rates in central and east European accession countries ***

Fixed effects estimation

</td></tr>
</table>

| Annual data panel 1994-99 | | |
|---|---|---|
| Explanatory variable | Estimation A | Estimation B |
| Labour productivity in agriculture | 0.46 (2.87) | 0.44 (3.64) |
| Labour productivity in industry | 0.76 (3.34) | 0.60 (2.65) |
| Consumption/GDP | 0.89 (4.13) | – |
| Government consumption/GDP | – | 0.45 (3.51) |
| Real rate of interest (USA, Germany) | – 0.21 (4.18) | – 0.23 (4.20) |

**\*** Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia. A positive coefficient implies a real currency appreciation; t values in brackets, computed using heteroskedasticity and auto-correlation-robust standard errors in accordance with M Arellano (1987), *Computing robust standard errors for within-group estimators,* Oxford Bulletin of Economics and Statistics 49, p 431-434.

Deutsche Bundesbank

nificant real currency appreciation. This applies, in particular, to the development of labour productivity in industry and also in agriculture. This by itself, is consistent with the Balassa-Samuelson hypothesis if it can be assumed that domestic prices of industrial and agricultural products are set by world market prices. For the agricultural sector, however, the validity of such an assumption is by no means self-evident since the prices of agricultural products are often state-regulated.

*Contradictions of the standard Balassa-Samuelson model*

In contrast to the broad expectations of the standard Balassa-Samuelson model, however, there is also a positive relationship between the (relative) labour productivity in the services sector and the real external value of the national currency concerned. The positive ef-

fects of consumption and/or general government demand, relative to GDP, on the real external value of the national currency analysed are not consistent with the standard Balassa-Samuelson hypothesis either. The cited demand aggregates, in particular, evidently have significant effects on the international price relationships.

In the standard Balassa-Samuelson model, an increase in productivity in the services sector – which, for the sake of simplicity, is generally equated in the literature with the non-tradeables sector – should reduce the prices of these goods and thus also lower the consumer price index, which would correspond to a real currency depreciation. The standard Balassa-Samuelson model also maintains that a variation in consumer demand should not produce any price effects at all but, instead, only quantity effects. That is because the model implies a completely price-elastic supply function for non-tradeables and the prices of tradeables are set through the world market.

*Expanded explanatory approach*

It is therefore necessary to expand and generalise the standard Balassa-Samuelson approach to make it more consistent with the empirical findings.[7] One possible explanation

---

[7] In particular, there are two assumptions of the standard Balassa-Samuelson model to be changed. First, if the prices of non-tradeables rise, the quantity supplied must be expanded only by a finite amount. This can be achieved by assuming that, instead of the homogeneous type of labour assumed in the standard Balassa-Samuelson approaches, a distinction is made between two types of labour, ie skilled and unskilled labour. Second, it has to be assumed that capital goods do not consist exclusively of tradeables but also, at least for the lesser part, of non-tradeables. Following the literature, this might include, for example, infrastructure and services used in the installation of capital. For further details and a description of the expanded model, see C Fischer, *op cit.*

for the, in some cases, significantly positive effect which labour productivity in the services sector has on the real external value might be that every exogenously induced rise in productivity – in whatever sector, be it industry, agriculture or services – results in additional investment. This pushes up the prices of capital goods, which in many cases are traded under what tend to be oligopolistic market conditions, and leads to a real currency appreciation. At the same time, the improved profitability and sales conditions result in increased capital flows from abroad, through which at least some of this investment is financed. This applies to all sectors, ie the services sector as well. Therefore, the tendency to real depreciation – which, in the Balassa-Samuelson approach, necessarily follows from an increase in productivity in the services sector – is accompanied by an opposing tendency to real currency appreciation.

Of course, an investment demand effect of this kind can likewise occur if there is an increase in productivity in the tradeables sector. In such a case, the overall impact on the real exchange rate would, in fact, be especially pronounced as both effects (investment demand effect and classical Balassa-Samuelson effect) would reinforce each other. The underlying mechanisms, however, are more complex than is assumed in standard Balassa-Samuelson models. The relationships between productivity gains in the industrial sector and the real appreciation of the currencies of developing and transition countries, which have been noted in many studies, can therefore be equated only to a limited extent with the Balassa-Samuelson effect. Instead, they

are also due in some cases to other transmission mechanisms, such as the described investment demand effect: growth, no matter in what sector, requires investment. This by itself results in upward trends in prices if the supply of capital goods for the country in question is not perfectly elastic, which is quite possible.

The obvious thing to do, therefore, is to test these relationships using total labour productivities as well rather than the sectoral productivity developments used in the above-mentioned estimations. This additionally has the advantage that, unlike the sectoral labour productivities and like the other variables, these data are also available on a quarterly basis. As a result, it is possible to switch from the annual figures used so far to a quarterly data panel, which is then comparatively sizeable. This makes it possible to apply more sophisticated estimation methods which, given the properties of the data, are more expedient. Specifically, these include SUR estimators, panel cointegration methods and the "pooled mean group" estimation method.[8]

*Quarterly data panel*

In qualitative terms, the results calculated using these more sophisticated methods confirm those produced with the aid of the simple estimations based on the annual data panel. This is also the case for the previously unmentioned connection between the real exchange rates of the accession countries and the real rate of interest in the "world"

*Results qualitatively robust but quantitatively widely dispersed*

**8** See M H Pesaran, Y Shin and R P Smith (1999), *Pooled mean group estimation of dynamic heterogeneous panels,* Journal of the American Statistical Association 94, p 621-634.

