The VARying Effect of Foreign Shocks in Central and Eastern Europe

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Abstract

This paper investigates the impact of international shocks – world interest rate shocks, world commodity price shocks and world supply side shocks – on macroeconomic developments in ten Central and Eastern European (CEE) countries by using near-VAR models. In contrast to previous work, the empirical analysis takes explicit account of the possibility of (multiple) structural breaks in the underlying time series. It is found that the effects of the shocks vary across countries, although there is substantial evidence in favor of synchronization in the responses of key variables between groups of CEE countries after supply side shocks. The latter outcome is a positive result for the future currency area and complete adoption of the euro in these economies.

Keywords: monetary policy; foreign shocks; multiple structural breaks; near-VAR model; CEE economies.
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I. Introduction

The study of the macroeconomic effects of monetary policy shocks in transition economies has long been the subject of a vast and growing literature, due to the prospects of accession into European Union (EU) from the early 1990s. Although there is an extensive literature (see, e.g., Ganev *et al.*, 2002; Maliszewski, 2002; Bitans *et al.*, 2003; Arnoštova and Hurník, 2004; European Forecasting Network, 2004; Jarocinski, 2005; Darvas, 2006; among others), no consensus has emerged among researchers on the effect of monetary policy shocks on the Central and Eastern European (CEE) countries studied. Results even appear occasionally inconsistent for the same country. For instance, a permanent or a temporary fall/rise in the CPI inflation rate can be observed after a monetary policy contraction for a specific country. Similarly, output may rise, fall or exhibit a humped shape in the aftermath of a monetary policy shock. Therefore, the puzzle is not the usual price or exchange rate puzzle so often analysed in the literature, but rather the large divergence of the results.[1] Elbourne and de Haan (2004) highlight that the main sources of cross-study heterogeneity in results are the following: a) the use of different time periods; b) the different schemes applied to identify monetary policy shocks; and c) the utilization of diverse sets of variables.[2] We would add to this list a fourth item: d) the failure to take account of structural breaks in the underlying time series.

The impact of shocks different from monetary policy shocks in CEE countries has received comparatively less research attention (see Frenkel and Nickel, 2005). Nevertheless, it is relevant to analyse how CEE economies respond to shocks other than monetary shocks given that the adhesion of these countries to the EU involves the adoption of the regulation on the single currency project. The latter project

[1] See Égert and MacDonald (2006) for a helpful survey. Table 1 reports the main results of the studies focused on VAR models.
[2] Héricourt (2006) also argues that it does matter whether one employs industrial production or GDP figures for output.

implies that CEE economies have to absorb foreign shocks without using the monetary policy or the exchange rate instrument. Furthermore, the more the responses to foreign shocks are correlated, the easier it is to conduct a common monetary policy.[3] Therefore, it is also imperative to analyze whether the responses to the shocks considered are similar among CEE economies.

This paper extends the previous literature by examining some gaps that have appeared in recent studies for CEE countries. First, we consider in our model the possibility of (multiple) structural changes (potentially related to the strong restructuring process during the transition period) in selected macroeconomic variables. Second, we analyze, in addition to monetary policy shocks, the role of other foreign shocks (commodity price shocks and supply side shocks coming from both the euro area and the US) that may hit these economies. Finally, we examine the degree of response heterogeneity to the shocks under study.

The paper is structured as follows. Section 2 describes the methodology and data. Section 3 sketches out the expected effects of the foreign shocks on selected macroeconomic variables, and subsequently presents the estimation results. Section 4 presents the degree of response heterogeneity to the shocks studied. Section 5 finally draws some conclusions.

2. Econometric Methodology and Data Issues

2.1. Detecting Multiple Structural Breaks

Structural breaks in key macroeconomic variables have important implications for macro-econometric modeling. This is very likely to be a serious issue in countries that have undergone economic restructuring. Thus, we first analyze the existence of (multiple) structural breaks in the variables used for this study in order to incorporate such possible breaks in our model.

[3] See Fidrmuc and Korhonen (2006) for a nice survey on business cycle synchronization.

The literature provides several techniques for testing and locating structural breaks in the intercept and trend (see, e.g., Bai and Perron, 1998, 2003a, 2003b, 2006), but only few are able to consider breaks in the variance (see Inclán and Tiao, 1994, McConnell and Pérez-Quirós, 2000, Wang and Zivot, 2000, and Herrera and Pesavento, 2005). The possibility of the existence of several breaks in the time series considered leads us not to perform the McConnell and Pérez-Quirós (2000) methodology, which has been developed to detect only the existence of one break in volatility. Furthermore, the possible existence of breaks in intercept/trend and variance at the same time leads us not to use the Inclán and Tiao (1994) or Herrera and Pesavento (2005) methodologies. Therefore, the methodology that allows us to detect multiple structural breaks in the intercept, trend and variance at the same time is that developed by Wang and Zivot (2000). Therefore, we apply this latter methodology to detect the number of breaks and to identify break dates. Once we identify the dating of breaks, we construct structural change dummies for each variable.

Wang and Zivot (2000) consider a segmented deterministically trending and heteroskedastic autoregressive model

$$y_t = a_t + b_t t + \sum_{i=1}^{p} \varphi_i y_{t-i} + s_t u_t , \tag{1}$$

for $t = 1,2,\ldots,T$ where $u_t | \Omega_t \sim iidN(0,1)$ and Ω_t denotes the information set at time *t*. They assume that parameters a_t, b_t and s_t are subject to *m*<*T* structural changes, *m* initially known, with break dates $k_1, k_2, \ldots, k_m$, $1 < k_1 < k_2 < \ldots < k_m \leq T$, so that the observations can be separated into *m*+1 regimes. Let $k = (k_1, k_2, \ldots, k_m)$ denote the vector of break dates. For each regime *i* $(i = 1,2,\ldots,m+1)$, the parameters a_t, b_t and s_t are given by: $a_t = \alpha_i$, $b_t = \beta_i$, $s_t = \sigma_i \geq 0$ for $k_{i-1} \leq t < k_i$ with $k_0 = 1$ and $k_{m+1} = T + 1$.

Let I_A denote an indicator variable such that I_A is equal to one if the event A is true and zero otherwise. Then (1) can be rewritten as

$$y_t = \sum_{i=1}^{m+1} I_{\{k_{i-1} \le t < k_i\}} (\alpha_i + \beta_i t) + \sum_{i=1}^{p} \phi_i y_{t-i} + s_t u_t \qquad (2)$$

Given the assumption of normality of the errors u_t, Wang and Zivot (2000) obtain the likelihood function of (2). The estimation of the model is possible by using the Gibbs sampler. Wang and Zivot (2000) determine the number of breaks and the form of the breaks on the basis of the Bayesian Information Criterion (BIC).[4]

2.2. Near-VAR model

CEE countries are small open economies for which foreign shocks can be very important. For this reason, we use four variables for the domestic sector (Y_t) and three variables for the foreign sector (X_t^*), and we assume that there is no feedback from variables of the CEE countries to the foreign variables.[5] Specifically, we consider the following *pth*-order near-VAR model for each country under study:[6]

$$\begin{bmatrix} Y_t \\ X_t^* \end{bmatrix} = \begin{bmatrix} \lambda_0^1 \\ \lambda_0^2 \end{bmatrix} + \begin{bmatrix} \lambda_{11} & \lambda_{12} \\ 0 & \lambda_{22} \end{bmatrix} \begin{bmatrix} D_t \\ D_t^* \end{bmatrix} + \sum_{j=1}^{p} \begin{bmatrix} \Phi_j^{11} & \Phi_j^{12} \\ 0 & \Phi_j^{22} \end{bmatrix} \begin{bmatrix} Y_{t-j} \\ X_{t-j}^* \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}, \qquad (3)$$

where Y_t denotes the vector of country-specific variables; $X_t^* = (P_t^W, X_t)'$ is a vector of foreign variables, with P_t^W being a world commodity price index and X_t a vector that contains other foreign variables; D_t is the vector of corresponding structural change dummies for domestic variables under consideration; D_t^* is the vector of

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[4] The reader is referred to Wang and Zivot (2000) for further discussion of this methodology.
[5] This is a reasonable assumption due to CEE countries are small open economies.
[6] Notice that λ_{22} and Φ_j^{22} are taken to be diagonal.

corresponding structural change dummies for foreign variables under consideration;[7] and $\varepsilon_t = (\varepsilon_{1t} \quad \varepsilon_{2t})'$ is the error term.[8]

The vector of domestic variables used here includes the industrial production index (*ip*), the consumer price index (*cpi*), a nominal short-term interest rate (*sr*), and the real effective exchange rate (*reer*): $Y_t = (ip_t, cpi_t, sr_t, reer_t)'$.

Two different specifications for X_t are considered:

1. $X_t = (ip_t^{EA}, sr_t^{EA})'$: Euro area industrial production index and euro area nominal short-term interest rate, respectively.

2. $X_t = (ip_t^{US}, sr_t^{US})'$: US industrial production index and US nominal short-term interest rate, respectively.

All variables but interest rates are seasonally adjusted and expressed in logs. In this paper we do not perform an explicit analysis of the long-run behavior of the economy. By doing the analysis in levels we allow for implicit cointegrating relationships in the data, and still have consistent estimates of the parameters. For further discussion about this issue, see, *e.g.,* Sims *et al.* (1990), Hamilton (1994), and Ramaswamy and Slփk (1998).

We estimate the near-VAR model by maximum likelihood, with the optimal lag length determined by Akaike Information Criterion. Furthermore, shocks are identified through a standard Choleski decomposition with the variables ordered as in Y_t and X_t^*. The underlying assumption is that domestic monetary policy shocks have no contemporaneous impact on output and prices[9] but may affect the effective

[7] D_t and D_t^* are step dummies.

[8] We are considering the fact that the effects of foreign shocks would depend on the exchange rate regime by including in D_t the breaks detected in real exchange rates that are explicitly related to changes in exchange rate regime.

