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INTRODUCTORY NOTE

This is the inaugural issue of the Czech National Bank Economic Research Bulletin, which will appear three times a year. The bulletin will highlight the results of in-house research done at the Czech National Bank.

Given that maintaining exchange rate stability in the context of joining the EU is one of the key concerns of the Czech National Bank, this first issue of the Bulletin is devoted to (equilibrium) exchange rate determination in the Czech Republic.

First, Aleš Bulíř looks into the scope of nominal exchange rate fluctuations in Central European countries to establish the causes of those fluctuations.

Next, Tomáš Holub investigates the factors of equilibrium real exchange rate appreciation in the Czech Republic, again from an international perspective. In this context, the effects of price convergence to the level of EU countries are analysed in more detail.

Finally, Vladislav Flek discusses the impact of real catching-up with EU productivity levels, within the framework of the Balassa-Samuelson Effect.

Since this is the inaugural issue of the Bulletin, an overview of activities undertaken thus far by the CNB Economic Research Department, established in 2001, is also included.

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Exchange rates in Central European countries have been subject to similar shocks, and exchange rate arrangements have also converged recently. Yet, the high-frequency exchange rate series of these countries exhibit different speeds of adjustment toward the longer-term trend, depending on the absolute size (depth) of the market and the degree of liberalization of the foreign exchange market and financial account of the balance of payments.

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The price convergence process may create challenges for monetary policy, as it means an appreciating real exchange rate trend. It may take about 15 years for the Czech aggregate price level to reach 60 percent of the average EU price level. It would take about the same time to reach the same degree of relative price differences as observed in the least developed EU countries. This corresponds to an average rate of real exchange rate appreciation of 2.5–3.5 percent a year.

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The economic consequences of real catching-up

If the candidate countries are to catch up with the EU economic level, they need to achieve substantial productivity gains. Is this process consistent with maintaining moderate inflation and exchange rate stability? This dilemma is frequently discussed within the theoretical framework of the Balassa-Samuelson Effect (BSEF). Contrary to the prevailing view, we question the meaning of the BSEF as a plausible explanatory variable of (equilibrium) real exchange rate determination in the Czech Republic. The same situation we simulate for the future, should productivity growth in the traded sector not accelerate dramatically.

Vladislav Flek (on page 6)

Exchange rate stability in transition countries: Some short-run evidence*

Aleš Bulíř

Economists have long observed that exchange rates are more volatile than would seem to be justified by conventional macroeconomic models (Meese and Rogoff, 1983) and that the amount of actual trading does seem to affect exchange rate developments (Evans and Lyons, 2002). In addition, exchange rate behavior seems to be highly nonlinear, reacting to "small" shocks differently than to "large" shocks (Sarno, 2003). Faruqee and Redding (1999) observed in a sample of G-7 countries that highly traded currencies tend to stabilize faster after a temporary shock than thinly traded currencies.

Would the nonlinear reaction of national currencies to shocks hold also for transition countries? Does it matter how large foreign exchange turnover is, or how liberalized the market is? Also, do we observe any changes in exchange rate behavior over time? Our research was motivated by these questions.

We tested a nonlinear model of the Faruqee–Redding type on daily and weekly exchange rate data for the U.S. dollar and euro against four Central European currencies for the 1998–2002 period: the Czech and Slovak korunas, Hungarian forint and Polish zloty. The idiosyncratic shocks to all four currencies were fairly similar, both in timing and in magnitude. Indications of endogenous liquidity were found in exchange rate returns, that is, sudden changes in the exchange rate level were typically followed by larger order flows and a gradual return toward the longer-term

trend. Each currency's exchange rate had 20 or more occurrences of remaining above or below the trend for at least 5 trading days (Figure 1). We were interested whether the speed-of-adjustment of national exchange rates toward this trend is related to deviations from this trend. Moreover, we wondered whether our results would support the conclusion by Darvas and Szapáry (2000) that volatility of exchange rates in the region appears to be only loosely related to the national exchange rate arrangements.

