Dibooglu, Selahattin; Kutan, Ali M.

Working Paper

Sources of inflation and output fluctuations in Poland and Hungary: Implications for full membership in the European Union

ZEI working paper, No. B 16-2001

Provided in cooperation with:
Rheinische Friedrich-Wilhelms-Universität Bonn

Zentrum für Europäische Integrationsforschung
Center for European Integration Studies
Rheinische Friedrich-Wilhelms-Universität Bonn

Working Paper

Selahattin Dibooglu and Ali M. Kutan

Sources of Inflation and Output Fluctuations in Poland and Hungary: Implications for Full Membership in the European Union

B 16
2001

Sources of Inflation and Output Fluctuations in Poland and Hungary:

Implications for Full Membership in the European Union

by

Selahattin Dibooglu* and Ali M. Kutan**

* Corresponding author. Department of Economics, University of Illinois at Urbana-Champaign, and Southern Illinois University. Mailing address: Departnment of Economics, Southern Illinois University at Carbondale, Carbondale, IL 62901-4515, USA. Phone: 618 453 5075; Fax: 618 453 2717; e-mail: dibo@siu.edu

** Department of Economics and Finance, Southern Illinois University at Edwardsville, Edwardsville, IL 62026-1102, USA, and Center for European Integration Studies (ZEI), University of Bonn, Germany.

We are indebted to Josef Brada for his comments and suggestions on an earlier draft of this paper. Kutan also wishes to acknowledge the support of the National Council for Eurasian and East European Research during the writing of this paper. The usual disclaimer applies.

ABSTRACT

This paper examines the sources of fluctuations in inflation and output in two leading transition-economy candidates for admission to the European Union (EU), Poland and Hungary. Using a rational expectations, dynamic open economy aggregate supply- aggregate demand model, we consider real oil price, supply, balance of payments, demand, and monetary disturbances incorporating important features of transition economies such as balance of payments disturbances and finite capital mobility. Evidence indicates that supply shocks explain a sizable portion of price level movements in Hungary while demand shocks are dominant in price level movements in Poland. Monetary shocks are an important source of output fluctuations in the short run in Hungary suggesting nominal inertia. In Poland, real demand shocks affect output in the short run (up to one year), while monetary shocks are negligible. Estimates of "core inflation" based on historical realizations of the shocks suggest that a major component of inflation has been demand driven, "core" inflation. Finally, policy implications of these findings regarding EU membership are evaluated.

JEL Classicication Codes: E3, P2, O5, C5
Keywords: Business Cycles, Inflation, Transition Economies, Time Series Models

1. Introduction

A significant economic and political challenge facing the transition economies of central and eastern Europe is to join the European Monetary System (EMS) and thus achieve full membership in the European Union (EU). The successful accession to membership in the EU by the current transition-economy applicants, the Czech Republic, Hungary, the Slovak Republic, Slovenia and Poland, will depend to a large extent on their ability to align themselves with the macroeconomic policies of the EU. Thus, an important task for the policymakers in the accession countries is to lower the inflation rate and, at the same time, to raise output per capita to a level approaching EU average. Although all transition economies have made a substantial progress in lowering inflation over time, their current inflation levels can be best described as "moderate", ranging between 10 to 20 percent, still well above the average EU level. On the other hand, the output growth rate in the candidate countries has been somewhat faster than that of the EU, but these economies need to exceed the average EU growth level by a large amount for a sustained period of time if their living standards are to approach EU standards.

The purpose of this paper is to investigate the sources of movements in inflation and output in two leading transition- economy candidate countries, Hungary and Poland.[1] Understanding the forces underlying inflation and output growth can help policymakers become better prepared for full membership in the EU and also allow them to design credible policies before they establish any formal link to the Euro. Among the performance measures that most observers would view as important markers of credibility for joining the EMS are inflation and output growth. In addition, some transition economies, such as the Czech Republic and Poland have been pursuing a policy of inflation targeting to better control and reduce inflation. Therefore, an empirical analysis of inflation rate movements is useful for monetary authorities in these countries, and their experience may provide important lessons for other transition economies.

Price stability has been an important policy goal for all transition policymakers since the beginning of transition efforts in early 1990s. Inflation is often blamed for major distortions in the economy, lack of foreign direct investment, appreciation of the real exchange rate, and worsening of the income distribution. Hence, it is particularly important to better understand the extent to which inflation is a demand driven, core inflation phenomenon. In this paper, we also construct a measure of core inflation for Poland and Hungary. If a substantial portion of total inflation is demand driven or core inflation, then there is room for policies aimed at limiting discretionary demand to bring down inflation and stabilize the economy. Looking forward, our results suggest that a major component of inflation in the two countries has been demand driven.

Brada (1998) and Desai (1997, 1998) argue that different initial conditions and different starting times of stabilization programs result in different paths for macroeconomic variables, such as output, prices, and real exchange rates. Different approaches to monetary policy may also lead to different behavior in these variables. Hungary began implementing stabilization programs much earlier than Poland and these two countries have also adapted different monetary policy stance and had different initial conditions. Dibooglu and Kutan (2001) provide empirical evidence that real exchange movements in Poland and Hungary during 1990-99 were affected by different factors. In this paper, we also test the validity of arguments made by Brada (1998) and Desai (1997, 1998) about the behavior of prices and output by providing evidence from Poland and Hungary.

The rest of the paper is organized as follows. In the next section, we provide an overview of macroeconomic policy in Hungary and Poland. Section 3 describes our methodology. In section 4, we describe data employed and present our empirical results. Section 5 discusses policy implications of our findings and concludes.

2. An Overview of Macroeconomic Policy in Hungary and Poland

2.1. Hungary

Initially, at the beginning of the 1990's, Hungary followed a gradualist macroeconomic policy as the authorities sought to balance the desire for reducing inflation with the need to control the government deficit and to service a large external debt. Too large a reduction in inflation would have reduced government revenues and increased expenditures on the social safety net, thus increasing the government's need to borrow abroad. The official exchange rate was tied to a currency basket consisting of 50 percent U.S. dollar and 50 percent German mark weights until May 1994, when the weights for the reference basket changed to 70 percent ECU and 30 percent U.S. dollar. Monetary policy included active exchange rate management based on a currency peg with a narrow band of permitted fluctuations (Kutan and Brada, 2000).

The initial exchange rate policy, which aimed at a real appreciation of the forint to help combat domestic inflation, was found to be too costly because of the declining competitiveness of Hungarian exports and sluggish growth. Moreover, it failed to provide a nominal exchange rate anchor to reduce inflationary expectations. These costs began to appear in 1993, when the current account deficit reached 9% of GDP and then increased to 9.4 % the following year. At the same time, the government’s budget deficit remained unacceptably high (Table 1). The fact that the foreign debt was also growing steadily put Hungary at risk of insolvency. This macroeconomic situation was certainly not sustainable.

During the 1990 to 1994 period, a loose fiscal policy lead to growing budget deficits and a high level of foreign debt. Financing this deficit required monetary expansion as well as high interest rates so that commercial banks would find government securities attractive, thus fueling the inflation that the strong forint policy had sought to reduce. The disinflation policy combined with a fixed exchange rate resulted in continuous real appreciation, causing a loss of competitiveness and high current account deficits. The persistence of these twin deficits (Table 1) created uncertainty among Hungary's foreign creditors as well as concerns about the stability of the forint.

The two conflicting priorities of the government, control of inflation and improving international competitiveness, led to speculation against the forint, which undermined the credibility of the exchange rate regime. Liberalization of foreign exchange operations and the continuous real appreciation of the forint, resulting in significant capital inflows, gradually narrowed the ability of the monetary authorities to control the money supply. Moreover, during this period, there was no coordination between monetary and fiscal policy (Nemenyi, 1997).

The 1994 Mexican crisis further worsened Hungary's ability to borrow in international markets as the risk premium increased for emerging markets. The government realized that it could not sustain the dual objectives of controlling inflation and improving international competitiveness at the same time and, as a result, announced a major fiscal adjustment program in March 1995 [Szapary and Jakab (1998)]. Fiscal policy was tightened to reduce the twin deficits through lower government expenditures, higher import tariffs, and reduced government borrowing. Price stability was declared the key goal of monetary policy in the long run.

The March 1995 measures included a major change in the nominal exchange rate regime that was intended to create credibility for economic policy and reduce the uncertainty associated with future policy measures so as to restore inventors' confidence in the system (Nemenyi, 1997). Following a 9 percent devaluation of the official exchange rate, a preannounced crawling band exchange rate system was introduced in March 1995. The band of permitted fluctuations was set at 2.25 percent on either side of the parity, and thus has been maintained until recently. The rate of crawl was set according to an inflation target. The initial monthly rate was 1.9 percent and it was gradually reduced to 0.3 percent in April 2000. The official currency basket was changed to 70 percent DM and 30 percent U.S. dollar in January 1997 and the DM was replaced by the euro in January 1998. In January 2000, the exchange rate was completely tied to the euro. Table 2 provides a summary of the exchange rate measures in Hungary during the 1990-2000 period.

In sum, the post-1995 exchange rate regime in Hungary focused on the stability of the nominal exchange rate as a tool of disinflation and on preventing significant real appreciation of the forint in order to sustain the current account balance and to control capital inflows (Orlowski, 2000). In addition, Hungary experienced some shock therapy, e.g. the bankruptcy legislation introduced in the early 1990s. It received a significant amount of foreign direct investment. As a result, supply shocks should play a key role in output and price movements. The 1995 Bokros package also contained elements of shock therapy, including drastic cuts in budget spending, devaluation of the forint, change to a crawling peg and the introduction of import surcharges. Thus, we also expect that aggregate demand shocks in a broader sense to affect inflation and output growth during our sample period.

2.2. Poland

The stabilization of the Polish economy began under much less favorable conditions than those found in Hungary. In 1989, inflation peaked at 54.8% per month, the government deficit was nearly 8% of GDP and both loss-making Polish firms and the government deficit were financed by rapid expansion of money and credit. Although the government began to deal with the crisis in late 1989, the major stabilization program began on January 1, 1990 with the Balcerowicz Plan. The zloty (zl) was devalued from 5,560 zl/US$ to 9,500 zl/US$ and pegged at the latter rate. Monetary and fiscal policies were tightened, enabling the government to achieve a surplus equivalent to 2.8 % of GDP in 1990 (Table 3) and credit creation was sharply curtailed (Brada and Kutan, 1999). The consequences of stabilization and liberalization were sufficiently virulent, both in the upsurge in prices and in the decline in production, to lead to an easing of macroeconomic policy late in 1990. However, the effects of this policy change were felt more in an acceleration of inflation than in real output growth (Wellisz, 1997) and the government soon abandoned this effort. As the recession deepened in 1991, the fiscal deficit reappeared and high inflation reduced the competitiveness of Polish exports. The zloty was devalued by 17 % in May 1991, and its peg was shifted to a basket of currencies.

Policy priorities gradually shifted from stabilization to stimulating growth (Krzak, 1996). Although the fiscal deficit was cut from 4.9 % of GDP in 1992 to 2.7 % in 1993 (Table 3), a level around which it has fluctuated since, monetary policy was relatively expansionary. While real interest rates remained positive, money supply and credit growth consistently outpaced the targets set by the National Bank of Poland (NBP). The zloty's peg was abandoned in October of 1991, replaced by a crawling peg in the same month with a preannounced devaluation of 1.8% per month against a basket of currencies (Nuti, 2000). 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 sufficiently credible to foreign investors that short-term capital inflows began to be a problem for the NBP by 1995 when, even with some NBP sterilization, capital inflows accounted for 59% of the growth of the money supply (Krzak, 1996). As a result, controlling the money supply became more difficult for the monetary authorities. We thus expect that balance of payments and monetary shocks have played a significant role in inflation and output movements during our sample period. Table 4 provides a summary of exchange rate policy regimes in Poland during 1990-1999.

Although Poland has had a higher rate of inflation than Hungary over the decade of the 1990s, it has also had a faster rate of growth of real GDP (Table 3). Relatively higher growth in Poland may be due as much to an earlier start in implementing economic reforms as to better economic policy. Analogously, Poland's higher rate of inflation may reflect its more severe initial macroeconomic disequilibrium rather than an inability to restrain the growth of the money supply. Recently, output growth has slowed somewhat due to a fall in exports to Russia and the Ukraine caused by the financial crises in those countries. As inflation has slackened and as the nominal anchor of the crawling peg has decreased in importance with a further widening of the bands, Poland has adopted inflation targeting (Brada and Kutan, 1999). In 1998, the Monetary Policy Council set a goal of lowering Polish inflation to 6.8-7.8% in 1999 and 4% as measured by the CPI by the year 2003. As shown in Table 3, the inflation rate for 1999 was 9.8 %, which is much higher than the estimates made by the Council for 1999. In addition, the preliminary estimates of inflation rate was 8.5 % in 2000, suggesting that the inflation targeting policy has not been very effective so far in Poland.

In summary, Poland moved gradually from a rigid fixed exchange rate targeting regime to a more flexible system with wide bands over time. Monetary policy in Hungary was geared to nominal exchange rate stability and radical measures were taken that generated substantial real shocks to the economy. Hence one may expect a higher incidence of monetary shocks and a smaller role for real shocks in Poland than in Hungary and vice versa.

3. The Dynamic Effects of the Shocks: An Illustrative Model

This section presents a dynamic aggregate supply, aggregate demand model that incorporates some important elements of an economy in transition, namely balance of payments problems and finite capital mobility. The model is consistent with a vertical long-run Phillips curve, and represents a middle ground between market clearing approaches and models based on short run nominal inertia and nominal rigidities. Models of this nature have been applied extensively to explain macroeconomic fluctuations (e.g., Shapiro and Watson, 1988; Blanchard and Quah, 1989; Gali, 1992; Karras, 1994; Ahmed and Park, 1994) and real exchange rate fluctuations (Clarida and Gali, 1994; Weber, 1997). Moreover, Quah and Vahey (1995) propose a technique for measuring core inflation based on aggregate demand neutrality: Core inflation is defined as that component of measured inflation that has no long-run impact on real output, a notion consistent with the vertical long-run Phillips curve. Recently, Wehinger (2000) use this aggregate demand neutrality to derive core inflation for the G7 countries and we follow a similar strategy in this paper.

In order to motivate the restrictions embedded in the structural VAR model, consider a dynamic open economy aggregate supply- aggregate demand model with finite capital mobility:

$h_t = h_{t-1} + \epsilon_t^h$	Oil price	(1)
$y_t^s = \check{y}_t - \theta\ h_t$	Aggregate supply	(2)
$\check{y}_t = \check{y}_{t-1} + \epsilon_t^s$	Evolution of capacity output	(3)
$k\ [i_t - i_t^* + (E_t s_{t+1} - s_t) - \rho_t] + \eta_1(s_t - p_t) - \eta_2 y_t + b_t = 0$	Balance of Payments (BOP)	(4)
$i_t = (E_t s_{t+1} - s_t) - (\eta_1/k)\ (s_t - p_t) + (\eta_2/k)\ y_t + [i_t^* + \rho_t - (1/k)b_t]$		(4')
$z_t = [i_t^* + \rho_t - (1/k)b_t]$		(5')
$z_t = z_{t-1} + \epsilon_t^z$	"BOP" shock	(5)
$y_t^d = d_t - \gamma[i_t - E_t(p_{t+1} - p_t)] + \eta_1(s_t - p_t) - \eta_2 y_t$	Aggregate demand/IS	(6)
$d_t = d_{t-1} + \epsilon_t^d$	Aggregate demand shock	(7)
$m_t^d = p_t + y_t - \lambda\ i_t - \mu z_t$	Money demand	(8)
$m_t^s = m^s_{t-1} + \epsilon_t^m$	Money supply	(9)
$y_t^s = y_t^d = y_t$	Goods market equilibrium	(10)
$m_t^s = m_t^d = m_t$	Money market equilibrium	(11)

where h is the real world oil price, y is domestic output, y̌ is capacity output, i is domestic nominal interest rate, i* is the foreign interest rate, s is the exchange rate expressed as the domestic currency price of foreign currency, p is the domestic price level, m is the money stock, d is autonomous aggregate demand, ρ is a risk premium on domestic currency investments, b represents an exogenous shift in net exports due to e.g., a change in competitiveness, z represents exogenous elements in the balance of payments equation, E_t is the expectations operator conditional on information available at time t, all variables except interest rates are in logarithms, and all parameters are assumed positive.