[9] The argument is that information about prices and output is only available with a lag, since they are not observable within a month.

exchange rate immediately. However, the monetary policy does not respond to contemporaneous changes in the effective exchange rate.[10]

Data come from Datastream and the International Financial Statistics of the International Monetary Fund.[11] Data Appendix provides details on data. We use monthly data and choose the sample period so that we estimate over the longest possible period.

2.3. Elasticities

To quantify the effects of the corresponding shock across countries, we construct three summary measures of impact: a) the maximum elasticity recorded between 1 and 12 (between 1 and 24, and between 12 and 24) months after the shock;[12] b) the average elasticity recorded between 1 and 12 (between 1 and 24, and between 12 and 24) months after the shock (so that single "peaks" have less influence on the impact measure); and c) the elasticity to the corresponding shock after 12 (and 24) months.

3. Empirical Results

3.1. Structural Breaks

The results from the Wang and Zivot (2000) test (see Table 2) reveal that most of the variables considered indeed exhibit often more than one break between the early 1990s and 2006/2007.[13] Structural breaks detected can be related to international financial crises like the Russian one, domestic financial crisis such as the Czech

[10] We also consider an alternative identification scheme that allows for real exchange rates contemporaneous respond to interest rate shocks. The results – which we do not report here due to space constraints - do not differ substantially from the baseline results.

[11] The proxy used for the Latvian industrial production comes from Central Statistical Bureau of Latvia.

[12] This maximum elasticity is defined as the smallest variable change registered between 1 and 12 months after the corresponding shock when the expected effect is negative, and it is defined as the largest variable change registered between 1 and 12 months after the shock when the expected effect is positive.

[13] We specify a criterion that if two or more breaks are obtained within a very short interval of six months, the set of such breaks is considered as one single break with the interim period being a period of adjustment.

koruna crisis in 1997, domestic macroeconomic adjustments like the one in Hungary in 1995, or changes in the nominal exchange rate regime.[14]

We exploit these breaks to estimate the reaction of industrial production, prices, short-term interest rate, and real effective exchange rate to foreign shocks.

Before looking at the empirical results, it is useful to summarize the expected impact of the shocks studied on the domestic variables.

3.2. Expected Effects of Foreign Shocks

We shall start with a positive commodity price shock, i.e., an increase in commodity prices (see Panel A, Table 3). One may think of a positive spillover effect on industrial production in the case of commodity producing and exporting countries, since higher commodity prices could trigger an increase in the production of commodities. While some of the countries in our sample have substantial agricultural output, none of them have substantial mineral or oil sectors and, consequently, they are net importers of these products. When industrial output relies heavily on commodity inputs, there can be a loss of competitiveness due to higher input prices. Obviously, inflation is expected to increase in the aftermath of commodity price increases as a consequence of an increase in oil prices, in food prices or in the price of diverse goods that contain different minerals. When inflation rises, domestic monetary policy may want to react by increasing interest rates to prevent second and third round effects, and to avoid the built-in of these price shocks in inflation expectations. Finally, short-term interest rate hikes may make exchange rate appreciate. However, in the medium/long term the exchange rate may depreciate to counteract the loss of external competitiveness.

Next, we shall consider a positive foreign interest rate shock, i.e., a rise in the foreign interest rate (see Panel B, Table 3). To the extent that higher interest rates

[14] For a further interpretation of located structural breaks see Égert *et al.* (2006).

curb domestic demand and thus imports in the foreign country, industrial production may contract due to the contraction of exports. As a result of falling demand, domestic prices may also decrease. The effect on domestic interest rates is ambiguous. Interest rates can either decrease (in an inflation targeting framework if inflation falls) or rise (in the case of exchange rate targeting). Whereas the decrease in prices and the trade account worsened could lead to a depreciation of the real exchange rate, the rise in interest rates could entail a nominal appreciation. Then, which effect overweighs the other becomes then an empirical matter.

Finally, let us look at a positive foreign shock hitting industrial production (see Panel C, Table 3). From the domestic country's perspective, this would boost domestic industrial production to the extent that foreign industrial production uses imported intermediate goods. The impact on inflation is ambiguous and, consequently, the impact on domestic interest rates is also uncertain. Finally, the real effective exchange rate would appreciate because of the improvement in the trade account.

3.3. Estimated Effects of Foreign Shocks

Let us now turn to the estimation results. Tables from 4 to 6 quantify the effects of the domestic variables to positive commodity price, foreign interest rate and foreign industrial production shocks for each transition economy,[15] by using the three above-mentioned summary measures of impact (i.e., the maximum elasticity, the average elasticity and the "after" elasticity).[16]

We first observe that the impact of a positive commodity price shock on industrial production is mixed (Table 4, Panel A). Whereas the industrial production

[15] An Appendix with all the impulse response functions, along with 95% confidence intervals, for the countries under study is available from the authors upon request.

[16] It should be noted that some results are not statistically significant at the 5% critical level. Nevertheless, although the impulse responses are not statistically significant, the estimations are still economically significant (regarding the signs of effects), and numerically and qualitatively plausible.

falls after the shock in three countries (Latvia, Lithuania and Romania) as it is predicted by the Theory, output increases in the remaining countries. Second, the responses of domestic prices to such a shock (Table 4, Panel B) are in line with the Theory, observing that prices increase in all countries but Romania. Moreover, price responses generally appear to be of higher magnitude in less developed country – a consequence of the higher shares of energy and foodstuff in their inflation basket. Third, the responses of interest rate to the shock is, in general, positive – a natural outcome of inflation targeting countries eager to prevent second and third round effects, and to avoid the incorporation of such effects into inflationary expectations (Table 4, Panel C). This holds true, in particular, for the Czech Republic. However, results are somewhat puzzling for a few countries where interest rates decrease. Finally, the outcome for the real exchange rate is in line with expectation, i.e., real exchange rate appreciates in some cases and it depreciates in others (Table 4, Panel D).

The response of industrial production to a positive euro area interest rate shock is negative, as predicted by the Theory, in Estonia, Hungary, Latvia, Lithuania, Poland and Romania, and it is very small in magnitude in all cases (Table 5 (a), Panel A). The expected reduction in CPI occurs in half of the countries considered (Table 5 (a), Panel B). The effects on the other two variables (interest rate and real effective exchange rate) are mixed, with cases where these variables rise and others in which the variables decline (Table 5 (a), Panels C and D). In addition, when we look at US interest rate shocks we obtain similar results (Table 5(b)).

Let us finally consider the effect of foreign industrial production shocks on the domestic variables of the ten CEE countries (Table 6). The results indicate that industrial production significantly rises everywhere after a positive foreign shock in the same variable. This is in line with expectations. Nonetheless, we find that the reaction to the same shock will be larger if the shock comes from the US than if it comes from the euro area. The two exceptions to this are Slovakia and Slovenia, where euro area shocks have larger effects. As expected, results for prices and interest rate vary across countries. Finally, results are fairly mixed for the real exchange rate, with a real exchange rate appreciation only in a limited number of countries. In fact, the real exchange rate depreciates, against our theoretical priors, in most countries after a positive foreign industrial production shock.

4. Similarities or differences? A further Analysis

From a theoretical point of view, the optimum currency area theory suggests that when the response to the same shock in a currency area is very different across member countries, such a shock may represent an important cost factor.[17] In other words, if two countries are affected by the same shock but the responses of domestic variables to this shock are different, then the measures to counteract such a shock may induce disequilibria between member countries. For example, competitiveness between countries may be affected and, consequently, the costs arise due to exchange rate cannot be used to eliminate such disequilibrium. Having this theoretical framework in mind, in this section we develop an additional analysis to obtain information, more in detail, on the similarities and differences between the dynamic responses to foreign shocks. To do so, we compute the correlation coefficients between the impulse response functions of individual countries for each shock under consideration and for all domestic variables.[18] This approach is intuitive and constitutes an effective mean in reducing the wealth of empirical information obtained. Tables from 7 to 9 illustrate these results.

Table 7 presents the cross-country correlation coefficients of impulse response functions to a positive commodity price shock. This Table reveals that there

[17] See Frenkel and Nickel (2005).
[18] This approach has already been used in the literature (see, e.g., Dedola and Lippi 2005; among others).

is a high similarity (positive correlations coefficients and greater than 0.75) in the response of prices for all countries (except for Romania and Slovenia, where the opposite occurs). In addition, the interest rate responses are very similar (larger than 0.90) between some pairs of countries (Czech Republic and Estonia, Hungary and Poland, Latvia and Lithuania, Romania and Slovakia, among others). No similarities in the interest rate response are found for Slovenia. Furthermore, the industrial production responses are alike in Bulgaria, Estonia, Hungary, Poland and Slovakia. Finally, the response of the real effective exchange rate is similar for Czech Republic and Poland, Hungary and Estonia, Latvia and Lithuania, among others.

Results from Tables 8 (a) and 8 (b) show that there are not remarkable similarities in the response of domestic variables among transition economies after a positive foreign interest rate shock.

Finally, results from Table 9 (a) indicate that we can distinguish three group of countries depending on their output responses to a positive euro area industrial production shock: a) Czech Republic, Estonia, Hungary, Poland, Romania and Slovakia, with similar responses; b) Latvia and Lithuania, whose responses are alike; and c) Bulgaria and Slovenia, which do not present similarities in their responses to any other transition economy. Regarding the responses of prices, Bulgaria, Estonia, Hungary, Latvia, Poland and Romania behave in a similar way. The price responses of other four countries (Czech Republic, Lithuania, Slovakia and Slovenia) are also similar among them. In addition, relevant similarities are not found either in the responses of interest rates or in those of real effective exchange rates following a positive euro area supply side shock. When the shock comes from United States (see Table 9(b)), the response of prices is similar: 1) for Bulgaria, Estonia and Hungary; 2) for Lithuania, Poland, Romania, Slovakia and Slovenia; and 3) no similarities are detected for Czech Republic and Latvia.

5. Concluding Remarks

This paper provides new empirical evidence on the impact of foreign shocks in ten CEE countries. To do so, we estimate near-VAR models that consider the structural breaks found in the selected macroeconomic series. This econometric specification allows us to disentangle appropriately the effects of world commodity price, foreign monetary policy and supply-side shocks.