In transition countries, similar to developed ones, when the exchange rate departure from the trend was "large," the exchange rate adjusted swiftly. In other words, we observed the hypothesis of nonlinear exchange rate adjustment. Without the "large-deviation" adjustment, it would take typically 15 to 40 trading days for the rate to return to its trend, depending on the period and currency in question. With large deviations, nonlinear adjustment kicked in, cutting the time for which the rate stays substantially above or below its trend.

The speed of adjustment of exchange rates toward the longer-term trend was influenced by two institutional factors: the absolute size (depth) of the market and the degree of liberalization of the foreign exchange market and financial account of the balance of payments. Moreover, both factors tended to reinforce each other. On the one hand, Slovakia liberalized early, although with a small market and the adjustment remained correspondingly slow. On the

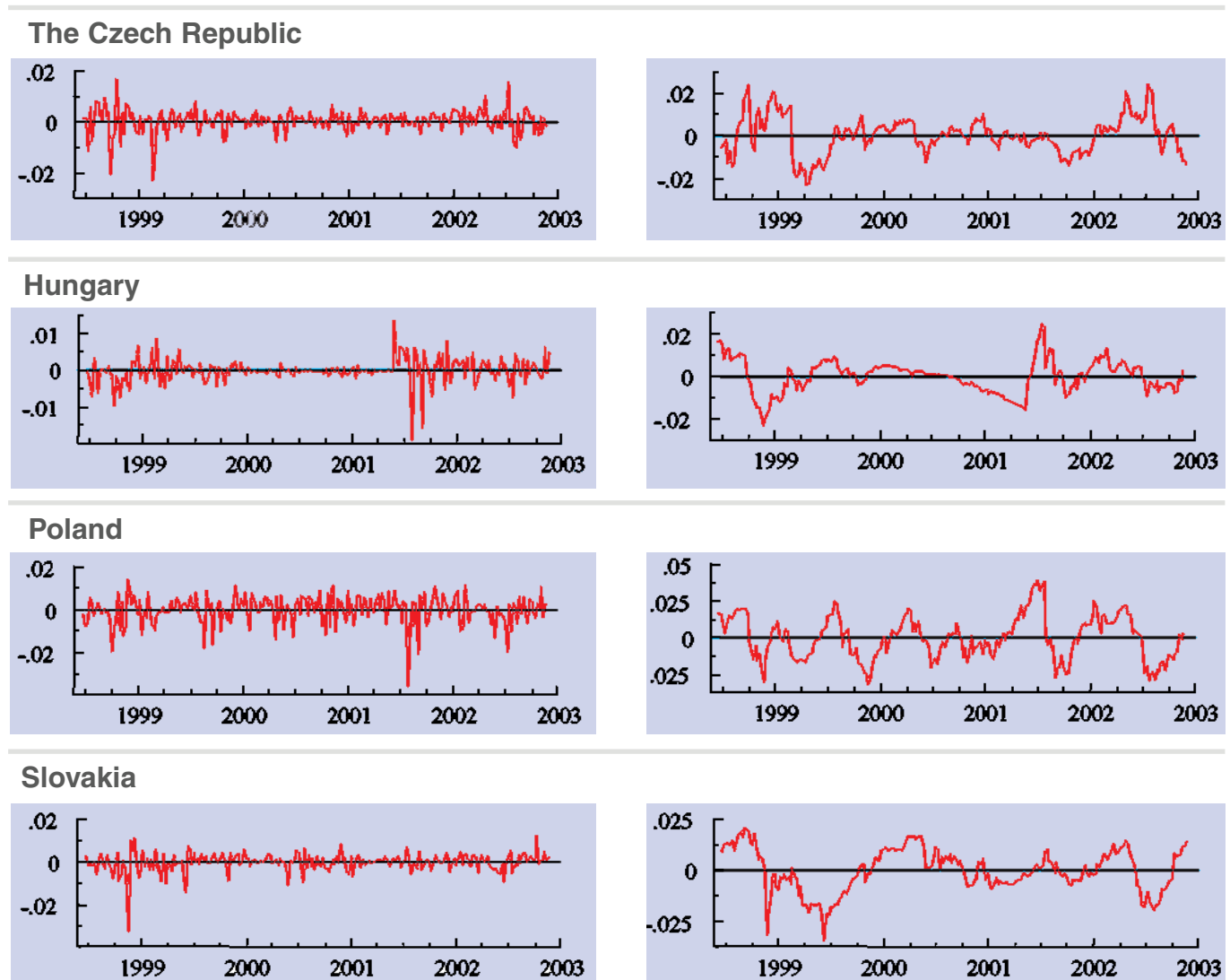
other hand, Hungary showed early benefits of liberalization – following some loosening of capital controls in 2000/2001, the speed of adjustment increased gradually.