Equation (1) is the evolution of the world oil price, which is assumed to be exogenous. Equation (2) is an aggregate supply equation, where aggregate supply depends on capacity output and world oil price. Capacity output in equation (3) is a function of the productive capacity of the economy (e.g., capital stock and employment), and for simplicity, it is assumed to be a random walk process.

A distinguishing feature of the model is that, due to risk premiums and fads, uncovered interest parity does not hold. Capital inflows are a function of the net domestic rate of return adjusted for a risk premium. Note that the parameter *k* represents the degree of capital mobility and large values of *k* indicate higher levels of capital mobility. The trade balance is a function of the real exchange rate[2] (s_t - p_t) and domestic income. Moreover, due to exogenous changes in terms of trade, b_t represents exogenous increases in net exports. Although equation (4) may seem to impose a zero balance of payments, the existence of the shift term b_t provides a more general specification. For example, one can view b_t as an exogenous level for the balance of payments. Equation (4') rewrites equation (4) in terms of the domestic nominal interest rate while equation (5') pools all the exogenous elements in the balance of payments equation to define z_t. Equation (5) specifies the evolution of z_t as a non-stationary stochastic process[3].

Equation (6) is an aggregate demand (IS) equation where aggregate spending depends on the expected real interest rate and net exports. The autonomous portion of aggregate demand, d_t, is assumed to follow a random walk in equation (7). Equation (8) is a conventional money demand equation with a unitary income elasticity. Money demand is also a function of the exogenous elements in the balance of payments. This specification allows for reductions in money demand when there are exogenous shifts in the balance of payments that necessitate a depreciation of domestic currency. The exogenous BOP shock in money demand is meant to allow for currency substitution. It is known that currency substitution is prevalent in inflationary environments. Moreover, when there is a risk premium associated with domestic currency or there exist self-fulfilling fads in exchange rate expectations, z_t will be positive. In such cases, money demand is reduced by μz_t.

Equation (9) is the evolution of money supply, which for simplicity, is assumed to follow a random walk[4]. Finally we close the model by postulating goods and money market equilibrium relationships (equations 10 and 11) and proceed to solve the model for the rational expectations equilibrium.

In order to solve the model, we eliminate the interest rate from equations (6) and (8) using equation (4') to obtain the following system:

$$\begin{vmatrix} \lambda(1+\frac{\eta_1}{k}) & 1-\frac{\lambda\eta_1}{k} \\ \gamma(1+\frac{\eta_1}{k})+\eta_1 & -\gamma(1+\frac{\eta_1}{k})-\eta_1 \end{vmatrix} \begin{vmatrix} s_t \\ p_t \end{vmatrix} = \begin{vmatrix} \lambda & 0 \\ \gamma & -\gamma \end{vmatrix} \begin{vmatrix} E_t\ s_{t+1} \\ E_t\ p_{t+1} \end{vmatrix} + \begin{vmatrix} m_t-(\frac{\lambda\eta_2}{k}-1)y_t + (\mu-\lambda)z_t \\ (1+\eta_2+\frac{\eta_2\gamma}{k})y_t-d_t-\gamma z_t \end{vmatrix} \qquad (12)$$

The system can be written compactly as $AY_t = B\ E_t\ Y_{t+1} + W_t$, or $Y_t = \Pi\ E_t\ Y_{t+1} + CW_t$ where $C = A^{-1}$ and $\Pi = A^{-1}B$. The eigenvalues of the matrix Π are $\{1/(1+\lambda);\ \gamma k / (\gamma k + \gamma\ \eta_1 + \eta_1 k)\}$. The eigenvalues are both within the unit circle for finite values of the parameters, hence the forward looking solution is convergent. The forward looking solution to the system in (12) is

$$E_t Y_{t+1} = C \sum_{i=1}^{\infty} \Pi^i \; E_t \; W_{t+i+1} \tag{13}$$

Given the stochastic processes for the exogenous variables, it is evident that $E_t \, W_{t+i} = W_t$ for i = 1, 2, ... Then the solutions for the real exchange rate, real money balances, and the price level in terms of the exogenous variables are:

$$s_t - p_t = \left[\frac{k}{\eta_1(\gamma+k)} + \frac{\eta_2}{\eta_1} \right] y_t - \frac{\gamma k}{\eta_1(\gamma+k)} z_t - \frac{k}{\eta_1(\gamma+k)} d_t \tag{14}$$

$$m_t - p_t = c_1 y_t + c_2 z_t + c_3 d_t$$

$$c_1 \equiv \frac{2\lambda\eta_2 + \lambda k}{k(\gamma+k)} - 1 \; ; \quad c_2 \equiv \frac{\lambda k}{\gamma+k} - \mu \; ; \quad c_3 \equiv -\frac{\lambda}{\gamma+k} \; ; \tag{15}$$

$$p_t = m_t - c_1 y_t - c_2 z_t - c_3 d_t \tag{16}$$

The observed movements in the vector of variables $X_t = [h_t \;\; y_t \;\; (m_t\text{-}p_t) \; (s_t\text{-}p_t) \; p_t]'$ are due to five mutually uncorrelated "structural" shocks with finite variances, $\epsilon_t = [\epsilon_t^h \; \epsilon_t^s \;\; \epsilon_t^z \; \epsilon_t^d \; \epsilon_t^m]$. These are oil price shocks, ϵ_t^h; aggregate supply shocks, ϵ_t^s; BOP shocks, ϵ_t^z; aggregate demand shocks, ϵ_t^d; and money supply shocks[5], ϵ_t^m.

It can be shown that the long run impact of the structural shocks on the endogenous variables has a specific structure. In order to show the long run effect of structural shocks, ϵ_t, on X_t we express the solution to the model in first differences:

$$\Delta h_t = \epsilon_t^h \tag{17}$$

$$\Delta y_t = -\theta\,\epsilon_t^h + \epsilon_t^s \tag{18}$$

$$\Delta(m_t - p_t) = c_1\,(\epsilon_t^s - \theta\,\epsilon_t^h) + c_2\,\epsilon_t^z + c_3\,\epsilon_t^d \tag{19}$$

$$\Delta(s_t - p_t) = \left[\frac{k}{\eta_1(\gamma+k)} + \frac{\eta_2}{\eta_1}\right](\epsilon_t^s - \theta\epsilon_t^h) - \frac{\gamma k}{\eta_1(\gamma+k)}\epsilon_t^z - \frac{k}{\eta_1(\gamma+k)}\epsilon_t^d \tag{20}$$

$$\Delta p_t = c_1\,\theta\,\epsilon_t^h - c_1\,\epsilon_t^s - c_2\,\epsilon_t^z - c_3\,\epsilon_t^d + \epsilon_t^m \tag{21}$$

Note from equations (15) and (21) that the long run effect of a BOP shock on the price level depends on the degree of capital mobility and on the magnitude of the semi-interest elasticity of money, λ, relative to the elasticity of money demand with respect to a BOP deterioration, μ. Assuming k is sufficiently large, the coefficient c_2 in equation (21) reduces to λ-μ. When $\mu < \lambda$ ($\mu > \lambda$), the predicted effect of a BOP shock on the price level is positive (negative). Consequently, the long run effect of a BOP shock on the price level is an empirical question. Similarly the long run effect of a supply shock on the price level can be of either sign. Notice that although all endogenous variables are unit root stochastic processes, the vector X_t is difference stationary. Finally, the long run impact of the structural shocks on the endogenous variables is "near-triangular", which we show in the next section.

Identification of the Shocks

Since the vector ΔX_t is covariance stationary, it can be written as an infinite moving average process in the structural shocks:

$$\Delta X_t = \sum A_i \epsilon_{t-i} = A(L)\epsilon_t \tag{22}$$

where A(L) is a matrix whose elements are polynomials in the lag operator L. Denote the elements of A(L) by $a_{ij}(L)$. The time path of the effects of a shock in ϵ_j on variable *i* after *k* periods can be denoted $\omega_{ij}(k)$. We also adopt the notation such that A(1) is the matrix of long run effects whose elements are denoted $a_{ij}(1)$; each element gives the cumulative effect of a shock in ϵ_j on variable *i* over time. Similarly, A_0 is the matrix of the contemporaneous impact effects and consists of $\omega_{ij}(0)$. The objective of identification is to discern the 25 elements of A_0. Given the model structure above, the long run effects of the shocks on the endogenous variables are given by

$$\begin{vmatrix} \Delta h_t \\ \Delta y_t \\ \Delta(m_t - p_t) \\ \Delta(s_t - p_t) \\ \Delta p_t \end{vmatrix} = \begin{vmatrix} a_{11}(1) & 0 & 0 & 0 & 0 \\ a_{21}(1) & a_{22}(1) & 0 & 0 & 0 \\ a_{31}(1) & a_{32}(1) & a_{33}(1) & a_{34}(1) & 0 \\ a_{41}(1) & a_{42}(1) & a_{43}(1) & a_{44}(1) & 0 \\ a_{51}(1) & a_{52}(1) & a_{53}(1) & a_{54}(1) & a_{55}(1) \end{vmatrix} \begin{vmatrix} \epsilon_t^h \\ \epsilon_t^s \\ \epsilon_t^z \\ \epsilon_t^d \\ \epsilon_t^m \end{vmatrix} \qquad (23)$$

Note that the matrix of long run effects is lower triangular except that $a_{34}(1)$ is not zero. The system in (23) provides 9 restrictions toward identification. Given the 15 restrictions embedded in the variance covariance matrix, an additional restriction is needed to identify the shocks.

For a sufficiently high level of capital mobility, aggregate demand shocks have no long run effect on real money balances. An aggregate demand shock in this case has no effect on real interest rates and any autonomous changes in aggregate demand have to be offset by a nominal and real appreciation of domestic currency. As a result, net exports decline and aggregate demand shocks have no long run effect on prices or real money balances under perfect capital mobility. Perfect capital mobility implies that the coefficient $c_3 = -\lambda/(\gamma+k)$ in equations (15) and (19) and the long run response $a_{34}(1)$ in equation (23) is zero. In the empirical model, it is fairly straightforward to re-estimate the model for non-zero values of $a_{34}(1)$ corresponding to limited capital mobility. This enables us to assess the sensitivity of the results to varying degrees of capital mobility.

4. Empirical Results

Our benchmark model consists of the system in (23) with “high capital mobility” where $a_{34}(1) = 0$. After estimating the model, we perform variance decompositions and impulse response analyses to study the dynamic effects of real oil price, aggregate supply, balance of payments, real demand, and monetary shocks on the price level and output. We then use simulations based on historical realizations of the orthogonal shocks to construct estimates of “core” inflation. The data are monthly from January 1990 through April 2000. The measures of the variables are: h_t = real domestic price of crude oil (West Texas crude oil converted to domestic currency using period average exchange rate and deflated by the producer price index), y_t = industrial production index, q_t = real effective exchange rate, p_t = consumer price index, m_t = M3 for Hungary, and M2 for Poland. Most series are from CD ROM edition of the *International Financial Statistics*, except the following: Industrial Production in Poland is taken from Plan Econ Inc.; West Texas crude oil price is from the Federal Reserve Bank of St Louis FRED® database; M3 in Hungary is from the National Bank of Hungary. All data are seasonally adjusted using the Census X-11 additive method.

In order to properly specify the VAR, variables ought to be tested for unit roots. Augmented Dickey-Fuller (ADF) tests for the levels and first differences of the variables are given in Table 5. The ADF test statistics seem to be sensitive to the lag length, hence we present sample autocorrelation coefficients for the variables as well. The sample ADF test statistics indicate that all variables are stationary in the first differences at the 5 percent significance level. However, the real exchange rate and the price level in Poland appear stationary. Moreover, real money balances in Poland and the real exchange rate and the price level in Hungary seem on the borderline of a unit root process. Sample autocorrelation coefficients for price levels and real exchange rates clearly suggest a unit root process in real exchange rates and prices in both countries. Moreover an AR(1) coefficient of 0.98 and a slowly decaying autocorrelation function in the real money balances in Poland point to a unit root process. For the empirical model, we proceed with the assumption that all variables are unit root processes in levels, and stationary in first differences[6].

We then let $\Delta X_t = [\Delta h_t\ \Delta y_t\ \Delta(m_t\text{-}p_t)\ \Delta(s_t\text{-}p_t)\ \Delta p_t]$ and estimate the VAR for Poland and Hungary. Starting with a maximum lag of 8, we pare down the model depending on the joint significance of maximum lag coefficients. Likelihood ratio tests indicate that the model can be pared down to 4 lags for Hungary and 6 lags for Poland. In order to preserve symmetry and capture possible dynamics, we estimate the VAR with six lags for both countries. The transition process by its very nature involves structural change. Moreover, both countries introduced major stabilization programs in 1995. In order to test for structural change, we divide the sample into two sub-periods: 1990.2-1994.12 and 1995.1-2000.4. We then test for structural change using a multivariate version of the Chow test. The estimated test statistic yields $\chi^2(155) = 428.14$ for Hungary and $\chi^2(155) = 434.22$ for Poland. Both statistics strongly reject the null hypothesis of no structural change. In order to account for the structural change, we include a dummy variable for both countries (d = 1 for t $\geq$ 1995:1 and zero otherwise) in the VAR. We then implement the identification strategy outlined above, and proceed with innovation accounting analysis typical of VARs**.**

Impulse Response Functions

Figure 1 presents responses of the price level to each shock (real oil price, supply, balance of payments, demand, and monetary) for Poland and Hungary. We present both median responses and a 90 percent confidence band based on bootsrapping with 1000 draws for the impulse response functions. The figure indicates that the response of the price level to a real oil price shock is insignificant in both countries. The effect of a supply shock on prices is similar to a closed economy case where prices fall in response to an aggregate supply shock in both Poland and Hungary. The effect of a BOP shock is negative but mostly insignificant in Poland. This indicates that a BOP shock has a demand deflating effect.

The effect of an aggregate demand shock on prices is positive and significant in both countries. Prices gradually rise in response to a monetary shock suggesting some nominal inertia in both Poland and Hungary. Prices level off after a year in both countries.

The response of output to various shocks is given in Figure 2. Output falls slightly in response to an oil price shock and then rises in both countries although the response is mostly statistically insignificant. Output effects of supply shocks are positive and significant as expected. As in the price level, a BOP shock has some demand deflating effect, and output mostly falls in response to a BOP deterioration. However, the response is statistically insignificant. A real demand shock is expansionary in both countries even though the response is not significant in Hungary. Similarly, monetary shocks seem to have output expansionary effects. Although the effect is mostly insignificant in Poland, there is a pronounced and significant impact effect of a monetary shock in Hungary. Overall, the results are broadly consistent with the implications of the aggregate supply - aggregate demand model.