The results arising from the near-VAR analysis indicate that the effects of the shocks vary substantially across countries. However, there is a strong and significant evidence of a clear positive effect of foreign industrial production shocks on domestic output.

The analysis of similarities or differences first indicates that a world commodity price shock affects to prices in the same direction in most of the transition economies. Second, there are no similarities in the response to a positive foreign interest rate shock probably due to the different adjustments and evolution of monetary policy in each transition economy. Third, after a positive foreign industrial production shock, similarities in the response of output and prices are detected between groups of countries. It is worth noting that the synchronization in the response of the key variables (output and prices) is, without any doubt, a positive result for the future currency area and complete adoption of the euro in these economies.

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Data Appendix

Table A.1: Periods and Data Sources

Country	Sample period	Industrial production	Prices	Interest rate	Real effective exchange rate
Bulgaria	2000:1-2006:12	Datastream	CPI IFS	Interbank rate IFS	Based on CPI IFS
Czech Rep.	1993:1-2006:12	Datastream	CPI IFS	Money market rate IFS	Based on CPI Datastream
Estonia	1994:1-2006:12	Datastream	CPI Datastream	Deposit rate IFS	Based on CPI IFS
Hungary	1989:1-2007:6	Datastream	CPI Datastream	Treasury bill rate Datastream	Based on CPI Datastream
Latvia	1994:1-2006:12	Industrial Sales Central Statistical Bureau of Latvia	CPI Datastream	Money market rate IFS	Based on CPI Datastream
Lithuania	1994:1-2006:12	Datastream	CPI Datastream	Money market rate Datastream	Based on CPI Datastream
Poland	1991:1-2007:6	Datastream	CPI Datastream	Money market rate Datastream	Based on CPI Datastream
Romania	1991:4-2007:6	Datastream	CPI Datastream	Money market rate Datastream	Based on CPI Datastream
Slovakia	1993:1-2007:6	Datastream	CPI Datastream	Money market rate Datastream	Based on CPI Datastream
Slovenia	1994:1-2006:12	Datastream	CPI Datastream	Money market rate Datastream	Based on CPI Datastream

Notes: (a) IFS: International Financial Statistics of the IMF. (b) United States industrial production and short-term interest rate are from IFS. Euro area industrial production and short-term interest rate are authors' calculations based on weights from Fagan *et. al* (2005) and data from IFS. (c) Commodity prices are from the Commodity Research Bureau. (d) Non-seasonally adjusted series have been seasonally adjusted using the TRAMO-SEAT program.

Table 1. Summary of VAR papers studying Central and Eastern European countries

Key: PL = Poland; SK = Slovakia; SV = Slovenia; CZ = Czech Republic; LV = Latvia; HU = Hungary; BG = Bulgaria; ROM = Romania; ES = Estonia; LIT = Lithuania; M = Monthly data; Q = Quarterly data; FX = Foreign exchange; CEEC = Central and Eastern European Countries; CEEC-10 = BG, CZ, ES, HU, LV, LT, PL, RO, SK, SV; CEEC-4 = CZ, HU, PL, SV.

Author	Results
Maliszewski (1999)	Inflation: PL: declines and recovers partially Output: PL: declines and recovers partially (stronger than inflation)
Kuijs (2002)	M2 shock: SK: increase in inflation (unit labor cost increases), little impact on output
Ganev *et al.* (2002)	Inflation: SV, CZ: permanent rise; LV, SK: temporary fall, HU permanent fall Output: decrease fastest in HU, more permanently in CZ, decreases and adjust in SK and SI, increases in the rest, Bulgaria (BG), Romania (ROM) large fluctuations
Maliszewski (2002)	Inflation: CZ, PL: slow decline and stabilisation at lower level Output: CZ, PL humped shaped, but not full recovery
Bitans *et al.* (2003)	LV: Prices: slow decrease and then slow recovery
EFN (2004)	Mostly not significant: ES, SV, LT Inflation: CZ: price puzzle; HU, LV: U-shaped; SK: permanent decrease (Q); U-shaped (M); PL: nothing (Q, M). Output: CZ, HU: U-shape; PL: Strong drop then recovery (M); SK: permanent increase
Arnoštova - Hurník (2004)	CZ; full period: FX and price puzzle, output: U-shaped 1998-: price and output: U-shaped, no FX puzzle
Creel - Levasseur (2007)	Inflation: Price puzzle for all Output increases, for 1999-2004, no reaction for HU
Darvas (2006)	Price puzzle CZ(1998,2004), HU(1994,1998), drop in PL Output: drops most PL, least in HU, but recovers quicker in PL than in HU Response profiles change over time
Elbourne –de Haan (2006)	CEEC-10: Inflation: largest and quickest drop: SK and ROM,; PL CZ protracted, others small, HU: price puzzle Output: large quick: CZ; mostly quick; slow: SK EE
Héricourt (2006)	Inflation; CZ: price and FX puzzle; HU, SI: Price puzzle, Output: CZ: GDP and IIP different EE, PL,SK: nothing
Jarociński (2005)	CEEC-4: Decline in output and prices
Vonnák (2005)	HU, 1992-2003: price puzzle HU, 1995-203: quick decline in output, slow decline in prices, FX appreciation
Wróbel (2001)	Prices: PL first increase, then decrease and slight recovery, but still negative Output: PL first increases, then decreases full recovery Credit: PL large decrease then slow recovery

Source: Égert and MacDonald (2006)

Table 2. Multiple Structural Breaks, Wang and Zivot (2000)

	Number of Breaks	Dates
Bulgaria (2000:1-2006:12)		
bg_ip	1	2002:4
bg_cpi	0	-
bg_sr	1	2005:3
bg_reer	0	-
Czech Republic (1993:1-2006:12)		
cz_ip	2	1998:9, 2003:11
cz_cpi	4	1997:6, 1998:9, 2001:4, 2003:10
cz_sr	3	1997:4, 1999:1, 2001:8
cz_reer	1	1996:6
Estonia (1994:1-2006:12)		
es_ip	3	1996:6, 1998:7, 2002:12
es_cpi	3	1997:3, 2000:5, 2003:3
es_sr	4	1997:7, 1999:3, 2003:7, 2005:11
es_reer	1	1999:1
Hungary (1989:1-2007:6)		
hu_ip	0	-
hu_cpi	2	1995:2, 2006:9
hu_sr	1	1996:5
hu_reer	2	1995:5, 2000:4
Latvia (1994:1-2006:12)		
lat_ip	2	1998:6, 2000:10
lat_cpi	2	1995:6, 2003:9
lat_sr	2	1996:12, 2001:12
lat_reer	2	2002:3, 1998:8
Lithuania (1994:1-2006:12)		
lit_ip	2	1996:12, 1999:6
lit_cpi	2	1996:3, 2002:2
lit_sr	3	1994:11, 1999:12, 2004:1
lit_reer	2	1998:8, 2002:7
Poland (1991:1-2007:6)		
po_ip	1	2001:8
po_cpi	2	1993:9, 2001:5
po_sr	2	1994:5, 2002:3
po_reer	2	2000:11, 2004:4
Romania (1991:4-2007:6)		
ro_ip	2	1997:12, 2006:11
ro_cpi	2	1997:3, 1999:2
ro_sr	2	1997:2, 2002:4
ro_reer	2	1991:8, 1998:3
Slovakia (1993:1-2007:6)		
sk_ip	0	-
sk_cpi	2	1998:12, 2004:1
sk_sr	2	1993:8, 1998:10
sk_reer	1	1998:8
Slovenia (1994:1-2006:12)		
sv_ip	1	2001:8
sv_cpi	1	1999:6
sv_sr	2	1996:9, 2004:3
sv_reer	1	1998:8
United States/Euro area (1989:1-2007:6)		
commodity	1	1996:5
us_ip	3	1993:8, 2000:11, 2001:11
us_sr	2	1992:7, 2000:12
ea_ip	0	-
ea_sr	3	1996:2, 1999:9, 2003:6

Note. ip: industrial production, cpi: consumer price index, sr: short-term interest rate, reer: real effective exchange rate.

Table 3. Theoretical Effects of Foreign Shocks

Panel A	
Effect of a positive commodity price shock on:	
Industrial production	-
Consumer price index	+
Domestic interest rate	+
Real effective exchange rate	+ or -
Panel B	
Effect of a positive foreign interest rate shock on:	
Industrial production	-
Consumer price index	-
Domestic interest rate	+ or -
Real effective exchange rate	+ or -
Panel C	
Effect of a positive foreign industrial production shock on:	
Industrial production	+
Consumer price index	+ or -
Domestic interest rate	+ or -
Real effective exchange rate	-

Table 4. Elasticity of domestic variables to a positive commodity price shock

Panel A

Elasticity of domestic output to a positive commodity price shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	0.31	0.44	0.44	0.17	0.29	0.42	0.31	0.44
Czech Rep.	0.08	0.08	0.03	0.04	0.03	0.02	0.04	0.01
Estonia	0.32	0.37	0.37	0.16	0.37	0.29	0.32	0.37
Hungary	0.14	0.19	0.19	0.08	0.14	0.19	0.14	0.19
Latvia	-0.06	-0.08	-0.08	-0.05	-0.06	-0.08	-0.06	-0.08
Lithuania	-0.26	-0.26	-0.08	-0.17	-0.08	0.01	-0.10	0.10
Poland	0.61*	0.67*	0.67*	0.45*	0.57*	0.70*	0.61*	0.67*
Romania	-0.20	-0.20	-0.14	-0.05	-0.08	-0.11	-0.05	-0.14
Slovakia	0.46*	0.59*	0.59*	0.26*	0.42*	0.58*	0.46*	0.59*
Slovenia	0.22*	0.22*	0.18*	0.18*	0.18*	0.18*	0.19*	0.16*

