Central Bank Reform and Inflation Dynamics in the Transition Economies: Theory and some evidence

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Abstract:

This paper examines the question whether CBI is an appropriate monetary institution for transition economies to change inflation dynamics and foster the transition process to a stable and efficient market economy. In this respect, we provide theoretical arguments and find empirical evidence. The time-series empirical approach used to determine the most likely date for the change in regime was based on Perron (1997), where the null hypothesis of a unit root is set against the alternative of stationarity about a single broken trend. The empirical results lead to the conclusion that the process of decontrol of domestic prices (or price liberalization) has a significant positive impact on inflation persistence in transition countries. However, in the presence of controls, there is no evidence to support conventional wisdom regarding the negative relation between CBI and inflation persistence. A reason for this conclusion is that such CBI is instrumental in reducing inflation persistence only when other structural features of the economy, such as the price liberalization, have become sufficiently and persistently similar to those of developed market economies. Consequently, in a period of severe macroeconomic imbalances, CBI doesn't seem to be an institutional arrangement effective to stabilize the economy.

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1. Introduction

During the last decade all Central and Eastern European (CEE) countries created completely new Central Bank (CB) laws, or reformed existing laws, at least once and sometime twice (Cukierman et *al*., 2002). In all these countries the new CB laws contain at least basic provisions for Central Bank Independence (CBI) and the average level of independence is high. The main factor motivating behind this central banks reform has been the belief that monetary policy lead to the famous dynamic inconsistency problem that arises when the optimal policy before the private agent's contracts are set is different from the optimal policy afterwards (Kydland and Prescott, 1977; Barro and Gordon, 1983). In this context, delegating monetary policy to an independent central banker (Rogoff, 1985) may be an institutional mechanism intended to mitigate the time inconsistency problem and increase the credibility of policymakers' commitments to stable prices.

There is now a wide consensus among economists that, at least in industrial economies, central banks should be independent. However, the question is whether this argument can automatically be transferred to CEE countries as well. In this paper we concentrate on the following question. Is central bank independence an appropriate monetary institution for transition economies to change inflation dynamics and foster the transition process to a stable and efficient market economy, or does it trend to lead to counter-productive effects?

Indeed, monetary policy framework reform in CEE countries includes a new definition of the role of monetary policy, which implies main structural changes with respect to institutional, strategic and instrumental aspects. Transforming such centrally planned economies into market-oriented economies, and thus trying to use monetary policy as an instrument for macroeconomic stabilization, changed its character fundamentally. It implied a switch from a complete accommodating to a non-accommodating policy (Wagner, 1999). On the other hand, specific features of transition economies may distort the influence of the

independence of central bank on inflation performance (Cukierman 1996). The initial stage of economic transformation was characterised by severe macroeconomic imbalances. Price liberalisation and devaluation of the currency, combined with an initial monetary overhang, produced substantial shocks to inflation. Although newly established central banks were generally provided with a considerable degree of statutory independence, the legal framework varies considerably from country to country and over time. Weak constraints on the amount of credit granted to the government significantly reduce central banks' ability to conduct independent monetary policy. Finally, the CEE countries quickly opened up their economies, running large deficits financed by borrowing from international institutions and, when they regained confidence, at financial markets. High deficits, combined with low level of international reserves and fragility of domestic financial systems make them highly vulnerable to balance of payments crises. Thus, macroeconomic imbalances, credit-hungry governments and underdeveloped financial systems produce an environment in which central bank independence is thoroughly tested.

In this context, the Central Bank reform in the transition experience of CEE countries provides a unique opportunity to examine the relationship between CBI and the inflation dynamics in environments with major structural changes and high inflation rates. Early attempts to explore the question of CBI in post-communist states started from descriptive studies by Hinton-Braaten (1994), Hochreiter (1994) and Hochreiter and Riesinger (1995). Sundararajan et al. (1997), following the same approach discuss CB reforms in former Soviet Union and Radzyner and Riesinger (1997) present an extensive review of central bank legal independence in the Czech and Slovak Republics, Hungary, Poland and Slovenia. Siklos (1994) constructs the first index of legal independence for Czech Republic, Hungary, Poland and Slovak Republic. This index is based on the Cukierman et al's (1992) methodology, but introduces some additional elements specific to transition economies. Eijffinger and Van

Keulen (1995) investigate also the new CB laws of Czech Republic, Hungary and Poland by presenting several indices of political independence for a broader group of eleven countries. Loungani and Sheets (1997) examine CBI in twelve post-communist countries by deriving two indices of CBI. The first covers goal, economic and political independence and the second assess similarity between the analysed law and the Bundesbank statute. A strong negative correlation between the measures of independence and the 1993 inflation rate emerges, even after controlling for fiscal performance and the overall reform progress.

