How would a fixed exchange rate regime fit the transition economies? The case of the Czech Republic, Hungary and Poland[1]

Jérôme Creel

Sandrine Levasseur

(OFCE, Paris)

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Abstract

This study is devoted to an extension of Dibooglu and Kutan's work [Journal of Comparative Economics, 29(2), June 2001] in two directions. First, a bivariate VAR, including the real effective exchange rate (REER) and the inflation, is tested not only for Hungary and Poland, but also for the Czech Republic, over the 1992:12-2002:12 time period. Second, industrial production is added to the multivariate VAR in order to investigate the effects of nominal and real shocks on output. By this way, we (wish to) illustrate the gains and costs of the actual exchange rate regime and draw some conclusions on the likely economic outcomes of adopting a firmly fixed exchange rate regime. Two main conclusions can be drawn from our empirical work: (1) contrary to Dibooglu and Kutan (2001), we find a quite high degree of flexibility in the CPI, which reveals the lower importance of administered prices and the substantial progress made by these economies towards a market economy; (2) in contrast to the Czech Republic and Hungary, nominal shocks appears to have a very strong effect on the REER in Poland. Especially, fluctuations in the nominal exchange rate explain a large part of fluctuations in the REER in this latter country.

Keywords: CEECs, structural VAR, exchange rate.

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1. Introduction: motivations

The forthcoming entry of 8 CEECs in the European Union in May 2004 is another important step towards full integration within Europe. Though real integration is already achieved in most of these CEECs, issues arise on the capacity of the new entrants to overcome the loss of monetary independence and exchange rate policy, and to satisfy the Stability and Growth Pact[2].

We intend to shed light on the economic policies of the largest newcomers, the Czech Republic, Hungary and Poland. Indeed, these three countries have moved from a fixed to a more flexible exchange rate regime along the transition process, and recently have adopted inflation-targeting monetary policies. Since flexible exchange rates and inflation-targeting strategies are not characteristics of the EU or the Euro area, it obviously questions the ability of these countries to move back to a quasi-fixed exchange rate and a common monetary policy[3].

We focus our study on the analysis of the extent to which prices are flexible or rigid in the three countries, and on the explanations of the variations in the real exchange rate. More specifically, we try to determine to what extent these countries have managed the exchange rate in order to compensate for exogenous shocks or as a growth-oriented tool. In this regard, we hinge extensively on a paper by Dibooglu and Kutan (2001) [D-K (2001), afterwards].

D-K (2001) use a structural VAR model of the real effective exchange rate (REER) and the price level. Decomposing real exchange rate and price movements into those attributable to real and nominal shocks is useful to assess the effectiveness of monetary and exchange rate policies in these transition economies. As noted by D-K (2001), a large temporary component in the real exchange rate due to nominal shocks could indicate a high degree of nominal rigidity in commodity prices; hence room for manoeuvre for exchange rate policy as the latter may alter competitiveness.

We extend D-K (2001) in two respects. First, we study a third country, the Czech Republic, whose monetary and exchange-rate frameworks have been somewhat similar to that of Hungary and Poland. The most important difference between these three countries is their timing for reform. A more flexible exchange rate regime was adopted as early as in 1996 in the Czech Republic (larger bands), but in 2000 and 2001 in Hungary and Poland respectively. Inflation targeting was adopted in 1998 in the Czech Republic and Poland, but in 2001 in Hungary.

Second, D-K (2001) argue that the real shocks in their study could be attributable to changes in endowment, productivity and technology. These are typically *supply shocks*. Nominal shocks are caused mainly by non expected variations in the nominal exchange rate or money growth. These are *nominal demand shocks*. We extend this decomposition to a *real demand shock*, thus incorporating industrial production in the structural VAR model[4]. A real demand shock would reflect an unexpected change in policy, for instance a change in public spending. A large, persistent and positive component in industrial production due to a real shock may reveal the future cost of implementing fiscal policy within the limits of the Stability and Growth Pact.

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[2] On this topic, see Coricelli and Ercolani (2002).

[3] The three countries will not enter the Euro area in the short run but will participate in the EMS II. This system is typically an asymmetrical one and the "leadership" will be devoted to the ECB.

[4] Due to the unavailability of GDP on a monthly basis, we use industrial production as a proxy.

The rest of the paper is organised as follows. Section 2 briefly provides an overview of monetary and exchange rate policies in the three countries. Section 3 is devoted to the presentation of the data and of the methodology used. Section 4 presents empirical results ensuing from the structural bivariate model. Section 5 introduces and discusses further results which permit to check for the main conclusions of section 4. Section 6 concludes and discusses policy implications of the empirical outcomes.

2. Monetary policy in the Czech Republic, Hungary and Poland

During the period under study (1993–2002), the three countries were characterized by a shift from a fixed exchange rate regime to a more flexible regime and by a shift from money supply targeting to inflation targeting. Of course, these two shifts were not independent from one to another.

In the beginning of the transition period, a fixed exchange rate regime was adopted in most post-socialist countries as a nominal anchor for stabilisation efforts. Indeed, inflation rates with two digits -or even three digits- were the rule (Arratibel and *alii*, 2002). Though the shifts in exchange rate regime and monetary policy framework might be related to country-specific factors, capital inflows within a fixed exchange rate – leading to a real exchange rate appreciation, which in turn resulted in a significant loss of competitiveness and a worsening of the current account – might be the common story to explain the shift to a more flexible exchange rate regime.

2.1. The Czech Republic

In 1990, the devaluation of the currency by 50% allowed the Czech Republic to renew quite rapidly with growth but, at the same time, it delayed restructuring of the economy. As a result, the Czech Republic was precipitated in a currency crisis in the spring of 1997, necessitating the introduction of two stabilisation packages in April and May 1997. Indeed, the roots of the crisis were to be found mainly in state-controlled banks that provided easy access to credit, in largely unregulated capital markets and in confused corporate governance. In such an environment, domestic firms failed to restructure and lost competitiveness, which resulted in a mounting external imbalance (see table 1). Despite rising interest rates, these developments forced the authorities to abandon the fixed exchange rate regime in May 1997 in favour of a managed float against the DM, and to introduce several macroeconomic and structural measures, including a tightening of fiscal policy, a moderation in nominal wage growth, a substantial increase in regulated prices and plans to complete rapidly the privatisation of both the banking sector and a number of state-controlled firms (Krkoska, 2001). Moreover, few months later, in December 1997, the Czech National Bank (CNB) decided to adopt an inflation-targeting framework.

The combination of monetary and fiscal restraint participated in a slowdown in GDP growth which set the stage for the recession of 1997-1998. Indeed, GDP fell by 0.8 % in 1997, and 1.0 % in 1998, mainly as a result of falling domestic demand. By closing the gap between the economy's aggregate supply and demand, the recession contributed to correcting the external imbalance. Imports declined, due to the depressed state of the economy, and exports recovered in response to improved competitiveness associated with the 1997 depreciation of the currency, so that the current account deficit shrank to 2.4 % of GDP in 1998. The drop in output, combined with nominal wage moderation, declines in food and energy prices and a pause in the process of liberating regulated prices, led to a substantial reduction in inflation, which fell from 10.7% in 1998 to 2.1% in 1999.

Though inflation somewhat resumed in 2000 and 2001, it has benefited from the change in the Central Bank law. Indeed, an amendment was enacted in August 2001, changing the goal of monetary policy from currency stability to price stability. This was a further step towards a fully flexible exchange rate regime.

As regards public finances, the general government deficit has increased steadily since 2000, leading to a substantial rise in public debt which is expected to be over 30% of the GDP in 2006 (EBRD, 2002). High deficits are mainly due to high social transfers, investments in infrastructure and housing, and lower revenues in the early 2000s consecutive to the recession in 1998-99. EU entry and the impending adoption of the SGP may not give this economy enough leeway to cope with a recession, *via* the automatic stabilisers, or to implement an ambitious public investment program.

TABLE 1: Czech Macroeconomic Indicators, 1993 to 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
GDP real growth rate	-0.9	2.6	5.9	4.3	-0.8	-1.0	0.5	3.3	3.3	n.a.
CPI rate of inflation*	20.8	10.1	9.1	8.8	8.5	10.7	2.1	3.9	4.8	1.8
Broad money (nominal increase)**	12.3	20.7	23.7	7.6	9.2	5.4	7.7	5.6	13.0	3.2
Nominal interest rate***	8.0	8.5	9.5	10.5	13.0	7.5	5.0	5.0	3.8	1.8
In % of GDP :										
Current account balance	0.3	-0.1	-2.7	-7.4	-6.1	-2.4	-3.0	-4.8	-4.4	n.a.
General government balance	n.a.	-1.9	-1.6	-1.9	-2.0	-2.4	-2.0	-4.2	-5.2	-9.3
Public debt	n.a.	17.6	15.3	13.2	12.9	13.0	14.5	16.7	18.7	n.a.