Panel B

Elasticity of domestic prices to a positive commodity price shock

Country	Maximum			Average			After	
	1:12	1:24	12:24	1:12	1:24	12:24	12	24
Bulgaria	0.28	0.58	0.58	0.15	0.32	0.49	0.28	0.58
Czech Rep.	-0.02	0.01	0.01	-0.01	0.00	0.01	0.00	0.01
Estonia	0.00	0.00	0.12	0.06	0.12	0.19	0.11	0.23
Hungary	0.00	0.05	0.05	0.00	0.01	0.03	0.00	0.05
Latvia	0.13	0.28	0.28	0.07	0.15	0.23	0.13	0.28
Lithuania	0.35	0.62	0.62	0.18	0.37	0.55	0.35	0.62
Poland	0.07	0.15	0.15	0.02	0.08	0.13	0.07	0.15
Romania	-1.64*	-2.27	-2.27	-0.77*	-1.51	-2.25	-1.64*	-2.27
Slovakia	0.10	0.17	0.17	0.05	0.10	0.15	0.10	0.17
Slovenia	0.01	-0.09	-0.09	0.00	-0.03	-0.06	-0.01	-0.09

Panel C

Elasticity of domestic interest rate (basis points) to a positive commodity price shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	4.31	7.47	7.47	3.28	4.89	6.50	4.31	7.47
Czech Rep.	13.60*	13.60*	13.15*	8.93*	11.4*	14.0*	13.2*	12.8*
Estonia	12.85	12.85	12.03	7.90	10.06	12.23	12.24	10.71
Hungary	4.81	8.42	8.42	2.16	4.76	7.36	4.81	8.42
Latvia	-2.84	-11.11	-11.11	-0.74	-4.31	-7.88	-11.1	-18.2
Lithuania	-32.59	-46.55	-46.55	-19.8	-32.0	-44.2	-32.5	-46.5
Poland	-18.63*	16.72	16.72	-7.06	3.97	14.99	6.46	16.72
Romania	-2.14*	-3.49*	-3.49*	-1.04*	-2.13*	-3.22*	-2.14*	-3.49*
Slovakia	-52.90*	-67.84*	-67.84*	-30.3*	-49.2*	-68.1*	-52.9*	-67.8*
Slovenia	10.17	10.17	-0.93	6.03	2.84	-0.35	1.93	0.29

Panel D

Elasticity of real effective exchange rate to a positive commodity price shock

Country	Maximum			Average			After	
	1:12	1:24	12:24	1:12	1:24	12:24	12	24
Bulgaria	0.28	0.45	0.45	0.19	0.30	0.40	0.28	0.45
Czech Rep.	-0.27*	-0.27*	-0.23	-0.19	-0.22	-0.25	-0.23	-0.23
Estonia	0.19	0.19	0.19	0.11	0.15	0.20	0.19	0.18
Hungary	0.20	0.22	0.22	0.13	0.18	0.23	0.20	0.22
Latvia	-0.08	-0.08	-0.06	-0.06	-0.04	-0.02	-0.07	0.03
Lithuania	-0.04	-0.4	-0.01	-0.03	-0.03	0.01	-0.02	0.02
Poland	-0.43*	-0.43*	-0.37*	-0.34*	-0.37*	-0.40*	-0.38*	-0.37*
Romania	-0.53	-0.53	-0.50	-0.27	-0.35	-0.43	-0.51	-0.31
Slovakia	0.44*	0.65*	0.65*	0.23*	0.43*	0.62*	0.44*	0.65*
Slovenia	0.21	0.22	0.22	0.11	0.17	0.23	0.21	0.21

Note. The maximum elasticity is the largest (positive elasticity) or smallest (negative elasticity) percentage of a change recorded between 1 and 12 months, 1 and 24 months, 12 and 24 months after one unit increase in the commodity price. The average elasticity is recorded between 1 to 12 months, 1 to 24 months and 12 to 24 months after one unit increase in the commodity price. The "after" elasticity is the percentage of a variable change registered 12 and 24 months after one unit increase in the commodity price. One asterisk means a p-value less than 5%.

Table 5 (a). Elasticity of domestic variables to a euro area positive interest rate (100 basis points) shock

Panel A

Elasticity of domestic output to a euro area positive interest rate (100 basis points) shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	0.01	0.04	0.04	0.00	0.01	0.03	0.01	0.04
Czech Rep.	0.01	0.02	0.02	0.00	0.01	0.02	0.01	0.02
Estonia	-0.09*	-0.11*	-0.11*	-0.05*	-0.08	-0.12	-0.09*	-0.11*
Hungary	-0.07*	-0.08	-0.08	-0.04	-0.06	-0.09	-0.07	-0.08
Latvia	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02
Lithuania	0.0 0	-0.01	-0.01	0.00	0.00	-0.01	0.00	-0.01
Poland	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Romania	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
Slovakia	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.00
Slovenia	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Panel B

Elasticity of domestic prices to a euro area positive interest rate (100 basis points) shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	0.06	0.18	0.18	0.00	0.07	0.14	0.06	0.18
Czech Rep.	0.00	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.01
Estonia	0.03	0.04	0.04	0.02	0.03	0.04	0.03	0.04
Hungary	0.06*	0.10	0.10	0.03*	0.06	0.09	0.06*	0.10
Latvia	-0.01	-0.02	-0.02	-0.01	-0.01	-0.02	-0.01	-0.02
Lithuania	-0.03	-0.05	-0.05	-0.02	-0.03	-0.04	-0.03	-0.05
Poland	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Romania	0.13*	0.31*	0.31*	0.05*	0.15*	0.25*	0.13*	0.31*
Slovakia	-0.02*	-0.02*	-0.02*	-0.01*	-0.01*	-0.01*	-0.02*	-0.01*
Slovenia	-0.02*	-0.02*	-0.02*	-0.01*	-0.01	-0.02	-0.02*	-0.02*

Panel C

Elasticity of domestic interest rate (basis points) to a euro area positive interest rate (100 basis points) shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	2.54	3.90	3.90	1.49	2.56	3.64	2.54	3.90
Czech Rep.	2.43*	2.43*	1.21*	1.66*	1.20	0.73	1.35*	0.28
Estonia	1.64	1.64	0.63	1.01	0.69	0.37	0.70	0.14
Hungary	-1.77	-4.32	-4.32	-0.90	-2.16	-3.42	-1.77	-4.32
Latvia	-0.30	0.66	0.66	-0.22	0.06	0.33	-0.11	0.66
Lithuania	7.20*	7.82*	7.82*	4.79	6.57	8.34*	7.20*	7.81
Poland	-2.04	-2.04	-1.30	-1.43	-1.32	-1.21	-1.34	-0.99
Romania	0.07	0.18	0.18	0.03	0.09	0.14	0.07	0.18
Slovakia	1.84	1.84	1.72	1.29	1.38	1.46	1.77	0.99
Slovenia	-4.60*	-4.60*	-1.41	-3.11	-1.96	-0.82	-1.73	-0.54

Panel D

Elasticity of real effective exchange rate to a euro area positive interest rate (100 basis points) shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	-0.09*	-0.09*	0.04	-0.05	-0.01	0.02	-0.01	0.04
Czech Rep.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Estonia	-0.01	-0.01	-0.00	0.00	0.00	0.00	0.00	0.00
Hungary	-0.02	0.02	0.02	-0.01	0.00	0.01	0.00	0.02
Latvia	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.00
Lithuania	-0.03*	-0.03*	-0.03*	-0.02*	-0.03*	-0.04*	-0.03*	-0.03*
Poland	0.03	0.03	0.03	0.02	0.03	0.04	0.03	0.03
Romania	-0.11	-0.11	-0.07	-0.08	-0.08	-0.08	-0.07	-0.07
Slovakia	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.02	-0.01
Slovenia	-0.03	-0.03	-0.03	-0.01	-0.02	-0.02	-0.03	-0.02

Note. The maximum elasticity is the largest (positive elasticity) or smallest (negative elasticity) percentage of a change recorded between 1 and 12 months, 1 and 24 months, 12 and 24 months after one unit euro area interest rate (100 basis points) increase. The average elasticity is recorded between 1 to 12 months, 1 to 24 months and 12 to 24 months after one unit euro area interest rate (100 basis points) increase. The "after" elasticity is the percentage of a variable change registered 12 and 24 months after one unit euro area interest rate (100 basis points) increase. One asterisk means a p-value less than 5%.

Table 5 (b). Elasticity of domestic variables to a United States positive interest rate (100 basis points) shock

Panel A

Elasticity of domestic output to a United States positive interest rate (100 basis points) shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	0.14	0.17	0.17	0.08	0.13	0.18	0.14	0.16
Czech Rep.	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00
Estonia	-0.01	-0.03*	-0.03*	0.00	-0.02	-0.03	-0.01	-0.02
Hungary	0.02	-0.04	-0.04	0.00	-0.01	-0.03	-0.01	-0.04
Latvia	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01
Lithuania	-0.05	-0.05	-0.04	-0.21	-0.03	-0.03	-0.04	0.02
Poland	-0.02	-0.02	-0.02	0.00	-0.01	-0.02	-0.02	-0.01
Romania	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.02
Slovakia	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Slovenia	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01

Panel B

Elasticity of domestic prices to a United States positive interest rate (100 basis points) shock

Country	Maximum			Average			After	
	1:12max	1: 24max	12:24max	1:12	1:24	12:24	12	24
Bulgaria	-0.14*	-0.14*	0.11*	-0.08*	-0.02	0.05	-0.05	0.11
Czech Rep.	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01
Estonia	-0.01	-0.01	0.01	0.00	0.01	0.02	0.01	0.03
Hungary	0.02	0.06	0.06	0.01	0.03	0.05	0.02	0.06
Latvia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lithuania	0.00	0.00	-0.01	-0.04	-0.04	-0.01	-0.01	-0.01
Poland	-0.02	-0.03	-0.03	-0.01	-0.02	-0.03	-0.02	-0.03
Romania	-0.27*	-0.37*	-0.37*	-0.11*	-0.25*	-0.38*	-0.27*	-0.34*
Slovakia	-0.02	-0.02	-0.02	-0.01	-0.02	-0.02	-0.02	-0.02
Slovenia	-0.02*	-0.02*	-0.02	-0.02*	-0.02	-0.02	-0.02*	-0.01