More recently, Cukierman, Miller and Neyapti (2002) present the most comprehensive study on CBI in transition economies to date. The authors construct CB independence index based on Cukierman et al's (1992) methodology for 26 post-communist economies, accounting for some recent changes in the laws. The main finding of the Cukierman et al. (2002) study is that CBI is negatively related to inflation only at a sufficiently high and sustained level of economic liberalisation. Thus, the CBI cannot protect economies from inflationary consequences of the powerful inflationary shocks experienced at the early stage of transformation. These findings are consistent with a recent study of de Melo, Denizer and Gelb (1996) who also reports that inflation is lower in transition economies with a higher level of sustained liberalization. Thus even high central bank independence cannot contain the initial powerful inflationary impact of price decontrols. But once the process of liberalization has gathered sufficient momentum legal independence become effective in reducing inflation. This finding may appear surprising, but in some cases after the enactment of Central Bank law most CEE economies experienced high and variable inflation.

This raises an important question. Why should CBI be more effective in containing inflation at higher than at lower levels of cumulative liberalization? To answer at this question, most existing studies on inflation and CBI are basically cross-sectional (see Cukierman, Miller and Neyapti, 2002). Indeed, this purely cross sectional focus is dictated by

the absence of meaningful temporal variation in existing measures of legal CBI. But in the case of transition economies there were, during the early 1990s, dramatic changes in CBI within all the countries concerned. This raises two additional and related questions. Did the enactment of new CB laws have a noticeable effect on inflation? And was the decrease in inflation bigger in countries that experienced a larger increase in the independence of their Central Banks? These questions can be answered by utilizing the cross-country variation, as well as the over time variation in CBI. The intention of the paper is twofold: Firstly we formulate a theoretical model in which we analyse the effects of central bank independence on inflation dynamics (or persistence) in transition countries. Secondly, we explore empirically, in a time-series context whether and how the CBI in transition countries affected the degree of inflation persistence in these countries. In this respect, we focus on changes in the policy regime (central bank reform) as phenomena that lead to shifts in the degree of inflation persistence in these countries. The technique used in this paper tests for one or more discrete shifts in the inflation process occurring at unknown dates, using some time series statistical tests. It consists of testing for an unknown break point in a time series and it is based upon the recently advanced work by Perron (1997), which proposes a series of tests where the null hypothesis of a unit root is set against the alternative of stationarity about a single broken trend line.

The rest of the paper is organized as follows. Section 2 sets up the theoretical framework. Section 3 analyses the effects of the intensity of liberalizing internal (output) markets on the inflation persistence (or inflation dynamics) in transition countries and takes a deeper look at the potential existence of an interaction between independence of central bank and the price liberalization. Section 5 presents the econometric methodology and empirical results. Section 6 summarizes the main conclusions of the paper.

2. The Theoretical Framework

This section provides a simple monetary policy game model to frame our analysis in the context of a transition economy. We consider a Barro-Gordon (1983) type of model extended to allow for persistent stochastic output shocks and indexed wage contracts (Gray, 1976; Fischer, 1983) in order to capture the extent of liberalization respectively in output and labour markets. Capital will be assumed fixed in the short-run, and output is given by the short-run production function[1]:

$$y_t = \alpha\, l_t + \theta_t \ , \qquad 0 < \alpha < 1 \qquad (1)$$

where y_t is the log of output, l_t is the log of employment, and θ_t is a measure of productivity shocks assumed to follow the process:

$$\theta_t = \phi\theta_{t-1} + \varepsilon_t \ , \qquad 0 \le \phi \le 1 \qquad (2)$$

where ϕ is the degree of autocorrelation in output random shocks and ε_t is a normally distributed random variable with zero mean and a variance varying with ϕ so as to standardize the variance of θ_t at σ_θ^2, that is $\varepsilon_t \approx N[0, (1-\xi^2)\sigma_\theta^2 I]$. The specification of the way in which shocks in output market evolve over time in equation (2) is motivated by the choice of a simple way to introduce the effects of price controls in output market in the former socialist economies (FSE), exerting thus an influence on the inertia of inflation. In this context, the autocorrelation coefficient ϕ shows that a random output shock is persistent and, since θ_t depends on θ_{t-1}, this shock will be transmitted forward in time generating an inflation persistence (see Bleaney, 2001). Firms decide on labour demand and output by