Sources: OECD, IMF, EBRD[5].
* Year-on-year, in per cent.
** M2.
*** Official discount rate.

2.2. Hungary

At the beginning of the transition period, the Hungarian monetary policy included active exchange rate management based on a currency peg with a narrow band of permitted fluctuation. But, this initial monetary policy, which aimed at a real appreciation of the forint to help combat domestic inflation, was rapidly determined to be too costly because of the declining competitiveness of Hungarian exports and sluggish growth (D-K, 2001). Moreover, it failed to provide a nominal exchange rate anchor to reduce inflationary expectations (see table 2). These costs began to appear in 1993/94 when current account and government deficits reached respectively 9% and 7% of GDP. The persistence of twin deficits led to a macroeconomic situation that was certainly not sustainable in the long run. Foreign debt was growing steadily, putting Hungary at risk of insolvency. In such a macroeconomic context, liberalization of foreign exchange rate operations, combined with concerns by foreign creditors about the stability of the forint, resulted in a period of strong macroeconomic

[5] Following Coricelli and Ercolani (2002), fiscal data were taken from the EBRD. General government balance excludes privatisation revenues. Government public debt is a consolidated outstanding debt excluding the indirect debt of Konsolidacni Agency and publicly guaranteed debt.

vulnerability in March 1995, necessitating the implementation of extensive stabilisation measures and to modifications in the exchange rate regime (Szapary and Jakab, 1998; Krkoska, 2001). Fiscal policy was tightened to reduce the twin deficits through lower government expenditures, higher imports tariffs, and reduced government borrowing. In order to restore investors' confidence, the forint was devaluated by 9% and a preannounced crawling band exchange rate system was introduced in March 1995. The band of permitted fluctuations was set at 2.25 % on either side of the parity, which has been maintained until May 2001. The rate of crawl was set according to an inflation target. The initial monthly rate was 1.9 % and it was gradually reduced to 0.2 % in April 2001.

Following the package of stabilisation measures, government deficit and current account were reduced (table 2). Economic growth slowed short after the March 1995 measures had been implemented, but it soon accelerated. Inflation declined steadily, in part due to falling import prices and also to the slowing rate of depreciation of the forint. Nevertheless, up to 2000, CPI inflation rate again came close to 10% (table 2).

In May 2001, the central bank of Hungary changed its monetary regime from a crawling band exchange rate to an inflation targeting framework. The bank has widened the exchange rate fluctuation margins to +/- 15%, hoping for an appreciation of the forint to achieve the inflation targets. Though inflation halved (falling from 9.2% to 5.3%), two years of experience in Hungary with inflation targeting has highlighted the fact that the disinflationary effect of exchange rate appreciation might be somewhat smaller than originally expected by the Bank. According to Jakab and Kovacs (2003), private sector wages have not yet adjusted to the lower level of inflation, and most of the adjustment has taken place in employment (mostly in the manufacturing sector)[6].

Finally, after several shifts in the currency basket during the 1990s reducing the weight of the US dollar (and generally increasing the weight of the DM), the exchange rate is completely tied to the Euro since January 2000. Since October 2001, the Forint has been introduced in fixed band with Euro peg.

[6] More precisely, their decomposition of the exchange rate pass-through for Hungary underlines the importance and timing of different markets in the process of disinflation for such a country. They found that "the quickest disinflationary effect comes from the permanent decrease in import prices. However, the adjustment process does not end here. The narrowing of the output gap (mark-up effect) helps in further disinflation. Lastly, labour market adjustment becomes a significant determinant in the exchange rate pass-through from year three and onward. This might happen as wage adjustment can be achieved via an increasing unemployment rate after the slowdown in GDP due to the real exchange rate channel. This result explains why companies reduce employment first and adjust wages only later" (Jakab and Kovacs, 2003, p.5).

TABLE 2: Hungarian Macroeconomic Indicators, 1993 to 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
GDP real growth rate*	-0.6	2.9	1.5	1.3	4.6	4.9	4.2	5.2	3.8	n.a.
CPI rate of inflation*	22.5	18.9	28.3	23.5	18.3	14.2	10.0	9.8	9.2	5.3
Broad money (nominal increase)**	n.a.	n.a.	20.1	22.5	19.8	15.2	16.1	12.4	n.a.	n.a.
Nominal interest rate***	22.0	25.0	28.0	23.0	20.5	17.0	14.5	11.0	9.8	8.5
In % of GDP :										
Current account balance	-9.0	-9.4	-5.6	-3.7	-2.1	-4.8	-4.3	-3.7	-2.1	n.a.
General government balance	-5.7	-7.5	-6.7	-5.0	-4.8	-4.8	-3.4	-3.3	-4.7	-6.0
Public debt	89.7	88.2	86.4	72.8	63.9	61.9	60.7	57.6	51.5	n.a.

Sources: OECD, IMF, EBRD.
* Year-on-year, in per cent.
** M3.
*** Official discount rate.

2.3. Poland

The stabilization of the Polish economy began under less favourable conditions than those found in Hungary (D-K, 2001)[7]. Especially the inflation rate was very high and difficult to curb. The Zloty was devaluated by almost 50% in January 1990 and by 17% in May 1991. Nevertheless, as high inflation was continuing, the competitiveness of Polish exports was reduced and current account worsened. The Zloty's peg was abandoned in October 1991, replaced by a crawling peg with a preannounced devaluation of 1.8 % per month against a basket of currencies. Over time, the rate of depreciation has been reduced and there have also been one-off devaluations and revaluations to accommodate exogenous shocks. In 1995, the band within which the Zloty could fluctuate was widened to +/- 7%. Poland's exchange rate policy was so credible to foreign investors that short-term capital inflows began to be a problem for the National Bank of Poland (NBP). By 1995, despite NBP sterilisation, capital inflows accounted for 59% of the growth of the money supply (D-K, 2001). As a result, controlling the money supply became more and more difficult for the monetary authorities. The task was also complicated by the progressive vanishing of a stable and predictable correlation between the monetary aggregate and inflation – a consequence of the development of financial markets and of the progress made in macroeconomic stabilisation – two factors that led to a rise in money demand (OECD, Economic surveys, Poland, January 2000).

In September 1998, the NBP adopted a new monetary policy framework: monetary policy targeting was replaced by inflation targeting. To a large extent, the central bank was trying to pursue two objectives (a monetary target and an exchange rate anchor) with only one instrument, which frequently led to monetary dilemmas. A common dilemma occurred when the central bank had to intervene on the exchange rate market to prevent an appreciation of the exchange rate, but at the same time had to take actions to bring money supply within the announced target. To achieve the two objectives simultaneously, the central bank had to resort to large-scale sterilisation operations, which were costly for the banking system and increasingly difficult to put in place. A new framework was therefore required to re-organise the priorities of monetary policy and limit the number of objectives.

[7] Note however that according to Falcetti and *alii* (2002), initial conditions have almost no impact on growth in the mid-run. This is confirmed by cross-sections and panel estimations.

The direct inflation targeting was accompanied in early 1999 by a considerably widening in the exchange rate fluctuation band, up to +/- 15%. The rate of crawl of the central parity in the fluctuation band was progressively reduced from 1% per month in early-1997 to 0.3% in March 1999, so that the inflation objective could be achieved more easily. Since April 2000, Poland is under a fully floating exchange rate regime. As the inflation rate seems more or less under control in Poland, the major problem has shifted to public finances. Since 2001, the general government deficit has steadily increased and is largely over the Maastricht deficit criterion. New measures announced by the government in August 2002, including tax and social contribution arrears forgiveness, state credit and tax deferral for small enterprises, and an increase in state guarantees for enterprise debt, are likely to further increase general government deficits (EBRD, 2002).

