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Exchange Rate Movements and Unemployment in the EU Accession Countries—A Panel Analysis

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Abstract

According to the traditional "optimum currency area" approach, not much will be lost from a very hard peg to a currency union if there has been little reason for variations in the exchange rate. This paper takes a different approach, and highlights the fact that high exchange rate volatility may as well signal high costs for labor markets. The impact of exchange rate volatility on labor markets in the CEECs is put to the test, finding that volatility *vis-à-vis* the euro significantly increases unemployment. Hence, the elimination of exchange rate volatility could be considered as a substitute for a removal of employment protection legislation. However, labor market reform could be argued to be an equally worthy strategy, backed up by central bank independence and the adoption of an anti-inflation monetary policy rule.

1. Introduction

The poor employment performance and persistent high unemployment in the Central and Eastern European Countries (CEECs), undermine the public support for European integration, and are therefore still one of the most important concerns to policymakers in the region. The rising unemployment rates may be explained by different factors, such as the ongoing macroeconomic and structural reforms, or the deterioration of the international environment (Nesporova, 2002). To what extent exchange rate variability can be made responsible for the negative developments in the CEEC labor markets, has received surprisingly little empirical attention, however.

Following up previous research conducted by participants, this paper investigates the specific costs and benefits to labor markets from suppressed exchange rate variability of 10 Central European Countries. In earlier studies they have shown that exchange rate variability can have a significant impact on labor markets (see Belke and Gros, 2001, for intra-European exchange rate variability, Belke and Gros, 2002b, for transatlantic exchange rate variability, and Belke and Gros, 2002a, for the Mercosur area).

This paper proceeds as follows: In section 2, the author derives a possible transmission channel that could account for a positive relationship between uncertainty and unemployment. He then explains the estimation procedure (section 3) and presents some empirical results (section 4). Section 5 gives a short conclusion.

2. A Model of Exchange Rate Uncertainty and the Labor Market

Most economists would probably assume, for a start, that exchange rate variability cannot have a significant impact on labor markets, given that the link between

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exchange rate variability and the volume of trade is known to be weak. However, there are several reasons why exchange rate volatility should have a strong negative impact on the economies of accession countries and, hence may constitute the basis for the fear of large exchange rate swings (Calvo and Reinhart, 2000). First, the pattern of trade invoicing is different in emerging markets as compared to that in industrial countries. Following McKinnon (1999), primary commodities are primarily dollar invoiced. Since the emerging market economies exports, generally, have a high primary commodity content, exchange rate volatility should have a significant impact on foreign trade of these countries. This is especially valid for Poland with its high primary product share. Additionally, and even more important, capital markets in emerging markets are of an incomplete nature. If future markets are either illiquid or even non-existent, tools for hedging the exchange rate risk are simply not available in these countries. Although this argument may be less important for countries with relatively efficient financial markets like the Czech Republic, Hungary, and Poland, problems that erupted in the Czech and Hungarian banking sector over the last years indicate that these countries are still vulnerable to speculative attacks—especially in the context of an elimination of all capital controls, as it is required by the acquis communautaire, the whole set of EU legislation and EU-"case law".

Due to the higher openness of these countries, emerging markets are, on average, more intolerant to large exchange rate fluctuations. When imports make up a large share of the domestic consumption basket, the pass-through from exchange rate swings to inflation is much higher (Calvo and Reinhart, 2000, pp. 18 ff.). Boreiko (2002) demonstrates the importance of trade with EMU countries for the CEECs, relating imports and exports to the euro area to total imports and exports in 1993–2000. His tables show clearly that most of the CEECs have already reached a high share of trade with the euro area. In some cases—such as Hungary (0.70), Poland (0.67), Slovenia (0.67), and the Czech Republic (0.66)—the shares are close to the average of EMU intra-trade (around 0.67 in 1999–2000; see also Belke and Hebler, 2002b). The realizations for the other candidate countries are lower (Romania: 0.63; Estonia: 0.59; Slovak Republic: 0.54; Latvia: 0.52; Bulgaria: 0.50; and Lithuania: 0.46). These differences in openness should be kept in mind for the empirical analysis, since they should, of course, influence the impact of DM/euro exchange rate variability on the labor markets in the respective candidate country.

How can one illustrate the transmission channel that could account for a negative relationship between exchange rate variability and labor market performance? The theoretical models that are used to describe this relationship typically start from the idea that, in order to export, one needs to sustain a sunk cost, due to irreversible investments in the underlying production process, set-up costs of distribution in the export markets, etc.