[1] The lower-case letters refer to logarithmic deviations from steady state variables.

maximizing their profits. They produce a homogenous good and stand in perfect competition. Hence labour demand is given by

$$l_t = \ln \arg\max_{L_t} \left\{ P_t Y_t - W_t L_t \mid Y_t = L_t^{\alpha} \Theta_t \right\}$$

where capital letters denote the according non-logarithmic variables. P_i is the price level and W_i is the nominal wage. Firms produce a homogenous good and stand in perfect competition. Maximizing profits yields the labour demand function:

$$l_t = \widetilde{l} + [1/(1-\alpha)](p_t - w_t + \theta_t) \tag{3}$$

where $\widetilde{l} \equiv \ln(\alpha)/(1-\alpha) > 0$, w_t is the logarithm of the nominal wage, p_t is the log of price level in time *t*. The labour supply by workers is given by:

$$l_t^s = \eta - \chi + \delta(w_t - p_t), \qquad \delta \geq 0 \tag{4}$$

where the intercept term in (4) is not set equal to that of the demand for labour because we assume that the labour supply is affected by distortions in the labour market, captured by the parameter $\chi(\chi > 0)$. Equating (3) and (4) under the assumption that $\delta = 0$, without any loss of generality of our results, we obtain:

$$\widetilde{w}_t = p_t + \upsilon_t + (1-\alpha)\chi \tag{5}$$

where $\widetilde{w}$ is the competitive equilibrium nominal wage in the labour market that would arise in the absence of nominal wage contracts and leads to the following competitive equilibrium output level: $\hat{y}_t = \widetilde{y} - k + \upsilon_t$, where $\widetilde{y} = \alpha\eta$ and $k = \alpha\chi$. Once wage contracts are signed at the beginning of each period, employment becomes demand determined. Thus, a moral hazard problem arise, justifying the incentive of workers to index their nominal wages to unexpected price movements (Gray, 1976) following the indexing rule:

$$w_t = E_{t-1}\widetilde{w}_t + \gamma(p_t - E_{t-1}p_t), \qquad 0 \leq \gamma \leq 1 \tag{6}$$

Equation (6) says that the nominal wage is an average of the expected competitive equilibrium nominal wage, $\tilde{w}$, and the unanticipated rise in prices, $p_t - E_{t-1}p_t$, which reduces the real wage and causes firms to employ more labour. Hence, according to the indexation degree, γ, which captures the flexibility (or inertia) in the labour market; both employment and output exhibit a deviation from their respective equilibrium. For $\gamma = 1$, wages are fully indexed, for $\gamma = 0$ they are not indexed and for $1 > \gamma > 0$ they are partially indexed. Finally, substituting equation (6) into (3) and using (1), we obtain the following aggregate supply function:

$$y_t = \tilde{y} - k + \xi(1-\gamma)[\pi_t - E_{t-1}\pi_t] + (1+\xi)\,\phi\theta_{t-1} + \varepsilon_t \qquad (7)$$

where $\pi_t (\equiv p_t - p_{t-1})$ is the inflation rate, $E_{t-1}\pi_t (\equiv E_{t-1}p_t - p_{t-1})$ is the expected inflation rate and $\xi = \alpha/(1-\alpha)$.

The government is assumed to minimize a loss function shared by society and defined over inflation and output. In other words, government dislikes deviations from both its inflation target, π^* (assumed to be zero for simplicity) and its output target, y^* (expressed in percentage points above natural output: $y_t^* = \hat{y}_t + k > 0$). Since the government has no credible commitment technology available, it selects a more "conservative" central banker about inflation than the government (Rogoff, 1985), which is assumed to minimize the following loss function:

$$L_t = \left(\frac{1+\beta}{2}\right)\pi_t^2 + \frac{\lambda}{2}\left(y_t - y_t^*\right)^2 \quad , \qquad (8)$$

where the parameter λ $(\lambda > 0)$ denotes the relative importance (preference) that government places on the output target and the inflation target. β ($0 < \beta < \infty$) is the degree of central bank independence or the central banker conservativeness.