Variance Decompositions

Table 6 presents variance decompositions of the price level and output under the assumption of perfect capital mobility. At short term forecasting horizons, real demand shocks play an important role in explaining the price level in Poland, followed by supply and BOP shocks. In Hungary, supply shocks seem to play the dominant role in price level movements although real demand shocks are still important in the short run. These findings are consistent with our prior expectations as discussed in Section 2.

For both countries, monetary shocks are negligible in explaining price level movements in the short run. In the long run, aggregate demand, supply, and monetary shocks play almost equally in price level movements in Poland while supply shocks seem to dominate the price level in Hungary. Notice the absence of any major role for real oil price shocks in influencing price level movements in both countries. Moreover, although monetary shocks do not play a major role in price level movements in the long run, they seem to explain a moderate proportion of price level movements in Poland. This may be attributed to the exchange rate based stabilization programs which tend to limit monetary discretion that have been implemented in both countries.

Variance decompositions of output reveal interesting patterns. First, in both countries supply shocks explain a sizable proportion of output movements in both countries. Second, balance of payments and real oil price shocks are negligible in both countries. On the other hand, aggregate demand shocks in the broad sense (real demand vs. monetary shocks) seem to play a different role in explaining output movements in each country. This finding supports the arguments made by Brada (1998) and Desai (1997, 1998) that different initial conditions and macroeconomic policy between the two countries are likely to yield different outcomes for the behavior of output and other key macroeconomic variables.

While both types of demand shocks are constrained to have no long run effect on output, the short run effect can be substantial. Indeed, monetary shocks seem to dominate output movements in Hungary in the short run while real demand shocks appear to be modest. In Poland, real demand shocks play a moderate to important role in output movements in the short run while monetary shocks are negligible. Overall, aggregate demand policies in the broad sense seem to have a significant role in the short run in both countries.

Imperfect capital mobility and alternative specifications

For transition economies, it may not be reasonable to assume perfect capital mobility particularly in the initial stages of transition since institutional infrastructure was in its infancy and there was more currency as well as political risk. However, the leading transition economies today possess almost prefect capital mobility as currency convertibility in both current and capital accounts is introduced.

In this section, we assess the sensitivity of the results to the degree of capital mobility. To that end, we estimate the model with limited capital mobility corresponding to non-zero values of the coefficient c_3. Recall that the parameter *k* measures the degree of capital mobility so $c_3 = -\lambda/(\gamma+k)$ determines the long run effect of aggregate demand impulses on real money balances. We gauge the effect of limited capital mobility by estimating the model for a finite *k*. We set the long run effect of aggregate demand shocks on the demand for real money balances at $a_{34}(1) = -$

0.009 standard deviations for Hungary and Poland[7]. Variance decompositions from this model are summarized in Table 7.

Limited capital mobility evidently has no bearing on the relative importance of real oil price, supply, or monetary shocks in explaining the price level or output. The effects of limited capital mobility can be summarized as follows: The importance of real demand shocks in explaining the price level in Hungary increases in the long run. In Poland, there is a reverse tendency: the effect of real demand shocks on the price level is somewhat diminished.. As for output, real demand (BOP) shocks explain a higher proportion of output movements in Hungary (Poland) under limited capital mobility. These results are more consistent with our prior expectations about the importance of monetary and real shocks in affecting prices and output as discussed in Section 2.

Overall, the assumption regarding capital mobility does not seem to alter the results substantially for Hungary. However the results are somewhat sensitive to capital mobility in Poland in that the role of real demand and BOP shocks change depending on capital mobility[8].

In order to assess the sensitivity of the results to different specifications of the VAR and sample periods, we estimated various models. First, we estimated the model with unit root inflation and output processes. The estimated impulse responses from this model did not conform to theoretical overidentification restrictions implied by the AS/AD model. Recall that a supply shock has a positive effect on the price level and money supply shock has a contractionary effect on output. We also estimated the model for 1992-2000 excluding the initial transition period. Results from this model show high standard errors in that most impulse responses are insignificant, perhaps due to insufficient observations. Therefore we conclude that the benchmark model provides the most plausible representation of the data.

Core Inflation

Following Quah and Vahey (1995), we construct "core inflation" by eliminating supply side influences (oil price shocks and supply shocks). The remaining "demand driven inflation" based on historical realizations of balance of payments shocks, real demand shocks, and monetary shocks gives an idea about the extent of policy induced inflation.[9] The deterministic part of the simulated inflation is included in the core inflation estimate. If a substantial portion of total inflation is demand driven or "core inflation", there is room for policies aimed at limiting discretionary demand policies to bring down inflation and stabilize the economy. A decomposition of inflation based on historical realizations of the shocks is given in Figure 3. A core inflation measure higher than total inflation indicates that favorable supply side effects featured strongly to bring down inflation.

Figure 3 reveals several interesting features of the inflation period in Poland and Hungary. First, in both countries core inflation was never far below total inflation[10] during the entire sample period except at the beginning of the transition in Poland. As a mater of fact, in the second half of the 1990s there is a moderating effect of favorable supply shocks on total inflation. Inflation moderating favorable supply shocks show no particular pattern for Poland but are strongly visible in Hungary after 1995. One can conjecture that the upgrading of old technologies through foreign direct investment, increase in product quality and structure, decline in unit labor costs, and introduction of the post-95 measures have been some of the main driving forces of the observed increase in output and decline in inflation in Hungary.

Given the negligible non-core inflation and oftentimes moderating supply side influences on inflation, the historical decomposition of inflation has important policy implications. If we assume that core inflation is mostly induced by discretionary demand policies, commitment mechanisms that limit discretionary policies have a good chance of stabilizing the economy.

5. Conclusions

Using a rational expectations, dynamic aggregate supply and aggregate demand model with limited capital mobility and structural VARs, we have attempted to decompose inflation and output movements into those attributable to real oil price, supply, balance of payments, real demand, and monetary shocks. Variance decompositions results have indicated that supply shocks explain a preponderance of price level movements in Hungary while demand shocks are dominant in price level movements in Poland. On the other hand, monetary shocks are an important source of output fluctuations in the short run in Hungary suggesting nominal inertia. In Poland, real demand shocks affect output in the short run (up to one year), while monetary shocks are negligible. We have found that these findings are not overly sensitive to the assumption regarding capital mobility. These results support the view that different initial conditions and different starting times of stabilization programs, as well as, different approaches to monetary and exchange rate policy in Poland and Hungary have resulted in different factors driving output and inflation [Brada (1998) and Desai (1997, 1998)].

Our results have suggested that aggregate demand policies in the broad sense have played a significant role in the short run in both countries. This may be related to the relative fixity of the exchange rate regimes that Poland and Hungary adopted in the 1990s. The relative effectiveness of real demand policies is compatible with the view that floating rates steepen the short run

Phillips curve trade-off (Dornbusch and Krugman 1976). Accordingly, even if demand policies are not stable, fixed rates provide a framework that stabilizes their effects. For example, an expansionary policy adopted in response to an imminent decline in economic activity under fixed exchange rates is more likely to raise output and employment rather than wages if it is not expected to persist (Alogoskoufis and Smith 1991; Eichengreen, 1993). Moreover, expansionary demand policies produce larger increases in output and employment under credible fixed exchange rates when inflation is not expected to persist, as compared to flexible exchange rates. In that regard, it is important for these countries to continue to have some form of fixed exchange rate regime before any formal peg to the Euro.

Empirical evidence has indicated that supply shocks have been a key determinant of output and prices in both short and long run in both countries. Therefore, it is important for both countries to put more emphasis on supply side policies that increase productivity over time. Estimates of core inflation based on historical realizations of the shocks have indicated a major component of inflation has been demand driven, core, inflation. Therefore, it is important that policymakers restrain discretionary demand policies to lower inflation.

Our results have important implications for full membership preparations of Hungary and Poland in the EU and lessons for other candidate countries. Based on our empirical findings, it appears that a combination of discretionary demand policies along with supply-side reforms that emphasize productivity enhancement and investment in new technology would be important factors to lower inflation and increase output growth in both countries, thus increasing their chances of full membership in the EU. In addition, unfavorable supply shocks would hurt the attempts of lowering inflation and achieving a sustainable output growth in both countries, perhaps significantly delaying the timing of full EU membership for the candidate countries.

REFERENCES

Ahmed, Shaghil and Park, Jae Ha (1994). Sources of Macroeconomic Fluctuations in Small Open Economies. *Journal of Macroeconomics*, 16(1): 1-36

Alogoskoufis, George S., and Ron Smith (1991). "The Phillips Curve, the Persistence of Inflation, and the Lucas Critique: Evidence from Exchange Rate Regimes," *The American Economic Review*, 81, 1254-75.

Blanchard, Olivier J. and Danny Quah (1989) "The Dynamic Effects of Aggregate Demand and Supply Disturbances," *American Economic Review* 79: 655-73.

Brada, Josef C. (1998). "Introduction: Exchange Rates, Capital Flows and Commercial Policies In Transition Economies," *Journal of Comparative Economics* 26 (4):613-620.

Brada, Josef. C. and Kutan, Ali M (1999). "The End of Moderate Inflation in Three Transition Economies?" Research Department Working Paper No. 99-003A, Federal Reserve Bank of St. Louis.

Clarida, Richard and Jordi Gali (1994) "Sources of Real Exchange-Rate Fluctuations: How Important are Nominal Shocks," *Carnegie-Rochester Conference Series on Public Policy* 41: 1-56.

Desai, Padma (1997). "Introduction," In Padma Desai, Ed., *Going Global: Transition from Plan to Market in the World Economy*, Cambridge: MIT Press, 1-94.

Desai, Padma (1998). "Macroeconomic Fragility and Exchange Rate Vulnerability: A Cautionary Record of Transition Economies." *Journal of Comparative Economics* 26 (4) 621-41.

Dibooglu, Selahattin and Kutan, Ali M. (2001). "Sources of Real Exchange Rate Fluctuations in Transition Economies: The Case of Hungary and Poland," *Journal of Comparative Economics* 21 (13): 1-19.

Dornbusch, Rudiger and Paul Krugman (1976). "Flexible Exchange Rates in the Short Run," *Brookings Papers on Economic Activity*, 537-75.

Eichengreen, Barry (1993). "Epilogue" in Barry Eichengreen and Michael Bordo, *A Retrospective on the Bretton Woods System.* Chicago: University of Chicago Press.

Gali, Jordi (1992). "How Well does the IS-LM Model Fit Postwar U.S. Data?" *Quarterly Journal of Economics*, 107, 709-38.

Karras, G. (1994). Sources of Business Cycles in Europe: 1960-1988. Evidence from France, Germany, and the United Kingdom, *European Economic Review*, 38(9): 1763-1778

Kiss, Gabor P. and Szapary, Gyorgy (2000). "Fiscal Adjustment in the Transition

Process: Hungary, 1990-1999," *Post-Soviet Geography and. Economics* 41(4): 233-264.

Krzak, Maciej (1996) “Persistent Moderate Inflation in Poland and Hungary,” *Focus on Transition, Oesterreichische Nationalbank.*

Kutan, Ali M. and Brada, Josef C. (2000). "The Evolution of Monetary Policy in Transition Economies,”*Federal Reserve Bank of St. Louis Review* 82 (2): 2:31-40.

Nemenyi, J. (1997). "Monetary Policy in Hungary: Strategies, Instruments and Transmission Mechanism," *Focus on Transition, Oesterreichische Nationalbank* 2: 131-61.

Nuti, Domenico Mario (2000). “The Polish Zloty, 1990-1999: Success and Under-Performance,” *American Economic Review* 90 (2): 53-58.

Orlowski, Lucjan, T. (2000). “Monetary Policy Regimes and Real Exchange Rates in Central Europe's Transition Economies,” *Economic Systems* 24 (2):145-169.

Shapiro, Matthew D. and Mark W. Watson (1988) “Sources of Business Cycle Fluctuations.” In Stanley Fischer (ed.) *NBER Macroeconomics Annual*. Cambridge, MA: MIT Press.

Szapary Georgy and Jakab, Zoltan M. (1998). “Exchange Rate Policy in Transition Economies: The Case of Hungary,” *Journal of Comparative Econ*omics 26 (4): 691-717.

Quah, D. and S. P. Vahey (1995). “Measuring Core Inflation,” *Economic Journal* 105 (432): 1130-1144.

Weber, A. A. (1997). Sources of Purchasing Power Disparities between the G3 Economies. *Journal of the Japanese and International Economies*, 11 (4): 548-583.

Wehinger, G. D. (2000). Causes of Inflation in Europe, the United States and Japan: Some Lessons for Maintaining Price Stability in the EMU from a Structural VAR Approach. *Empirica,* 27 (1): 83-107.

Wellisz, Stanislaw, “Inflation and Stabilization in Poland, 1990-95.” In Mario I. Blejer and Marko Skreb, Eds., *Macroeconomic Stabilization in Transition Economies.* Cambridge: Cambridge University Press, 1997.

Table 1 – Hungary: Macroeconomic Indicators 1991 to 2000

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Real GDP growth (%)	-11.9	-3.1	-0.6	2.9	1.5	1.4	4.6	4.9	4.2	5.2
CPI rate of inflation (%)	34.2	23.0	22.5	18.9	28.3	23.5	18.3	14.3	10.0	9.8
In % of GDP:										
Current account balance	0.8	0.9	-9.0	-9.4	-5.6	-3.7	-2.1	-4.8	-4.3	-3.9
Government deficit[a]	3.0	7.0	6.5	8.4	6.7	3.1	4.9	4.8	3.7	3.8
Public debt										
Consolidated[b]	66.9	65.0	84.3	83.2	85.4	71.7	63.6	63.5	66.3	62.8
Non-consolidated[c]	74.7	79.0	90.8	88.3	86.5	72.6	63.7	62.1	60.9	56.7

Note: Figures for 2000 are preliminary.

[a] Based on official data reported in Kiss and Szapary (Table 2, 2000), which includes transactions of the central government, the social security funds, the local authorities, and the extra-budgetary funds. For details, see Kiss and Szapary (2000).
[b] Government and National Bank of Hungary, excluding the sterilization instruments of the central bank, see Kiss and Szapary (Table 1,2000)
[c] Non-consolidated with the National Bank of Hungary. For details, see Kiss and Szapary (Table 1,2000)

Table 2 – Exchange rate policy measures in Hungary: 1990-2000

Dates	Currency basket	Rate Adjustment
32873	Introduction of an adjustable fixed rate regime based on the currency composition of previous year's foreign trade until December 8, 1991	
December 9, 1991	50% USD-50% ECU	-
March 16, 1992		1.90
June 24		1.60
November 19		1.9
34011		1.9
March 26		2.90
June 7		1.90
July 9		3.00
August 2	50% US$-50% DM	
September 29		4.50
34336		1
February 16		2.60
May 13		1.00
May 16	70% ECU-30% US$	
June 10		1.20
August 5		8.00
October 11		1.10
November 29		1.00
34701		1.4
February 14		2.00
36962	Introduction of preannounced crawling peg adjustments	9
March 16		Daily devaluations
36965		0.06
July 1		0.042
35064		0.04
35430	70% DM-30% US$	-
April 1		0.036
37117		0.033
January 1, 1998		0.030
June 15		0.026
37164		0.023
January 1, 1998	70% EURO-30% US$	
January 1		0.020
July 1		0.016
37164		0.013
36525	100 % EURO	0.013
36981		0.01

Source: National Bank of Hungary, various annual and monthly Reports.

