Wage Flexibility under Various Exchange Rate Regimes: The Case of EU Accession Countries

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Abstract: A fixed exchange rate regime eliminates one degree of freedom to accommodate shocks in economy. Therefore, the adjustment through the labor market is likely to be greater in countries with fixed exchange rate regimes. This paper assesses the role of real wage flexibility as a correction mechanism to deal with economic disturbances. A comparable quarterly data set is constructed covering the past decade for ten countries that are both in the process of transition and accession to the European Union (EU). We perform time-varying and panel estimations to determine if we indeed observe more flexible wages when the exchange rates are pegged. Macroeconomic data seems support the argument that the degree of wage flexibility is significantly higher under fixed compared to flexible exchange rate regimes.

Keywords: Labor market, Wage flexibility, Exchange rate regime, Transition, EU accession.
JEL Codes: E24, E52, C22, C33, P20
Theme: Labor markets in transition economies

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The background for this paper was prepared in 2001 when the author was in the European II Department of the IMF. The opinions expressed in these paper and the mistakes made are solely those of the author.

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I. Introduction

Various studies suggest that there is a need in higher labor market flexibility in the context of for example the European monetary union (e.g. Hallet, 2000, Obstfeld, 1997, Pissarides, 1997), a currency board arrangement (e.g. Gulde et al., 2000), or a less rigid exchange rate peg such as the European Exchange Rate Mechanism (e.g. Kopits, 1999). Indeed, it is commonly argued that a fixed exchange rate eliminates one degree of freedom to accommodate shocks in economy. Since the independent exchange rate policy is no more available under fixed exchange arrangements, the adjustment through the labor market is likely to be of higher magnitude in countries with fixed exchange rates regimes than with flexible ones.

This paper aims to verify econometrically whether a fixed exchange rate regime indeed goes with higher labor market flexibility in reality. This is done for a group of ten transition/EU accession countries, using quarterly data for 1990-2000. The issue is of particular importance to these countries for two reasons. First, both transition and EU accession imply extensive reforms and restructuring, which are more effective the more flexible the labor market is. Second, EU accession will lead to participation in the European monetary union at some point, requiring sufficient labor market flexibility. Currently, four of these countries (Estonia, Latvia, Lithuania and Bulgaria) already peg their currency to the Euro. The rest (Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia) are characterized by more flexible exchange rate arrangements.

The notion of labor market flexibility is of course a very broad one. In principle, labor market adjustment to shocks can go via either price of labor, quantity of labor, or as a combination of both. Hence on can distinguish two dimensions of labor market flexibility: wage flexibility and labor mobility. Each of these two broad classes has multiple aspects. For example, wage flexibility can be described in nominal or in real terms. Labor mobility, in turn, can be spatial (e.g. geographical migration) or non-spatial (e.g. occupational mobility or adjustment of hours of work).

In this paper we concentrate on wage flexibility[2]. Hyclak and Johnes (1992), Boeri et al. (1998), and Blanchflower (2000) argue that wage flexibility is a key determinant of labor market flexibility. European Commission (2003, p.155) stresses the importance of wage flexibility in the following paragraph:

> Obviously, wages as the price of labour have a key role to play in determining the overall balance of supply and demand on the labour market. Furthermore, the formation of economic and monetary union (EMU) is often taken to put further demands on the flexibility of wages to compensate for the lack of (national) instruments to deal with economic disturbances. If wages are too rigid, the necessary adjustment will come slowly and with considerable economic and social costs.

Furthermore, wage flexibility has different forms depending on the types of shocks that affect labor supply and demand[3]. The sensitivity of real wages with respect to the rate of unemployment is generally used as the macroeconomic measure of labor market flexibility (see Layard *et al.* (1991), Pissarides (1997), OECD (1997), and European Commission (2003), among others)[4]. In our study we also adopt this common definition of wage flexibility as responsiveness of real wages to the unemployment rate.

This is also the measure of real wage flexibility that we aim to estimate and confront with the exchange rate regime. In spite of the common argument that a fixed exchange rate regime requires higher wage flexibility, both theoretical frameworks and empirical evidence are lacking. This also goes for studies focusing on the labor market in transition/accession countries (e.g. Schiff et al., 2001). This creates the primary novel aspect of this paper. Other novel aspects lie in the construction of a comparable quarterly data set for the ten transition/accession countries for 1990-2000, the performance of time-varying estimations of

[2] There is a nearly consensus among the economists that European labor markets are characterized by low mobility of workers. The unwillingness of workers to move across countries is generally attributed to cultural and language differences.

[3] See European Commission (2003,p.157) for details.

[4] Apart from the unemployment rate, wages might react, for example, to the price inflation, to the composition of labor demand or supply (e.g. geographical, sectoral, or skill mismatch), to external competitiveness (e.g. exchange rates), etc.

wage flexibility (using the Kalman filter methodology), and analysis the effect of exchange rate pegs on wage flexibility in a panel framework.

Macroeconomic seems support the argument that the degree of wage flexibility is significantly different (higher) in countries with fixed exchange rate regimes. The issue for further research is to check whether real wage adjustment can compensate the lack of exchange rate flexibility. In case of a negative answer, it would follow that either adjustment to shocks goes via other channels than wage flexibility, in face of exchange rate pegs, or that the adverse labor market development (e.g. in terms of high unemployment) in some of these countries could at least partially be explained by insufficient wage flexibility.