In the following, we consider a one-shot Nash equilibrium. The central banker sets his policy instrument π_t in order to minimize the expected value of the loss function (8), taking $E_{t-1}\pi_t$ and θ_{t-1} as given, and after observing the current-period supply shock. Taking the first order condition of the minimisation problem gives:

$$\pi_t = \frac{\lambda\xi^2(1-\gamma)^2 E_{t-1}\pi_t}{1+\beta+\lambda\xi^2(1-\gamma)^2} + \frac{\lambda\xi(1-\gamma)[k-\xi(\phi\theta_{t-1}+\varepsilon_t)]}{1+\beta+\lambda\xi^2(1-\gamma)^2} \tag{9}$$

The, assuming rational expectations of the private sector and solving for $E_{t-1}\pi_t$ yields:

$$E_{t-1}\pi_t = \frac{\lambda\xi(1-\gamma)[k-\xi\phi\theta_{t-1}]}{(1+\beta)}. \tag{10}$$

By substituting equation (10) into (9), the time-consistent rational expectations equilibrium inflation rate is readily found as:

$$\pi_t = \frac{\lambda\xi(1-\gamma)k - \lambda\xi^2\phi(1-\gamma)\theta_{t-1}}{1+\beta} - \frac{\lambda\xi^2(1-\gamma)\,\varepsilon_t}{1+\beta+\lambda\xi^2(1-\gamma)^2} \tag{11}$$

Equation (11) reveals that the equilibrium inflation rate in each period is determined by three factors: $\lambda\xi(1-\gamma)k/(1+\beta)$ is the permanent inflationary bias due to the discretionary policy, $\lambda\xi^2(1-\gamma)\varepsilon_t/[1+\beta+\lambda\xi^2(1-\gamma)^2]$ is the inflation due to output stabilization in the present period and $\lambda\xi^2\phi(1-\gamma)\theta_{t-1}/(1+\beta)$ is the temporary inflationary bias due to past stabilization.

3. Price liberalization, CBI and inflation persistence

This section examines the influence of price liberalization on the inflation persistence as well as the interaction between the process of liberalisation and the CBI. The inflation persistence may be easily calculated by the correlation coefficient ρ between π_t and π_{t-1}, as follows:

$$\rho = \mathrm{Cov}(\pi_t, \pi_{t-1}) / \mathrm{Var}(\pi_t) \tag{12}$$

To determine the variance of π_t and the covariance of π_t and π_{t-1}, the unconditional mean of the inflation rate, $\overline{\pi}$, can be written as:

$$\overline{\pi} = \frac{\lambda\xi(1-\gamma)k}{1+\beta} \tag{13}$$

where a higher degree of central bank independence (a higher value of the parameter β) reduces the average inflation rate. Using equations (11) and (13), the unconditional variance of the inflation rate amounts to:

$$\text{Var}(\pi_t) \equiv E\left[(\pi_t - \overline{\pi})^2\right] = \left(\frac{\lambda\xi^2(1-\gamma)}{1+\beta}\right)^2 [\phi^2 + c(1-\phi^2)]\sigma_\theta^2 \tag{14}$$

where $c \equiv (1+\beta)^2 / [1+\beta+\lambda\xi^2(1-\gamma)^2]^2 \leq 1$.

To obtain the covariance of the inflation rates π_t and π_{t-1}, we use equation (11) for the period $t-1$ and, from equation (2), the fact that $\phi\theta_{t-2} = \theta_{t-1} - \varepsilon_{t-1}$. Finally, assuming that $E(\varepsilon_t\varepsilon_{t-1}) = E(\varepsilon_{t-1}\theta_{t-1}) = E(\varepsilon_t\theta_{t-1}) = 0$, we obtain[2]:

$$\text{Cov}(\pi_t, \pi_{t-1}) \equiv E\left[(\pi_t - \overline{\pi})(\pi_{t-1} - \overline{\pi})\right] = \left(\frac{\lambda\xi^2(1-\gamma)}{1+\beta}\right)^2 \phi\sigma_\theta^2 \tag{15}$$

From equations (13), (15) and (16), follows the correlation coefficient between π_t and π_{t-1} or inflation persistence, ρ, as:

$$\rho = \frac{\phi}{\phi^2 + c\,(1-\phi^2)} \geq 0 \tag{16}$$

Taking two boundary cases, we find that when productivity shocks are not persistent at all ($\phi = 0$), the degree of inflation persistence ρ is also equal to zero. In the opposite, when $\phi = 1$, the inflation persistence ρ becomes equal to one. Finally, under condition $c \geq (1-c)\phi$, we obtain $\rho \leq 1$. We note that this condition is necessary in order to insure a correlation