Determinants of the real effective
exchange rates in central and
east European accession countries *

SUR fixed effects estimation

Quarterly data panel 1994 Q1 – 2000 Q4

| Explanatory variable | Estimation A | Estimation B |
|---|---|---|
| Total labour productivity | 1.68 (17.49) | 1.58 (15.81) |
| Consumption/GDP | 0.55 (3.98) | – |
| Government consumption/GDP | – | 0.24 (3.39) |
| Real rate of interest (USA, Germany) | – 0.03 (2.77) | – 0.04 (3.52) |

* Czech Republic, Estonia, Hungary, Latvia, Lithuania,
Poland and Slovak Republic. A positive coefficient im-
plies a real currency appreciation; t values in brackets.

Deutsche Bundesbank

market. As expected, a rise in the real global
interest rate level, according to the performed
estimations, results in a real currency depreci-
ation in the candidate countries. In quantita-
tive terms, the estimation results differ con-
siderably, however, both with regard to the
rate of real interest and the other explanatory
variables used, depending on the specifica-
tion and the estimation procedure. For ex-
ample, the estimate for the effect of a 1% in-
crease in total labour productivity is a real cur-
rency appreciation in the order of between
0.9% and 1.7%. The estimated elasticities of
changes in the general government share of
consumption of GDP are also relatively widely
dispersed: according to the present estima-
tions, they fluctuate between 0.24 and 0.56.
If the real rate of interest in the "world" mar-
ket goes up 1 percentage point, a real depre-

ciation of between 0.03% and 0.23% is ob-
tained, depending on the estimate. In other
words, although each of these coefficients is
significantly different from zero and although
the trend impact of the variables appears to
be unambiguous according to the performed
calculations, this shows that quantitative
statements are fraught with major uncer-
tainty. Strictly speaking, it is possible, at most,
to state orders of magnitude which may dif-
fer widely from each other depending on the
specific circumstances and the country ana-
lysed.

*Terms-of-trade effects…*

The influence of the terms of trade on the
real exchange rate generally proves to be in-
significant. Much the same can be said for
the commodities price index.[9] At first glance,
this may seem to be at variance with the gen-
eral assumption that world market commod-
ity prices have quite a large influence on the
domestic inflation of the candidate countries.
Even theoretically, however, a surge in infla-
tion does not have an impact on the real ex-
change rate if the inflation rate of the major
trading partners is similarly affected by
changes in commodities prices.

*…and other influences*

Further estimations were performed to inves-
tigate the extent to which the transition pro-
cess itself caused the real currency appreci-
ation. To do this, proxy variables for those as-

9 When using the "pooled mean group" estimation pro-
cedure, however, a rise in the deflated commodities price
index leads to a small, but significant real appreciation in
the case of the candidate countries. This initially perhaps
surprising result may be explained by the fact that rising
commodity prices cause considerable upward price pres-
sure precisely in countries where the basket of goods, dir-
ectly or indirectly, consists of a relatively high percentage
of commodities.

pects of institutional transformation which may be assumed to have an effect on the real exchange rate were included in the equation as additional explanatory variables. However, no significant influence could be ascertained for proxy variables of price and trade liberalisation. By contrast, the impact of a proxy variable for progress in privatisation proved to be significant in some cases. Since privatisation creates opportunities for investment, a real currency appreciation may result. Evidence of such a connection can be found only for the first few years of the transition process, however.

## Summary and conclusions

*Supply and demand-side impact of productivity effects*

The results of the analysis thus essentially confirm the widely held view, delineated at the beginning of this article, that the observed real currency appreciation in the central and east European accession countries is largely due to those countries having higher productivity gains than their trading partners. However, in addition to the Balassa-Samuelson effect, which is often cited as an explanation in this context, other transmission channels, such as investment demand,

also appear to be a factor. At all events, some of the findings cannot be reconciled with the simple explanatory paradigm of the standard Balassa-Samuelson model.

It goes without saying that the empirical findings cannot simply be extrapolated into the future. Nevertheless, given the continuing disparities in development between the accession countries and the more advanced economies of western Europe, it may be expected that the catching-up process will continue to be accompanied by a real appreciation of the accession countries' currencies. These young, up-and-coming market economies not having the possibility of making exchange rate adjustments and of determining their monetary policy stance autonomously would entail significant risks for their international competitiveness and the continuation of the real catching-up process[10] In the efforts to gain early Eurosystem membership, it is imperative not to lose sight of these factors and the associated risks.

*Real and nominal convergence*

---

**10** A detailed discussion of the conditions for accession to the EU and EMU and the associated monetary policy challenges may be found in Deutsche Bundesbank, Monetary aspects of the enlargement of the EU, *Monthly Report,* October 2001, p 15-30.