The paper now develops a fully-fledged model apart from the Calvo and Reinhart (2000) spending channel, to illustrate a mechanism that explains a negative relationship between exchange rate uncertainty and *job creation*.[1] This model has originally been based on the idea that uncertainty of future earnings raises the "option value of waiting", with decisions which concern *investment projects* in general (Dixit, 1989; Belke and Gros, 2001). The model which heavily relies on Belke and Kaas (2002) does not pretend to be close to reality. It is designed to convey the basic idea in a simple way. Moreover, our intention is to present a model that allows us to ask whether even a *temporary*, *short-run* increase in uncertainty can have a strong impact on employment and the unemployment rate, and how this impact depends on labor market parameters.

Consider a set-up with three periods, and a single firm active in an export-oriented industry decides about job creation. During the first two periods (called zero and one) the firm can open a job, hire a worker, and produce output that is sold in a foreign market during the following periods. If the job is created during period zero, the worker is hired for two periods (zero and one) to produce output to be sold in periods one and two. If the job is created in period one, the worker is hired only for period one and output is sold in period two.

To create a job, the firm pays a start-up cost c which reflects the cost of hiring, training and the provision of job-specific capital. After a job is created, a worker is hired and is paid a wage w above the worker's fallback (or reservation) wage $\underline{w}$ during every period he is employed. The fallback wage measures (besides disutility of work) all opportunity income that the worker has to give up by accepting the job. In particular, it includes unemployment benefits, but it might also be positively related to a collective wage set by a trade union or to a minimum wage, both of which should raise the worker's fallback position. In general, the author argues that the fallback wage should be higher in countries that are characterized by generous unemployment benefit systems, by strong trade unions or by minimum wage legislation.

In every period in which the worker is employed, he produces output that is sold in the following period in a foreign market at domestic price p which has a certain component p^* (the foreign price) plus a stochastic component e (the exchange rate). It can be assumed that the foreign price is fixed ("pricing to market" or dollar invoiced exports), and that the exchange rate follows a random walk. In period one, the exchange rate e_1 is uniformly distributed between $-\sigma_1$ and $+\sigma_1$. The exchange rate in period two, e_2, is uniformly distributed between $e_1 - \sigma_2$ and $e_1 + \sigma_2$. An increase in σ_i means an increase in uncertainty, or an increase in the mean preserving spread in period $i = 1, 2$ (σ_i is proportional to the standard deviation of e_i). Uncertainty can be temporary (e.g. if $\sigma_1 > 0$ and $\sigma_2 = 0$) or persistent (if also $\sigma_2 > 0$). As will become apparent soon, however, the variability of the exchange rate during the second period has no influence on the result.

The wage rate w for the job is determined by the (generalized) Nash bargaining solution that maximizes a weighted product of the worker's and the firm's expected net return from the job. The author assumes that both the firm and the worker are risk-neutral. This assumption implies that risk-sharing issues are of no importance for our analysis. Thus we may assume realistically (but without loss of generality) that the worker and the firm bargain about a fixed wage rate w (which is independent of realizations of the exchange rate) when the worker is hired, so that the firm bears all the exchange rate risk. A wage contract which shifts some exchange rate risk to the worker would leave the (unconditional) expected net returns unaffected, and has, therefore, no effect on the job creation decision. Of course, if the firm was risk-averse, the assumption that the firm bears all exchange rate risk would make a postponement of job creation in the presence of uncertainty even more likely.

Consider first the wage bargaining problem for a job created in *period zero*. In this case the worker is hired for two periods. After the job is created (and the job creation cost is sunk), the (unconditional) expected net return of this job is equal to $E_0(S_0) = 2p^* - 2\underline{w} = 2\pi$ where $\pi = p^* - \underline{w}$ denotes the expected return of a filled job per period. Denoting the bargaining power of the worker by $0 < \beta < 1$ and the cost of job creation the firm's net return from the job created in period zero is[2]