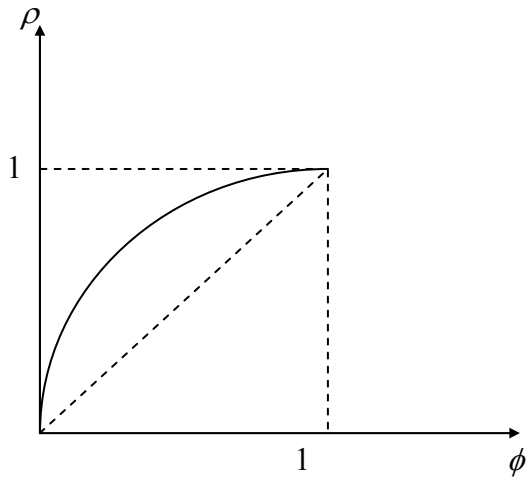
[2] Note that the unconditional mean of π_{t-1} is also equal to $\overline{\pi}$.

coefficient ρ taking values only between one and zero. Using equation (16), the following proposition can be established.

Proposition 1: The inflation persistence (indicated by parameter ρ) is negatively related with the decontrol (or liberalization) of domestic prices that is essential to the process of adjustment in internal goods market.

Proof: Using equation (16) and the condition $c \geq (1-c)\phi$, we obtain a positive relation between the parameter ρ, indicating the degree of inflation persistence, and the parameter ϕ, indicating the degree of adjustment in domestic goods market:

$$\frac{\partial \rho}{\partial \phi} = \frac{c-(1-c)\phi^2}{[\phi^2 + c(1-\phi^2)]^2} \geq 0 \qquad (17)$$



Proposition 2: The degree of inflation persistence is negatively related with the degree of the nominal wage indexation and hence the degree of flexibility in labour market (indicated by parameter γ).

Proof: Starting from $c \equiv (1+\beta)^2 / [1+\beta+\lambda\xi^2(1-\gamma)^2]^2$, we easily obtain:

$$\frac{\partial c}{\partial \gamma} = \frac{4(1+\beta)^2\lambda\xi^2(1-\gamma)}{[1+\beta+\lambda\xi^2(1-\gamma)^2]^3} \geq 0 .$$

Then, taking from (17) the first derivative of ρ with respect to c, we get:

$$\frac{\partial \rho}{\partial c} = -\frac{\phi(1-\phi^2)}{[\phi^2 + c(1-\phi^2)]^2} \leq 0 ,$$

And therefore:
$$\frac{\partial \rho}{\partial \gamma} = \frac{\partial \rho}{\partial c} \cdot \frac{\partial c}{\partial \gamma} \leq 0 \qquad (18)$$

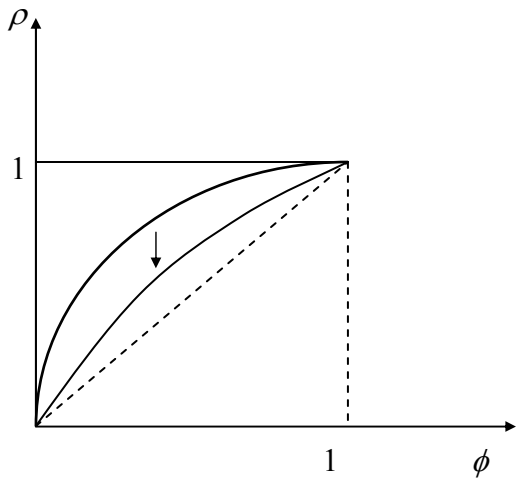
We ask then whether central bank independence increases or reduces the impact of the process of domestic price liberalization on the inflation persistence ρ (that is, a reduction in parameter ϕ). In this respect, we can establish the following proposition.

Proposition 3: An increase of the degree of central bank independence increases the effect of the process of domestic price liberalization on the inflation persistence.

Proof: Taking the first derivative of c with respect to β, it comes that:

$$\frac{\partial c}{\partial \beta} = \frac{2(1+\beta)^3 \lambda \xi^2 (1-\gamma)}{[1+\beta+\lambda\xi^2(1-\gamma)^2]^3} \geq 0$$

Using then $\frac{\partial \rho}{\partial c} = -\frac{\phi(1-\phi^2)}{[\phi^2 + c(1-\phi^2)]^2} \leq 0$, we obtain $\frac{\partial \rho}{\partial \beta} = \frac{\partial \rho}{\partial c} \cdot \frac{\partial c}{\partial \beta} \leq 0$



It is clear in this graph that if Central Bank's reform is introduced once the process of liberalization has begun, the economy will switch from the curve with a high degree of inflation persistence to those characterized by a lower value of ρ.