After this introduction, Section 2 describes our database and stylized evolution of unemployment, wages and exchange rates in transition economies. These facts motivate our model choice and estimation techniques, discussed in Section 3. Estimation results are presented in Section 4. We end with a brief conclusion in Section 5.

II. Data and stylized facts

Data issues in transition economies require extra attention, in particular if the objective is cross-country comparison. Despite the apparent simplicity of the data needed, which are basic macroeconomic indicators, no single source provides either sufficient coverage or the length of quarterly time series. Therefore, a novel contribution of this paper is the construction of a data set of quarterly macroeconomic indicators for transition countries. The sources used are the following (in the order of priority):

- *OECD Analytical Database and Statistical Compendium;*
- *IMF International Financial Statistics and Working Database;*
- *IMF Staff Estimates (Country-desk data) and National Statistics.*

Priority was given to OECD data, because they have the broadest coverage of transition economies. The data from the other sources were checked for consistency and selected as to provide maximum compatibility with the OECD data. There is a question as to which form of the data, original or deseasonalized, should be used in the estimations. We opted for seasonally-adjusted data since some of the series were available only in deseazonalized form (in particular the OECD data). At the final stage of the construction of our data set we removed, when necessary, the seasonal component by applying the U.S. Census Bureau's X12 procedure, the same method as generally used by the OECD[5].

In short, our data set contains nominal wages, consumer price inflation (CPI) and the registered unemployment rate. Wage inflation rate $\dot{W}_t$ is defined as percentage changes in nominal wages with respect to the previous quarter:

$$\dot{W}_t = \frac{Wn_t - Wn_{t-1}}{Wn_{t-1}} \cdot 100(\%) \qquad \textbf{(1)}$$

[5] X12 is a sort of moving-average filtering procedure with time-evolving seasonal factors.

where Wn_t are nominal wages at period *t*. Similarly, price inflation rate $\dot{P}_t$ and the real wage growth rate $\dot{W}r_t$ are defined according to the following expressions:

(2) $$\dot{P}_t = \frac{P_t - P_{t-1}}{P_{t-1}} \cdot 100(\%)$$

where P_t is the consumer price index at quarter *t* the price level, and

(3) $$\dot{W}r_t = \frac{Wr_t - Wr_{t-1}}{Wr_{t-1}} \cdot 100(\%)$$

where real wages are commonly defined as the ratio of nominal wages to the price level:

(4) $$Wr_t = \frac{Wn_t}{P_t}$$

Figure 1 illustrates the evolution of quarterly unemployment and wage inflation rates in ten accession countries over the last decade. On each country-specific graph left axes denote unemployment rates U_t, in percent of the labor force[6], and right axes are used for wage inflation rates $\dot{W}_t$. Figure 1 shows high variation in both unemployment and wage inflation rates across countries as well as over time.

Table 1 shows the time-series properties of the data. Following the identification strategy detailed in Enders (2004), we perform the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. Notice that the period under consideration – approximately ten years of quarterly observations – is short to draw robust conclusions. Therefore, the tests may lack power to reject the null hypothesis of the unit root. On overall, the series of price inflation, wage inflation, and unemployment in the CEECs can be characterized as stationary. As a benchmark, the last three lines of Table 1 show the corresponding numbers for France, Germany, and the United States.

[6] Registered unemployment rates are considered since they are available over wider periods than labor force survey based unemployment rates.

Table 2 helps to establish several regularities in the data. First, there is a strong negative correlation between the series of unemployment and wage inflation. The average correlation coefficient is –0.35, the highest correlation between wage inflation and unemployment is observed for Latvia, Lithuania and Estonia (-0.65, -0.62 and -0.61, correspondingly). As a benchmark, the last three lines of Table 2 shows the numbers for France, Germany, and the United States (-0.52, -0.51 and -0.26 respectively).

The remaining two columns of Table 2 illustrate period average correlation between the unemployment rate U_t and price inflation $\dot{P}_t$, and between U_t and the real wage growth rate $\dot{W}r_t$. Price inflation is negatively correlated with the unemployment rate for all ten transition countries. Changes in real wages show negative correlation with unemployment in six out of ten countries. However, the correlation between real wage growth and unemployment in transition countries is much weaker compared to the selected developed countries. One possible reason for this is higher noise introduced by the transformation process. Table 3 shows that the coefficient of variation of the variables of interest – unemployment, wage inflation, and price inflation – is, on average, higher in the CEECs than in selected countries such as France, Germany, and the United States.

Wages, prices, and unemployment rates are in principle sufficient to construct a basic measure of wage flexibility. In order to be able to answer the key question of the paper, we also need data on the exchange rate regimes.

Table 4 presents exchange rate regimes in transition/EU accession countries. Classification considered in this table reflects the IMF's official classification of exchange rate arrangements.

Using the standard source, the IMF Annual Report on Exchange Rate Arrangements and Exchange Rate Restrictions, we constructed a dummy equal to one for a fixed exchange rate and zero otherwise. Note that the IMF Annual Report on Exchange Rate Arrangements and

Exchange Rate Restrictions classifies exchange rate regimes on the basis of what national authorities say their policy is, that is we use a *de jure* measure of the exchange rate regime.