Panel C

Elasticity of domestic interest rate (basis points) to a United States positive interest rate (100 basis points) shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24x	1:12	1:24	12:24	12	24
Bulgaria	0.54	0.89	0.89	0.26	0.47	0.67	0.27	0.89
Czech Rep.	2.42*	2.42*	2.14*	1.81*	1.70	1.60	2.24*	0.88
Estonia	1.19	1.25	1.25	0.19	0.52	0.84	1.19	0.12
Hungary	3.27	3.55	3.55	1.96	2.87	3.77	3.27	3.37
Latvia	0.56	0.56	0.56	0.41	0.50	0.58	0.56	0.50
Lithuania	1.48	1.69	1.69	-6.08	0.29	1.59	1.48	1.12
Poland	5.32*	5.32*	2.41	3.71*	2.41	1.12	2.86	0.32
Romania	-0.20*	-0.22	-0.22	-0.14*	-0.18	-0.23	-0.20*	-0.20
Slovakia	-2.63*	1.91	1.91	-0.61	0.61	1.83	1.52	1.29
Slovenia	-4.94*	-4.94*	-2.22	-3.08	-1.78	-0.48	-2.79	0.28

Panel D

Elasticity of real effective exchange rate to a United States positive interest rate (100 basis points) shock

Country	Maximum			Average			After	
	1:12	1:24	12:24	1:12	1:24	12:24	12	24
Bulgaria	-0.11*	-0.11*	-0.04	-0.06	-0.04	-0.01	-0.05	0.02
Czech Rep.	0.03	0.03	0.01	0.02	0.02	0.01	0.01	0.01
Estonia	0.03	0.03	0.01	0.01	0.01	0.01	0.01	-0.01
Hungary	-0.03*	-0.03*	-0.03*	-0.02	-0.02	-0.02*	-0.03*	-0.02*
Latvia	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Lithuania	-0.04*	-0.04*	-0.04*	-0.19	-0.03	-0.03	-0.04*	-0.03
Poland	0.08*	0.08*	0.07*	0.04	0.05	0.06	0.08*	0.04
Romania	0.24	0.24	-0.05	0.11	0.04	-0.04	0.00	-0.03
Slovakia	-0.03*	-0.03*	-0.03*	-0.02	-0.02	-0.03	-0.03*	-0.02
Slovenia	0.03	-0.02	-0.02	0.01	-0.01	-0.02	-0.02	-0.01

Note. The maximum elasticity is the largest (positive elasticity) or smallest (negative elasticity) percentage of a change recorded between 1 and 12 months, 1 and 24 months, 12 and 24 months after one unit United States interest rate (100 basis points) increase. The average elasticity is recorded between 1 to 12 months, 1 to 24 months and 12 to 24 months after one unit United States interest rate (100 basis points) increase. The "after" elasticity is the percentage of a variable change registered 12 and 24 months after one unit United States interest rate (100 basis points) increase. One asterisk means a p-value less than 5%.

Table 6 (a). Elasticity of domestic variables to a euro area positive industrial production shock

Panel A

Elasticity of domestic output to a euro area positive industrial production shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	0.30	0.30	0.16	0.17	0.13	0.08	0.18	0.00
Czech Rep.	1.18*	1.36*	1.36*	0.84*	1.12*	1.41*	1.18*	1.36*
Estonia	1.53*	1.87*	1.87*	0.88*	1.40*	1.93*	1.53*	1.87*
Hungary	1.85*	3.41*	3.41*	0.93*	1.97*	3.01*	1.85*	3.41*
Latvia	1.52*	1.52*	1.46*	1.35*	1.42*	1.48*	1.47*	1.28
Lithuania	1.98*	1.98*	1.83*	1.60*	1.80*	1.91*	1.85*	1.70
Poland	1.28*	1.36*	1.36*	0.89*	1.17*	1.45*	1.28*	1.36
Romania	1.43*	1.65*	1.65*	0.95*	1.33*	1.70*	1.43*	1.65
Slovakia	0.36	0.74*	0.74*	0.10	0.37*	0.64*	0.36	0.74
Slovenia	0.71*	0.71*	0.63*	0.60*	0.61*	0.63*	0.63*	0.55

Panel B

Elasticity of domestic prices to a euro area positive industrial production shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	-1.43	-2.73	-2.73	-0.67	-1.51	-2.35	-1.43	-2.73
Czech Rep.	0.34*	0.45	0.45	0.19	0.33	0.46	0.34*	0.45
Estonia	-0.40	-0.44	-0.44	-0.23	-0.35	-0.46	-0.40	-0.42
Hungary	-1.15*	-2.52*	-2.52*	-0.54*	-1.30*	-2.07*	-1.15*	-2.52*
Latvia	-0.03	-0.07	-0.07	-0.02	-0.04	-0.06	-0.03	-0.07
Lithuania	0.48	0.70	0.70	0.29	0.48	0.67	0.48	0.70
Poland	-0.21	-0.26	-0.26	-0.16	-0.21	-0.26	-0.21	-0.26
Romania	-4.85*	-10.56*	-10.56*	-2.48*	-5.52*	-8.56*	-4.85*	-10.5*
Slovakia	0.36*	0.64*	0.64*	0.18*	0.38*	0.57*	0.36*	0.64*
Slovenia	0.28	0.44	0.44	0.16	0.28	0.41	0.28	0.44

Panel C

Elasticity of domestic interest rate (basis points) to a euro area positive industrial production shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	-28.91*	-46.05*	-46.05*	-17.2*	-29.5*	-41.7*	-28.9*	-46.0*
Czech Rep.	-36.68*	-36.68*	-30.17*	-23.4*	-28.0*	-32.5*	-30.1*	-30.0*
Estonia	-11.37	-11.37	-4.12	-6.21	-4.24	-1.58	-4.88	-0.09
Hungary	-59.56	-79.84	-79.84	-28.1	-54.9	-81.6	-59.5	-78.6
Latvia	74.41*	74.41	74.28	61.18	69.18	77.19	74.4*	67.52
Lithuania	-59.35	-70.37	-70.37	-38.5	-55.7	-72.9	-59.2	-70.3
Poland	-10.99	12.80	12.80	-4.00	2.92	9.84	1.14	12.80
Romania	2.74	3.11	3.11	1.47	2.36	3.24	2.74	2.78
Slovakia	22.38	22.38	20.77	17.19	17.54	17.89	21.38	12.47
Slovenia	35.36	35.36	17.36	25.99	18.31	10.63	19.77	5.28

Panel D

Elasticity real effective exchange rate to a euro area positive industrial production shock

Country	Maximum			Average			After	
	1:12	1:24	12:24	1:12	1:24	12:24	12	24
Bulgaria	-0.52	-1.13	-1.13	-0.15	-0.55	-0.94	-0.52	-1.13
Czech Rep.	0.56*	0.97*	0.97*	0.26*	0.58*	0.90*	0.56*	0.97*
Estonia	0.12	0.12	0.06	0.07	0.06	0.06	0.06	0.05
Hungary	-0.12	-0.77	-0.77	-0.03	-0.27	-0.50	-0.12	-0.77
Latvia	-0.92*	-0.92*	-0.92*	-0.67*	-0.82*	-0.97*	-0.92*	-0.86*
Lithuania	0.70*	0.70*	0.70*	0.52*	0.73*	0.64*	0.70*	0.66*
Poland	0.30	0.36	0.36	0.08	0.23	0.38	0.30	0.36
Romania	0.71	0.71	-0.26	0.37	0.17	-0.03	0.31	-0.26
Slovakia	0.45	0.65	0.65	0.29	0.46	0.63	0.45	0.65
Slovenia	0.23	0.23	0.23	0.11	0.17	0.23	0.23	0.19

Note. The maximum elasticity is the largest (positive elasticity) or smallest (negative elasticity) percentage of a change recorded between 1 and 12 months, 1 and 24 months and 12 and 24 months after one unit increase in the euro area industrial production. The average elasticity is recorded between 1 to 12 months, 1 to 24 months and 12 to 24 months after one unit increase in the euro area industrial production. The "after" elasticity is the percentage of a variable change registered 12 and 24 months after one unit increase in the euro area industrial production. One asterisk means a p-value less than 5%..

Table 6 (b). Elasticity of domestic variables to a United States positive industrial production shock

Panel A

Elasticity of domestic output to a United States positive industrial production shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	-4.98*	-7.67*	-7.67*	-2.66*	-4.91*	-7.16*	-4.98*	-7.67*
Czech Rep.	1.68*	2.02*	2.02*	1.18*	1.61*	2.04*	1.68*	2.02*
Estonia	1.33	1.40	1.40	0.96	1.23	1.51	1.33	1.40
Hungary	2.61*	3.94*	3.94*	1.40*	2.56*	3.72*	2.61*	3.94*
Latvia	2.08*	2.08*	2.02*	1.84*	1.98*	2.13*	2.04*	1.90*
Lithuania	2.08*	2.08*	1.94*	9.95*	1.87*	2.09*	1.94*	1.92*
Poland	1.72*	1.72*	1.72*	1.24*	1.49*	1.73*	1.72*	1.48*
Romania	1.39*	1.50*	1.50*	0.78*	1.19*	1.61*	1.39*	1.48*
Slovakia	0.34	0.47	0.47	0.25	0.35	0.45	0.34	0.47
Slovenia	0.46*	0.46*	0.44*	0.39*	0.42*	0.45*	0.44*	0.40*

Panel B

Elasticity of domestic prices to a United States positive industrial production shock