TABLE 3: Polish Macroeconomic Indicators, 1993 to 2002

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
GDP real growth rate*	3.7	5.2	7.0	6.0	6.8	4.8	4.1	4.0	n.a.	n.a.
CPI rate of inflation*	35.3	32.2	27.8	19.9	14.9	11.6	7.3	10.1	5.5	1.9
Broad money (nominal increase)**	36.0	38.2	35.0	29.2	30.6.	25.4	19.4	11.8	13.7	n.a.
Nominal interest rate***	29.0	28.0	25.0	22.0	24.5	18.25	19.0	21.5	14.0	7.5
In % of GDP :										
Current account balance	-7.9	1.0	0.7	-2.4	-4.3	-4.4	-8.4	-6.0	-3.0	n.a.
General government balance	-2.1	-2.2	-3.1	-3.3	-3.1	-3.2	-3.7	-3.2	-6.0	-5.0
Public debt	n.a.	72.4	57.9	51.2	49.8	43.2	44.5	42.5	44.5	n.a.

Sources: OECD; IMF, EBRD[8].
* Year-on-year, in per cent.
** M2.
*** Official discount rate.

3. Data and methodological issues

In our bivariate decompositions, we consider the log of the price level, p_t, measured by the Consumer Price Index (CPI), and the log of the real exchange rate, q_t. The latter is the CPI-based real effective exchange rate index, that is, the relative price of domestic goods in terms of foreign goods. The data are monthly observations from 1992:12 to 2002:12 taken from OECD while CPI data are taken from the International Financial Statistics of the IMF.

In order to specify properly the VAR, we test for unit roots, stationarity, and cointegration. Table 4 presents the augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and cointegration test statistics. The maximum lag in the ADF test is specified using the general-to-specific procedure (Hall, 1994). Starting from a maximum lag of 16, the lag length is pared down depending on the significance of the last coefficient. In testing for a unit root, we consider the possibility of a linear trend in price levels. The ADF test statistics indicate that a unit root (nonstationarity) cannot be rejected for real exchange rates and prices. PP tests in Table 4 confirm that stationarity can be rejected at conventional significance levels. Thus,

[8] General government balance excludes privatisation revenues.

both tests indicate that the real exchange rate and price levels are nonstationary, which is a necessary condition for cointegration. We have also checked that both variables for the three countries were integrated of order one. Table 4 also presents the two-step test for cointegration. In the first step, the real exchange rate is regressed on a constant and the price level. Then, the residuals are tested for unit roots using an ADF test. The test statistics in Poland, Hungary and Czech Republic indicate that the price level and the real exchange rate are not cointegrated; hence, a VAR in first difference is appropriate.

In what follows, we will also consider trivariate decompositions, including industrial productions. Data are monthly and seasonally adjusted; they incorporate total industrial activities except construction. Data are taken from the OECD. As noted by Korhonen (2003), industrial production data are still more precisely measured than many other sectors of the economy. Moreover, the data fit better for explaining real exchange rate fluctuations since industrial production excluding construction is more open to international trade than private services, for instance. Tests for stationarity are given in table 4. Unit roots can be rejected at the 5% critical level. To test for the cointegration of the real effective exchange rate, the price level and industrial production, we use the same procedure as to test for two-variable cointegration. The stationarity for the residuals can be rejected at the 5% critical level. A VAR in first difference for these three variables is also appropriate.

TABLE 4: Unit Root, Stationarity, and Cointegration Tests

	Czech Republic			Hungary			Poland		
	REER[a]	CPI[b]	IP[c]	REER[a]	CPI[b]	IP[c]	REER[a]	CPI[b]	IP[c]
ADF statistic[(1)]	-0.45 (-2.89)	0.13 (-3.45)	-1.89 (-3.45)	0.63 (-2.89)	-0.37 (-3.45)	-2.96 (-3.45)	-1.00 (-2.89)	-1.71 (-3.45)	-0.91 (-3.45)
Lag length	7	13	1	12	13	12	2	12	12
PP statistic	-1.33	0.42	-2.64	0.56	-0.25	-3.29	-1.17	-1.98	-1.55
Cointegration ADF statistic[d]	-1.06			-0.44			-1.97		
Lag length	10			10			10		
Cointegration ADF statistic[e]	-3.65			-1.09			-2.16		
Lag length	10			10			10		

(1) The ADF critical value at 5% is set under parentheses (Fuller, chap. 8, p.373, 1976).
[a] The test assumes a constant in the ADF and PP procedures.
[b] The test assumes a constant and a linear trend in the ADF and PP procedures.
[c] The test assumes a constant and a linear trend in the ADF and PP procedures.
[d] The cointegration test is the residual ADF statistic from the regression of the log of REER on a constant and the log of CPI. The critical value of the test for 2 variables with 100 observations and without trend at the 5 % significance level is -3.3988 (computed using tables in MacKinnon, 1991).
[e] The cointegration test is the residual ADF statistic from the regression of the log of REER on a constant, the log of CPI and the log of industrial production. The critical value of the test for 3 variables and 100 observations at the 5 % significance level is -3.8277 (computed using tables in MacKinnon, 1991).

Following D-K (2001), consider two types of orthogonal shocks, each of whom could be the source of variation in the observed movements in real exchange rates and prices. A supply shock, ε_{st}, reflects changes in endowment, productivity shocks and technology, and a nominal demand shock, ε_{ndt}, is caused by nominal money supply shocks or devaluation/depreciation of the exchange rate. Because the vector $\Delta X_t = [\Delta q_t, \Delta q_t]'$ is stationary, it can be written as an infinite moving average in the structural shocks; i.e.:

$$\begin{vmatrix} \Delta q_t \\ \Delta p_t \end{vmatrix} = \begin{vmatrix} A_{11}(L) & A_{12}(L) \\ A_{21}(L) & A_{22}(L) \end{vmatrix} \begin{vmatrix} \varepsilon_{st} \\ \varepsilon_{ndt} \end{vmatrix}, \quad (1)$$

where A_{ij} are polynomials in the lag operator, L.

In our bivariate SVAR, we impose one "economic" zero restriction on the impact of shocks in the long run, and interprets the resulting long run (and short run) dynamics. More specifically, in order to identify the shocks, it is assumed that nominal demand shocks have no long-run effect on the real effective exchange rate. This assumption draws on perfect price flexibility at least in the long run: a depreciation/appreciation of the nominal exchange rate would not influence the real exchange rate as price would fully adjust[9].

4. Empirical results with a bivariate VAR

A finite-order bivariate vector autoregressive model (VAR) is estimated for the Czech Republic, Hungary and Poland. The number of lags has been chosen so that it could be at a minimum with tests on the residuals indicating the absence of autocorrelation. The VARs have been pared down to 4 lags[10]. In order to examine the possibility of exogenous shifts in the variables and regime changes, we have also tested for the significance of period and policy-specific dummies, as in D-K (2001).

First, for the three countries under study, the Asian and Russian crises in 1997 to 1998 may have influenced the time path of the endogenous variables. Second, the implementation of different exchange rate and monetary regimes are considered. Table 5 reports the definitions of various dummies. In each case, we have tested for the significance of the different dummies in the VAR. Only those which were significant at the 5% critical level for at least one endogenous variable have been kept in our estimation. As exchange rate regimes and monetary (inflation-targeting) regimes are very likely to be intricate, we never test simultaneously the two related dummies (*d2* and *d5*, for example, in the case of the Czech Republic).

The Asian and Russian crises dummy is not significant for either country. This result is consistent with the findings of D-K (2001). In the same manner, the dummy for the monetary regime is (quite surprisingly) not significant for either country. By contrast, the exchange rate regime matters: the dummy for the exchange rate regime is significant for the three countries, especially with respect to the inflation rate. Hence, in the final VAR, we include *d2, d3* and *d4*, in order to control for the shift in the exchange rate regime in, respectively, the Czech Republic, Hungary and Poland.

Though VARs are a-theoretical, the inclusion of restrictions in the structural VARs (SVARs) is such that one can expect some typical variations in the endogenous variables after a shock. What are such typical responses? And what will be the cost/benefit trade-off consecutive to the renunciation in some monetary and fiscal activism or in the fluctuations of the nominal exchange rate?

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[9] An alternative assumption could have been studied: a (temporary) nominal demand shock would have no long run effect on the price level. Hence, full nominal price rigidity could have been explored. However, preliminary results with the first type of restriction largely conclude in favour ofa relatively high price flexibility, so that the alternative loses much of its initial appeal.

[10] We thank Guillaume Chevillon for having made clear to us that lags should be kept to a minimum, hence following Johansen's view on this peculiar topic.

TABLE 5: Definition of Period or Regime-Specific dummies

Asian and Russian crises: *d*1 = 1 between 1997:5 and 1998:8, 0 otherwise.
Exchange rate regimes of the Czech Republic: *d*2 =

a. Peg 1993:1-1996:1 = 0,
b. Large bands 1996:2-1997:4 = 1,
c. Managed flexible exchange rate 1997:5-2002:11, = 2.