However, actual exchange rate regimes do not necessarily reflects what they are said to be. Therefore, we use several alternative *de facto* measures of exchange rate regimes. One measure is proposed by Levy-Yeyati and Sturzenegger (2000) and another is developed by Sahay (2000). Classification by Leavy-Yeati and Sturzenegger (denoted as LYS) is based on quantitative criteria (clustering procedures applied to the nominal exchange rate volatility, the volatility of exchange rate changes, and the volatility of international reserves). The measure by Sahay (denoted as RS) was obtained based on author's expert opinion. The LYS and RS measures are binary, taking the value of one for a pegged exchange rate and zero otherwise. The correspondence between these two *de facto* measures and the IMF *de ju*re classification is illustrated on Figure 2. While for several countries and/or periods all three characteristics coincide (e.g. the Baltic states classified as pegged, or Bulgaria labeled as pegged since 1997), in certain cases there is no consensus between the exchange rate classifications[7].

III. The Model

Despite a relatively transparent definition of wage flexibility as responsiveness of real wages to the unemployment rate, there is a number of different empirical strategies. One common approach, due to Phillips (1958), is to specify a wage equation with the unemployment rate and other parameters on the right-hand side as follows:

$$\Delta w_t = c_1 + c_2 u_t + c_3 \Delta p_{t-1} + \varepsilon_t \qquad \textbf{(5)}$$

where $\Delta w_t = \ln(w_t) - \ln(w_{t-1})$, $\Delta p_{t-1} = \ln(p_{t-1}) - \ln(p_{t-2})$, u_t is the natural logarithm of the unemployment rate. Equation (5) is the basic version of the macroeconomic Phillips curve.

[7] Further step is to use the alternative *de facto* classification of exchange rate regimes recently proposed by Reinhart and Rogoff (2004). This classification seems be the most accurate and preferable.

Coefficient c_2 represents the responsiveness of the rate of change of wage rates to the unemployment rate and thus characterizes wage flexibility. Although nominal wages are present on the left-hand side, the coefficient c_2 measures real wage flexibility since price inflation is present on the right-hand side. The remaining part of wage growth (e.g. due to productivity growth, increase in import prices, etc.) is captured by the constant term c_1. The error term ε_t is assumed to be normal and independently distributed.

A. Methodological framework: switching regression

Alogoskoufis and Smith in their AER (1991) paper estimate the following Phillips curve specification for the United Kingdom and the United States, using quarterly data over 1857-1987[8]:

(6) $$\Delta w_t = c_1 + c_2 u_{t-1} + c_3 \Delta p_{t-1} + c_4 \Delta u_t + \varepsilon_t$$

The authors find that the coefficient at lagged prices is statistically different under fixed gold-based compared to managed exchange rate regimes. This finding is used to illustrate the relevance of the Lucas critique: a policy change (change in the exchange rate regime) affects the structure of econometric models.

In our work, based on a number of arguments that wage flexibility may be different under fixed versus floating exchange rate regimes, we test stability of the coefficients on unemployment. Since the coefficient on the change of unemployment is insignificant in the sample of ten CEECs, we focus on the basic Phillips curve specification given by eq. (5): $\Delta w_t = c_1 + c_2 u_t + c_3 \Delta p_{t-1} + \varepsilon_t$.

[8] The lagged unemployment on the right hand site reflects that fact that, according to Phillips (1958) wage inflation is influenced not only by the level of unemployment and the rate of change of retail prices, but also by the change in unemployment.

The hypothesis that real wage flexibility is different under various exchange rate regimes can be written as

(7) $$c_2 = c_2' + c_2'' ER$$

where ER is dummy taking one for fixed/pegged exchange rate regime and zero otherwise. Substituting (7) into (5) gives

(8) $$\Delta w_t = c_1 + (c_2' + c_2'' ER)u_t + c_3 \Delta p_{t-1} + \varepsilon_t = c_1 + c_2' u_t + c_2'' ER u_t + c_3 \Delta p_{t-1} + \varepsilon_t$$

If wage flexibility is affected by the exchange rate regime, then the coefficient c_2'' should be statistically different from zero. In order to increase the power of test, we estimate (8) for a panel of 10 CEECs over 1990-2000, quarterly.

B. Sensitivity checking

The sensitivity of results is performed with respect to:

(i) the choice of countries (CEEC-10, CEEC-10 excluding Bulgaria and Romania, ….)

(ii) the time period (1990-2000 versus 1993-2000, in order to minimize assess the impact of the transformational recession)

(iii) the choice of exchange rate regime dummies: IMF *de jure* classification (ER1), Ratna Sahay *de facto* pegging (ER2), or Levy- and Sturzenegger *de facto* pegging (ER3).

(iv) the specification choice (see below).

Note that the coefficient c_3 at lagged inflation can be affected by the exchange rate regime as well (Alogoskoufis and Smith, 1991). It means that

(9) $$c_3 = c_3' + c_3'' ER$$

Therefore, (8) transforms into

(10) $$\Delta w_t = c_1 + c_2' u_t + c_2'' ER u_t + c_3' \Delta p_{t-1} + c_3'' ER \Delta p_{t-1} + \varepsilon_t$$

So, we assess the sensitivity of the results by allowing shift in coefficient at lagged prices c_3, the coefficient at unemployment c_2, and both.

IV. The Results

Static estimates of the Phillips curve (5) indicate that there is heterogeneity of labor market adjustment among the CEECs (Table 4). Compared to the benchmark cases – France, Germany, and US – on can see that wage reaction in the CEECs is on average higher than that in the selected three developed countries.

Panel estimates for a group of 10 CEECs over the nineties (Table 5a) show that there is indeed a shift in the coefficient at unemployment: wage flexibility is higher under fixed than under flexible exchange rate regimes.

The coefficient at lagged prices changes in the same direction as for UK and US in Alogoskoufis and Smith (1991) but these changes are not statistically significant.