$$E_0(\Pi_0) = (1-\beta)E_0(S_0) - c = 2(1-\beta)\pi - c. \tag{1}$$

In order to make the problem non-trivial, the expected return from job creation in period zero must be positive, i.e. assume that $2(1-\beta)\pi - c > 0$. The model assumes implicitly that the firm and the worker sign a binding employment contract for two periods (zero and one). Hence they cannot sign a contract that allows for the possibility of job termination in the first period, whenever the exchange rate turns out to be unfavorable. In period one (after realization of the exchange rate) the conditional expected surplus from job continuation is $E_1(S_1) = \pi + e_1$, which may be negative if the exchange rate falls below $-\pi < 0$ in period one. In such circumstances, both the worker and the firm would benefit from termination. If a contract allowing for termination in period one could be signed, the unconditional expected surplus in period zero would be larger (consequently, both the worker and the firm would prefer to sign such a contract).[3] However, having in mind the interpretation of a rather short period length (a month, to be compatible with our empirical analysis), the assumption of a binding contract for two periods seems to be more appropriate. Of course, once a binding contract for two periods is signed, the worker always prefers continuation (since the contract wage exceeds the fallback wage), and the firm would incur losses if the exchange rate turned out to be unfavorable.[4]

If the firm waits until *period one*, it keeps the option of whether or not to open a job. It will create a job only if the exchange rate realized during period one (and so expected for period two) is above a certain threshold level, or barrier, denoted by b. Given that an employment relationship in period one yields a return only during period two, this barrier to make the creation of the job just worthwhile, is given by the condition that the (conditional) expected net return to the firm is zero:

$$(1-\beta)(p^* + b - \underline{w}) - c = 0 \text{ or } b = c/(1-\beta) + \underline{w} - p^* = c/(1-\beta) - \pi. \tag{2}$$

Whenever $e_1 \geq b$, the firm creates a job in period one, and the conditional expected net return to the firm is $E_1(\Pi_1) = (1-\beta)(\pi + e_1) - c \geq 0$. Whenever $e_1 < b$, the firm does not create a job in period one, and its return is zero. Hence, whenever both events occur with positive probabilities (i.e. whenever $\sigma_1 > b > -\sigma_1$),[5] the unconditional expected return of waiting in period zero is given by:

$$E_0(\Pi_1) = [(\sigma_1 + b)/(2\sigma_1)]0 + [(\sigma_1 - b)/(2\sigma_1)][(1-\beta)(\pi + (\sigma_1 + b)/2) - c], \tag{3}$$

where the first element is the probability that it will not be worthwhile to open a job (in this case the return is zero). The second term represents the product of the probability that it will be worthwhile to open the job (because the exchange rate is above the barrier), and the average expected value of the net return to the firm under this outcome. Given condition (2) this can be rewritten as:

$$E_0(\Pi_1) = (1-\beta)(\sigma_1 - b)^2/(4\sigma_1). \tag{4}$$

This is the key result, since it implies that an increase in uncertainty *increases* the value of the waiting strategy, since equation (4) is an increasing function of σ_1.[6] As σ_1 increases, it becomes more likely that it is worthwhile to wait until more information is available about the expected return during period two. At that point, the firm can avoid the losses that arise if the exchange rate is unfavorable by not opening a job. This option not to open the job becomes *more valuable* with *more uncertainty*. The intuitive explanation is that waiting implies that the firm foregoes the expected return during period one, but it keeps the option not to open the job which is valuable if the exchange rate turns out to be unfavorable. The higher the variance, the higher the potential losses the firm can avoid, and the higher the potential for a very favorable realization of the exchange rate, with consequently very high profits. It is now clear from (1) and (4) that a firm prefers to wait if and only if

$$(1-\beta)(\sigma_1-b)^2/(4\sigma_1) > 2(1-\beta)\pi - c. \tag{5}$$

As the left hand side is increasing in σ_1, the firm delays job creation if exchange rate uncertainty is large enough. The critical value at which (5) is satisfied with equality can be solved as[7]

$$\sigma_1^* = 3\pi - c/(1-\beta) + 2\sqrt{\pi(2\pi - c/(1-\beta))}. \tag{6}$$

Whenever $\sigma_1 > \sigma_1^*$, firms decide to postpone job creation in period zero. Since σ_1^* is increasing in π (and thereby decreasing in the fallback wage $\underline{w}$), decreasing in the cost of job creation c and decreasing in the worker's bargaining power β, this paper concludes that a strong position of workers in the wage bargain (reflected in a high fallback wage or in the bargaining power parameter), and higher costs of hiring raise the option value of waiting, and make a postponement of job creation more likely. Thus, the adverse impact of exchange rate uncertainty on job creation and employment, should be stronger if the labor market is characterized by generous unemployment benefit systems, powerful trade unions, minimum wage restrictions or large hiring costs. That such features of the labor market are detrimental to employment is, of course, not surprising. The adverse impact of these features on employment has been confirmed empirically in various studies, and there are many other theoretical mechanisms explaining it (Nickell, 1997). Our simple model shows that these features also reinforce the negative employment effects of contemporaneous and short spikes of exchange rate uncertainty. In sum, we retain two conclusions from the model. First, even a *temporary* "spike" in exchange rate variability can induce firms to wait with their creation of jobs (of course, and for exactly this reason, the level of the exchange rate at the same time loses explanatory power). Second, the relationship between exchange rate variability and (un-)employment should be particularly strong if the labor market is characterized by rigidities that improve the bargaining position of workers. A stronger fallback position of workers raises the contract wage, lowers the net returns to firms, and induces firms to delay job creation in the face of uncertainty.