Exchange rate regimes of Hungary: *d*3 =

a. Fixed 1993:1-1995:2, = 0,
b. Narrow bands 1995:3-2001:9, = 1,
c. Large bands 2001:10:5-2002:11, = 2.

Exchange rate regimes of Poland: *d*4 =

a. Crawling peg 1993:1-1995:4 = 0,
b. Crawling band 1995:5-2000:3, = 1,
c. Flexible exchange rate 2000:4-2002:11, = 2.

Inflation targeting of the Czech Republic: *d*5 = 1 between 1998:1 and 2002:11, 0 otherwise.
Inflation targeting of Hungary: *d*6 = 1 between 2001:6 and 2002:11, 0 otherwise.
Inflation targeting of Poland: *d*7 = 1 between 1998:9 and 2002:11, 0 otherwise.

1.1. The theoretical framework

The implicit framework hinges on a Mundell-Fleming-type model with flexible prices. First, consider a supply shock, which is assumed to be a positive shock on productivity. A transitory impact on the real effective exchange rate will reflect the capacity of the terms of trade to absorb the shock, hence a high degree of domestic price flexibility in the short run. As a consequence, one can reasonably consider that active exchange rate or expansionary monetary policies are relatively inefficient as they tend to be inflationary. The reverse may also be true: restrictive monetary policies may be quite efficient in *curbing* inflation. Such a conclusion nevertheless necessitates, as a confirmation, that a nominal shock has few impact on other real variables in the short run (e.g. production). A transitory impact of a supply shock on the real variables may also reveal that fiscal policy could be fettered by the flexibility of prices and may have an inflationary effect. The latter would have to be confirmed by the impact of a real demand shock on inflation, a shock which will be studied in the next part. Now, if the impact of a supply shock on the REER is persistent, one can question the flexibility of the price level; thus, policies may be more efficient than in the previous situation. The impact of a positive supply shock on prices is expected to be negative, unless the productivity growth is overstated by wage increases that fuel domestic inflation. This could reveal the existence of a so-called Balassa-Samuelson effect in the country.

Second, consider a nominal demand shock which is assumed to have no impact on the REER in the long run. In the short run however, nominal exchange rate depreciation is supposed to provoke an improvement in the terms of trade, hence a depreciation in the REER. The transitory improvement in the terms of trade should provoke a progressive increase in the price level, unless at least one of the following situations occurs: prices may be sticky; monetary policy would counter the inflationary impact of the shock (in the case of an efficient inflation-targeting policy); or fiscal policy would be restrictive. Testing for the significance of the two latter assumptions is possible. To test for the first assumption, one can either test the significance of the related dummy, or reduce the time span to scratch the period under which the inflation-targeting regime has been implemented. The occurrence of a fiscal contraction could be confirmed by a trivariate decomposition. After a nominal demand shock, exhibiting the three following responses of endogenous variables – a transitory reduction in the REER,

no increase in the price level and a reduction in industrial production – may reveal such a policy stance.

1.2. First empirical outcomes

The dynamic paths of the real exchange rate and price level can be explored by examining the impulse response functions (IRFs) of the SVARs. Figure 1 presents the IRFs of the two endogenous variables to the supply and nominal demand shocks, respectively, for the three countries under study.

We begin with the *supply shock*. Let us briefly summarise the empirical results in D-K (2001, p.271). In Hungary and Poland, the impact of the shock is permanent on the REER, which tends to reveal high price rigidity even in the long run. The sole difference between countries lies on the response of the price levels: while the increase is permanent in Hungary, prices respond cyclically and convergingly towards zero in Poland. The increase in prices is quite surprisingly to us not analysed precisely in terms of the Balassa-Samuelson effect.

Our empirical results do not support the view of high price rigidity in the three countries under study, except to a certain extent for Poland. The response of the REER to a (1 %) supply shock is transitory, converging towards zero 10, 8 and 10 months after the shock, respectively in the Czech Republic, Hungary and Poland. In the short run, the responses to the shock are quite high (+1.5% on average for the three countries) but they decline very rapidly, especially in the Czech Republic and Hungary. As regards the CPI responses to the positive supply shock, the response is initially positive in the three countries, but becomes negative in the second (Czech Republic and Hungary) or third (Poland) month. Afterwards, Poland appears as a specific case. Whereas inflation remains below its before-the-shock level during a few months in the Czech Republic and Hungary, the Polish inflation responds positively five months after the occurrence of the shock. Such a finding for Poland is consistent with D-K (2001), but we tend to attribute this phenomenon to the presence of a Balassa-Samuelson effect. A more prominent Balassa-Samuelson effect in Poland, in comparison with the Czech Republic and Hungary, has already been reported by Egert (2002), which tends to confirm our preliminary results. Moreover, table 6 below shows that real wage growth in the Polish business sector have been quite high since 1994. Though this is not evidence of a B-S effect, the underlying wage-price dynamics which is under way in Poland could explain the positive impact of the supply shock on the price level.

We now turn to the effects of a (positive) *nominal demand shock*. Responses in D-K (2001) to such a shock are an initial and quite substantial depreciation in the REER, followed by an appreciation towards the before-the-shock level. Prices increase linearly and permanently after the shock.

In our setting, the responses of the REER to a nominal demand shock are quite different from that reported in D-K (2001). In the Czech Republic, the response is "flat": IRFs do not almost depart from zero. This confirm a quite high degree of price flexibility in this country (as evidenced also in the Czech inflation response) and, then the intuition that monetary and exchange rate policies may be ineffective to boost growth, but effective to curb inflation[11]. In Hungary, the REER instantaneously appreciates. As we shall see below, this is largely due to the substantial increase in inflation (+0.8%) which pushes the terms of trade downwards. The appreciation in the REER is followed, first, by a depreciation and, second, by a return towards the before-the-shock level after 5 months. Indeed, price rigidity seems rather an inappropriate

[11] OECD (2000, p.27) notes that, in the Czech Republic, the price behaviour since 1996 has been heavily influenced by exchange rate changes.

manner to characterise Hungarian and Czech economies. The REER of Poland exhibits a very different pattern following a (1%) positive nominal demand shock. Initially, the REER depreciates by (almost) 1% and, three months after the shock the REER appreciates to reach +0.25% of appreciation one month later. Combined with the response of prices, the initial depreciation of the REER is then largely explained by a substantial depreciation in the nominal exchange rate. Few months later, the increase in prices explains roughly all the appreciation of the REER.

Finally, with respect to inflation responses, it is quite interesting to note that our responses follow the same path whatever the country studied, but that this path is totally different from that reported in D-K (2001). Following a positive nominal shock, prices increase instantaneously and we do not find initial inertia in prices reported in D-K (2001). This immediate rise may reveal the lower importance of administered prices in these three countries. This is confirmed in the case of the Czech Republic and Poland (see table 7 in the appendix). The Hungarian case is more cumbersome since the share of administered prices has risen since the early 1990s. The immediate rise in the response of prices may also reveal the actual and substantial progress made by these three economies towards a market economy. The private sector share in GDP is remarkably high in 2001 as regards the situation prevailing almost ten years before when this share was a mere 50%. It is now up to 75 to 80% in the three countries (EBRD, 2002), with Hungary at this peak since 1998, hence somewhat earlier than in the Czech Republic (1999) or Poland (2001).

It is also worth noting that the nominal shock has had no permanent impact on nominal variables. There seems to be either intrinsic forces or policy instruments which are able to curb inflation. The nature of these instruments can be analysed further within a trivariate SVAR model.

5. Further analysis after incorporating industrial production

When describing the expected IRFs of a bivariate VAR in section 4., we mentioned two cases in which a trivariate decomposition would be helpful to reach more robust conclusions. First, when discussing about the possible consequences of high price flexibility, we mentioned that fiscal policy may be inflationary. The trivariate decomposition permits to give a preliminary insight on this assumption. Second, the decreasing trend in the inflation rate after a nominal demand shock has occurred may be due to a fiscal contraction. In this case again, introducing a trivariate decomposition may be helpful. Using this type of decomposition would also permit to evaluate the incidence of a real demand shock on the REER: do unexpected shocks on public expenditures have a persistent impact on the competitiveness of the countries under study? Are they compensated by an active nominal exchange rate policy, in which case the entry into the SME II would make these countries incur large costs?

Like in the previous SVAR model, the trivariate decompositions accept dummies related to the shifts in the exchange rate regime. They are thus incorporated again in the SVARs.