The results do not seem be qualitatively affected by the choice of the exchange rate classification (ER1 vs. ER2 vs. ER3), estimation period (1990-2000 vs. 1993-2000), or the composition of the panel (10 CEECs, CEECs excluding Romania and Bulgaria, CEECs excluding Hungary[9]).

[9] ER2 classification does not contain Hungarian exchange rate regime.

V. Conclusions

Turning back to the questions risen in the beginning of this document, one can say the following:

- Real wage flexibility is indeed higher under fixed compared to flexible exchange rate regimes.

- To the extend that the exchange rate regime choice is exogenous (i.e. given by political factors), it follows that real wage flexibility has a tendency to increase along with the adoption of the fixed exchange rate regime.

- However, this increase in real wage flexibility is only marginal and, therefore, it is not sufficient to compensate for a loss of exchange rate adjustment tool, in face of exchange rate pegs. The real wage flexibility itself is not sufficient to be an effective adjustment tool: the elasticity of real wage to the unemployment is only at the level of several percentage points.

VI. Further work

- testing assumptions on epsilon in eq. (4);
- using the de-facto exchange rate regime classification by Reinhart and Rogoff (2004);
- sensitivity checking: excluding observations which are close to the regime change periods;
- sensitivity checking: considering eliminating spike periods in the data. Wage flexibility in a steady state could be something totally different than flexibility during crisis (e.g. the Czech Republic episode of 1997);
- using the Kalman-filtering technique for estimation of eq. (6) to obtain the time-varying coefficient of wage flexibility $c_2(t)$.

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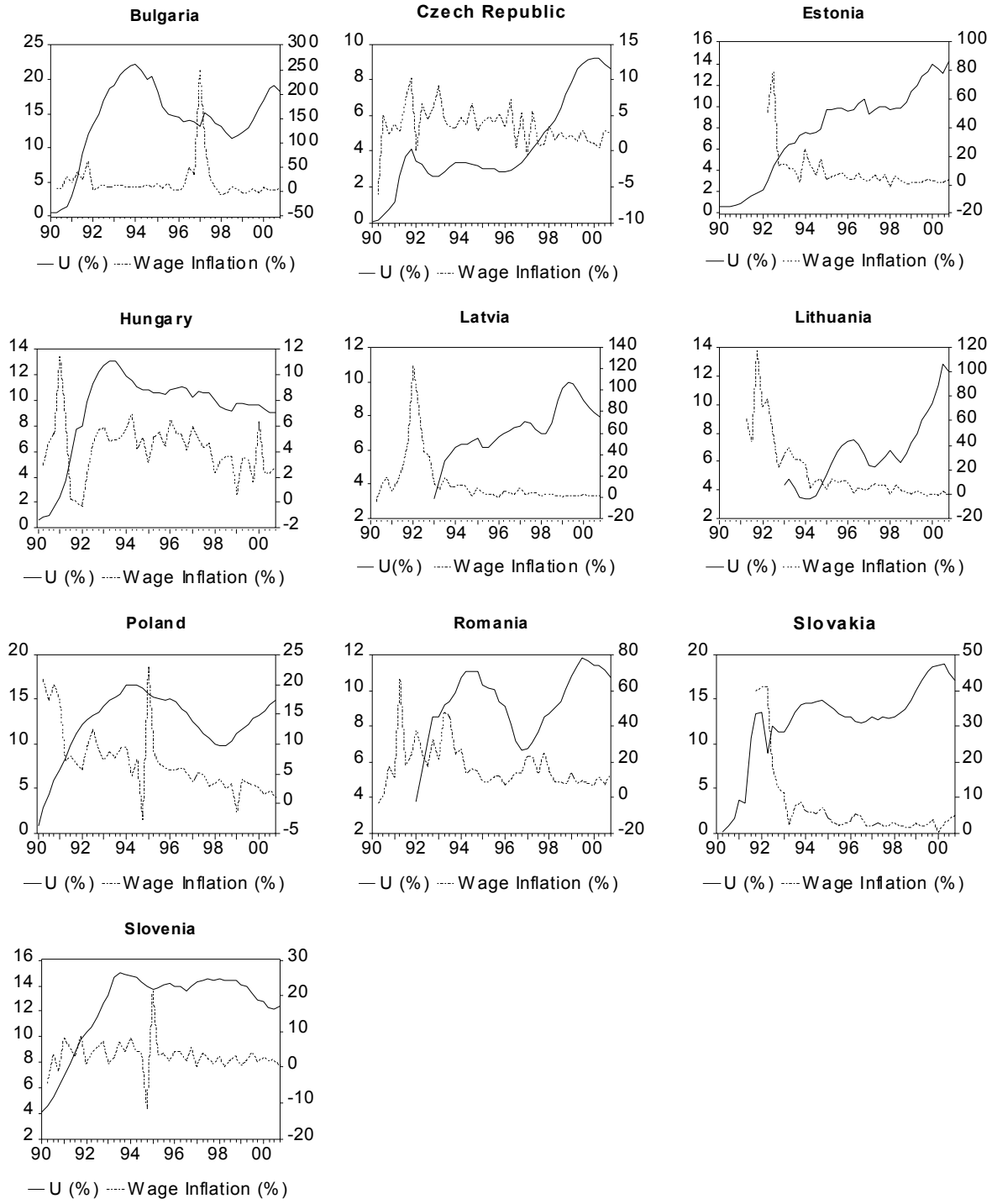
Figure 1 Unemployment and wage inflation rates in the CEECs



Source: OECD, IMF, author's calculations.