Country	Maximum			Average			After	
	1:12	1: 24max	12:24max	1:12	1:24	12:24	12	24
Bulgaria	2.48	2.48	-2.20	1.30	0.13	-1.05	0.46	-2.20
Czech Rep.	0.13	0.13	0.13	0.08	0.09	0.09	0.13	0.02
Estonia	-0.21	-0.31	-0.31	-0.08	-0.19	-0.31	-0.21	-0.31
Hungary	-1.06*	-1.90	-1.90	-0.54*	-1.11	-1.68	-1.06*	-1.90
Latvia	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02
Lithuania	0.13	0.31	0.31	0.24	0.14	0.25	0.13	0.31
Poland	0.42*	0.78*	0.78*	0.20*	0.45*	0.70*	0.42*	0.78*
Romania	7.74*	12.20*	12.20*	3.36*	7.53*	11.6*	7.74*	12.2*
Slovakia	0.55*	0.87*	0.87*	0.24*	0.53*	0.82*	0.55*	0.87*
Slovenia	0.23	0.44	0.44	0.11	0.25	0.39	0.23	0.44

Panel C

Elasticity of domestic interest rate (basis points) to a positive United States industrial production shock

Country	Maximum			Average			After	
	1:12	1: 24	12:24	1:12	1:24	12:24	12	24
Bulgaria	-28.35*	-28.35	-22.70	-15.0	-15.1	-15.2	-4.24	-22.7
Czech Rep.	-54.55*	-56.91*	-56.91*	-45.2*	-52.7*	-60.2*	-54.1*	-56.9*
Estonia	-11.10	-11.10	-10.44	7.96	0.63	-6.70	-11.0	-3.54
Hungary	-124.78*	-124.94*	-124.94*	-86.2*	-107*	-127*	-124*	-109*
Latvia	36.57	36.57	32.57	31.49	32.66	33.84	32.86	30.02
Lithuania	112.88	112.88	102.96	426.8	85.43	95.72	105.7	75.04
Poland	-76.44	-76.44	-40.92	-49.2	-38.1	-27.1	-45.8	-16.1
Romania	4.33*	7.63*	7.63*	1.59*	4.28*	6.97*	4.33*	7.63*
Slovakia	-34.00	-34.00	-31.21	-23.8	-23.9	-24.0	-32.4	-13.7
Slovenia	45.88	45.88	42.96	33.66	36.25	38.84	44.13	29.88

Panel D

Elasticity real effective exchange rate to a United States positive industrial production shock

Country	Maximum			Average			After	
	1:12	1:24	12:24	1:12	1:24	12:24	12	24
Bulgaria	2.48*	2.48*	0.98	1.38	1.01	0.64	0.89*	0.22
Czech Rep.	0.45	0.79	0.79	0.10	0.43	0.75	0.45	0.79
Estonia	0.65	0.65	0.06	0.37	0.16	0.05	0.10	0.08
Hungary	-0.45	-0.65	-0.65	-0.30	-0.45	-0.60	-0.45	-0.65
Latvia	-0.08	-0.08	-0.04	-0.06	-0.04	-0.03	-0.04	-0.02
Lithuania	0.69*	0.69*	0.67*	3.38*	0.64*	0.72*	0.65*	0.67*
Poland	-0.74	-0.74	-0.40	-0.51	-0.39	-0.27	-0.44	-0.14
Romania	1.83	1.91	1.91	0.41	1.10	1.80	1.83	1.28
Slovakia	0.62	0.77	0.77	0.26	0.53	0.79	0.62	0.77
Slovenia	0.27	0.27	0.27	0.23	0.26	0.28	0.27	0.25

Note. The maximum elasticity is the largest (positive elasticity) or smallest (negative elasticity) percentage of a change recorded between 1 and 12 months, 1 and 24 months and 12 and 24 months after one unit increase in the United States industrial production. The average elasticity is recorded between 1 to 12 months, 1 to 24 months and 12 to 24 months after one unit increase in the United States industrial production. The "after" elasticity is the percentage of a variable change registered 12 and 24 months after one unit increase in the United States industrial production. One asterisk means a p-value less than 5%.

Table 7. Cross-country correlation coefficients of impulse response functions to a positive commodity shock

	Bulgaria				Czech R.				Estonia				Hungary			
	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	**1.00**	**1.00**	**1.00**	**1.00**	-0.45	0.91	0.59	-0.38	0.93	0.99	0.42	0.67	0.96	0.94	0.96	0.81
Czech R.	-0.45	0.91	0.59	-0.38	**1.00**	**1.00**	**1.00**	**1.00**	-0.23	0.92	0.98	-0.86	-0.37	0.83	0.70	-0.79
Estonia	0.93	0.99	0.42	0.67	-0.23	0.92	0.98	-0.86	**1.00**	**1.00**	**1.00**	**1.00**	0.97	0.95	0.55	0.97
Hungary	0.96	0.94	0.96	0.81	-0.37	0.83	0.70	-0.79	0.97	0.95	0.55	0.97	**1.00**	**1.00**	**1.00**	**1.00**
Latvia	-0.91	0.99	-0.96	0.85	0.46	0.92	-0.43	0.06	-0.78	0.99	-0.25	0.32	-0.87	0.95	-0.94	0.48
Lithuania	0.86	0.98	-0.96	0.90	-0.78	0.94	-0.75	-0.08	0.71	0.99	-0.61	0.50	0.78	0.89	-0.99	0.64
Poland	0.91	0.99	0.81	-0.40	-0.12	0.96	0.62	0.92	0.93	0.99	0.52	-0.70	0.94	0.91	0.93	-0.69
Romania	-0.64	-0.90	-0.95	-0.13	0.75	-0.93	-0.69	0.70	-0.42	-0.91	-0.55	-0.67	-0.60	-0.74	-0.99	-0.59
Slovakia	0.98	0.99	-0.90	0.94	-0.37	0.94	-0.81	-0.54	0.97	0.99	-0.70	0.84	0.99	0.89	-0.96	0.93
Slovenia	-0.05	-0.98	-0.41	0.67	0.72	-0.90	-0.31	-0.76	0.07	-0.97	-0.27	0.95	0.04	-0.96	-0.58	0.95

	Latvia				Lithuania				Poland				Romania			
	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	-0.91	0.99	-0.96	0.85	0.86	0.98	-0.96	0.90	0.91	0.99	0.81	-0.40	-0.64	-0.90	-0.95	-0.13
Czech R.	0.46	0.92	-0.43	0.06	-0.78	0.94	-0.75	-0.08	-0.12	0.96	0.62	0.92	0.75	-0.93	-0.69	0.70
Estonia	-0.78	0.99	-0.25	0.32	0.71	0.99	-0.61	0.50	0.93	0.99	0.52	-0.70	-0.42	-0.91	-0.55	-0.67
Hungary	-0.87	0.95	-0.94	0.48	0.78	0.89	-0.99	0.64	0.94	0.91	0.93	-0.69	-0.60	-0.74	-0.99	-0.59
Latvia	**1.00**	**1.00**	**1.00**	**1.00**	-0.77	0.99	0.90	0.95	-0.88	0.99	-0.85	0.06	0.81	-0.92	0.93	0.26
Lithuania	-0.77	0.99	0.90	0.95	**1.00**	**1.00**	**1.00**	**1.00**	0.59	0.99	-0.91	0.00	-0.76	-0.96	0.99	0.03
Poland	-0.88	0.99	-0.85	0.06	0.59	0.99	-0.91	0.00	**1.00**	**1.00**	**1.00**	**1.00**	-0.49	-0.94	-0.95	0.55
Romania	0.81	-0.92	0.93	0.26	-0.76	-0.96	0.99	0.03	-0.49	-0.94	-0.95	0.55	**1.00**	**1.00**	**1.00**	**1.00**
Slovakia	-0.90	0.99	0.83	0.72	0.81	0.99	0.99	0.86	0.95	0.99	-0.92	-0.45	-0.61	-0.96	0.98	-0.39
Slovenia	-0.12	-0.98	0.52	0.31	-0.51	-0.95	0.57	0.54	0.35	-0.97	-0.84	-0.59	0.22	0.84	0.65	-0.73

	Slovakia				Slovenia			
	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	0.98	0.99	-0.90	0.94	-0.05	-0.98	-0.41	0.67
Czech R.	-0.37	0.94	-0.81	-0.54	0.72	-0.90	-0.31	-0.76
Estonia	0.97	0.99	-0.70	0.84	0.07	-0.97	-0.27	0.95
Hungary	0.99	0.89	-0.96	0.93	0.04	-0.96	-0.58	0.95
Latvia	-0.90	0.99	0.83	0.72	-0.12	-0.98	0.52	0.31
Lithuania	0.81	0.99	0.99	0.86	-0.51	-0.95	0.57	0.54
Poland	0.95	0.99	-0.92	-0.45	0.35	-0.97	-0.84	-0.59
Romania	-0.61	-0.96	0.98	-0.39	0.22	0.84	0.65	-0.73
Slovakia	**1.00**	**1.00**	**1.00**	**1.00**	0.03	-0.96	0.62	0.87
Slovenia	0.03	-0.96	0.62	0.87	**1.00**	**1.00**	**1.00**	**1.00**

Note. Light grey cells mean a positive correlation coefficient larger than 0.75. Dark grey cells mean a negative correlation coefficient larger than -0.75.