Table 3. Poland: Macroeconomic Indicators 1990 to 2000

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
GDP real growth rate	-11.6	-7.0	2.6	3.8	5.2	7.0	6.1	6.9	4.8	4.1	4.1
CPI rate of inflation	249	60.4	44.3	37.6	29.5	21.6	18.5	13.2	8.6	9.8	8.5
In % of GDP:											
Current Account balance	5.2	-2.8	-3.7	-2.7	-1	4.3	-0.9	-3	-4.3	-7.5	-6.1
General government balance[a]	2.8	-1.8	-4.9	-2.3	-2.7	-2.6	-2.5	-1.3	-2.4	-2.0	-2.2
Public Debt	na	na	147.3	108.6	69.0	59.0	53.6	49.4	43.0	na	42.0

Notes:
[a] General government includes the state, municipalities and extra-budgetary funds. General government balance includes privatization receipts. Figures for 2000 are preliminary.

Sources: EBRD Transition Report, various issues, EIU and national statistics

Table 4. Exchange Rate Policy in Poland 1990-1999

Date	Regime
January 1990	Fixed exchange rate against the US $ (After a 31.6% devaluation on January 1, 1990)
May 1991	Fixed rate against a basket of 5 currencies (after a 17% devaluation). Currency basket: 45% US$, 35% DM, 10% British Pounds, 5% French franc, 5% CHF
October 1991	Crawling peg, pre-announced crawling devaluation at a monthly rate of 1.8%
February 1992	10.7% Devaluation
August 1993	7.4% Devaluation; monthly crawling rate 1.6%
September 1994	Monthly crawling rate 1.5%
November 1994	Monthly crawling rate 1.4%
February 1995	Monthly crawling rate 1.2%
May 1995	Crawling band, widened band (+/- 7%), same crawling rate
December 1995	6% Revaluation
January 1996	Monthly crawling rate 1.0%
February 1998	Band widened to +/- 10%, monthly crawl 0.8%
July 1998	Monthly crawling rate 0.65%
September 1998	Monthly crawling rate 0.5%
October 1998	Band widened to +/- 12.5%
January 1999	New currency basket: 55% EURO, 45% US$
March 1999	Band widened to +/- 15%, monthly crawling rate 0.3%.

Source: Adapted from Nuti (2000)

Table 5. Stationarity: Autocorrelation and ADF Statistics

	q_t	p_t	m_t-p_t	y_t	h_t	Δq_t	Δp_t	$\Delta(m_t$-$p_t)$	Δy_t	Δh_t
					POLAND					
					Autocorrelations (ρ_k)					
k = 1	0.91	0.97	0.98	0.94	0.92	0.22	0.65	-0.11	-0.4	0.29
k = 6	0.66	0.82	0.87	0.86	0.55	0.08	0.44	-0.01	0.22	-0.11
k = 12	0.42	0.67	0.73	0.75	0.12	0.02	0.35	0.26	0.61	-0.1
					ADF τ_μ *Statistic*					
	-4.49	-4.6	-2.85	1.49	-0.39	-6.65	-3.04	-6.34	-8.8	-7.33
Lags	1	2	1	1	3	1	3	1	1	2
					HUNGARY					
					Autocorrelations (ρ_k)					
k = 1	0.95	0.98	0.98	0.84	0.97	0.16	0.23	0.14	-0.4	0.05
k = 6	0.72	0.86	0.81	0.66	0.81	-0.15	-0.1	-0.06	0.35	0
k = 12	0.5	0.72	0.54	0.6	0.66	-0.12	0.51	-0.01	0.59	0.23
					ADF τ_μ *Statistic*					
	-2.85	-2.48	-0.6	-1.59	0	-3.87	-5.92	-7.55	-3.5	-7.93
Lags	7	2	1	3	2	6	1	1	2	2

Notes: The critical value of the ADF τ_μ test at the 5 % significance level is -2.89.
The maximum lag for the ADF test is selected by the Schwarz Criterion.

Table 6. Variance Decomposition of the Price Level and Output: High Capital Mobility

	Poland					Hungary				
	Percent of forecast error variance attributable to									
	ϵ^h	ϵ^s	ϵ^z	ϵ^d	ϵ^m	ϵ^h	ϵ^s	ϵ^z	ϵ^d	ϵ^m
k	*Price level*									
1	4.0	26.1	23.9	41.9	4.0	15.0	50.1	6.1	28.4	0.4
6	4.8	31.7	12.1	34.5	16.8	8.1	58.8	6.5	20.8	5.9
12	1.8	29.7	8.8	37.0	22.7	2.4	66.0	7.9	10.2	13.4
18	1.6	29.8	8.8	36.2	23.6	1.9	63.8	11.0	8.3	15.0
24	1.7	30.2	8.9	35.3	23.9	2.8	61.0	13.2	6.9	16.0
30	1.9	30.6	9.0	34.6	24.0	3.7	58.7	14.9	6.3	16.3
36	2.0	30.9	9.0	34.1	24.0	4.5	57.1	16.0	5.9	16.5
k	*Output*									
1	0.9	58.5	1.7	32.2	6.7	0.1	24.4	8.5	12.8	54.2
6	12.6	63.8	0.6	14.7	8.2	11.7	36.3	8.9	6.9	36.3
12	9.8	76.8	0.8	7.8	4.7	15.5	53.6	7.4	3.8	19.7
18	8.3	82.9	0.6	5.1	3.1	14.1	66.7	5.2	2.2	11.7
24	7.0	86.5	0.5	3.7	2.3	11.6	75.3	3.6	1.5	8.0
30	6.2	88.8	0.4	2.8	1.8	9.6	80.5	2.7	1.2	6.1
36	5.5	90.4	0.3	2.3	1.4	8.2	83.7	2.2	1.0	5

Table 7. Variance Decomposition of the Price Level and Output: Low Capital Mobility

	Poland					Hungary				
	Percent of forecast error variance attributable to									
	ϵ^h	ϵ^s	ϵ^z	ϵ^d	ϵ^m	ϵ^h	ϵ^s	ϵ^z	ϵ^d	ϵ^m
k	*Price level*									
1	4.0	26.2	15.0	50.8	4.0	15.0	50.1	6.4	28.0	0.4
6	4.8	31.7	15.8	30.8	16.8	8.1	58.8	3.7	23.5	5.9
12	1.8	29.7	19.0	26.7	22.7	2.4	66.0	1.0	17.1	13.4
18	1.6	29.8	18.3	26.7	23.6	1.9	63.8	0.6	18.7	15.0
24	1.7	30.2	17.6	26.6	23.9	2.8	61.0	0.8	19.4	16.0
30	1.9	30.6	17.1	26.4	24.0	3.7	58.7	0.9	20.3	16.3
36	2.0	31.0	16.7	26.3	24.0	4.5	57.1	1.1	20.9	16.5
k	*Output*									
1	0.9	58.6	32.6	1.3	6.7	0.1	24.5	0.8	20.6	54.0
6	12.6	63.9	13.1	2.1	8.2	11.6	36.4	1.5	14.2	36.2
12	9.8	76.8	6.4	2.2	4.7	15.4	53.7	1.5	9.7	19.7
18	8.3	82.9	4.1	1.6	3.1	14.1	66.8	1.4	6.0	11.7
24	7.0	86.6	2.9	1.2	2.3	11.6	75.3	1.0	4.1	7.9
30	6.2	88.9	2.3	0.9	1.8	9.5	80.5	0.8	3.1	6.0
36	5.5	90.4	1.8	0.8	1.4	8.2	83.7	0.6	2.5	4.9

ENDNOTES

1. Other transition economies, including the Czech Republic, are not included due to insufficient observations for empirical analysis. For most transition economies, data start either in 1993 or 1994, which does not provide enough degrees of freedom to get reliable estimates using the structural VAR model. In a future study, we plan to include other transition economies and draw more general conclusions. In this sense, our paper is exploratory and provides an initial analysis of this issue.

2. For simplicity, foreign prices are normalized to unity. In the empirical analysis we will use real effective exchange rates, which does not assume unit foreign prices.

3. Although ϵ_t^z is labeled a "balance of payments shock", it is evident that it captures foreign interest rate shocks, risk premium shocks, and competitiveness shocks. Without further structure, it is impossible to disentangle ϵ_t^z into its constituent parts. To keep the dimensions of the VAR tractable, ϵ_t^z will be a composite shock of the above.

4. In the empirical model, we do not restrict "exogenous variables" to follow any particular process; the assumption of random walk is to illustrate identification restrictions.

5. If one assumes a stable money demand function, ϵ_t^m can be interpreted as a money supply shock. However, if money demand is not stable, ϵ_t^m will capture money supply shocks *net of* money demand shocks.

6. Even though some variables appear stationary in levels (e.g., real exchange rates, price levels, real money balances), an autoregressive coefficient near unity makes it impossible to invert the VAR in order to obtain the moving average representation. Hence, based on a slowly decaying ACF, we assume that these variables are unit root processes in levels.

7. A long run effect of 0.009 standard deviations is comparable in absolute value to an average long run effect of a shock presented in Figure 1. Moreover, $a_{34}(1)$ coefficients in equation (23) that are higher than 0.009 in absolute value did not converge.

8. Strictly speaking, real demand shocks and BOP shocks are indistinguishable under limited capital mobility.

9. Demand driven inflation is only an approximation to policy induced inflation, as not all broadly defined demand shocks are policy related.

10. The fact that supply shocks explain a sizable proportion of the forecast of error variance in the price level is not inconsistent with a sizable core inflation. Variance decompositions give an idea about the effects of various shocks of the *same size* while historical decompositions simulate the series based on the historical incidence of the shocks.