Our argument rests on the assumption that workers cannot be fired immediately if the exchange rate turns out to be unfavorable. Hence, sunk wage payments are associated with the decision to hire a worker. These sunk costs and, consequently, the impact of uncertainty on job creation become more important if there are high firing costs. However, as we argue in Belke and Kaas (2002), even if there are no firing costs and if workers can be laid off at any point in time, exchange rate uncertainty should have a direct impact on job destruction. A more elaborate labor market model of job creation and job destruction (e.g. following the model of Pissarides, 2000, ch. 3), might further clarify these issues, but one would expect that uncertainty has a negative effect on both job creation and destruction flows. In the empirical analysis, it is therefore preferable to employ the total economy unemployment rate as an aggregate labor market indicator rather than more disaggregate job flow data.

After having modeled the impact of return uncertainty on employment, the next question arising is whether different measures of exchange rate volatility (both nominal and real effective volatility *vis-à-vis* the 31 most important trade partners, and the bilateral volatility of the nominal and real DM/euro exchange rate), have any ability to explain the residuals of unemployment regressions for CEEC economies. Up to now, the amount of literature which examines the link between exchange rate variability and labor market performance in emerging markets is rather thin. Hence, the author feels legitimized to present and comment some first results.

Are we legitimized then to transfer the above mentioned transmission channel to the CEECs? According to Belke and Gros (2002b), the temptation to postpone job creation is especially strong if a country is characterized by extensive labor market rigidities (and therefore higher sunk costs in the job creation process). Where do the CEECs stand in this respect?. Riboud, Sánchez-Páramo, and Silva-Jáuregui (2002) have assessed the flexibility of labor market institutions in six CEECs: the Czech Republic, Estonia, Hungary, Poland, Slovakia, and Slovenia. According to their findings, based on a large scale of indicators for regular contracts, temporary contracts and collective dismissals, the CEECs generally opted for labor market institutions similar to those in Western Europe (Riboud, Sánchez-Páramo, and Silva-Jáuregui, 2002). Employment stability protection, like mandated severance payments and other regulations penalizing employment termination in the CEECs, is *even stricter* than in some EU Countries. These results are consistent with findings by Belke and Hebler (2002a) or Cazes (2002), who state that Central European Countries have adopted labor market institutions, institutional arrangements and legal frameworks that share many common features with the old EU Member Countries. This trend clearly increases the job creation costs. Hence, the transmission channel from exchange rate variability to labor market performance seems to be relevant in the case of the CEECs.

3. Empirical Analysis

The next step is to ask whether different measures of exchange rate volatility have any ability to explain the residuals of unemployment regressions for CEEC Economies. Our panel consists of ten CEECs, namely Bulgaria (BG), the Czech Republic (CZ), Estonia (EE), Hungary (HU), Latvia (LV), Lithuania (LT), Poland (PL), Romania (RO), Slovak Republic (SK), and Slovenia (SL). The original sample ranges from 1990 to 2001. However, in view of the financial turmoil in the first years of transition, our estimations mostly exclude at least the year 1990.

In order to test empirically for the conjectured impact of exchange rate variability on labor-market performance, the author uses different measures of exchange rate variability (denoted by "VOL"). The nominal exchange rate variability of each country is measured by taking for each year the standard deviation of the 12 month-to-month changes in the logarithm of its nominal exchange rate, against the currencies of its main trade partner countries. For the construction of the real variability variable, see the appendix. To calculate effective volatilities, the standard deviations based on bilateral rates, are then aggregated in one composite measure of exchange rate variability, using the weights that approximate the importance of these currencies in trade with its 31 most important trade partners over the period 1990–2002 (for details see appendix).