Table 1 Order of integration of the series (1990Q1 – 2000Q4)

	U rate		*Wage inflation*		*Price inflation*	
	ADF	PP	ADF	PP	ADF	PP
Bulgaria	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
Czech republic	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
Estonia	I(**1**)	I(0)	I(0)	I(0)	I(0)	I(0)
Hungary	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
Latvia	I(**1**)	I(0)	I(**1**)	I(0)	I(**1**)	I(0)
Lithuania	I(0)	I(**1**)	I(0)	I(0)	I(0)	I(0)
Poland	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
Romania	I(**1**)	I(0)	I(0)	I(0)	I(0)	I(0)
Slovakia	I(0)	I(0)	I(**1**)	I(0)	I(0)	I(0)
Slovenia	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
France	I(**1**)	I(**1**)	I(0)	I(0)	I(0)	I(0)
Germany	I(**1**)	I(**1**)	I(0)	I(0)	I(0)	I(0)
United States	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)

Source: Author's calculations.
Note: Wage inflation and price inflation are defined with respect to the previous period.

Table 2 Correlation between the unemployment rate and wage inflation, price inflation, and the real wage growth rate over 1990Q1 – 2000Q4

U rate	***Wage inflation***	***Price inflation***	***Real wage growth rate***
Bulgaria	-0.16	-0.14	-0.10
Czech republic	-0.52	-0.52	-0.14
Estonia	-0.61	-0.75	-0.17
Hungary	0.01	-0.33	0.32
Latvia	-0.65	-0.72	-0.03
Lithuania	-0.62	-0.45	-0.09
Poland	0.04	-0.16	0.21
Romania	-0.43	-0.52	0.32
Slovakia	-0.36	-0.04	-0.35
Slovenia	-0.16	-0.70	0.64
CEEC-10 Average	-0.35	-0.43	0.06
France	-0.52	-0.58	-0.14
Germany	-0.51	-0.54	-0.39
United States	-0.26	0.18	-0.28

Source: Author's calculations.
Notes: Wage inflation, price inflation and real wage growth are defined with respect to the previous period.

Table 3 Coefficient of variation, 1990Q1 – 2000Q4

	Wage inflation	*Price inflation*	*Ln(U rate)*
Bulgaria	1.42	1.58	0.39
Czech republic	0.82	0.85	0.88
Estonia	1.38	1.72	0.54
Hungary	0.50	0.42	0.37
Latvia	1.56	1.57	0.12
Lithuania	1.26	1.51	0.20
Poland	0.67	0.71	0.22
Romania	0.66	0.67	0.11
Slovakia	1.31	0.83	0.40
Slovenia	1.39	1.42	0.14
CEEC-10 average	1.10	1.13	0.34
France	0.44	0.54	0.05
Germany	2.00	0.82	0.16
United States	0.72	0.38	0.12

Source: Author's calculations.
Note: Coefficient of variation is defined as the ratio of standard deviation to the mean.

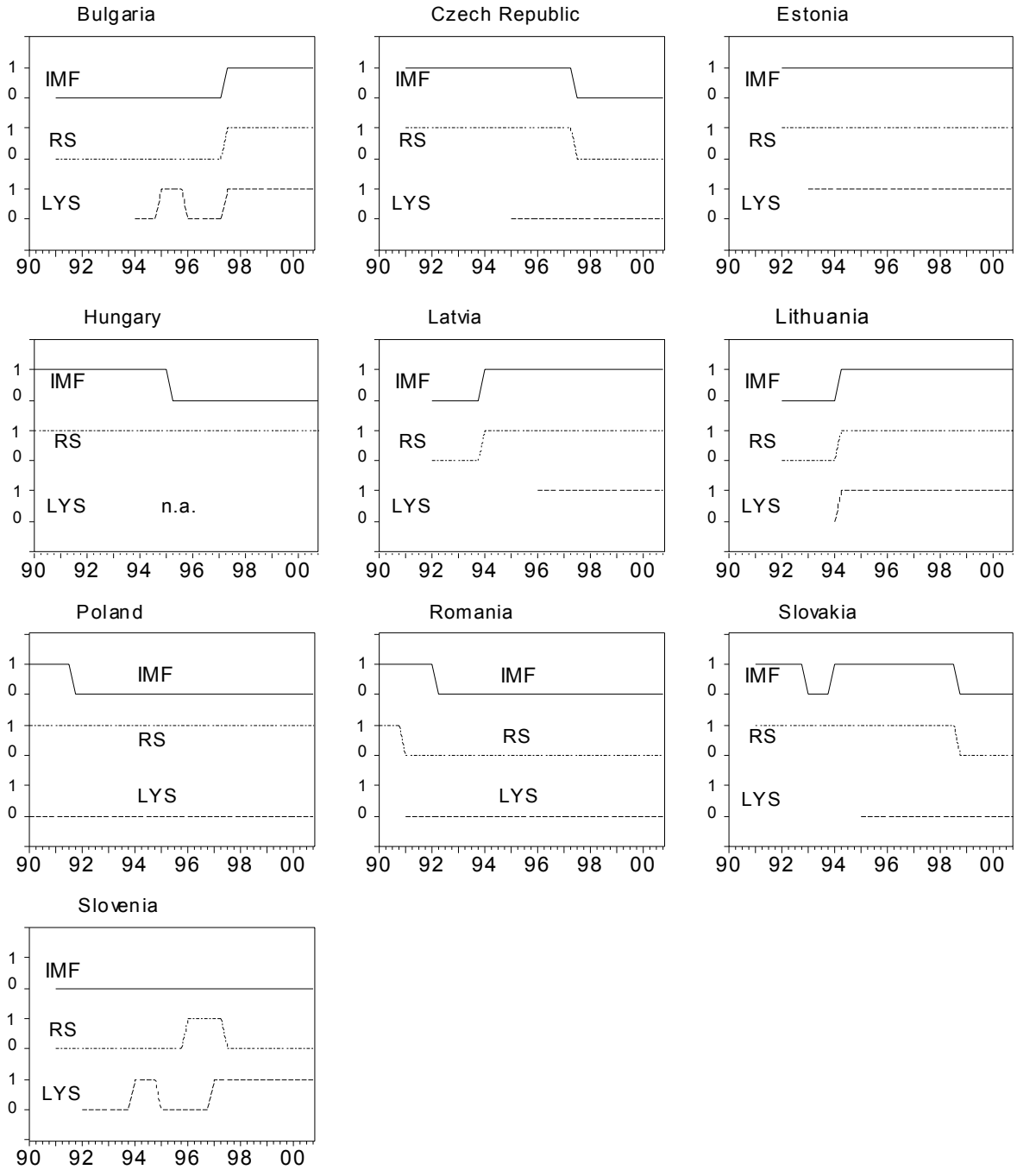
Table 4 Exchange rate regimes in the CEECs