Figure 1. Response of the Price Level

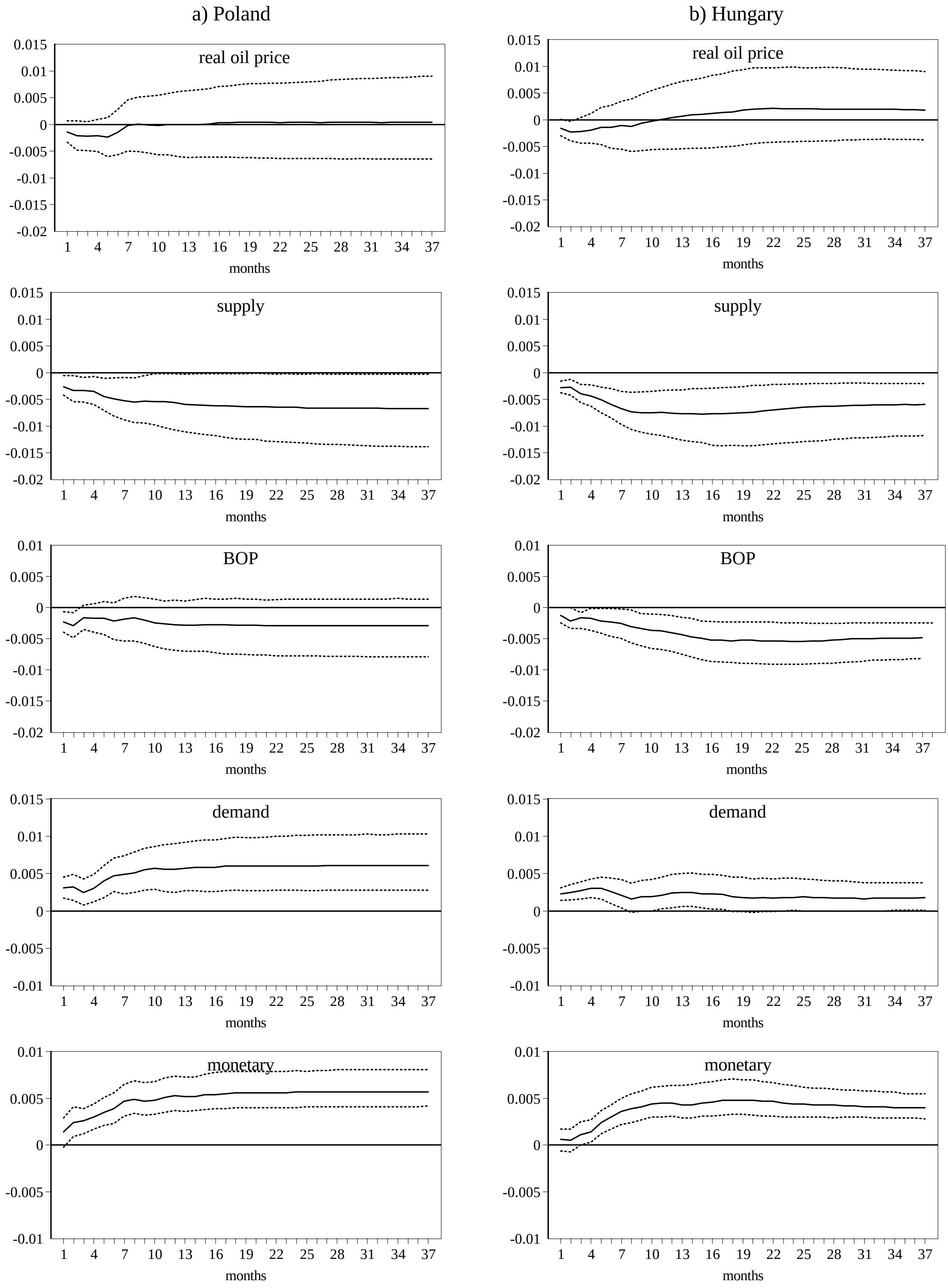


Figure 2. Responses of Output

a) Poland

b) Hungary

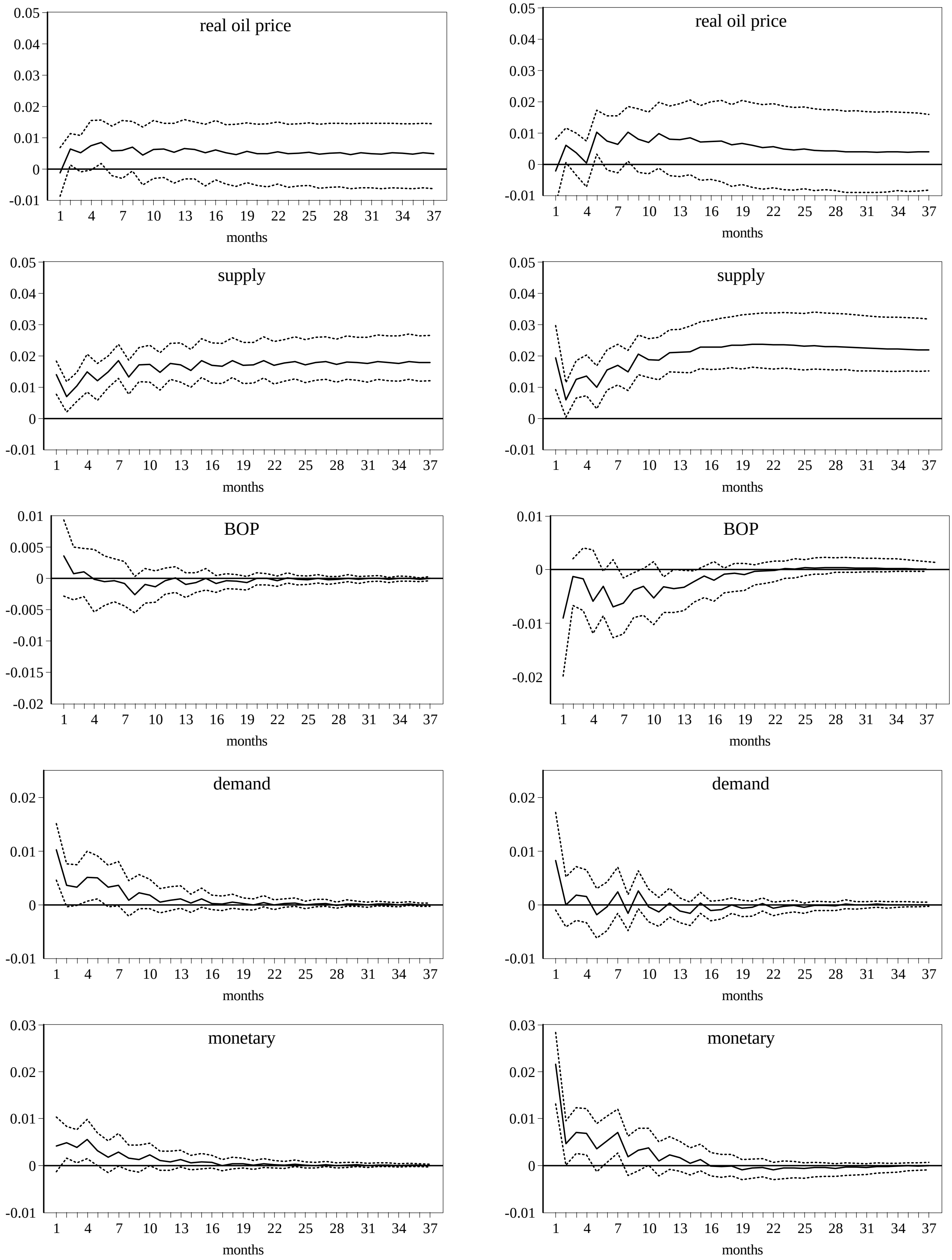
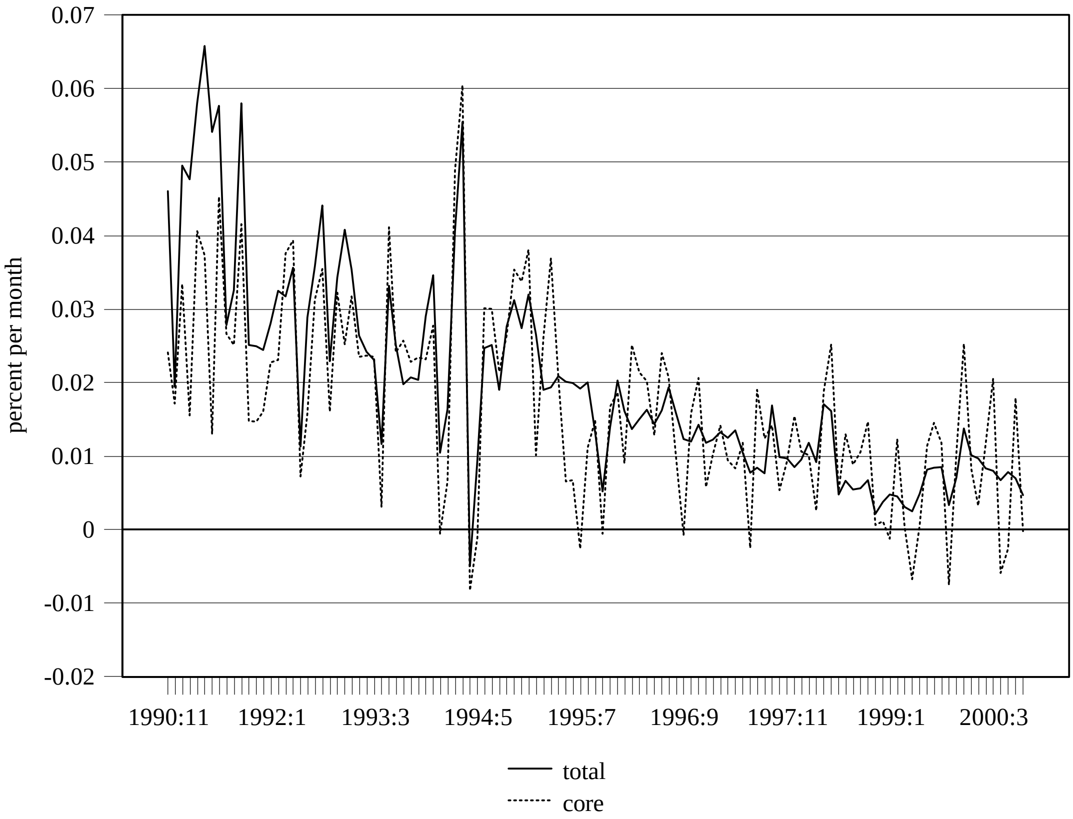
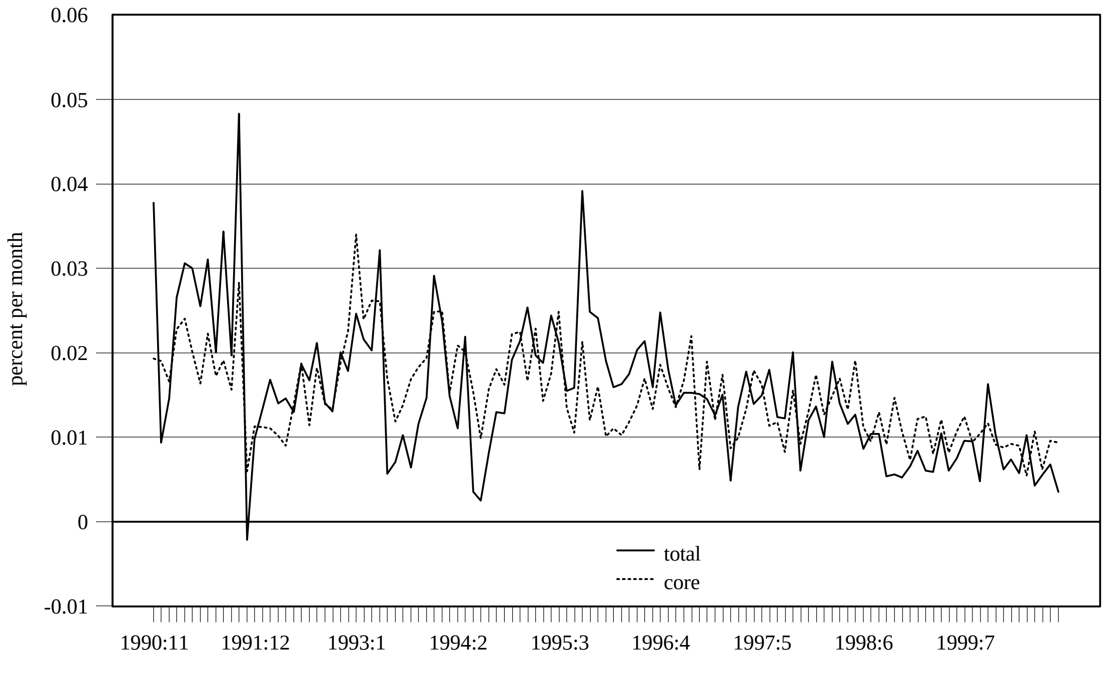


Figure 3. Core and non-core inflation

a) Poland



b) Hungary



ZEI Papers

ZEI Policy Paper B97-01	A Stability Pact for Europe (a Forum organized by ZEI)
ZEI Policy Paper B97-02	Employment and EMU (Deutsch-Französisches Wirtschaftspolitisches Forum/ Forum Economique Franco-Allemand)
ZEI Policy Paper B97-03	Liberalising European Markets for Energy and Telecommunications: Some Lessons from the US Electric Utility Industry (Tom Lyon and John Mayo)
ZEI Policy Paper B97-04	Macroeconomic Stabilization with a Common Currency: Does European Monetary Unification Create a Need for Fiscal Insurance or Federalism? (Kenneth Kletzer)
ZEI Policy Paper B98-01	Budgeting Institutions for Aggregate Fiscal Discipline (Jürgen von Hagen)
ZEI Policy Paper B98-02	Trade with Low-Wage Countries and Wage Inequality (Jaleel Ahmad)
ZEI Policy Paper B98-03	Central Bank Policy in a More Perfect Financial System (Jürgen von Hagen and Ingo Fender)
ZEI Policy Paper B98-04	The EMU`s Exchange Rate Policy (Deutsch-Französisches Wirtschaftspolitisches Forum/ Forum Economique Franco-Allemand)
ZEI Policy Paper B98-05	Estimating a European Demand for Money (Bernd Hayo)
ZEI Policy Paper B98-06	Monetary Union, Asymmetric Productivity Shocks and Fiscal Insurance: an Analytical Discussion of Welfare Issues (Kenneth M. Kletzer)
ZEI Policy Paper B98-07	Designing Voluntary Environmental Agreements in Europe: Some Lessons from the U.S. EPA`s 33/50 Program (John W. Maxwell)
ZEI Working Paper B98-08	Money-Output Granger Causality Revisited: An Empirical Analysis of EU Countries (Bernd Hayo)
ZEI Working Paper B98-09	US Monetary Policy AND Monetary Policy and the ESCB (Robert L. Hetzel)
ZEI Policy Paper B98-10	Der Wettbewerb der Rechts- und politischen Systeme in der Europäischen Union (Martin Seidel)

You can download these papers at the ZEI web site www.zei.de

ZEI Working Paper B98-11	Exchange Rate Regimes in the Transition Economies: Case Study of the Czech Republic: 1990-1997 (Julius Horvath)
ZEI Policy Paper B98-11A	Die Bewertung der „ dauerhaft tragbaren öffentlichen Finanzlage“ der EU Mitgliedstaaten beim Übergang zur dritten Stufe der EWWU (Rolf Strauch)
ZEI Working Paper B98-12	Price Stability and Monetary Policy Effectiveness when Nominal Interest Rates are Bounded at Zero (Athanasios Orphanides and Volker Wieland)
ZEI Working Paper B98-13	Fiscal Policy and Intranational Risk-Sharing (Jürgen von Hagen)
ZEI Working Paper B98-14	Free Trade and Arms Races: Some Thoughts Regarding EU-Russian Trade (Rafael Reuveny and John Maxwell)
ZEI Working Paper B98-15	Can Taxing Foreign Competition Harm the Domestic Industry? (Stefan Lutz)
ZEI Policy Paper B98-16	Labour Market & Tax Policy in the EMU (Deutsch-Französisches Wirtschaftspolitisches Forum/ Forum Economique Franco-Allemand)
ZEI Working Paper B99-01	The Excess Volatility of Foreign Exchange Rates: Statistical Puzzle or Theoretical Artifact? (Robert B.H. Hauswald)
ZEI Working Paper B99-02	The Consequences of Labour Market Flexibility: Panel Evidence Based on Survey Data (Rafael Di Tella and Robert MacCulloch)
ZEI Working Paper B99-03	The Macroeconomics of Happiness (Rafael Di Tella, Robert MacCulloch and Andrew J. Oswald)
ZEI Working Paper B99-04	The Finance-Investment Link in a Transition Economy: Evidence for Poland from Panel Data (Christian Weller)
ZEI Working Paper B99-05	Tumbling Giant: Germany`s Experience with the Maastricht Fiscal Criteria (Jürgen von Hagen and Rolf Strauch)
ZEI Working Paper B99-06	Productivity Convergence and Economic Growth: A Frontier Production Function Approach (Christopher M. Cornwell and Jens-Uwe Wächter)

ZEI Working Paper B99-07	Comovement and Catch-up in Productivity Across Sectors: Evidence from the OECD (Christopher M. Cornwell and Jens-Uwe Wächter)
ZEI Working Paper B99-08	The Connection Between More Multinational Banks and Less Real Credit in Transition Economies (Christian Weller)
ZEI Working Paper B99-09	Monetary Policy, Parameter Uncertainty and Optimal Learning (Volker Wieland)
ZEI Working Paper B99-10	Financial Liberalization, Multinational Banks and Credit Supply: the Case of Poland (Christian Weller)
ZEI Policy Paper B99-11	Financial Supervision and Policy Coordination in the EMU (Deutsch-Französisches Wirtschaftspolitisches Forum / Forum Economique Franco-Allemand)
ZEI Working Paper B99-12	Size Distortions of Tests of the Null Hypothesis of Stationarity: Evidence and Implications for Applied Work (Mehmet Caner and Lutz Kilian)
ZEI Working Paper B99-13	Financial Fragility or What Went Right and What Could Go Wrong in Central European Banking? (Christian E. Weller and Jürgen von Hagen)
ZEI Working Paper B99-14	Industry Effects of Monetary Policy in Germany (Bernd Hayo and Birgit Uhlenbrock)
ZEI Working Paper B99-15	Financial Crises after Financial Liberalization: Exceptional Circumstances or Structural Weakness? (Christian E. Weller)
ZEI Working Paper B99-16	Multinational Banks and Development Finance (Christian E. Weller and Mark J. Scher)
ZEI Working Paper B99-17	Stability of Monetary Unions: Lessons from the Break-up of Czechoslovakia (Jan Fidrmuc, Julius Horvath and Jarko Fidrmuc)
ZEI Working Paper B99-18	Why are Eastern Europe`s Banks not failing when everybody else`s are? (Christian E. Weller and Bernard Morzuch)
ZEI Working Paper B99-19	The Evolution of Monetary Policy in Transition Economies (Ali M. Kutan and Josef C. Brada)
ZEI Working Paper B99-20	Subnational Government Bailouts in Germany (Helmut Seitz)

ZEI Working Paper B99-21	The End of Moderate Inflation in Three Transition Economies? (Josef C. Brada and Ali M. Kutan)
ZEI Working Paper B99-22	Partisan Social Happiness (Rafael Di Tella and Robert MacCulloch)
ZEI Working Paper B99-23	Informal Family Insurance and the Design of the Welfare State (Rafael Di Tella and Robert MacCulloch)
ZEI Working Paper B99-24	What Makes a Revolution? (Robert MacCulloch)
ZEI Working Paper B99-25	Micro and Macro Determinants of Public Support for Market Reforms in Eastern Europe (Bernd Hayo)
ZEI Working Paper B99-26	Skills, Labour Costs, and Vertically Differentiated Industries: a General Equilibrium Analysis (Stefan Lutz and Alessandro Turrini)
ZEI Working Paper B00-01	Monetary Union and Fiscal Federalism (Kenneth Kletzer and Jürgen von Hagen)
ZEI Working Paper B00-02	Inflation Bias and Productivity Shocks in Transition Economies: The Case of the Czech Republic (Josef C. Brada, Arthur E. King and Ali M. Kutan)
ZEI Working Paper B00-03	Integration, Disintegration and Trade in Europe: Evolution of Trade Relations During the 1990`s (Jarko Fidrmuc and Jan Fidrmuc)
ZEI Policy Paper B00-04	A New Political Culture in the EU – Democratic Accountability of the ECB (Christa Randzio-Plath)
ZEI Working Paper B00-05	Liberalization, Democracy and Economic Performance during Transition (Jan Fidrmuc)
ZEI Working Paper B00-06	The Demand for Money in Austria (Bernd Hayo)
ZEI Policy Paper B00-07	EMU and Economic Growth in Europe (Deutsch-Französisches Wirtschaftspolitisches Forum / Forum Economique Franco-Allemand)
ZEI Working Paper B00-08	The Effectiveness of Self-Protection Policies for Safeguarding Emerging Market Economies from Crises (Kenneth Kletzer)
ZEI Working Paper B00-09	Rational Institutions Yield Hysteresis (Rafael Di Tella and Robert MacCulloch)
ZEI Working Paper B00-10	The Importance of Domestic Political Institutions: Why and How Belgium and Italy qualified for EMU (Mark Hallerberg)