The results regarding the speed of exchange rate adjustment over time are more nuanced. Some countries, notably the Czech Republic and more recently Hungary, showed signs of a maturing market: the adjustment appeared to be fast even for small departures from the trend, while preserving the nonlinear, endogenous-liquidity nexus for larger departures. In contrast, we observed a slowdown in the speed of adjustment in Poland and Slovakia, which was offset, however, by a gradually growing weight of endogenous liquidity in their markets.

Our findings have some attractive policy implications. First, early liberalization of the foreign exchange market and financial-account transactions may pay off in terms of market liquidity and, hence, faster adjustment of the exchange rate to the longer-term trend. However, early liberalization is a necessary condition for liquidity, not a sufficient one, as shown by some currencies. Second, the endogenous liquidity hypothesis does not imply that the volatility of the nominal exchange rate is necessarily low in a liquid market; we only observe that the self-correcting mechanism is faster than in an illiquid market. The endogenous-liquidity hypothesis seems to hold especially well in the full sample of the Czech koruna and shorter samples of the Hungarian forint. ■

* The author is Senior Economist at the International Monetary Fund. This short article is based on Bulíř (2003) and was written during the author's sabbatical leave at the Czech National Bank, Economic Research Department. Full version of the above noted Czech National Bank Working Paper is available at <http://www.cnb.cz>.
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FIGURE 1: The Czech Republic, Hungary, Poland and Slovakia: Weekly Euro Exchange Rate Returns¹ and Deviations from the Trend,² May 1998–December 2002



¹ First differences; left-hand column; all data are in logs.

² Differences from the Hodrick–Prescott filter; right-hand column; all data are in logs.

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Price convergence to the EU: Some challenges for monetary policy

Tomáš Holub

The link between the long-run GDP and price convergence processes has been discussed for a long time by researchers and policy makers in the accession countries. The price convergence process may create challenges for monetary policy, as it means an appreciating real exchange rate trend. This is particularly important for the accession countries, which will have to fulfil simultaneously the Maastricht inflation and exchange rate stability criteria in the future before joining the eurozone.

It is a well known fact that in cross-country comparison economies with a lower per capita GDP tend to have lower price levels, too, compared with more advanced countries (see Figure 1). The Balassa–Samuelson model (see Balassa, 1964; Samuelson, 1964) is usually used as the main explanation, but other factors such as price regulation or terms-of trade differences may be partly responsible for this as well.

Based on the empirical relationship from Figure 1, a converging economy that achieves a growth differential compared to the EU of 2 percentage points a year, which might be realistic for the more advanced accession countries, can be expected to show a yearly real exchange rate appreciation of about 1.8 percentage points on average. This "benchmark convergence scenario" is close to the real exchange rate appreciation that some recent studies predict for Central European economies due to the Balassa–Samuelson effect (Halpern and Wyplosz, 2001; Begg et al., 2002; Deutsche Bundesbank, 2001).