Restrictions are threefold. The first two of them are the natural consequence of the former restriction in the bivariate decomposition: a nominal shock is assumed to have no influence in the long run on real variables, like REER and industrial production. The third restriction consists in imposing that real demand shocks are temporary, in line with the now usual decomposition between supply and demand shocks by Blanchard and Quah (1989).

The IRFs are presented in figure 2. The three following questions are answered. First, is a temporary positive shock on public spending inflationary? Second, is there an industrial

production decrease after a positive nominal shock? Third, how does industrial production respond to a productivity shock, and are there hence other elements which would testify to the presence of a B-S effect?

There seems to be convergent elements concluding in favour of high price flexibility in the Czech Republic, as a *temporary shock on public spending* provokes an instantaneous increase in the inflation rate and an appreciation in the REER. Following the sharp real appreciation, the inflation rate falls rapidly below its before-the-shock level until the sixth month after the shock. The subsequent substantial decrease in the REER (from +1.6% to almost zero between the first and second month after the shock) also reveals that the Czech authorities do use the nominal exchange rate to counter the consequences of the shock on competitiveness. The dynamic path for inflation and the REER is quite similar in the case of Hungary, though less pronounced than in the Czech Republic. The situation of Poland is once again very peculiar. The instantaneous impact of the positive real demand shock on inflation is negative and a very steep real depreciation, fuelled by a nominal depreciation, occurs. Two conclusions may thus arise in the case of this country. First, temporary fiscal impulses are not inflationary. This may be due to the implementation of a restrictive and efficient monetary policy. The consecutive policy mix would explain the low and temporary variability of industrial production to the real demand shock. Second, exchange rate policy in Poland seems to be rather active. On the whole, it is also worth noting that the real demand shock has no impact on inflation right after the sixth or seventh month after the shock has occurred.

Now, turning to the *nominal demand shock*, in the case of Hungary, it is possible to conclude that the decreasing trend of the inflation rate can be explained, at least partly, by the reduction in the industrial production, which may have resulted from a fiscal contraction. The reduction in the industrial production is less pronounced in the Czech Republic than in Poland. In Poland, instantaneous industrial production is reduced sharply, but it recovers until the fourth month. In this very short run, a nominal depreciation seems rather profitable to the Polish economy. Abandoning the exchange rate would incur a slight temporary cost of about 0.2% of industrial production (i.e. accumulated responses until the fourth month after the shock has occurred).

The responses of industrial production to a *supply shock* are instantaneously and globally negative, even in Poland where the shock is now disinflationary. In the case of Hungary and the Czech Republic, we consider that it corroborates the unfavourable effect on inflation and industrial production of a large catch-up of wages on productivity, which has made the former go beyond the latter. On average since 1994 (1997 in the case of Poland), the real wage growth has been up to 5.2%, 2.3% and 3.1% respectively in the Czech Republic, Hungary and Poland (table 6). Unfortunately, we have not found yet long reliable series of data concerning labour productivity in order to make a comparison with real wage growth.

In the three countries, the initial decrease in industrial production is likely to be also the consequence of the initial real appreciation. It is worth noting that in Poland, the initial real appreciation is compensated during 4 months by a quite substantial real depreciation despite increasing inflation, a phenomenon which tends to corroborate the use of active exchange rate policies in this country.

TABLE 6: Real Wage Developments, 1994 to 2001

Annual percentage changes, business sector

	1994	1995	1996	1997	1998	1999	2000	2001
Czech Republic	7.4	9.2	8.2	2.9	0.3	4.9	3.8	n.a.
Hungary *	3.9	-6.6	-0.3	3.0	3.7	4.4	4.0	6.5
Poland	n.a.	3.4	n.a.	5.7	3.8	3.1	1.2	1.5

Sources: OECD Economic Surveys , various issues.

*: nominal wage growth taken from the OECD Hungary Economic Survey 2001-2002; CPI inflation rate taken from the National Bank of Hungary; real wage growth computed by the authors.

6. Conclusion: policy implications

The EU enlargement towards 8 CEECs in May 2004 still raises questions on the optimal road for adopting the Euro. Unilateral euroisation has been largely debated in the recent years, with some countries like Poland having envisaged to abandon unilaterally their currency in favour of the Euro. However, the biggest incumbents to the EU, among which Poland, have recently adopted a flexible exchange rate regime. The entry in the ERM II or in the Euro area may thus have huge consequences on their economic policies, encompassing exchange rate policy, but also on economic growth and on the inflation path.

A first step of our work has consisted in a review of the monetary and exchange-rate frameworks in these largest incumbents, namely the Czech Republic, Hungary, and Poland. Capital inflows within fixed exchange rate regimes – which led to real exchange rate appreciations and to a consecutive loss of competitiveness and a worsening of the current account – might explain the shift to a more flexible exchange rate regime in the three countries.

A second step has been devoted to a replication of D-K (2001) methodology to the three countries in order to evaluate their degree of price flexibility. Contrary to D-K (2001), impulse response functions show a very high degree of flexibility in the CPI, which reveals the lower importance of administered prices in the Czech Republic and Poland, and the substantial progress made by the three economies towards a market economy.

A third step has been devoted to an extension of D-K (2001) to a multivariate VAR incorporating real industrial production. We have been able to refine the results obtained with a bivariate decomposition. Most noteworthy, Poland seems a rather peculiar country as regards the use of monetary and fiscal policies, in comparison with the Czech Republic and Hungary. First, fiscal policy is not inflationary. We argue that this can be the consequence of a specific policy mix, under which monetary policy would be restrictive when fiscal policy would be expansionary. The former would be aimed at curbing inflation while the latter would boost growth. Second, exchange rate policy in Poland seems to be rather active. In contrast to the Czech Republic and Hungary, nominal shocks appears to have a very strong effect on the REER in Poland. Especially, fluctuations in the nominal exchange rate explain a large part of fluctuations in the REER in this latter country.

These results have strong policy implications. First, in the three countries, high price flexibility, though a rather new phenomenon, surely make them be in line with countries already in the EU. This means that the *real* transmission mechanisms of monetary policy in the three countries is close to the EU standard. Second, there are still some intriguing responses of the price level to a supply shock. This may be viewed as evidence of either a

Balassa-Samuelson effect or of an uncontrolled wage-price spiral. Adopting a fixed exchange rate regime, like the ERM II, will necessitate that real wage hikes are taken to an end, unless competitiveness will be largely altered. Third, this is all the more important in the case of Poland, as this country has benefited from the fluctuations of the nominal exchange rate substantially to compensate for the real exchange rate appreciations in the past. Thus, adopting a firmly fixed exchange rate regime in Poland seems rather problematic. The use of its fiscal policy would also be fettered by the dispositions of the Stability and Growth Pact. Unless monetary policy in Europe is optimal to the Polish economy, the cost of participating in the EU might be quite high for this country and, at least, higher than in the case of the Czech Republic or Hungary.

A possible extension of our work could be to refine our VARs and, therefore use Canova's (2001) sign restrictions for long run pairs of variables. Restrictions would be economically and consistently sensible and we could assess the robustness of our present results concerning the sources of real exchange rate fluctuations and their consequences on output and inflation to a more suitable macroeconomic framework. There would also be scope for testing on the CEECs some of the theoretical insights due to the New Open Economy, rather than sticking to the now 'old-fashioned' Mundell-Fleming-type model. So long as a "'preferred' specification that is buttressed by extensive supporting empirical evidence" (Lane, 2001) will not have been adopted within the New Open Economy paradigm, it will be difficult to evaluate its legitimacy with only long-run restrictions, as the latter are very sensitive to the specification of preferences, the inclusion of policies, the exact denomination of price stickiness, etc. Within this paradigm, it seems less difficult to define sign restrictions for long run pairs of variables: there is hence scope for confronting the New Open Economy with Canova's methodology, in the case of the CEECs.

7. References

ARRATIBEL O., D. RODRIGUEZ-PALENZUELA and C. THIMANN, (2002): "Inflation Dynamics and Dual Inflation in Accession Countries: a 'New Keynesian' Perspective", *European Central Bank Working Paper Series*, no.132, March.

BLANCHARD O.J. and D. QUAH, (1989): "The Dynamic Effects of Aggregate Demand and Supply Disturbances", *American Economic Review*, vol.79, no.4, September.

CANOVA F., (2001): "The Transmission of US Shocks to Latin American Economies", *mimeo*.

CORICELLI F. and V. ERCOLANI, (2002): "Cyclical and Structural Deficits on the Road to Accession: Fiscal Rules for an Enlarged European Union", *CEPR Discussion Paper*, no.3672, December.