You can download these papers at the ZEI web site www.zei.de

ZEI Working Paper B00-11	A Dynamic Approach to Inflation Targeting in Transition Economies (Lucjan T. Orlowski)
ZEI Policy Paper B00-12	Rechtsetzung und Rechtsangleichung als Folge der einheitlichen europäischen Währung (Martin Seidel)
ZEI Working Paper B00-13	Back to the Future: The Growth Prospects of Transition Economies Reconsidered (Nauro F. Campos)
ZEI Working Paper B00-14	Sources of Real Exchange Rate Fluctuations in Transition Economies: The Case of Poland and Hungary (Selahattin Dibooglu and Ali M. Kutan)
ZEI Working Paper B00-15	Regional Risksharing and Redistribution in the German Federation (Jürgen von Hagen and Ralf Hepp)
ZEI Policy Paper B00-16	The European Central Bank: Independence and Accountability (Christa Randzio-Plath and Tomasso Padoa-Schioppa)
ZEI Policy Paper B00-17	Rückführung der Landwirtschaftspolitik in die Verantwortung der Mitgliedsstaaten? – Rechts- und Verfassungsfragen des Gemeinschaftsrechts (Martin Seidel)
ZEI Working Paper B00-18	Budget Processes: Theory and Experimental Evidence (Karl-Martin Ehrhart, Roy Gardner, Jürgen v. Hagen and Claudia Keser)
ZEI Working Paper B00-19	Income Dynamics and Stability in the Transition Process – General Reflections applied to the Czech Republic (Jens Hölscher)
ZEI Working Paper B00-20	Breaking-Up a Nation, from the Inside (Etienne Farvaque)
ZEI Working Paper B01-01	Divided Boards: Partisanship through Delegated Monetary Policy (Etienne Farvaque, Gaël Lagadec)
ZEI Working Paper B01-02	The Konstanz Seminar on Monetary Theory and Policy at Thirty (Michele Fratianni, Jürgen von Hagen)
ZEI Working Paper B01-03	Preferences over Inflation and Unemployment: Evidence from Surveys of Happiness (Rafael di Tella, Robert J. MacCulloch and Andrew J. Oswald)
ZEI Working Paper B01-04	The Determination of Umemployment Benefits (Rafael di Tella and Robert J. MacCulloch)

You can download these papers at the ZEI web site www.zei.de

ZEI-Policy Paper B01-05	Trade Rules and Global Governance: A Long Term Agenda / The Future of Banking (Deutsch-Französisches Wirtschaftspolitisches Forum/ Forum Economique Franco-Allemand)
ZEI Working Paper B01-06	Opposites Attract: The Case of Greek and Turkish Financial Markets (Konstantinos Drakos and Ali M. Kutan)
ZEI Working Paper B01-07	The Convergence of Monetary Policy between Candidate Countries and the European Union (Josef C. Brada and Ali M. Kutan)
ZEI Working Paper B01-08	The Functioning of Economic Policy Coordination (Jürgen von Hagen and Susanne Mundschenk)
ZEI Working Paper B01-09	Democracy in Transition Economies: Grease or Sand in the Wheels of Growth? (Jan Fidrmuc)
ZEI Working Paper B01-10	Integration of the Baltic States into the EU and Institutions of Fiscal Convergence: A Critical Evaluation of Key Issues and Empirical Evidence (Ali M. Kutan and Niina Pautola-Mol)
ZEI Working Paper B01-11	Inflationary Performance in a Monetary Union with Large Wage Setters (Lilia Cavallari)
ZEI Policy Paper B01-12	The Impact of Eastern Enlargement on EU-Labour Markets / Pensions Reform Between Economic and Political Problems (Deutsch-Französisches Wirtschaftspolitisches Forum/Forum Economique Franco-Allemand)
ZEI Working Paper B01-13	German Public Finances: Recent Experiences and Future Challenges (Jürgen von Hagen und Rolf R. Strauch)
ZEI Working Paper B01-14	Formal Fiscal Restraints and Budget Processes as Solutions to a Deficit and Spending Bias in Public Finances – U.S. Experience and Possible Lessons for EMU (Rolf Strauch and Jürgen von Hagen)
ZEI Working Paper B01-15	Programs without Alternative: Public Pensions in the OECD (Christian E. Weller)
ZEI Working Paper B01-16	Sources of Inflation and Output Fluctuations in Poland and Hungary: Implications for Full Membership in the European Union (Selahattin Dibooglu and Ali M. Kutan)

You can download these papers at the ZEI web site www.zei.de

Figure 1. Response of the Price Level

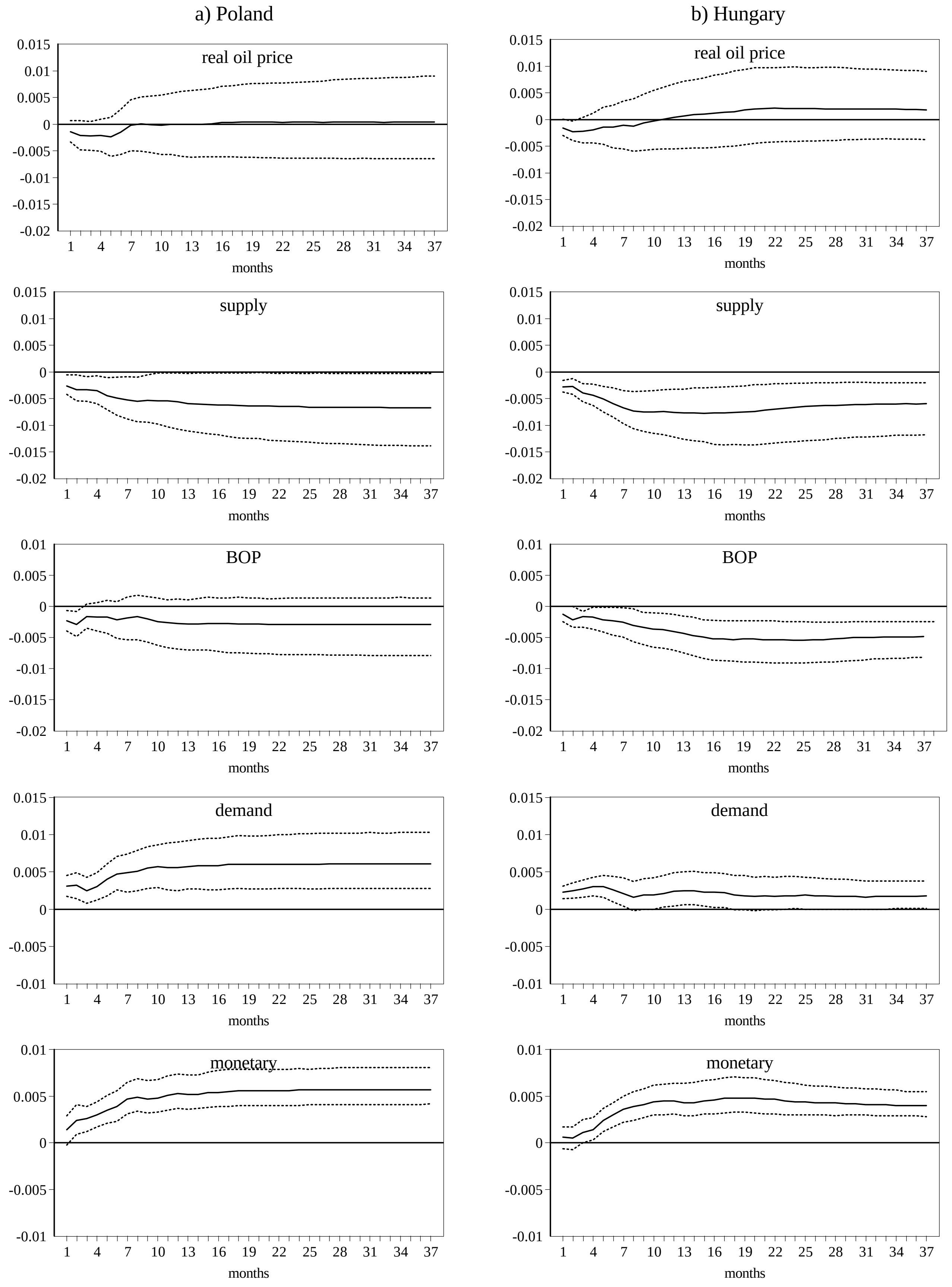


Figure 2. Responses of Output

a) Poland

b) Hungary

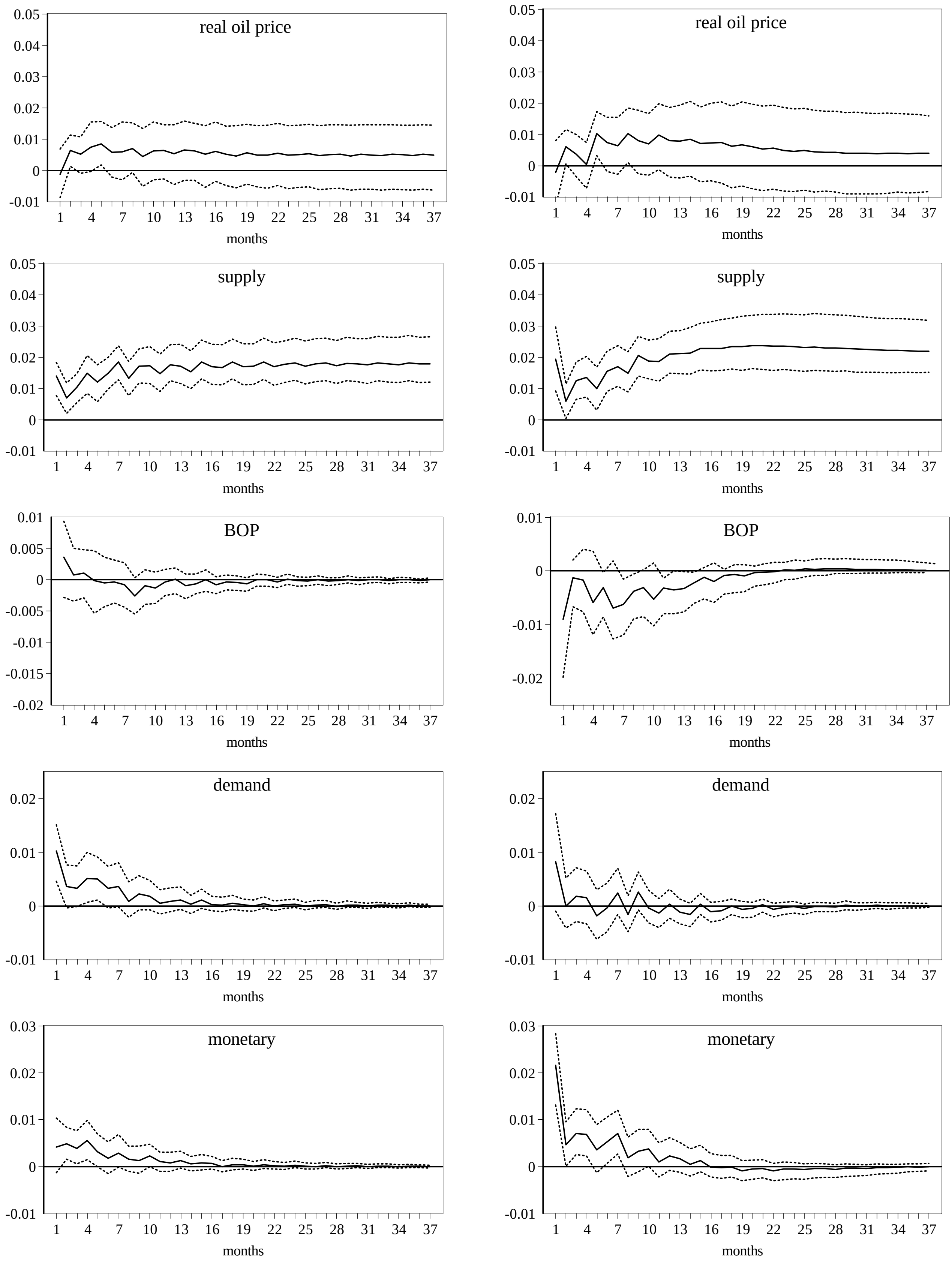
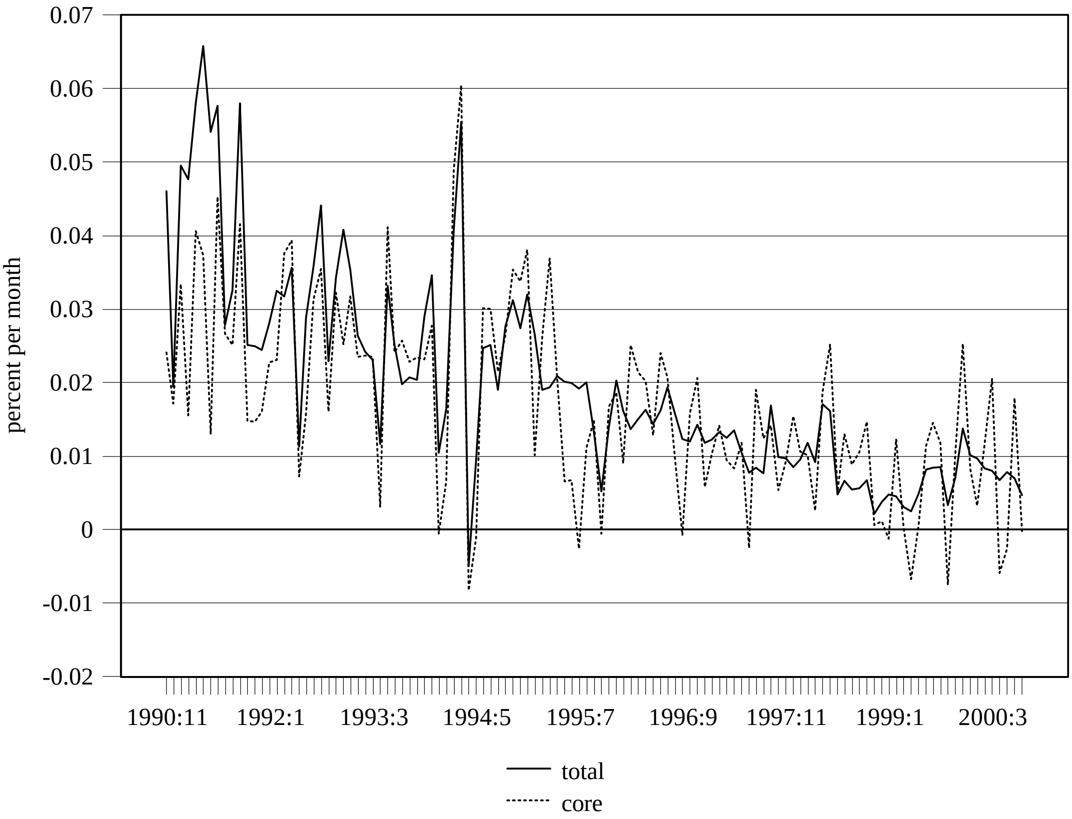
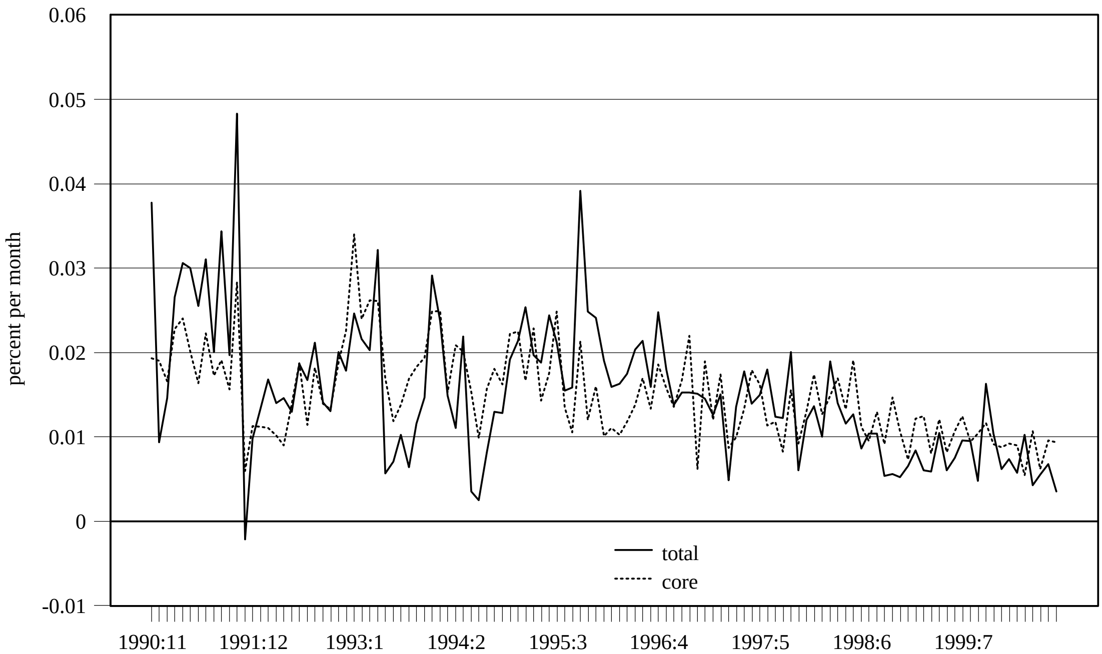