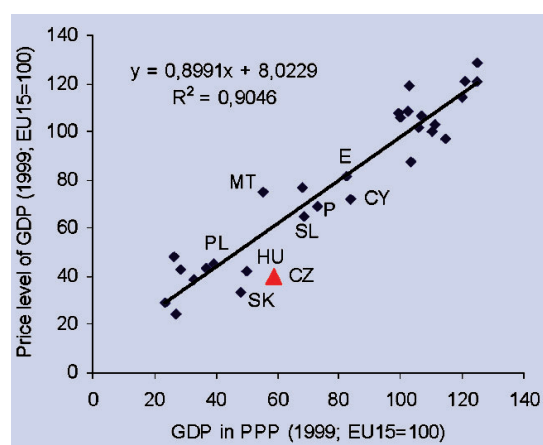
Such a rate of real appreciation can be characterised as modest,

but may still be challenging. On the one hand, the countries with currency boards may theoretically face problems with fulfilling the Maastricht inflation criterion. Inflation is the only channel of real appreciation in their case, and the Maastricht limit is just 1.5 percentage points above the three EU countries with the lowest inflation rate. On the other hand, the countries that currently have floating exchange rates might experience a nominal appreciation trend during the test period in ERM II, which would push them away from the central parity. If the exchange rate criterion is evaluated on the wide 15 percent band, this should not be a big practical problem. But if a narrower interpretation is chosen by the EU institutions – in line with the current official statements – the issue may become more serious. However, the EU may be more tolerant of an appreciation than a depreciation, which would allow the criterion to be fulfilled even with a narrower evaluation band.

The described benchmark convergence scenario should be interpreted with a degree of caution, though, as it neglects other factors besides GDP growth which may influence the speed of price convergence. For example, it is a well-known fact that the Czech Republic's price level seems a bit too low in comparison with its GDP only, by about twenty percentage points in 1999. This has led some authors to suggest that there might be a risk of price jumps upon the Czech Republic's accession to the EU and/or the eurozone (see, for instance, Vintrová, et al., 2002). We show that the other factors that effect price levels include cross-country diffe-

rences in employment rates, non-tradable productivity, the size of the non-tradable sector, government policies and the structure of foreign trade. If these are taken into account, the Czech price level in 1999 can be explained well.

FIGURE 1: Cross-Country Comparison of GDP and Price Levels



Source: Czech Statistical Office; Eurostat
Note: CY=Cyprus; CZ=Czech Republic; E=Spain; HU=Hungary; MT=Malta; P=Portugal; PL=Poland; SK=Slovakia; SL=Slovenia.

This finding makes the argument about future price jumps in the Czech Republic less compelling, as the additional explanatory factors are likely to develop in a relatively smooth manner. In fact, we argue that after the exchange rate appreciation in 2001–2002 (to about 47 percent of the EU in 2001), the Czech koruna might have become "overvalued" in cross-country comparison, which could justify the central bank's policy steps to reduce the appreciation since mid-2001.

It should also be remembered that the international price differences do not concern average price levels only, but also – and perhaps even

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more importantly – relative prices. There are many prices in the Czech Republic which are less than 20 percent of the average EU level, such as rents, schooling, health care and transport services. On the other hand, communications, cars and alcoholic beverages have virtually the same price as in the EU. This means that relative prices (such as the price of cars in terms of rents) are significantly different in the Czech Republic – and other accession countries – compared with the EU. Moreover, we show that these differences in relative price structures are still much bigger than in the least developed EU countries.

An econometric analysis of the cross-country price differences of individual commodity groups shows that one cannot strictly distinguish between tradable and non-tradable commodities, as all prices tend to have a positive relationship to GDP levels. In particular, the "empirical degree of non-tradability" of the various commodity groups ranges from 10 percent (the most tradable) to 84 percent (the least tradable). We use these detailed findings to estimate roughly how prices in the individu-

al groups are likely to develop depending on the rate of real economic convergence.