DIBOOGLU S. and A.M. KUTAN, (2001): "Sources of Real Exchange Rate Fluctuations in Transition Economies: The Case of Poland and Hungary", *Journal of Comparative Economics*, vol.29, no.2, June.

EGERT B., (2002): "Investigating the Balassa-Samuelson Hypothesis in the Transition, Do We Understand what We See? A Panel Study", *Economics of Transition*, vol.10, no.2.

EUROPEAN BANK FOR RECONSTRUCTION AND DEVELOPMENT (2002), *Transition Report*, EBRD, London.

FALCETTI E., M. RAISER and P. SANFEY, (2002): "Defying the Odds: Initial Conditions, Reforms, and Growth in the First Decade of Transition", *Journal of Comparative Economics*, vol.30, no.2, June.

FULLER W.A., (1976): *Introduction to Statistical Time Series*, NY: John Wiley and Sons.

HALL A.R., (1994): "Testing for a Unit Root in Time Series with Pretest Data-based Model Selection", *Journal of Business and Economic Statistics*, vol.12, no.4, October.

JAKAB Z.M. and M.A. KOVACS, (2003): "Explaining the Exchange Rate Pass-Through in Hungary : simulations with the NIGEM Model", *NBH Working Papers*, 2003/5, April.

KORHONEN I., (2003): "Some Empirical Tests on the Integration of Economic Activity between the Euro Area and the Accession Countries: a Note", *Economics of Transition*, vol.11, no.1.

KRKOSKA L., (2001): "Assessing macroeconomic vulnerability in central Europe", *Post-Communist Economies*, vol.13, no.1, pp.41-55.

LANE Ph., (2001): "The New Open Economy Macroeconomics: A Survey", *Journal of International Economics*, vol.54, no.2, August 2001.

LEVASSEUR S., (2003): "La situation macroéconomique des pays candidats à la veille de leur adhésion à l'UE", in FITOUSSI J.-P. and LE CACHEUX J. *Rapport sur l'état de l'Union européenne 200*3, Fayard/Presses de Sciences Po, forthcoming.

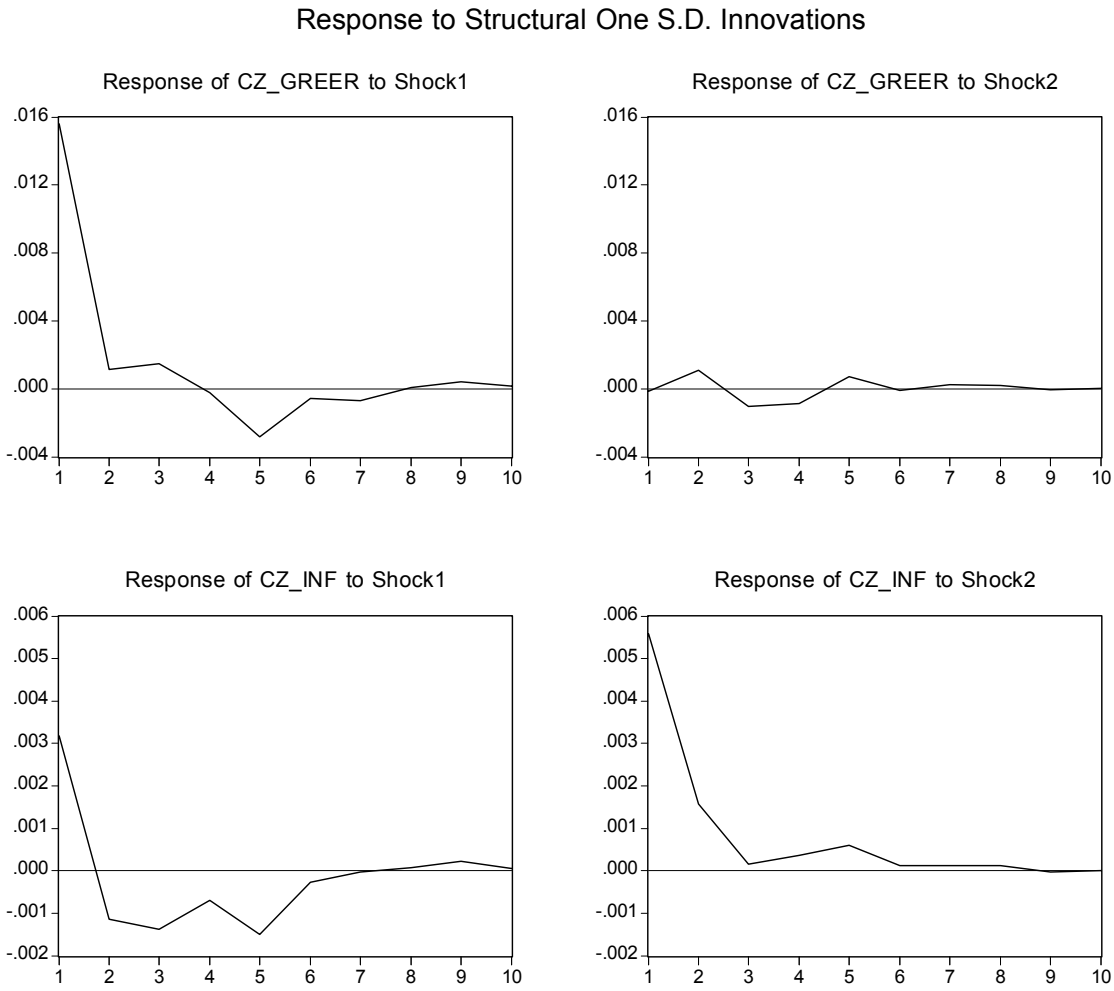
MACKINNON J., (1991): "Critical Values for Cointegration Tests", in ENGLE R.F. and C.W.J. GRANGER (eds.), *Long Run Economic Relationships*, Oxford University Press.

OECD Economic Surveys: various issues.

SZAPARY G. and Z.M. JAKAB, (1998): "Exchange Rate Policy in Transition Economies: The Case of Hungary", *Journal of Comparative Economics*, vol.26, no.4, December.

UNCTAD, Country facts sheets: various years.