Table 8(a). Cross-country correlation coefficients of impulse response functions to a positive euro area interest rate shock

	Bulgaria				Czech R.				Estonia				Hungary			
	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	**1.00**	**1.00**	**1.00**	**1.00**	0.86	-0.81	-0.74	0.72	-0.79	0.86	-0.79	0.39	-0.76	0.97	-0.96	0.98
Czech R.	0.86	-0.81	-0.74	0.72	**1.00**	**1.00**	**1.00**	**1.00**	-0.95	-0.99	0.97	0.83	-0.94	-0.81	0.82	0.64
Estonia	-0.79	0.86	-0.79	0.39	-0.95	-0.99	0.97	0.83	**1.00**	**1.00**	**1.00**	**1.00**	0.99	0.87	0.82	0.35
Hungary	-0.76	0.97	-0.96	0.98	-0.94	-0.81	0.82	0.64	0.99	0.87	0.82	0.35	**1.00**	**1.00**	**1.00**	**1.00**
Latvia	0.50	-0.98	0.89	-0.82	0.19	0.80	-0.88	-0.80	0.03	-0.86	-0.85	-0.68	0.08	-0.99	-0.98	-0.79
Lithuania	-0.92	-0.96	0.86	-0.51	-0.65	0.91	-0.37	0.03	0.54	-0.95	-0.50	0.29	0.51	-0.98	-0.72	-0.59
Poland	0.27	-0.98	0.49	0.33	0.34	0.71	-0.79	-0.30	-0.15	-0.77	-0.82	-0.55	-0.13	-0.95	-0.59	0.42
Romania	0.28	0.98	0.96	0.48	0.08	-0.77	-0.83	0.46	0.16	0.83	-0.83	0.10	0.20	0.99	-0.99	0.40
Slovakia	-0.92	0.12	-0.16	0.81	-0.75	0.43	0.66	0.89	0.66	-0.39	0.47	0.73	0.63	0.02	0.38	0.76
Slovenia	0.49	-0.42	0.76	-0.29	0.75	0.80	-0.93	0.27	-0.88	-0.80	-0.97	0.65	-0.89	-0.52	-0.76	-0.33

	Latvia				Lithuania				Poland				Romania			
	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	0.50	-0.98	0.89	-0.82	-0.92	-0.96	0.86	-0.51	0.27	-0.98	0.49	0.33	0.28	0.98	0.96	0.48
Czech R.	0.19	0.80	-0.88	-0.80	-0.65	0.91	-0.37	0.03	0.34	0.71	-0.79	-0.30	0.08	-0.77	-0.83	0.46
Estonia	0.03	-0.86	-0.85	-0.68	0.54	-0.95	-0.50	0.29	-0.15	-0.77	-0.82	-0.55	0.16	0.83	-0.83	0.10
Hungary	0.08	-0.99	-0.98	-0.79	0.51	-0.98	-0.72	-0.59	-0.13	-0.95	-0.59	0.42	0.20	0.99	-0.99	0.40
Latvia	**1.00**	**1.00**	**1.00**	**1.00**	-0.59	0.98	0.55	0.03	0.65	0.96	0.67	0.15	0.92	-0.99	0.98	-0.39
Lithuania	-0.59	0.98	0.55	0.03	**1.00**	**1.00**	**1.00**	**1.00**	-0.10	0.90	0.22	-0.95	-0.33	-0.96	0.70	0.13
Poland	0.65	0.96	0.67	0.15	-0.10	0.90	0.22	-0.95	**1.00**	**1.00**	**1.00**	**1.00**	0.81	-0.98	0.59	-0.17
Romania	0.92	-0.99	0.98	-0.39	-0.33	-0.96	0.70	0.13	0.81	-0.98	0.59	-0.17	**1.00**	**1.00**	**1.00**	**1.00**
Slovakia	-0.69	-0.05	-0.56	-0.95	0.82	0.15	0.36	0.06	-0.49	-0.26	-0.46	-0.27	-0.52	0.12	-0.39	0.60
Slovenia	-0.39	0.49	0.77	-0.27	-0.20	0.65	0.53	0.84	-0.03	0.28	0.82	-0.90	-0.41	-0.42	0.77	-0.13

	Slovakia				Slovenia			
	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	-0.92	0.12	-0.16	0.81	0.49	-0.42	0.76	-0.29
Czech R.	-0.75	0.43	0.66	0.89	0.75	0.80	-0.93	0.27
Estonia	0.66	-0.39	0.47	0.73	-0.88	-0.80	-0.97	0.65
Hungary	0.63	0.02	0.38	0.76	-0.89	-0.52	-0.76	-0.33
Latvia	-0.69	-0.05	-0.56	-0.95	-0.39	0.49	0.77	-0.27
Lithuania	0.82	0.15	0.36	0.06	-0.20	0.65	0.53	0.84
Poland	-0.49	-0.26	-0.46	-0.27	-0.03	0.28	0.82	-0.90
Romania	-0.52	0.12	-0.39	0.60	-0.41	-0.42	0.77	-0.13
Slovakia	**1.00**	**1.00**	**1.00**	**1.00**	-0.35	0.84	-0.38	0.27
Slovenia	-0.35	0.84	-0.38	0.27	**1.00**	**1.00**	**1.00**	**1.00**

Note. Light grey cells mean a positive correlation coefficient larger than 0.75. Dark grey cells mean a negative correlation coefficient larger than -0.75.

Table 8(b). Cross-country correlation coefficients of impulse response functions to a positive United States interest rate shock

	Bulgaria				Czech R.				Estonia				Hungary			
	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	**1.00**	**1.00**	**1.00**	**1.00**	0.35	0.71	-0.46	-0.80	-0.84	0.96	-0.18	0.43	-0.59	0.91	0.67	0.55
Czech R.	0.35	0.71	-0.46	-0.80	**1.00**	**1.00**	**1.00**	**1.00**	-0.23	0.87	0.67	0.08	0.40	0.76	0.11	-0.28
Estonia	-0.84	0.96	-0.18	0.43	-0.23	0.87	0.67	0.08	**1.00**	**1.00**	**1.00**	**1.00**	0.69	0.94	0.54	0.79
Hungary	-0.59	0.91	0.67	0.55	0.40	0.76	0.11	-0.28	0.69	0.94	0.54	0.79	**1.00**	**1.00**	**1.00**	**1.00**
Latvia	0.11	-0.85	0.41	-0.05	-0.48	-0.86	0.56	0.14	-0.49	-0.93	0.64	0.55	-0.78	-0.96	0.86	0.74
Lithuania	-0.16	0.44	0.53	0.89	-0.60	-0.31	-0.05	-0.71	-0.32	0.18	0.63	0.60	-0.51	0.21	0.83	0.84
Poland	-0.79	-0.90	-0.62	-0.53	-0.39	-0.91	0.82	0.22	0.60	-0.98	0.17	-0.84	0.53	-0.96	-0.39	-0.96
Romania	0.52	-0.57	-0.42	-0.63	0.56	-0.98	-0.44	0.81	-0.06	-0.76	-0.71	0.32	0.15	-0.61	-0.92	0.23
Slovakia	0.45	-0.64	0.49	0.24	0.39	-0.99	-0.01	0.00	0.06	-0.83	0.68	0.70	0.23	-0.73	0.86	0.92
Slovenia	0.03	0.55	0.47	-0.32	0.40	-0.19	-0.85	0.57	0.31	0.30	-0.28	0.59	0.67	0.35	0.24	0.57

	Latvia				Lithuania				Poland				Romania			
	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	0.11	-0.85	0.41	-0.05	-0.16	0.44	0.53	0.89	-0.79	-0.90	-0.62	-0.53	0.52	-0.57	-0.42	-0.63
Czech R.	-0.48	-0.86	0.56	0.14	-0.60	-0.31	-0.05	-0.71	-0.39	-0.91	0.82	0.22	0.56	-0.98	-0.44	0.81
Estonia	-0.49	-0.93	0.64	0.55	-0.32	0.18	0.63	0.60	0.60	-0.98	0.17	-0.84	-0.06	-0.76	-0.71	0.32
Hungary	-0.78	-0.96	0.86	0.74	-0.51	0.21	0.83	0.84	0.53	-0.96	-0.39	-0.96	0.15	-0.61	-0.92	0.23
Latvia	**1.00**	**1.00**	**1.00**	**1.00**	0.77	0.00	0.57	0.39	-0.23	0.97	0.12	-0.77	-0.54	0.76	-0.95	0.58
Lithuania	0.77	0.00	0.57	0.39	**1.00**	**1.00**	**1.00**	**1.00**	0.35	-0.03	-0.54	-0.81	-0.89	0.46	-0.69	-0.32
Poland	-0.23	0.97	0.12	-0.77	0.35	-0.03	-0.54	-0.81	**1.00**	**1.00**	**1.00**	**1.00**	-0.65	0.81	0.07	-0.21
Romania	-0.54	0.76	-0.95	0.58	-0.89	0.46	-0.69	-0.32	-0.65	0.81	0.07	-0.21	**1.00**	**1.00**	**1.00**	**1.00**
Slovakia	-0.77	0.84	0.61	0.83	-0.80	0.40	0.99	0.61	-0.29	0.89	-0.54	-0.84	0.83	0.98	-0.75	0.53
Slovenia	-0.91	-0.13	-0.26	0.79	-0.65	0.98	0.36	0.06	0.25	-0.16	-0.95	-0.54	0.50	0.35	0.04	0.92

	Slovakia				Slovenia			
	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	0.45	-0.64	0.49	0.24	0.03	0.55	0.47	-0.32
Czech R.	0.39	-0.99	-0.01	0.00	0.40	-0.19	-0.85	0.57
Estonia	0.06	-0.83	0.68	0.70	0.31	0.30	-0.28	0.59
Hungary	0.23	-0.73	0.86	0.92	0.67	0.35	0.24	0.57
Latvia	-0.77	0.84	0.61	0.83	-0.91	-0.13	-0.26	0.79
Lithuania	-0.80	0.40	0.99	0.61	-0.65	0.98	0.36	0.06
Poland	-0.29	0.89	-0.54	-0.84	0.25	-0.16	-0.95	-0.54
Romania	0.83	0.98	-0.75	0.53	0.50	0.35	0.04	0.92
Slovakia	**1.00**	**1.00**	**1.00**	**1.00**	0.78	0.27	0.38	0.81
Slovenia	0.78	0.27	0.38	0.81	**1.00**	**1.00**	**1.00**	**1.00**

Note. Light grey cells mean a positive correlation coefficient larger than 0.75. Dark grey cells mean a negative correlation coefficient larger than -0.75.