We conclude that it may take about 15 years for the Czech aggregate price level to reach 60 percent of the EU price level, and it would take about the same time to reach the same degree of relative price differences as observed in the least developed EU countries. This corresponds to an average rate of real exchange rate appreciation of 2.5–3.5 percent a year, which is above the "benchmark" estimate based on the aggregate cross-country regressions, but still somewhat below the trend observed in the Czech Republic over the past decade.

Another conclusion is that with inflation targets announced by the central bank, a GDP growth rate exceeding 4.7 percent and real exchange rate appreciation faster than 2–3 percent a year would force the prices of the "most tradable" commodity groups to decline, which may "hit the constraint" of lower downward flexibility of prices. A growth rate of 4.7 percent does not appear to be a binding constraint, since the benchmark

convergence scenarios include slower growth for the Czech Republic. However, if factors such as a significant exchange rate appreciation exceeding the benchmark scenario put additional downward pressure on inflation, prices of some commodities may start to decline.

In such a situation, a smooth price adjustment to the EU level would require companies and labour unions to adjust their behaviour to the circumstances of low inflation, nominal exchange rate appreciation and falling prices of tradable goods. Policy makers can contribute in this respect by communicating more actively to the private sector the implications of the announced inflation targets and the process of real economic convergence.

This could help overcome the behavioural aspect of the downward rigidity of prices and its real macroeconomic costs which may stem from the companies' and labour unions' lack of experience with the low-inflation environment, the appreciating nominal exchange rate and the falling prices of tradable goods. ■

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The economic consequences of real catching-up

Vladislav Flek

Recent discussion among professional economists has made the Balassa–Samuelson Effect (BSEF) a fashionable subject. It has influenced the framework within which policy makers in the EU accession countries perceive the magnitude of the equilibrium real exchange rate appreciation, as well as the macroeconomic sustainability of the real catching-up process. What are the reasons for this popularity?

Sectoral productivity improvements are likely to be associated with rises in sectoral wages. A "productivity-related" wage increase in the traded sector, however, could spill over into rising wages in the non-traded sector amid lower productivity growth than in the traded sector. If wages tend to equalise across sectors in spite of productivity differentials, the non-traded sector would have to allow for higher price increases, since it cannot accommodate the rising wage level of the traded sector.

By this logic, higher productivity growth in the traded sector causes higher price inflation in the non-traded sector. This translates either into a rising domestic CPI level (which causes cross-country inflation differentials to emerge) or into nominal exchange rate appreciation (or some combination of the two). As a result, in a country with higher productivity growth of tradables relative to nontradables than abroad, there are appreciation pressures on the real exchange rate.

If such a mechanism really works, then the EU candidate countries will have to face, as a by-product of the

catching-up process, a trend of real exchange rate appreciation, and the process of joining the EMU (ERM2) could be adversely affected by incompatibility of the "real" catching-up process with the "nominal" convergence criteria. Empirical research on the EU candidate countries seems to signal almost uniformly the presence of the BSEF. See, among others, Begg et al. (2001) for the most recent empirical results supporting the presence of the BSEF and a broader literature overview. To be more precise, the empirical literature at our disposal questioning the relevance of the BSEF for the EU candidate countries is rather scarce. See Egert (2002) and Mihaljek (2002).

The majority of studies on this topic deal with (quite heterogenous) panels of transition countries or with the EU countries only. In contrast, we include the Czech Republic in the panel of highly developed EU countries and attempt to compare our results with the above approaches. With regard to the developments in the selected EU countries, there are two basic tendencies (Figure 1):

1) There is a trend of a faster productivity growth in the traded sector than in the non-traded sector (see the prevailing upward slope of the T/N lines, representing the ratio of sectoral productivity levels at national constant prices). This makes further analysis plausible, because the basic condition exists from which the entire causal mechanism of the BSEF starts.