Figure 3. Core and non-core inflation

a) Poland



b) Hungary



2008		
B01-08	**Euro-Diplomatie durch gemeinsame „Wirtschaftsregierung“**	*Martin Seidel*
2007		
B03-07	**Löhne und Steuern im Systemwettbewerb der Mitgliedstaaten der Europäischen Union**	*Martin Seidel*
B02-07	**Konsolidierung und Reform der Europäischen Union**	*Martin Seidel*
B01-07	**The Ratification of European Treaties - Legal and Constitutional Basis of a European Referendum.**	*Martin Seidel*
2006		
B03-06	**Financial Frictions, Capital Reallocation, and Aggregate Fluctuations**	*Jürgen von Hagen, Haiping Zhang*
B02-06	**Financial Openness and Macroeconomic Volatility**	*Jürgen von Hagen, Haiping Zhang*
B01-06	**A Welfare Analysis of Capital Account Liberalization**	*Jürgen von Hagen, Haiping Zhang*
2005		
B11-05	**Das Kompetenz- und Entscheidungssystem des Vertrages von Rom im Wandel seiner Funktion und Verfassung**	*Martin Seidel*
B10-05	**Die Schutzklauseln der Beitrittsverträge**	*Martin Seidel*
B09-05	**Measuring Tax Burdens in Europe**	*Guntram B. Wolff*
B08-05	**Remittances as Investment in the Absence of Altruism**	*Gabriel González-König*
B07-05	**Economic Integration in a Multicone World?**	*Christian Volpe Martincus, Jennifer Pédussel Wu*
B06-05	**Banking Sector (Under?)Development in Central and Eastern Europe**	*Jürgen von Hagen, Valeriya Dinger*
B05-05	**Regulatory Standards Can Lead to Predation**	*Stefan Lutz*
B04-05	**Währungspolitik als Sozialpolitik**	*Martin Seidel*
B03-05	**Public Education in an Integrated Europe: Studying to Migrate and Teaching to Stay?**	*Panu Poutvaara*
B02-05	**Voice of the Diaspora: An Analysis of Migrant Voting Behavior**	*Jan Fidrmuc, Orla Doyle*
B01-05	**Macroeconomic Adjustment in the New EU Member States**	*Jürgen von Hagen, Iulia Traistaru*
2004		
B33-04	**The Effects of Transition and Political Instability On Foreign Direct Investment Inflows: Central Europe and the Balkans**	*Josef C. Brada, Ali M. Kutan, Taner M. Yigit*
B32-04	**The Choice of Exchange Rate Regimes in Developing Countries: A Mulitnominal Panal Analysis**	*Jürgen von Hagen, Jizhong Zhou*
B31-04	**Fear of Floating and Fear of Pegging: An Empirical Anaysis of De Facto Exchange Rate Regimes in Developing Countries**	*Jürgen von Hagen, Jizhong Zhou*
B30-04	**Der Vollzug von Gemeinschaftsrecht über die Mitgliedstaaten und seine Rolle für die EU und den Beitrittsprozess**	*Martin Seidel*
B29-04	**Deutschlands Wirtschaft, seine Schulden und die Unzulänglichkeiten der einheitlichen Geldpolitik im Eurosystem**	*Dieter Spethmann, Otto Steiger*
B28-04	**Fiscal Crises in U.S. Cities: Structural and Non-structural Causes**	*Guntram B. Wolff*
B27-04	**Firm Performance and Privatization in Ukraine**	*Galyna Grygorenko, Stefan Lutz*
B26-04	**Analyzing Trade Opening in Ukraine: Effects of a Customs Union with the EU**	*Oksana Harbuzyuk, Stefan Lutz*
B25-04	**Exchange Rate Risk and Convergence to the Euro**	*Lucjan T. Orlowski*
B24-04	**The Endogeneity of Money and the Eurosystem**	*Otto Steiger*
B23-04	**Which Lender of Last Resort for the Eurosystem?**	*Otto Steiger*
B22-04	**Non-Discretonary Monetary Policy: The Answer for Transition Economies?**	*Elham-Mafi Kreft, Steven F. Kreft*
B21-04	**The Effectiveness of Subsidies Revisited: Accounting for Wage and Employment Effects in Business R+D**	*Volker Reinthaler, Guntram B. Wolff*
B20-04	**Money Market Pressure and the Determinants of Banking Crises**	*Jürgen von Hagen, Tai-kuang Ho*
B19-04	**Die Stellung der Europäischen Zentralbank nach dem Verfassungsvertrag**	*Martin Seidel*

B18-04	**Transmission Channels of Business Cycles Synchronization in an Enlarged EMU**	*Iulia Traistaru*
B17-04	**Foreign Exchange Regime, the Real Exchange Rate and Current Account Sustainability: The Case of Turkey**	*Sübidey Togan, Hasan Ersel*
B16-04	**Does It Matter Where Immigrants Work? Traded Goods, Non-traded Goods, and Sector Specific Employment**	*Harry P. Bowen, Jennifer Pédussel Wu*
B15-04	**Do Economic Integration and Fiscal Competition Help to Explain Local Patterns?**	*Christian Volpe Martincus*
B14-04	**Euro Adoption and Maastricht Criteria: Rules or Discretion?**	*Jiri Jonas*
B13-04	**The Role of Electoral and Party Systems in the Development of Fiscal Institutions in the Central and Eastern European Countries**	*Sami Yläoutinen*
B12-04	**Measuring and Explaining Levels of Regional Economic Integration**	*Jennifer Pédussel Wu*
B11-04	**Economic Integration and Location of Manufacturing Activities: Evidence from MERCOSUR**	*Pablo Sanguinetti, Iulia Traistaru, Christian Volpe Martincus*
B10-04	**Economic Integration and Industry Location in Transition Countries**	*Laura Resmini*
B09-04	**Testing Creditor Moral Hazard in Souvereign Bond Markets: A Unified Theoretical Approach and Empirical Evidence**	*Ayse Y. Evrensel, Ali M. Kutan*
B08-04	**European Integration, Productivity Growth and Real Convergence**	*Taner M. Yigit, Ali M. Kutan*
B07-04	**The Contribution of Income, Social Capital, and Institutions to Human Well-being in Africa**	*Mina Baliamoune-Lutz, Stefan H. Lutz*
B06-04	**Rural Urban Inequality in Africa: A Panel Study of the Effects of Trade Liberalization and Financial Deepening**	*Mina Baliamoune-Lutz, Stefan H. Lutz*
B05-04	**Money Rules for the Eurozone Candidate Countries**	*Lucjan T. Orlowski*
B04-04	**Who is in Favor of Enlargement? Determinants of Support for EU Membership in the Candidate Countries' Referenda**	*Orla Doyle, Jan Fidrmuc*
B03-04	**Over- and Underbidding in Central Bank Open Market Operations Conducted as Fixed Rate Tender**	*Ulrich Bindseil*
B02-04	**Total Factor Productivity and Economic Freedom Implications for EU Enlargement**	*Ronald L. Moomaw, Euy Seok Yang*
B01-04	**Die neuen Schutzklauseln der Artikel 38 und 39 des Beitrittsvertrages: Schutz der alten Mitgliedstaaten vor Störungen durch die neuen Mitgliedstaaten**	*Martin Seidel*
2003		
B29-03	**Macroeconomic Implications of Low Inflation in the Euro Area**	*Jürgen von Hagen, Boris Hofmann*
B28-03	**The Effects of Transition and Political Instability on Foreign Direct Investment: Central Europe and the Balkans**	*Josef C. Brada, Ali M. Kutan, Taner M. Yigit*
B27-03	**The Performance of the Euribor Futures Market: Efficiency and the Impact of ECB Policy Announcements (Electronic Version of International Finance)**	*Kerstin Bernoth, Juergen von Hagen*
B26-03	**Souvereign Risk Premia in the European Government Bond Market (überarbeitete Version zum Herunterladen)**	*Kerstin Bernoth, Juergen von Hagen, Ludger Schulknecht*
B25-03	**How Flexible are Wages in EU Accession Countries?**	*Anna Iara, Iulia Traistaru*
B24-03	**Monetary Policy Reaction Functions: ECB versus Bundesbank**	*Bernd Hayo, Boris Hofmann*
B23-03	**Economic Integration and Manufacturing Concentration Patterns: Evidence from Mercosur**	*Iulia Traistaru, Christian Volpe Martincus*
B22-03	**Reformzwänge innerhalb der EU angesichts der Osterweiterung**	*Martin Seidel*
B21-03	**Reputation Flows: Contractual Disputes and the Channels for Inter-Firm Communication**	*William Pyle*
B20-03	**Urban Primacy, Gigantism, and International Trade: Evidence from Asia and the Americas**	*Ronald L. Moomaw, Mohammed A. Alwosabi*
B19-03	**An Empirical Analysis of Competing Explanations of Urban Primacy Evidence from Asia and the Americas**	*Ronald L. Moomaw, Mohammed A. Alwosabi*

B18-03	**The Effects of Regional and Industry-Wide FDI Spillovers on Export of Ukrainian Firms**	*Stefan H. Lutz, Oleksandr Talavera, Sang-Min Park*
B17-03	**Determinants of Inter-Regional Migration in the Baltic States**	*Mihails Hazans*
B16-03	**South-East Europe: Economic Performance, Perspectives, and Policy Challenges**	*Iulia Traistaru, Jürgen von Hagen*
B15-03	**Employed and Unemployed Search: The Marginal Willingness to Pay for Attributes in Lithuania, the US and the Netherlands**	*Jos van Ommeren, Mihails Hazans*
B14-03	**FCIs and Economic Activity: Some International Evidence**	*Charles Goodhart, Boris Hofmann*
B13-03	**The IS Curve and the Transmission of Monetary Policy: Is there a Puzzle?**	*Charles Goodhart, Boris Hofmann*
B12-03	**What Makes Regions in Eastern Europe Catching Up? The Role of Foreign Investment, Human Resources, and Geography**	*Gabriele Tondl, Goran Vuksic*
B11-03	**Die Weisungs- und Herrschaftsmacht der Europäischen Zentralbank im europäischen System der Zentralbanken - eine rechtliche Analyse**	*Martin Seidel*
B10-03	**Foreign Direct Investment and Perceptions of Vulnerability to Foreign Exchange Crises: Evidence from Transition Economies**	*Josef C. Brada, Vladimír Tomsík*
B09-03	**The European Central Bank and the Eurosystem: An Analysis of the Missing Central Monetary Institution in European Monetary Union**	*Gunnar Heinsohn, Otto Steiger*
B08-03	**The Determination of Capital Controls: Which Role Do Exchange Rate Regimes Play?**	*Jürgen von Hagen, Jizhong Zhou*
B07-03	**Nach Nizza und Stockholm: Stand des Binnenmarktes und Prioritäten für die Zukunft**	*Martin Seidel*
B06-03	**Fiscal Discipline and Growth in Euroland. Experiences with the Stability and Growth Pact**	*Jürgen von Hagen*
B05-03	**Reconsidering the Evidence: Are Eurozone Business Cycles Converging?**	*Michael Massmann, James Mitchell*
B04-03	**Do Ukrainian Firms Benefit from FDI?**	*Stefan H. Lutz, Oleksandr Talavera*
B03-03	**Europäische Steuerkoordination und die Schweiz**	*Stefan H. Lutz*
B02-03	**Commuting in the Baltic States: Patterns, Determinants, and Gains**	*Mihails Hazans*
B01-03	**Die Wirtschafts- und Währungsunion im rechtlichen und politischen Gefüge der Europäischen Union**	*Martin Seidel*
2002		
B30-02	**An Adverse Selection Model of Optimal Unemployment Assurance**	*Marcus Hagedorn, Ashok Kaul, Tim Mennel*
B29B-02	**Trade Agreements as Self-protection**	*Jennifer Pédussel Wu*
B29A-02	**Growth and Business Cycles with Imperfect Credit Markets**	*Debajyoti Chakrabarty*
B28-02	**Inequality, Politics and Economic Growth**	*Debajyoti Chakrabarty*
B27-02	**Poverty Traps and Growth in a Model of Endogenous Time Preference**	*Debajyoti Chakrabarty*
B26-02	**Monetary Convergence and Risk Premiums in the EU Candidate Countries**	*Lucjan T. Orlowski*
B25-02	**Trade Policy: *Institutional* Vs. *Economic* Factors**	*Stefan Lutz*
B24-02	**The Effects of Quotas on Vertical Intra-industry Trade**	*Stefan Lutz*
B23-02	**Legal Aspects of European Economic and Monetary Union**	*Martin Seidel*
B22-02	**Der Staat als *Lender of Last Resort* - oder: Die Achillesverse des Eurosystems**	*Otto Steiger*
B21-02	**Nominal and Real Stochastic Convergence Within the Transition Economies and to the European Union: Evidence from Panel Data**	*Ali M. Kutan, Taner M. Yigit*
B20-02	**The Impact of News, Oil Prices, and International Spillovers on Russian Fincancial Markets**	*Bernd Hayo, Ali M. Kutan*