4. The Econometric Methodology and empirical results

4.1. Methodology and data

In this section, we take a deeper look at the potential existence of an interaction between independence of central bank and sustained liberalization. The reduced form of inflation dynamics equation: $\pi_t = \rho\pi_{t-1} + \varepsilon_t$ provides the theoretical framework for testing

empirically in this section whether the process of liberalization has affected the central bank independence reform to become more effective in reducing the inflation persistence in transition economies. The testing hypothesis indicates that change in inflation persistence affects significantly the coefficient on lagged inflation in the equation $\pi_t = \rho\pi_{t-1} + \varepsilon_t$. We also allow for shifts on the constant term to capture the effect on the mean inflation rate. The dates of the shifts in the coefficients indicate the change in the policy regime. To prevent ourselves from possible subjective break date specification, we adopt a framework, which detects multiple coefficients shifts determined by the data. This framework is based upon earlier work carried out by Perron (1989), Perron and Vogelsang (1992) , Zivot and Andrews (1992) and Perron (1997). According to this framework, the null hypothesis of a unit root is set against the stationarity about a single broken line for alternative equation specifications. Details of model specifications are found in Perron (1989,1997) and for the exposition of our results we will briefly refer to them. The first model is called "innovational outlier model 1" and it has the form:

$$y_t = \mu + \theta DU_t + \beta t + \delta D(T_b)_t + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + e_t \qquad (21)$$

where μ is a constant, α measures inflation persistence, t is a time trend, the dummy DU captures the effect on inflation when the break occurs (the innovation term) and the dummy $D(T_b)$ captures shifts in inflation persistence. The term $\sum_{i=1}^{k} c_i \Delta y_{t-i}$ corresponds to the number of additional lagged regressors of the first differenced dependent variable included to remove serial correlation. The unit root test is performed using the t-statistic for testing $\alpha = 1$ in the above equation. This model allows only a change in the intercept under both the null and alternative hypotheses. The second model is called "innovational outlier model 2" and it has the form of equation:

$$y_t = \mu + \theta DU_t + \beta t + \gamma DT_t + \delta D(T_b)_t + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + e_t \qquad (22)$$

where the dummy $D(T)$ captures the change in slope. The unit root test is performed using the t-statistic for testing $\alpha = 1$ in the above equation. This model allows changes in the intercept and the slope under both the null and alternative hypotheses. Finally, the third model allows for the changes in slope but both segments of the trend function are joined at the time break. This is called the "additive outlier model", described by the following equations:

$$y_t = \mu + \beta t + \gamma DT_t^* + \tilde{y}_t \qquad (23a)$$

and

$$\tilde{y}_t = \alpha \tilde{y}_{t-1} + \sum_{i=1}^{k} c_i \Delta \tilde{y}_{t-i} + e_t \qquad (23b)$$

The Unit Root test $\alpha = 1$ is performed on equation (23b) using the t-statistic. In all equations, T_b and k are treated as unknown. The methods of choosing the proper break dates and k are described in Perron (1997). We employ the procedure written by Colletaz and Serranito (1998) for Rats as developed by Doan (1997), to identify T_b and k.

4.2. Data and empirical measures

The empirical testing focuses on the phase of the restructuring in the FSE transition countries from centrally planned economies to market-oriented economies and the sample period is chosen according to the data availability. Monthly data for seven FSE transition economies (Chech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia) are obtained from IMS CD-ROM. Over the past 15 years, all these countries created completely new Central Bank laws, or reformed existing laws, at least once and sometime twice (Cukierman

et *al*., 2002). Table 1 presents highest inflation rates experienced in these countries, dates of stabilizations attempts, and changes in central bank laws.