FIGURE 1: Impulse response functions – Czech Republic



N.B.: shock 1: supply shock; shock 2: nominal demand shock

FIGURE 1 (continued) – Hungary

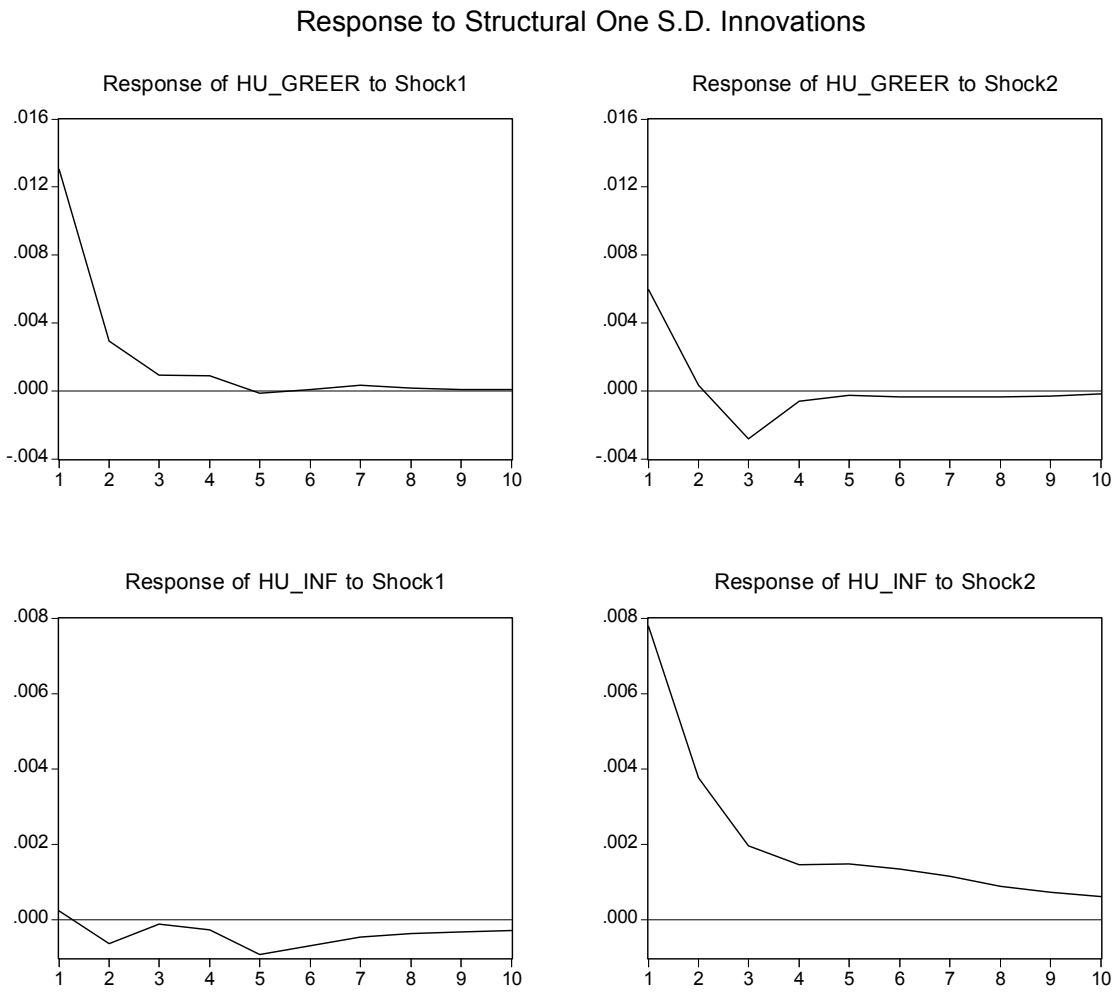


FIGURE 1 (continued) – Poland

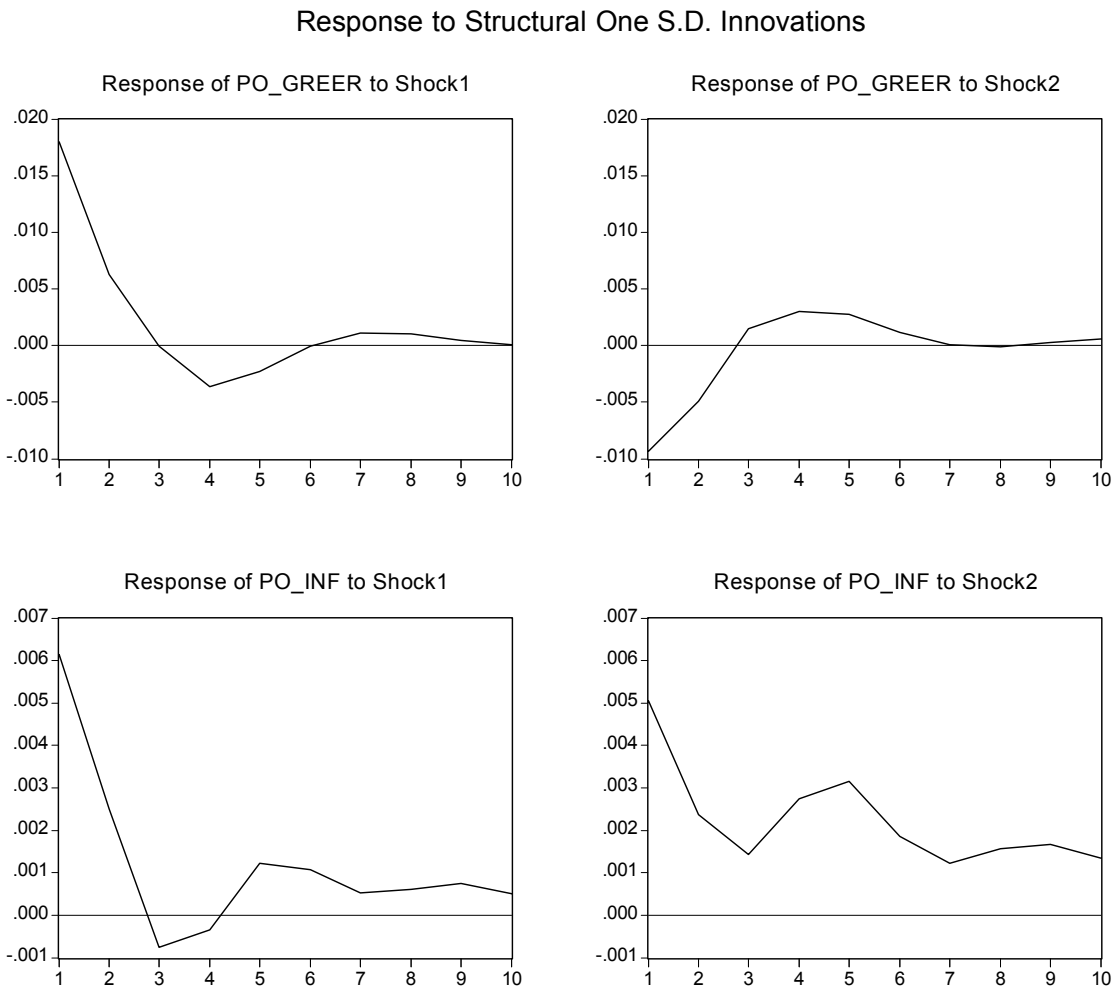
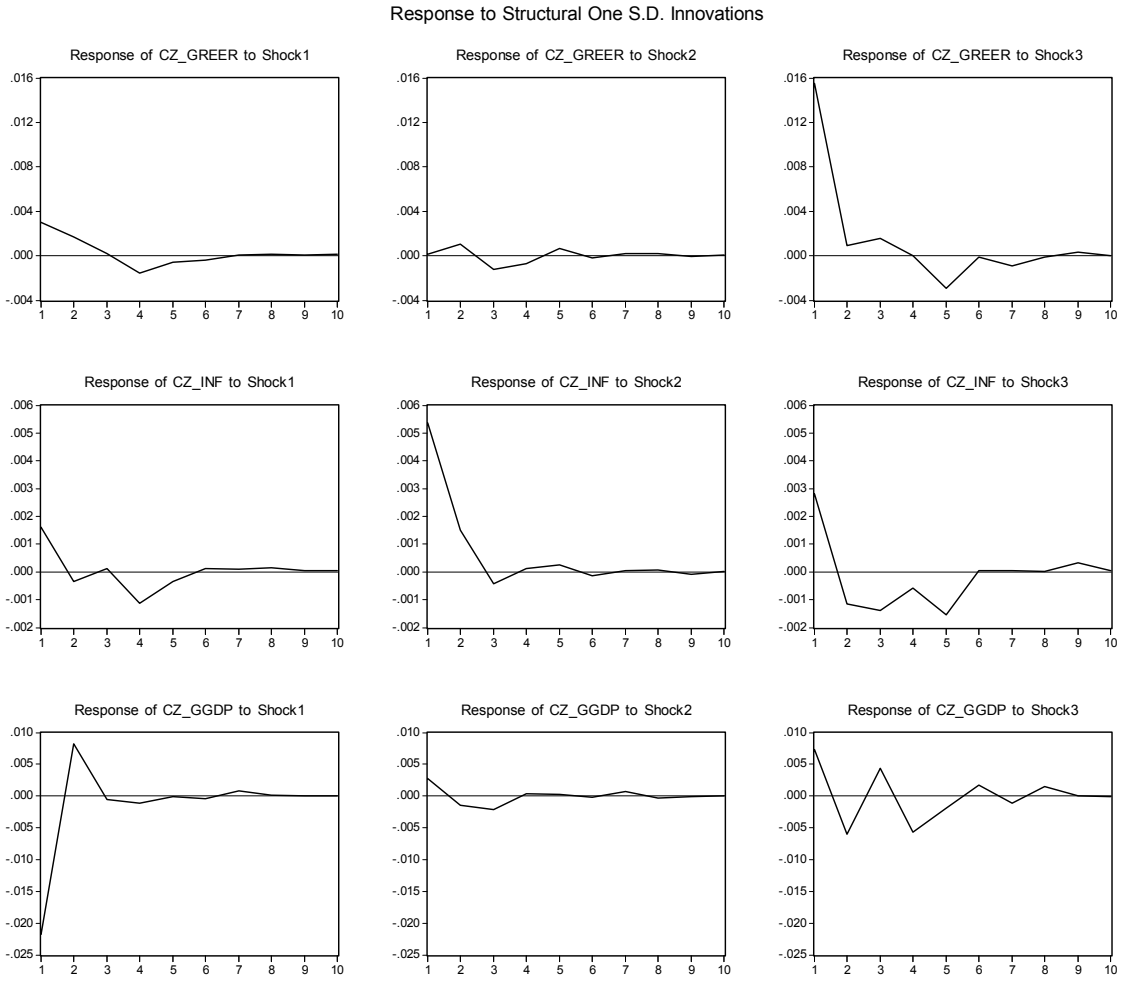