	1990	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
Bulgaria	3	8	8	8	8	8	8	2	2	2	2
Czech republic	3	3	3	3	3	3	6	7	7	7	7
Estonia	n.a.	n.a.	2	2	2	2	2	2	2	2	2
Hungary	3	3	3	3	3	6	6	6	6	6	6
Latvia	n.a	n.a	8	8	3	3	3	3	3	3	3
Lithuania	n.a	n.a	8	8	2	2	2	2	2	2	2
Poland	3	5	5	5	5	6	6	6	6	6	8
Romania	3	7	7	7	7	7	7	7	7	7	7
Slovakia	3	3	3	3	3	3	6	6	7	7	7
Slovenia	n.a	n.a	7	7	7	7	7	7	7	7	7

Exchange rate regime description:
1: Dollarization, no separate legal tender
2: Currency Board, currency fully backed by foreign exchange reserves
3: Conventional Fixed Pegs, peg to another currency or currency basket within a band of at most ±1%
4: Horizontal Bands, pegs with bands larger than ±1%
5: Crawling Pegs, pegs with central parity periodically adjusted in fixed amounts at a fixed, pre-announced rate or in response to changes in selected quantitative indicators
6: Crawling Bands, crawling pegs combined with bands of more than ±1%
7: Managed Float with No Preannounced Exchange Rate Path, active intervention without precommitment to a preannounced target or path for the exchange rate
8: Independent Float, market-determined exchange rate and monetary policy independent of exchange rate policy.

Source: Halpern, L. and Wyplosz, C. 2001. "Economic Transformation and Real Exchange Rates in the 2000s: The Balassa-Samuelson Connection." Table 2. Exchange Rate Arrangements.

Figure 2 Exchange rate regimes in the CEECs



Notes: Exchange rate dummies equal one for pegged and zero for flexible regimes.
IMF: based on the IMF *de jure* classification
RS: Ratna Sahay *de facto* pegging
LYS: Levy- and Sturzenegger *de facto* pegging

Table 5 Time series Phillips curve estimates, over 1990-2000, quarterly

	BU	CZ	ES	HU	LA	LI	PO	RO	SK	SN
Constant	0.491	0.066 ***	0.474 **	0.038 *	0.308 **	0.167 **	0.025	0.239 **	0.686 ***	0.032
	(0.343)	(0.014)	(0.198)	(0.021)	(0.133)	(0.062)	(0.042)	(0.110)	(0.253)	(0.062)
U	-0.156	-0.024 ***	-0.185 **	-0.003	-0.133 **	-0.070 **	-0.003	-0.074 *	-0.234 **	-0.001
	(0.119)	(0.006)	(0.083)	(0.007)	(0.062)	(0.030)	(0.015)	(0.046)	(0.093)	(0.024)
DP(-1)	0.516 ***	0.178	0.152 **	0.231	-0.077	0.467 ***	0.715 ***	0.466 ***	-0.052	0.041
	(0.132)	(0.172)	(0.072)	(0.180)	(0.192)	(0.082)	(0.191)	(0.130)	(0.717)	(0.056)
N-obs	38	38	35	42	32	32	42	36	37	42
R-squared	0.38	0.27	0.64	0.07	0.43	0.83	0.65	0.54	0.18	0.01
F-stat	10.71 ***	6.62 ***	28.30 ***	1.39	10.99 ***	71.08 ***	35.92 ***	19.14 ***	3.76 ***	0.21
D-W	2.47	2.73	2.65	1.25	1.60	2.34	1.72	1.96	0.19	2.81

	CEEC-10 avr	FR	GE	US
Constant	0.253	0.053 ***	0.084 ***	0.036 ***
		(0.011)	(0.030)	(0.013)
U	-0.088	-0.018 ***	-0.038 ***	-0.009
		(0.004)	(0.014)	(0.009)
DP(-1)	0.264	-0.413 **	0.303	-0.861 ***
		(0.162)	(0.524)	(0.275)
N-obs		42	42	42
R-squared		0.31	0.30	0.12
F-stat		8.71 ***	8.26 ***	2.66 ***
D-W		0.74	1.91	3.15

Notes: OLS estimates of the equation $\Delta w_t = c_1 + c_2 u_t + c_3 \Delta p_{t-1} + \varepsilon_t$,

where $\Delta w_t = \ln(w_t) - \ln(w_{t-1})$, $\Delta p_{t-1} = \ln(p_{t-1}) - \ln(p_{t-2})$, u_t is the natural logarithm of the unemployment rate. White heteroskedasticity-consistent standard errors in parentheses.
* significant at 10%, ** significant at 5%, *** significant at 1%.