Table 1: Inflation, Stabilization programs and Central Banks reforms

Country	Dates of maximum Inflation rate	Dates of stabilization programs	Dates of New Central Bank laws and major amendments
Czech Republic	1991 (52%)	January 1991	December 1992
Estonia	1992 (954%)	January 1992	Mars 1990, May 1993 (CBI upgraded)
Hungary	1990 (33%)	Mars 1990	October1991, January 1997 (CBI upgraded)
Latvia	1992 (959%)	June 1992	Mars 1990, May 1992 (CBI upgraded)
Lithuania	1992 (1161%)	June 1992	February 1990, Mars 1996 (CBI upgraded)
Poland	1990 (90%)	January 1990	January 1989, February 1992 (CBI upgraded), August 1997 (CBI upgraded)
Slovak Republic	1991 (58%)	January 1991	December 1992 (CBI reduced)

Source: Fischer, S., Sahay, R. and Vegh, C. (1996), IMF (1998), Lybeck (1999), Maliszewski (2000)

In all countries the new CB laws contain at least basic provisions for Central Bank Independence (CBI) and the average level of independence is high. In all these countries the new CB laws contain at least basic provisions for CBI and the average level of independence is high. For instance, five countries in the group (Lithuania, Poland, Estonia, Chech Republic and Latvia) have higher or equal legal independence than the Bundensbank in the original GMT index. Political independence is high in Latvia, Chech Republic, Lithuania and Hungary. Economic independence is high in countries that adopted currency board arrangements: Lithuania and Estonia.

Furthermore, four countries (Chech Republic, Hungary, Poland and Slovakia) stabilized their economies at the start of the CB laws reform process. In this group CB laws were amended in Hungary, Poland, Lithuania, Latvia and Estonia, the five countries experiencing relatively high and persistent inflation. CB laws reform were often introduced just prior to, or concurrently with price liberalization in internal and external markets included in these

stabilization programs. It is likely that in such cases CBI cannot offset the temporary impact of price decontrol on the measured rate of inflation. Even if substantial, CBI alone is insufficient to contain the, temporary but powerful, price level adjustment that are essential to the process of liberalization of internal prices. Table 2 presents the cumulative liberalization index experienced in these countries.

Table 2: Cumulative liberalization index (CLI)

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Czech Republic	0	0.16	0.95	1.84	2.74	3.64	4.57	5.5	6.43
Estonia	0.07	0.27	0.59	1.23	2.04	2.93	3.86	4.79	5.72
Hungary	0.34	0.91	1.65	2.43	3.25	4.11	5.01	5.91	6.84
Latvia	0.04	0.17	0.46	0.97	1.64	2.45	3.26	4.11	5.0
Lithuania	0.04	0.17	0.5	1.05	1.83	2.72	3.61	4.5	5.39
Poland	0.24	0.92	1.64	2.46	3.28	4.14	5.03	5.92	6.81
Slovak Republic	0	0.16	0.95	1.81	2.64	3.47	4.33	5.19	6.05

Source : deMelo et al. (1996) , Cukierman et al. (2002)

4.2. The empirical results

In the following, we study whether the CBI (identified by the dates of Central Bank laws reform and their major amendments in Table1) and the process of price liberalization, (included in stabilization programs in Table 1 and identified by the cumulative liberalization index in Table 2) did have any effect on inflation by protecting transition economies from inflation persistence consequences of the powerful inflationary shocks experienced at the early stage of transition. We examine also whether the CBI is negatively related to inflation persistence only at a sufficiently high and sustained level of economic liberalization, as argued by Cukierman et al. (2002) using cross-country data. The empirical results for the respective models are reported in Table 3.

Table 3: Sequential Tests for Break Points in the Inflation Equations

Estimated equation : $y_t = \mu + \theta DU_t + \beta t + \delta D(T_b)_t + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + e_t$

Dependent variable	Sample	k	Persistence term (α)	Constant (μ)	Innovation Term (θ)	Change in Inflation Persistence (δ)	Break Point	t^*_α Unit root term (α)
Czech Republic Inflation	1994:01-2004:08	18	0.75 (12.39)	0.028(3.89)**	0.0046 (2.29)**	-0.005(-0.82)	1997:04	-4.01
Estonia Inflation	1993:01-2004:08	16	0.89 (29.50)	0.0219(2.46)**	-0.0152 (-3.21)**	0.0045 (0.52)	1996:08	-3.71
Hungary Inflation	1991:01-2004:08	18	0.89 (29.48)	0.028(3.46)**	0.0047(2.05)**	-0.119 (-1.69)	1994:07	-3.52
Latvia Inflation	1993:01-2004:07	17	0.95(66.30)	0.0047(0.98)	-0.0071(-2.92)**	0.0234(4.38)**	1995:12	-3.25
Lithuania Inflation	1993:05-2004:08	19	0.88(38.34)	0.0211(2.92)**	-0.0184(-3.76)**	0.0171(2.22)**	1996:07	-5.39*
Poland Inflation	1991:01-2004:06	16	0.92(29.84)	0.027(2.17)**	-0.0097(-3.20)**	0.012(1.31)	1995:03	-2.65
Slovak Republic Inflation	1994:01-2004:08	19	0.65 (8.68)	0.038 (4.43)**	0.018 (3.54)**	-0.012 (-1.28)	1999:05	-4.78