FIGURE 2: IRFs – Czech Republic



N.B.: shock 3: real demand shock

FIGURE 2 (continued) – Hungary

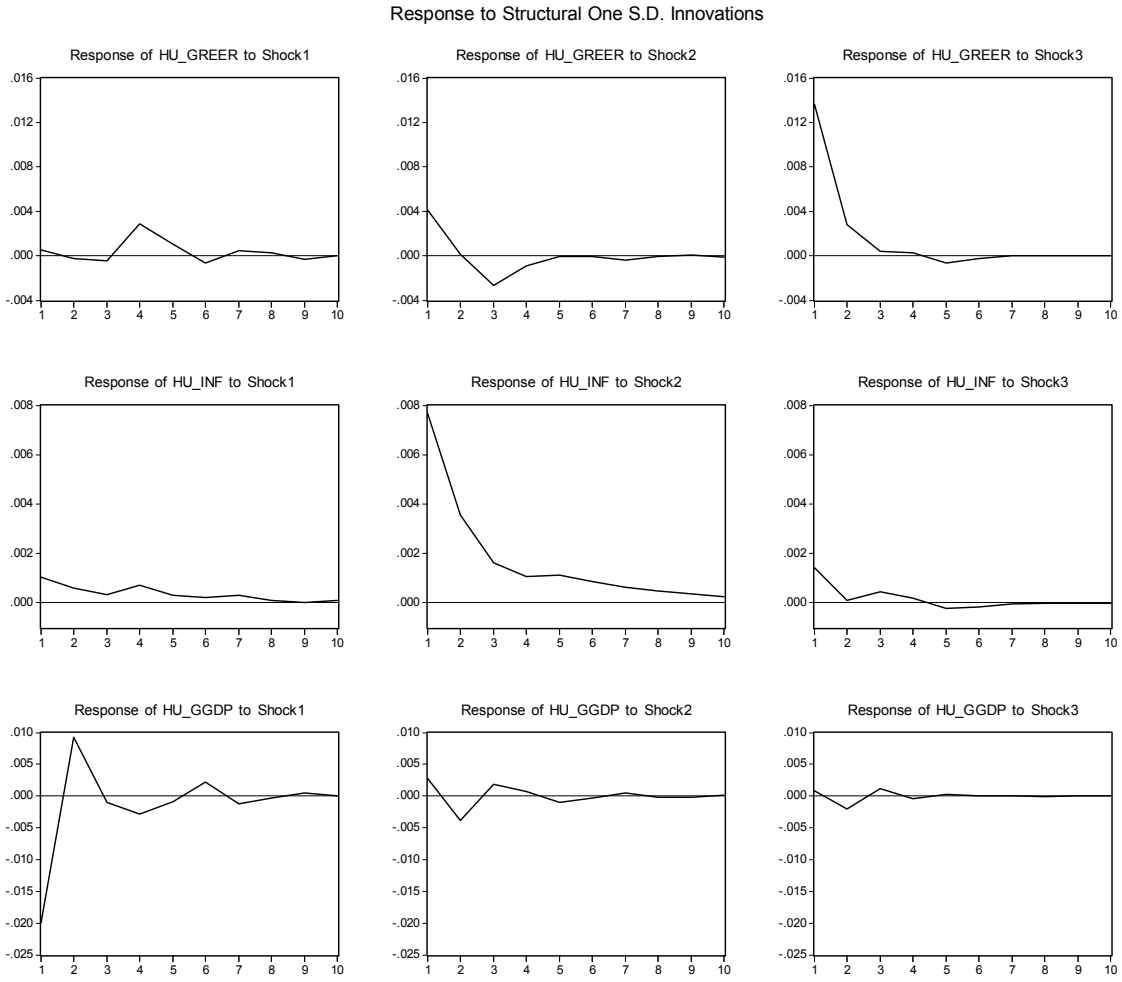
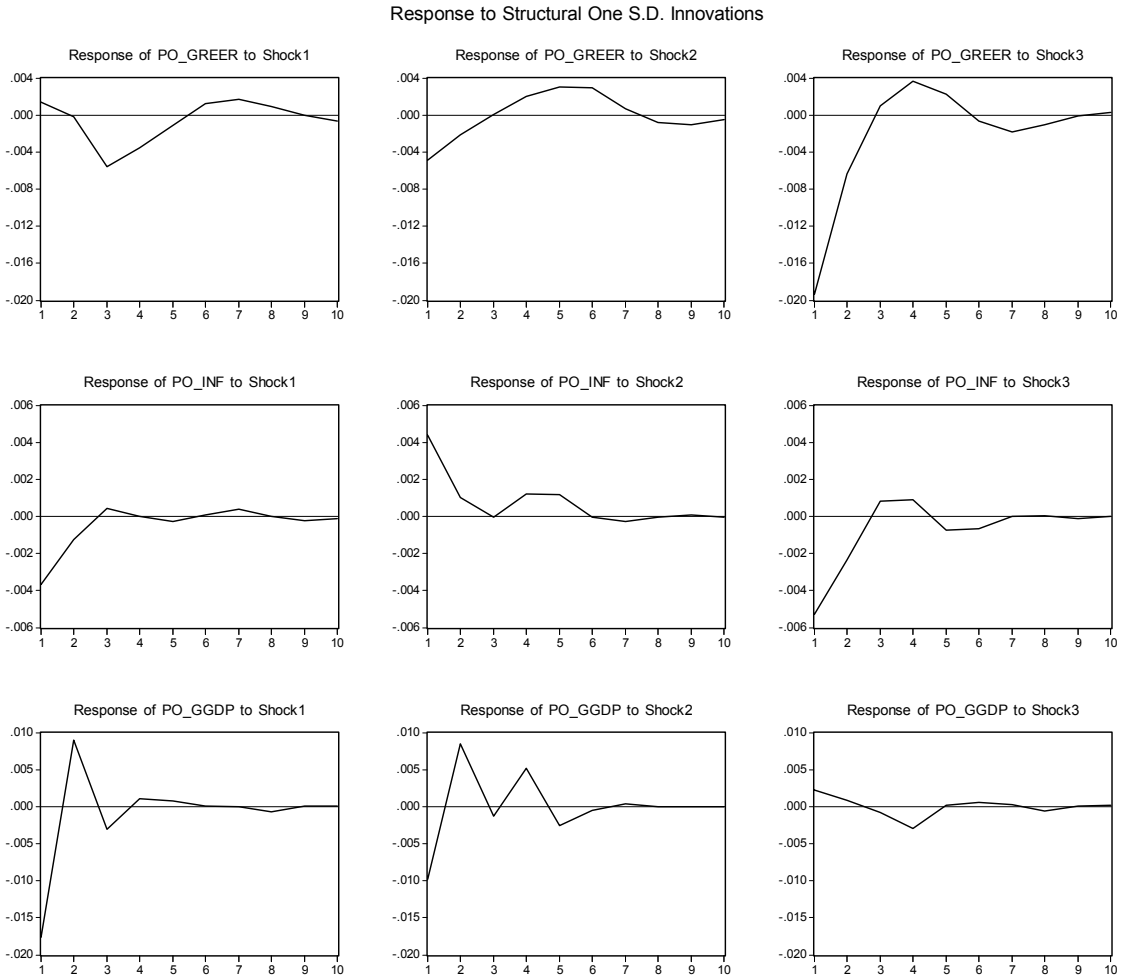


FIGURE 2 (continued) – Poland



APPENDIX : Degree of price liberalization in the Czech Republic, Hungary and Poland

Price liberalization is still continuing in the Czech Republic while it is almost fully implemented in Poland. In this latter country, the share of administered prices is now very close to zero (table 7 below). In the Czech Republic, 12% of prices were still administered in 2001, to be compared with a 18%-share 6 years earlier. Hungary is a remarkable country as regards the share of regulated prices which still accounted for 18% of the consumer price index (CPI) in 2001. It is also worth noting that this share follows a positive trend as only 11% of prices were administered in 1993. Despite this evolution, the EBRD index of price liberalisation is the same for Hungary and Poland, which should testify to the "good" evolution of the Hungarian economy towards a market economy.

TABLE 7: Share of administered prices in CPI
(In per cent)

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Czech Rep.	17.9	18.1	17.4	17.4	13.3	13.3	13.3	13.3	12.4
Hungary	10.8	11.8	12.9	12.8	15.9	17.0	18.2	18.3	18.5
Poland	10.6	12.0	12.0	11.6	10.6	10.6	9.0	2.6	1.2

Source: EBRD, 2002.