Table 9(a). Cross-country correlation coefficients of impulse response functions to a positive euro area industrial production shock

	Bulgaria				Czech R.				Estonia				Hungary			
	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	**1.00**	**1.00**	**1.00**	**1.00**	-0.40	-0.94	0.52	-0.97	-0.46	0.74	-0.70	-0.01	-0.73	0.99	0.83	0.92
Czech R.	-0.40	-0.94	0.52	-0.97	**1.00**	**1.00**	**1.00**	**1.00**	0.93	-0.91	0.10	-0.07	0.84	-0.91	0.63	-0.89
Estonia	-0.46	0.74	-0.70	-0.01	0.93	-0.91	0.10	-0.07	**1.00**	**1.00**	**1.00**	**1.00**	0.92	0.67	-0.61	0.22
Hungary	-0.73	0.99	0.83	0.92	0.84	-0.91	0.63	-0.89	0.92	0.67	-0.61	0.22	**1.00**	**1.00**	**1.00**	**1.00**
Latvia	0.57	0.99	-0.34	0.54	0.30	-0.93	-0.77	-0.60	0.16	0.72	-0.21	-0.50	-0.12	0.99	-0.56	0.24
Lithuania	0.46	-0.97	0.91	-0.51	0.49	0.99	0.71	0.57	0.37	-0.86	-0.53	0.53	0.12	-0.95	0.96	-0.22
Poland	-0.22	0.91	-0.82	-0.89	0.93	-0.93	-0.06	0.93	0.95	0.83	0.97	-0.01	0.80	0.89	-0.70	-0.69
Romania	-0.41	0.99	-0.47	0.76	0.91	-0.89	-0.64	-0.79	0.98	0.64	0.27	0.56	0.90	0.99	-0.87	0.90
Slovakia	-0.73	-0.99	0.33	-0.96	0.83	0.96	-0.49	0.99	0.92	-0.78	-0.67	0.02	0.99	-0.99	-0.05	-0.88
Slovenia	0.63	-0.99	0.77	-0.63	0.27	0.98	0.01	0.65	0.13	-0.82	-0.90	0.42	-0.13	-0.97	0.64	-0.29

	Latvia				Lithuania				Poland				Romania			
	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	0.57	0.99	-0.34	0.54	0.46	-0.97	0.91	-0.51	-0.22	0.91	-0.82	-0.89	-0.41	0.99	-0.47	0.76
Czech R.	0.30	-0.93	-0.77	-0.60	0.49	0.99	0.71	0.57	0.93	-0.93	-0.06	0.93	0.91	-0.89	-0.64	-0.79
Estonia	0.16	0.72	-0.21	-0.50	0.37	-0.86	-0.53	0.53	0.95	0.83	0.97	-0.01	0.98	0.64	0.27	0.56
Hungary	-0.12	0.99	-0.56	0.24	0.12	-0.95	0.96	-0.22	0.80	0.89	-0.70	-0.69	0.90	0.99	-0.87	0.90
Latvia	**1.00**	**1.00**	**1.00**	**1.00**	0.95	-0.96	-0.66	-0.99	0.37	0.89	-0.01	-0.74	0.25	0.99	0.72	0.03
Lithuania	0.95	-0.96	-0.66	-1.00	**1.00**	**1.00**	**1.00**	**1.00**	0.60	-0.95	-0.68	0.70	0.48	-0.94	-0.78	0.01
Poland	0.37	0.89	-0.01	-0.74	0.60	-0.95	-0.68	0.70	**1.00**	**1.00**	**1.00**	**1.00**	0.96	0.88	0.35	-0.61
Romania	0.25	0.99	0.72	0.03	0.48	-0.94	-0.78	0.01	0.96	0.88	0.35	-0.61	**1.00**	**1.00**	**1.00**	**1.00**
Slovakia	-0.18	-0.99	0.73	-0.67	0.07	0.99	-0.06	0.64	0.80	-0.91	-0.59	0.91	0.89	-0.97	0.47	-0.73
Slovenia	0.98	-0.98	0.22	-0.92	0.97	0.99	0.58	0.90	0.38	-0.94	-0.86	0.85	0.24	-0.96	-0.25	-0.12

	Slovakia				Slovenia			
	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	-0.73	-0.99	0.33	-0.96	0.63	-0.99	0.77	-0.63
Czech R.	0.83	0.96	-0.49	0.99	0.27	0.98	0.01	0.65
Estonia	0.92	-0.78	-0.67	0.02	0.13	-0.82	-0.90	0.42
Hungary	0.99	-0.99	-0.05	-0.88	-0.13	-0.97	0.64	-0.29
Latvia	-0.18	-0.99	0.73	-0.67	0.98	-0.98	0.22	-0.92
Lithuania	0.07	0.99	-0.06	0.64	0.97	0.99	0.58	0.90
Poland	0.80	-0.91	-0.59	0.91	0.38	-0.94	-0.86	0.85
Romania	0.89	-0.97	0.47	-0.73	0.24	-0.96	-0.25	-0.12
Slovakia	**1.00**	**1.00**	**1.00**	**1.00**	-0.19	0.99	0.70	0.67
Slovenia	-0.19	1.00	0.70	0.67	**1.00**	**1.00**	**1.00**	**1.00**

Note. Light grey cells mean a positive correlation coefficient larger than 0.75. Dark grey cells mean a negative correlation coefficient larger than -0.75.

Table 9(b). Cross-country correlation coefficients of impulse response functions to a positive United States industrial production shock

	Bulgaria				Czech R.				Estonia				Hungary			
	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	**1.00**	**1.00**	**1.00**	**1.00**	-0.96	0.74	0.45	-0.76	-0.82	0.84	-0.26	0.80	-0.99	0.91	-0.03	0.61
Czech R.	-0.96	0.74	0.45	-0.76	**1.00**	**1.00**	**1.00**	**1.00**	0.92	0.36	0.35	-0.94	0.96	0.51	0.85	-0.92
Estonia	-0.82	0.84	-0.26	0.80	0.92	0.36	0.35	-0.94	**1.00**	**1.00**	**1.00**	**1.00**	0.83	0.98	0.68	0.78
Hungary	-0.99	0.91	-0.03	0.61	0.96	0.51	0.85	-0.92	0.83	0.98	0.68	0.78	**1.00**	**1.00**	**1.00**	**1.00**
Latvia	-0.26	-0.37	-0.14	-0.77	0.50	-0.04	-0.65	0.82	0.70	-0.72	0.20	-0.95	0.27	-0.66	-0.52	-0.66
Lithuania	-0.50	-0.95	0.20	0.12	0.64	-0.61	-0.65	0.47	0.82	-0.94	-0.64	-0.21	0.51	-0.99	-0.90	-0.68
Poland	-0.50	-0.92	-0.15	-0.98	0.67	-0.49	0.19	0.74	0.86	-0.98	-0.08	-0.81	0.53	-0.99	0.30	-0.56
Romania	-0.88	-0.83	-0.40	-0.33	0.93	-0.31	-0.64	0.60	0.92	-0.99	-0.60	-0.63	0.90	-0.97	-0.55	-0.41
Slovakia	-0.97	-0.83	-0.54	-0.53	0.98	-0.33	0.27	0.93	0.85	-0.99	0.29	-0.86	0.97	-0.98	0.59	-0.92
Slovenia	-0.17	-0.92	0.27	0.38	0.43	-0.54	-0.60	0.17	0.63	-0.97	-0.41	0.07	0.19	-0.99	-0.82	-0.27

	Latvia				Lithuania				Poland				Romania			
	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	-0.26	-0.37	-0.14	-0.77	-0.50	-0.95	0.20	0.12	-0.50	-0.92	-0.15	-0.98	-0.88	-0.83	-0.40	-0.33
Czech R.	0.50	-0.04	-0.65	0.82	0.64	-0.61	-0.65	0.47	0.67	-0.49	0.19	0.74	0.93	-0.31	-0.64	0.60
Estonia	0.70	-0.72	0.20	-0.95	0.82	-0.94	-0.64	-0.21	0.86	-0.98	-0.08	-0.81	0.92	-0.99	-0.60	-0.63
Hungary	0.27	-0.66	-0.52	-0.66	0.51	-0.99	-0.90	-0.68	0.53	-0.99	0.30	-0.56	0.90	-0.97	-0.55	-0.41
Latvia	**1.00**	**1.00**	**1.00**	**1.00**	0.85	0.58	0.44	0.05	0.76	0.62	-0.54	0.78	0.46	0.68	-0.09	0.56
Lithuania	0.85	0.58	0.44	0.05	**1.00**	**1.00**	**1.00**	**1.00**	0.89	0.98	-0.62	-0.19	0.67	0.93	0.23	0.27
Poland	0.76	0.62	-0.54	0.78	0.89	0.98	-0.62	-0.19	**1.00**	**1.00**	**1.00**	**1.00**	0.82	0.98	0.54	0.29
Romania	0.46	0.68	-0.09	0.56	0.67	0.93	0.23	0.27	0.82	0.98	0.54	0.29	**1.00**	**1.00**	**1.00**	**1.00**
Slovakia	0.41	0.71	-0.54	0.76	0.55	0.94	-0.82	0.65	0.53	0.98	0.82	0.48	0.86	0.99	0.32	0.66
Slovenia	0.94	0.64	0.65	-0.24	0.68	0.99	0.95	0.84	0.73	0.99	-0.77	-0.45	0.44	0.96	-0.01	0.35

	Slovakia				Slovenia			
	ip	cpi	sr	reer	ip	cpi	sr	reer
Bulgaria	-0.97	-0.83	-0.54	-0.53	-0.17	-0.92	0.27	0.38
Czech R.	0.98	-0.33	0.27	0.93	0.43	-0.54	-0.60	0.17
Estonia	0.85	-0.99	0.29	-0.86	0.63	-0.97	-0.41	0.07
Hungary	0.97	-0.98	0.59	-0.92	0.19	-0.99	-0.82	-0.27
Latvia	0.41	0.71	-0.54	0.76	0.94	0.64	0.65	-0.24
Lithuania	0.55	0.94	-0.82	0.65	0.68	0.99	0.95	0.84
Poland	0.53	0.98	0.82	0.48	0.73	0.99	-0.77	-0.45
Romania	0.86	0.99	0.32	0.66	0.44	0.96	-0.01	0.35
Slovakia	**1.00**	**1.00**	**1.00**	**1.00**	0.34	0.97	-0.93	0.35
Slovenia	0.34	0.97	-0.93	0.35	**1.00**	**1.00**	**1.00**	**1.00**

Note. Light grey cells mean a positive correlation coefficient larger than 0.75. Dark grey cells mean a negative correlation coefficient larger than -0.75.