Table 6 Panel estimates of the Phillips curve, 1990-2000, quarterly

	Basic	shift in U ER1	shift in U,P ER1	shift in P ER1	shift in U ER2	shift in U,P ER2	shift in P ER2	shift in U ER3	shift in U,P ER3	shift in P ER3
Regressors										
LU	-0.030 ***	-0.035 ***	-0.040 ***	-0.039 ***	-0.037 ***	-0.038 ***	-0.045 ***	-0.031 ***	-0.036 ***	-0.038 ***
	(0.010)	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)	(0.014)	(0.011)	(0.011)	(0.011)
DP(-1)	0.419 ***	0.403 ***	0.433 ***	0.449 ***	0.422 ***	0.424 ***	0.473 ***	0.404 ***	0.439 ***	0.454 ***
	(0.061)	(0.057)	(0.065)	(0.069)	(0.065)	(0.074)	(0.095)	(0.058)	(0.067)	(0.071)
LU*ER	-	-0.008 *	-0.006	-	-0.023 *	-0.022 *	-	-0.008	-0.006	-
		(0.005)	(0.005)		(0.014)	(0.012)		(0.006)	(0.005)	
DP(-1)*ER	-	-	-0.090	-0.111	-	-0.037	-0.155	-	-0.107	-0.122
			(0.114)	(0.108)		(0.144)	(0.197)		(0.110)	(0.109)
Country Fixed Effects***										
BU	0.164	0.188	0.195	0.186	0.222	0.225	0.200	0.177	0.184	0.181
CZ	0.070	0.084	0.090	0.085	0.081	0.083	0.092	0.078	0.084	0.083
ES	0.106	0.136	0.148	0.134	0.173	0.176	0.143	0.127	0.141	0.132
HU	0.088	0.107	0.116	0.109	-	-	-	0.108	0.117	0.109
LA	0.085	0.110	0.116	0.104	0.143	0.144	0.112	0.101	0.108	0.101
LI	0.098	0.122	0.127	0.116	0.147	0.149	0.122	0.115	0.120	0.113
PO	0.113	0.128	0.139	0.135	0.130	0.132	0.145	0.136	0.147	0.137
RO	0.150	0.164	0.170	0.166	0.165	0.167	0.172	0.155	0.160	0.161
SK	0.137	0.164	0.173	0.162	0.120	0.122	0.138	0.156	0.166	0.159
SN	0.079	0.095	0.105	0.102	0.137	0.139	0.121	0.088	0.098	0.099
N obs.	374	372	372	372	270	270	270	372	372	372
Adj. R-sq.	0.45	0.45	0.45	0.45	0.49	0.48	0.47	0.45	0.45	0.45
F-stat.	315.1 ***	158.9 ***	106.9 ***	159.5 ***	132.9 ***	88.3 ***	125.4 ***	158.4 ***	107.0 ***	160.0 ***
D.-W.	1.91	1.90	1.94	1.96	2.15	2.15	2.22	1.90	1.94	1.96

Notes: Pooled Least Squares estimates of :

Basic specification: $\Delta w_{it} = c_i + c_2 u_{it} + c_3 \Delta p_{t-1} + \varepsilon_{it}$,

Switching regimes:

- Shift in U-coef.: $\Delta w_{it} = c_i + (c_2' + c_2'' ER) u_{it} + c_3 \Delta p_{t-1} + \varepsilon_{it}$
- Shift in U- and P- coefs: $\Delta w_{it} = c_i + (c_2' + c_2'' ER) u_{it} + (c_3' + c_3'' ER) \Delta p_{t-1} + \varepsilon_{it}$
- Shift in P-coef.: $\Delta w_{it} = c_i + c_2 u_{it} + (c_3' + c_3'' ER) \Delta p_{t-1} + \varepsilon_{it}$

where $\Delta w_t = \ln(w_t) - \ln(w_{t-1})$, $\Delta p_{t-1} = \ln(p_{t-1}) - \ln(p_{t-2})$, u_t is the natural logarithm of the unemployment rate.

ER - the exchange rate dummy equal one for pegged and zero for flexible regimes – is one of the following: the IMF *de jure* classification (ER1), Ratna Sahay *de facto* pegging (ER2), or Levy- and Sturzenegger *de facto* pegging (ER3). See Figure 2 for detail.

White heteroskedasticity-consistent standard errors in parentheses.

* significant at 10%, ** significant at 5%, *** significant at 1%.