2) There is a remarkable correlation between the sectoral productivity ratios (T/N) and relative price

developments (N/T). This is also in line with the BSEF approach and justifies further, more advanced analysis, analysis in which the data for the Czech Republic would also be included.

Using panel data for selected national economies (including the Czech Republic), we first estimate relative price changes stemming from fluctuations in sectoral productivity (i.e., the impact of a one per cent change in relative labour productivity T/N on the sectoral relative price ratio N/T). Subsequently, we simulate the cross-country CPI-inflation differentials implied by sectorally unbalanced productivity growth, taking into account country-specific weights of non-tradables in consumption (value added) and assuming there are no adjustments in nominal exchange rates.

Sectoral productivity developments have a statistically significant impact on relative prices in the EU countries and also in the Czech Republic, but the magnitude of the impact is not as strong as the BSEF would predict (according to the BSEF, there should be a unit impact, whilst in our various model specifications the appropriate regression coefficient ranges between 0.36 and 0.65).

The final impact of relative productivity on inflation (on the real exchange rate) is even weaker, and, moreover, in the case of the Czech Republic the impact is negligible. Apart from the relatively low regression coefficient (see above), this is caused by the fact that the difference between the sectoral productivity growth rates is actually very low. ■

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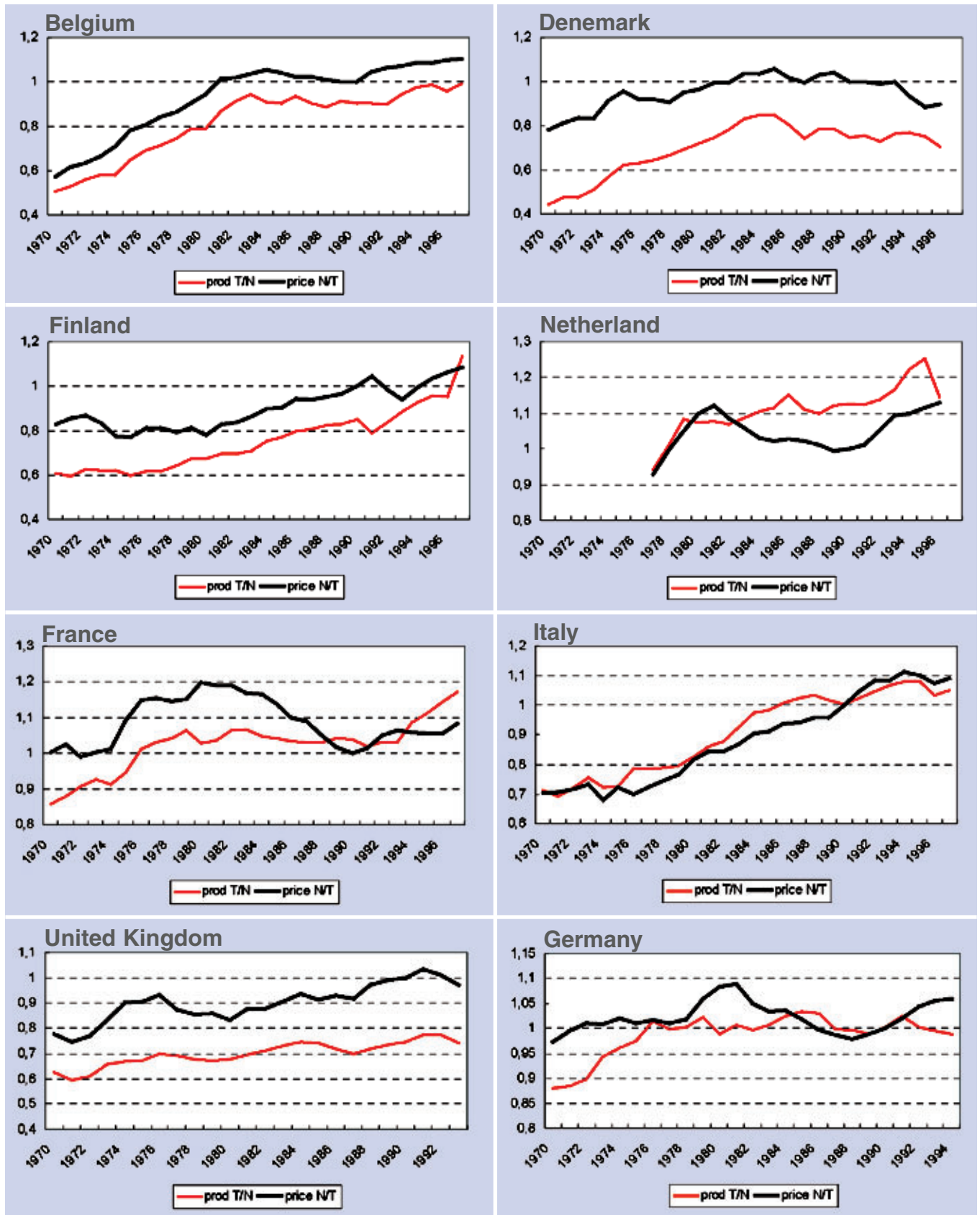
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FIGURE 1: Sectoral Productivity Ratio (T/N) and Relative Prices (N/T)