B19-02	**East Germany: Transition with Unification, Experiments and Experiences**	*Jürgen von Hagen, Rolf R. Strauch, Guntram B. Wolff*
B18-02	**Regional Specialization and Employment Dynamics in Transition Countries**	*Iulia Traistaru, Guntram B. Wolff*
B17-02	**Specialization and Growth Patterns in Border Regions of Accession Countries**	*Laura Resmini*
B16-02	**Regional Specialization and Concentration of Industrial Activity in Accession Countries**	*Iulia Traistaru, Peter Nijkamp, Simonetta Longhi*
B15-02	**Does Broad Money Matter for Interest Rate Policy?**	*Matthias Brückner, Andreas Schaber*
B14-02	**The Long and Short of It: Global Liberalization, Poverty and Inequality**	*Christian E. Weller, Adam Hersch*
B13-02	**De Facto and Official Exchange Rate Regimes in Transition Economies**	*Jürgen von Hagen, Jizhong Zhou*
B12-02	**Argentina: The Anatomy of A Crisis**	*Jiri Jonas*
B11-02	**The Eurosystem and the Art of Central Banking**	*Gunnar Heinsohn, Otto Steiger*
B10-02	**National Origins of European Law: Towards an Autonomous System of European Law?**	*Martin Seidel*
B09-02	**Monetary Policy in the Euro Area - Lessons from the First Years**	*Volker Clausen, Bernd Hayo*
B08-02	**Has the Link Between the Spot and Forward Exchange Rates Broken Down? Evidence From Rolling Cointegration Tests**	*Ali M. Kutan, Su Zhou*
B07-02	**Perspektiven der Erweiterung der Europäischen Union**	*Martin Seidel*
B06-02	**Is There Asymmetry in Forward Exchange Rate Bias? Multi-Country Evidence**	*Su Zhou, Ali M. Kutan*
B05-02	**Real and Monetary Convergence Within the European Union and Between the European Union and Candidate Countries: A Rolling Cointegration Approach**	*Josef C. Brada, Ali M. Kutan, Su Zhou*
B04-02	**Asymmetric Monetary Policy Effects in EMU**	*Volker Clausen, Bernd Hayo*
B03-02	**The Choice of Exchange Rate Regimes: An Empirical Analysis for Transition Economies**	*Jürgen von Hagen, Jizhong Zhou*
B02-02	**The Euro System and the Federal Reserve System Compared: Facts and Challenges**	*Karlheinz Ruckriegel, Franz Seitz*
B01-02	**Does Inflation Targeting Matter?**	*Manfred J. M. Neumann, Jürgen von Hagen*
2001		
B29-01	**Is Kazakhstan Vulnerable to the Dutch Disease?**	*Karlygash Kuralbayeva, Ali M. Kutan, Michael L. Wyzan*
B28-01	**Political Economy of the Nice Treaty: Rebalancing the EU Council. The Future of European Agricultural Policies**	*Deutsch-Französisches Wirtschaftspolitisches Forum*
B27-01	**Investor Panic, IMF Actions, and Emerging Stock Market Returns and Volatility: A Panel Investigation**	*Bernd Hayo, Ali M. Kutan*
B26-01	**Regional Effects of Terrorism on Tourism: Evidence from Three Mediterranean Countries**	*Konstantinos Drakos, Ali M. Kutan*
B25-01	**Monetary Convergence of the EU Candidates to the Euro: A Theoretical Framework and Policy Implications**	*Lucjan T. Orlowski*
B24-01	**Disintegration and Trade**	*Jarko and Jan Fidrmuc*
B23-01	**Migration and Adjustment to Shocks in Transition Economies**	*Jan Fidrmuc*
B22-01	**Strategic Delegation and International Capital Taxation**	*Matthias Brückner*
B21-01	**Balkan and Mediterranean Candidates for European Union Membership: The Convergence of Their Monetary Policy With That of the Europaen Central Bank**	*Josef C. Brada, Ali M. Kutan*
B20-01	**An Empirical Inquiry of the Efficiency of Intergovernmental Transfers for Water Projects Based on the WRDA Data**	*Anna Rubinchik-Pessach*
B19-01	**Detrending and the Money-Output Link: International Evidence**	*R.W. Hafer, Ali M. Kutan*

B18-01	**Monetary Policy in Unknown Territory. The European Central Bank in the Early Years**	*Jürgen von Hagen, Matthias Brückner*
B17-01	**Executive Authority, the Personal Vote, and Budget Discipline in Latin American and Carribean Countries**	*Mark Hallerberg, Patrick Marier*
B16-01	**Sources of Inflation and Output Fluctuations in Poland and Hungary: Implications for Full Membership in the European Union**	*Selahattin Dibooglu, Ali M. Kutan*
B15-01	**Programs Without Alternative: Public Pensions in the OECD**	*Christian E. Weller*
B14-01	**Formal Fiscal Restraints and Budget Processes As Solutions to a Deficit and Spending Bias in Public Finances - U.S. Experience and Possible Lessons for EMU**	*Rolf R. Strauch, Jürgen von Hagen*
B13-01	**German Public Finances: Recent Experiences and Future Challenges**	*Jürgen von Hagen, Rolf R. Strauch*
B12-01	**The Impact of Eastern Enlargement On EU-Labour Markets. Pensions Reform Between Economic and Political Problems**	*Deutsch-Französisches Wirtschaftspolitisches Forum*
B11-01	**Inflationary Performance in a Monetary Union With Large Wage Setters**	*Lilia Cavallar*
B10-01	**Integration of the Baltic States into the EU and Institutions of Fiscal Convergence: A Critical Evaluation of Key Issues and Empirical Evidence**	*Ali M. Kutan, Niina Pautola-Mol*
B09-01	**Democracy in Transition Economies: Grease or Sand in the Wheels of Growth?**	*Jan Fidrmuc*
B08-01	**The Functioning of Economic Policy Coordination**	*Jürgen von Hagen, Susanne Mundschenk*
B07-01	**The Convergence of Monetary Policy Between Candidate Countries and the European Union**	*Josef C. Brada, Ali M. Kutan*
B06-01	**Opposites Attract: The Case of Greek and Turkish Financial Markets**	*Konstantinos Drakos, Ali M. Kutan*
B05-01	**Trade Rules and Global Governance: A Long Term Agenda. The Future of Banking.**	*Deutsch-Französisches Wirtschaftspolitisches Forum*
B04-01	**The Determination of Unemployment Benefits**	*Rafael di Tella, Robert J. MacCulloch*
B03-01	**Preferences Over Inflation and Unemployment: Evidence from Surveys of Happiness**	*Rafael di Tella, Robert J. MacCulloch, Andrew J. Oswald*
B02-01	**The Konstanz Seminar on Monetary Theory and Policy at Thirty**	*Michele Fratianni, Jürgen von Hagen*
B01-01	**Divided Boards: Partisanship Through Delegated Monetary Policy**	*Etienne Farvaque, Gael Lagadec*

2000

B20-00	**Breakin-up a Nation, From the Inside**	*Etienne Farvaque*
B19-00	**Income Dynamics and Stability in the Transition Process, general Reflections applied to the Czech Republic**	*Jens Hölscher*
B18-00	**Budget Processes: Theory and Experimental Evidence**	*Karl-Martin Ehrhart, Roy Gardner, Jürgen von Hagen, Claudia Keser*
B17-00	**Rückführung der Landwirtschaftspolitik in die Verantwortung der Mitgliedsstaaten? - Rechts- und Verfassungsfragen des Gemeinschaftsrechts**	*Martin Seidel*
B16-00	**The European Central Bank: Independence and Accountability**	*Christa Randzio-Plath, Tomasso Padoa-Schioppa*
B15-00	**Regional Risk Sharing and Redistribution in the German Federation**	*Jürgen von Hagen, Ralf Hepp*
B14-00	**Sources of Real Exchange Rate Fluctuations in Transition Economies: The Case of Poland and Hungary**	*Selahattin Dibooglu, Ali M. Kutan*
B13-00	**Back to the Future: The Growth Prospects of Transition Economies Reconsidered**	*Nauro F. Campos*

B12-00	**Rechtsetzung und Rechtsangleichung als Folge der Einheitlichen Europäischen Währung**	*Martin Seidel*
B11-00	**A Dynamic Approach to Inflation Targeting in Transition Economies**	*Lucjan T. Orlowski*
B10-00	**The Importance of Domestic Political Institutions: Why and How Belgium Qualified for EMU**	*Marc Hallerberg*
B09-00	**Rational Institutions Yield Hysteresis**	*Rafael Di Tella, Robert MacCulloch*
B08-00	**The Effectiveness of Self-Protection Policies for Safeguarding Emerging Market Economies from Crises**	*Kenneth Kletzer*
B07-00	**Financial Supervision and Policy Coordination in The EMU**	*Deutsch-Französisches Wirtschaftspolitisches Forum*
B06-00	**The Demand for Money in Austria**	*Bernd Hayo*
B05-00	**Liberalization, Democracy and Economic Performance during Transition**	*Jan Fidrmuc*
B04-00	**A New Political Culture in The EU - Democratic Accountability of the ECB**	*Christa Randzio-Plath*
B03-00	**Integration, Disintegration and Trade in Europe: Evolution of Trade Relations during the 1990's**	*Jarko Fidrmuc, Jan Fidrmuc*
B02-00	**Inflation Bias and Productivity Shocks in Transition Economies: The Case of the Czech Republic**	*Josef C. Barda, Arthur E. King, Ali M. Kutan*
B01-00	**Monetary Union and Fiscal Federalism**	*Kenneth Kletzer, Jürgen von Hagen*
1999		
B26-99	**Skills, Labour Costs, and Vertically Differentiated Industries: A General Equilibrium Analysis**	*Stefan Lutz, Alessandro Turrini*
B25-99	**Micro and Macro Determinants of Public Support for Market Reforms in Eastern Europe**	*Bernd Hayo*
B24-99	**What Makes a Revolution?**	*Robert MacCulloch*
B23-99	**Informal Family Insurance and the Design of the Welfare State**	*Rafael Di Tella, Robert MacCulloch*
B22-99	**Partisan Social Happiness**	*Rafael Di Tella, Robert MacCulloch*
B21-99	**The End of Moderate Inflation in Three Transition Economies?**	*Josef C. Brada, Ali M. Kutan*
B20-99	**Subnational Government Bailouts in Germany**	*Helmut Seitz*
B19-99	**The Evolution of Monetary Policy in Transition Economies**	*Ali M. Kutan, Josef C. Brada*
B18-99	**Why are Eastern Europe's Banks not failing when everybody else's are?**	*Christian E. Weller, Bernard Morzuch*
B17-99	**Stability of Monetary Unions: Lessons from the Break-Up of Czechoslovakia**	*Jan Fidrmuc, Julius Horvath and Jarko Fidrmuc*
B16-99	**Multinational Banks and Development Finance**	*Christian E.Weller and Mark J. Scher*
B15-99	**Financial Crises after Financial Liberalization: Exceptional Circumstances or Structural Weakness?**	*Christian E. Weller*
B14-99	**Industry Effects of Monetary Policy in Germany**	*Bernd Hayo and Birgit Uhlenbrock*
B13-99	**Fiancial Fragility or What Went Right and What Could Go Wrong in Central European Banking?**	*Christian E. Weller and Jürgen von Hagen*
B12 -99	**Size Distortions of Tests of the Null Hypothesis of Stationarity: Evidence and Implications for Applied Work**	*Mehmet Caner and Lutz Kilian*
B11-99	**Financial Supervision and Policy Coordination in the EMU**	*Deutsch-Französisches Wirtschaftspolitisches Forum*
B10-99	**Financial Liberalization, Multinational Banks and Credit Supply: The Case of Poland**	*Christian Weller*
B09-99	**Monetary Policy, Parameter Uncertainty and Optimal Learning**	*Volker Wieland*
B08-99	**The Connection between more Multinational Banks and less Real Credit in Transition Economies**	*Christian Weller*

B07-99	**Comovement and Catch-up in Productivity across Sectors: Evidence from the OECD**	*Christopher M. Cornwell and Jens-Uwe Wächter*
B06-99	**Productivity Convergence and Economic Growth: A Frontier Production Function Approach**	*Christopher M. Cornwell and Jens-Uwe Wächter*
B05-99	**Tumbling Giant: Germany‘s Experience with the Maastricht Fiscal Criteria**	*Jürgen von Hagen and Rolf Strauch*
B04-99	**The Finance-Investment Link in a Transition Economy: Evidence for Poland from Panel Data**	*Christian Weller*
B03-99	**The Macroeconomics of Happiness**	*Rafael Di Tella, Robert MacCulloch and Andrew J. Oswald*
B02-99	**The Consequences of Labour Market Flexibility: Panel Evidence Based on Survey Data**	*Rafael Di Tella and Robert MacCulloch*
B01-99	**The Excess Volatility of Foreign Exchange Rates: Statistical Puzzle or Theoretical Artifact?**	*Robert B.H. Hauswald*
1998		
B16-98	**Labour Market + Tax Policy in the EMU**	*Deutsch-Französisches Wirtschaftspolitisches Forum*
B15-98	**Can Taxing Foreign Competition Harm the Domestic Industry?**	*Stefan Lutz*
B14-98	**Free Trade and Arms Races: Some Thoughts Regarding EU-Russian Trade**	*Rafael Reuveny and John Maxwell*
B13-98	**Fiscal Policy and Intranational Risk-Sharing**	*Jürgen von Hagen*
B12-98	**Price Stability and Monetary Policy Effectiveness when Nominal Interest Rates are Bounded at Zero**	*Athanasios Orphanides and Volker Wieland*
B11A-98	**Die Bewertung der "dauerhaft tragbaren öffentlichen Finanzlage"der EU Mitgliedstaaten beim Übergang zur dritten Stufe der EWWU**	*Rolf Strauch*
B11-98	**Exchange Rate Regimes in the Transition Economies: Case Study of the Czech Republic: 1990-1997**	*Julius Horvath and Jiri Jonas*
B10-98	**Der Wettbewerb der Rechts- und politischen Systeme in der Europäischen Union**	*Martin Seidel*
B09-98	**U.S. Monetary Policy and Monetary Policy and the ESCB**	*Robert L. Hetzel*
B08-98	**Money-Output Granger Causality Revisited: An Empirical Analysis of EU Countries (überarbeitete Version zum Herunterladen)**	*Bernd Hayo*
B07-98	**Designing Voluntary Environmental Agreements in Europe: Some Lessons from the U.S. EPA's 33/50 Program**	*John W. Maxwell*
B06-98	**Monetary Union, Asymmetric Productivity Shocks and Fiscal Insurance: an Analytical Discussion of Welfare Issues**	*Kenneth Kletzer*
B05-98	**Estimating a European Demand for Money (überarbeitete Version zum Herunterladen)**	*Bernd Hayo*
B04-98	**The EMU's Exchange Rate Policy**	*Deutsch-Französisches Wirtschaftspolitisches Forum*
B03-98	**Central Bank Policy in a More Perfect Financial System**	*Jürgen von Hagen / Ingo Fender*
B02-98	**Trade with Low-Wage Countries and Wage Inequality**	*Jaleel Ahmad*
B01-98	**Budgeting Institutions for Aggregate Fiscal Discipline**	*Jürgen von Hagen*
1997		
B04-97	**Macroeconomic Stabilization with a Common Currency: Does European Monetary Unification Create a Need for Fiscal Insurance or Federalism?**	*Kenneth Kletzer*
B-03-97	**Liberalising European Markets for Energy and Telecommunications: Some Lessons from the US Electric Utility Industry**	*Tom Lyon / John Mayo*
B02-97	**Employment and EMU**	*Deutsch-Französisches Wirtschaftspolitisches Forum*
B01-97	**A Stability Pact for Europe**	*(a Forum organized by ZEI)*

ISSN 1436 - 6053

Zentrum für Europäische Integrationsforschung
Center for European Integration Studies
Rheinische Friedrich-Wilhelms-Universität Bonn

Walter-Flex-Strasse 3
D-53113 Bonn
Germany

Tel.: +49-228-73-1732
Fax: +49-228-73-1809
www.zei.de