Table 7 Panel estimates of the Phillips curve, 1993-2000, quarterly

	Basic	shift in U ERR1	shift in U,P ERR1	shift in P ERR1	shift in U ERR2	shift in U,P ERR2	shift in P ERR2	shift in U ERR3	shift in U,P ERR3	shift in P ERR3
Regressors										
LU	-0.036 ***	-0.037 ***	-0.038 ***	-0.040 ***	-0.034 ***	-0.037 **	-0.048 ***	-0.039 ***	-0.039 ***	-0.038 ***
	(0.013)	(0.013)	(0.014)	(0.015)	(0.012)	(0.015)	(0.019)	(0.013)	(0.015)	(0.015)
DP(-1)	0.504 ***	0.477 ***	0.478 ***	0.508 ***	0.470 ***	0.476 ***	0.533 ***	0.477 ***	0.477 ***	0.508 ***
	(0.089)	(0.079)	(0.086)	(0.094)	(0.096)	(0.111)	(0.133)	(0.079)	(0.086)	(0.094)
LU*ER	-	-0.012 **	-0.012 **	-	-0.028 *	-0.027 **	-	-0.012 **	-0.012	-
		(0.005)	(0.005)		(0.015)	(0.013)		(0.006)	(0.005) **	
DP(-1)*ER	-		-0.020	-0.118	-	-0.069	-0.213	-	-0.006	-0.087
		(0.000)	(0.122)	(0.136)		(0.171)	(0.226)		(0.120)	(0.135)
Country Fixed Effects***										
BU	0.164	0.186	0.188	0.176	0.215	0.222	0.202	0.191	0.192	0.172
CZ	0.075	0.086	0.087	0.083	0.075	0.079	0.096	0.088	0.089	0.080
ES	0.114	0.147	0.149	0.129	0.177	0.183	0.151	0.151	0.151	0.125
HU	0.105	0.119	0.120	0.116	-	-	-	0.143	0.144	0.115
LA	0.091	0.117	0.118	0.102	0.147	0.151	0.119	0.121	0.121	0.099
LI	0.101	0.126	0.127	0.111	0.150	0.154	0.128	0.129	0.129	0.108
PO	0.120	0.125	0.127	0.130	0.118	0.124	0.150	0.161	0.162	0.131
RO	0.144	0.152	0.153	0.153	0.147	0.151	0.168	0.156	0.156	0.150
SK	0.119	0.143	0.144	0.131	0.111	0.117	0.146	0.152	0.152	0.128
SN	0.109	0.114	0.115	0.119	0.152	0.158	0.143	0.124	0.125	0.116
N obs.	320	320	320	320	252	252	252	320	320	320
Adj. R-sq.	0.50	0.51	0.50	0.50	0.51	0.51	0.48	0.50	0.50	0.50
F-stat.	29.8 ***	28.2 ***	25.9 ***	27.4 ***	24.5 ***	22.4 ***	22.4 ***	28.1 ***	25.8 ***	27.3 ***
D.-W.	2.38	2.35	2.36	2.40	2.46	2.49	2.54	2.35	2.35	2.40

See notes for Table 6.

Table 8 Panel estimates of the Phillips curve, 1990-2000, quarterly, excluding Bulgaria and Romania

	Basic	shift in U ERR1	shift in U,P ERR1	shift in P ERR1	shift in U ERR2	shift in U,P ERR2	shift in P ERR2	shift in U ERR3	shift in U,P ERR3	shift in P ERR3
Regressors										
LU	-0.034 ***	-0.037 ***	-0.037 ***	-0.036 ***	-0.045 ***	-0.037 **	-0.042 ***	-0.037 ***	-0.036 ***	-0.036 ***
	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.010)	(0.010)	(0.011)
DP(-1)	0.318 ***	0.311 ***	0.289 ***	0.301 ***	0.136 ***	0.082 ***	0.158 ***	0.315 ***	0.286 ***	0.288 ***
	(0.063)	(0.063)	(0.079)	(0.073)	(0.110)	(0.100)	(0.102)	(0.065)	(0.082)	(0.076)
LU*ER	-	-0.002 **	-0.003 **	-	-0.012 *	-0.015 **	-	0.001 **	0.000	-
		(0.004)	(0.005)		(0.006)	(0.006)		(0.005)	(0.005) **	
DP(-1)*ER	-	-	0.035	0.023	-	0.316	0.219	-	0.045	0.043
			(0.116)	(0.104)		(0.153)	(0.168)		(0.118)	(0.112)
Country Fixed Effects***										
CZ	0.077	0.084	0.083	0.081	0.099	0.087	0.093	0.082	0.081	0.081
ES	0.124	0.136	0.135	0.129	0.181	0.158	0.135	0.130	0.129	0.129
HU	0.100	0.109	0.109	0.106	-	-	-	0.106	0.106	0.105
LA	0.096	0.106	0.106	0.101	0.142	0.128	0.107	0.101	0.102	0.101
LI	0.113	0.123	0.124	0.119	0.154	0.136	0.117	0.119	0.120	0.120
PO	0.128	0.137	0.136	0.135	0.168	0.152	0.159	0.134	0.134	0.133
SK	0.149	0.161	0.161	0.156	0.147	0.127	0.138	0.156	0.156	0.156
SN	0.095	0.107	0.107	0.105	0.159	0.142	0.129	0.106	0.106	0.106
N obs.	300	298	298	298	206	206	206	298	298	298
Adj. R-sq.	0.40	0.41	0.40	0.41	0.33	0.36	0.32	0.41	0.40	0.41
F-stat.	23.6 ***	21.3 ***	19.3 ***	21.3 ***	12.4 ***	12.4 ***	11.9 ***	21.3 ***	19.3 ***	21.4 ***
D.-W.	1.40	1.39	1.40	1.40	1.87	2.04	2.05	1.40	1.41	1.41

See notes for Table 6.