For the case of Czech Republic, a significant change in the mean inflation and a shift in inflation persistence occur in 1997:04. This break point doesn't seem to be correlated with the date of the CB law reform and the introduction of CBI in this country (December 1992). However, this break point seems to be correlated with a sufficient and sustained process of price liberalization in this country (1997: the sixth year of price liberalization). For the case of Estonia, we find a break in the inflation rate in 1996:08, which can be identified with the fifth year of a persistent process of price liberalization (1996) included in its stabilization program started at June 1992. However, the dates of the initial CB law reform (Mars 1990) and its major amendment upgrading CBI (May 1993) do not seem to be correlated with the detected break point at 1996:08. For the case of Hungary, the break point is identified in 1994:07 and corresponds to the fourth year of a sustained process of price liberalization in this country (1994) started with its stabilization program in Mars 1990. However, the dates of

the initial CB law reform (October 1991) and the major amendment upgrading CBI (January 1997) do not seem to be correlated with the detected break point at 1994:07. In the cases, of Latvia and Lithuania, the break points are detected respectively in 1995:12 and 1996:07 and correspond to the fourth year of their process of price liberalization started with their stabilization programs in June 1992. The dates of the initial CB law reform (Mars 1990 and February 1990 respectively) do not seem to be correlated with the detected break point. Concerning the first major amendment upgrading CBI (May1992 for Latvia and Mars 1996 for Lithuania) seems to be correlated with the detected break point in Lithuania. Thus only in the case of Lithuania the break point in inflation persistence coincides with the second and last CB law enacted at 1996. For the case of Poland the data reveal a break point in 1995:03. This break point does not coincide with the first (January 1989), the second (February 1992) and the third (August 1997) CB laws reform and the CBI upgrading. However, this break point in inflation persistence seems to be correlated with the sixth year of a sustained process of price liberalization, started with its stabilization program in January 1990. Finally, for the case of Slovak Republic, the break point is identified in 1999:05 and corresponds to the seventh year of a process of price liberalization in this country, started with its stabilization program in January 1991. Similarly, the date of the CB law reform (December 1992) reducing the CBI does not seem to be correlated with the detected break point in inflation persistence.

In all cases discussed above, the changes in CB law were motivated by policy makers' increasing aversion to inflation and their attempts to establish anti-inflationary credibility. However, the general picture that emerges from the results reported in Table 3 leads to the conclusion that the process of decontrol of domestic prices (or process of price liberalization) has a significant positive impact on inflation persistence in transition countries and that, in the presence of controls, there is no evidence to support conventional wisdom regarding the

negative relation between CBI and inflation persistence. A possible reason for the second conclusion is that such CBI is instrumental in reducing inflation persistence only when other structural features of the economy, such as the price liberalization, have become sufficiently and persistently similar to those of developed market economies.

5. Conclusions

In this paper we study the question whether CBI is an appropriate monetary institution for transition economies to change inflation dynamics and foster the transition process to a stable and efficient market economy. Indeed, all transition economies passed through a period of very high inflation, and economic theory suggests that CBI can protect an economy from excessive monetary expansion, facilitating the stabilisation process and protecting economy from inflationary bias. In this respect, we provide theoretical arguments and find empirical evidence on the relation between CBI, price liberalization and inflation persistence. The empirical approach used to determine the most likely date for the change in regime was based on Perron (1997), where the null hypothesis of a unit root is set against the alternative of stationarity about a single broken trend. The general picture that emerges from the empirical results leads to the conclusion that the process of decontrol of domestic prices (or process of price liberalization) has a significant positive impact on inflation persistence in transition countries and that, in the presence of controls, there is no evidence to support conventional wisdom regarding the negative relation between CBI and inflation persistence. A possible reason for the second conclusion is that such CBI is instrumental in reducing inflation persistence only when other structural features of the economy, such as the price liberalization, have become sufficiently and persistently similar to those of developed market economies. Consequently, in a period of severe macroeconomic imbalances, CBI may not be an institutional arrangement effective enough to stabilize the economy.

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