Source: Eurostat, OECD.

Note: T = manufacturing + agriculture; N = construction + transport. For each year, sectoral productivity levels in national currencies are used for calculating the *prod T/N* ratio, while in the case of the *price N/T* we use sectoral basic price indexes (1990 = 100).

CNB Working Papers Series

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08/2003	Martin Čihák Tomáš Holub	Price convergence: what can the Balassa–Samuelson model tell us?
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CNB Research Seminars and Conferences

I. Conferences

Research conferences are held by once every two years. The conference proceedings are published on internet. Conferences are normally organised in co-

operation with the Office of the CNB or with external academic institution. Table 1 gives summary of the conferences announced in the CNB Research program.

TABLE 1: Research Conferences

Conference	Date	Proceedings	Notes
Integration into the EU and EMU: Challenges of Nominal and Real Convergence	September 2001	http://www.cnb.cz	Conference marking the 75th anniversary of the establishment of central banking in the Czech Republic, on the theme
Fiscal Policy and Financial Markets	August 2003	http://nb.vse.cz/fak1	Conference organised by the Prague School of Economics – Joint Conference with the CNB

II. Joint Seminars of the Czech National Bank and the Czech Economic Society

Distinguished foreign speakers are invited to give seminars organised by the Czech National Bank and the Czech Economic Society. For each seminar, there is a follow-up internal CNB seminar with a to-

pic related to the speakers' work. Four seminars are typically incorporated into the CNB Research Programme each year. Table 2 summarises the list of speakers.

TABLE 2: CNB Research Seminars

Lecturer	Seminar Title	Date
Juergen von Hagen	Public Finance Issues in the European Context	12.12.2003
William R White	Monetary and Financial Stability: How to Find Reinforcing Anchors?	31.10.2003
Nouriel Roubini	Sovereign Debt Restructurings	20.06.2003
David Begg	Monetary Integration in Europe	23.11.2002
Mario Nuti	Prospects of Unilateral Euro-Isation in EU Accession Candidate Countries	2.10.2002
Frederic Mishkin	Inflation Targeting: International Experience	5.04.2002
Willem Buitier	The Stability and Growth Pact Meets the Accession Countries: What Happens?	29.04.2002
Kenneth Wallis	Recent Developments in Macroeconometric Modelling	25.09.2001
David Mayes	Moral Hazard and Orderly Bank Exit	16.05.2001
Laurence Ball	The State of the Phillips Curve	18.04.2001