The author uses monthly exchange rates to calculate volatility instead of daily volatility, to ensure consistency throughout the entire sample period. Another reason to prefer this measure over shorter-term alternatives (e.g. daily variability) was that, while the latter might be important for financial actors, they are less relevant for export or employment decisions. The drawback of monthly exchange rates, is that we had to use annual data to have a meaningful measure of variability. As a consequence, there are only eleven observations for each country.[8] Furthermore, he uses *actual* exchange rate changes instead of unanticipated ones, since at the monthly horizon, the anticipated change is usually close to zero, given the small interest rate differentials in Europe. Hence, actual and unanticipated changes are comparable (Gros and Thygesen, 1992, p. 102; Peeters, 1997, pp. 5 ff).

Note that this paper limits its empirical analysis to the impact of exchange rate variability *on the unemployment rate*. The author feels legitimized to this restraint for two reasons: First, if labour force were constant, the coefficients on unemployment and the growth rate in employment would be approximately equal in absolute value and of opposite sign. In case of a declining labour force as in the CEECs, the impact of exchange rate variability on employment should actually be even greater than on unemployment. Second, from a political point of view the unemployment rate is a much more interesting indicator, since its rise and fall has a much higher importance in the political debate than the corresponding course for the employment rate. In addition, this variable is typically derived from reliable surveys.

Our formal empirical analysis is based on tests of the non-stationarity of the levels and the first differences of the variables under consideration. The results of the unit root test by Levin and Lin (1992) reveal evidence of a stationary behaviour of the levels of exchange rate volatility.[9] Hence, exchange rate variability was used in levels, all remaining variables in differences.[10] This implies that temporary shocks of exchange rate variability result in permanent changes of the unemployment rate. This is a common finding, and is usually explained as the implication of a strong hysteresis (Belke and Gros, 2001, p. 243).

To test for a significant negative relationship between exchange rate variability and labor-market performance, the paper undertakes a fixed effects estimation. By this, it accounts for different intercepts and, hence, different natural rates of unemployment estimated for each CEEC.[11] Following the main arguments in section 2, it was decided to dispense with the exercise to implement random-effects as well since there is no reason to assume the country-specific constants in the (un-)employment equations as random *a priori*.

The empirical model used can be described by the usual form:[12]

$$y_{it} = \alpha_i + x'_{it}\beta_i + \varepsilon_{it}, \tag{7}$$

with y_{it} as the dependent (macroeconomic labor market) variable, x_{it} and β_i as k-vectors of non-constant regressors (e.g. exchange rate variability) and parameters for i = 1, 2, . . . , N cross-sectional units and t = 1, 2, . . . , T, as the periods for which each cross-section is observed. Imposing $\alpha_i = \alpha_j = \alpha$, a pooled analysis with common constants is nested in this specification.

Basing the analysis on *levels* of the unemployment rate as an endogenous lagged variable is problematic for, at least, two reasons. First, unemployment and employment time series might be plagued by non-stationarity problems (see above). This problem is less severe, though, since the unemployment rate is bounded by one from above and by zero from below. Second, one has to take account of the well-known problem of endogenous lagged variables in the context of panel analyses (group effects). This is usually avoided by taking first differences, which is a further reason why the analyses are conducted in these terms.

With respect to the well-known path-dependence of the unemployment rate, it is advisable to test for *dynamic effects* as well. In order to capture the speed of adjustment of labor markets, the option is used to include lagged unemployment variables in the set of regressors throughout this paper. The main problem to be treated here is the correlation of the lagged dependent variable (unemployment rate or level of employment) with the disturbance, even if the latter does not exhibit autocorrelation itself. While taking first differences enabled us to get rid of heterogeneity, i.e. the group effects, the problem of the correlation between the lagged dependent variable and the disturbance still remains. Moreover, a moving-average error term now appears in the specification. However, the treatment of the resulting model is a standard application of the instrumental variables approach.

The transformed model reads as follows:

$$y_{it} - y_{i,t-1} = (x_{it} - x_{i,t-1})'\beta_i + \delta(y_{i,t-1} - y_{i,t-2}) + (\varepsilon_{it} - \varepsilon_{i,t-1}). \tag{8}$$

Arellano (1989) and Greene (2000) for instance, recommend using the lagged levels $y_{i,t-2}$ and $y_{i,t-3}$ as instrumental variables for $(y_{i,t-1} - y_{i,t-2})$, in order to derive a simple instrumental variable estimator. The remaining variables can be taken as their own instruments. As our second step of analysis, we therefore implement this procedure within a dynamic framework (in Tables 1 and 2 this corresponds to the second column for each volatility measure).

We rely on Seemingly Unrelated Regression (SUR) estimates of a model assuming the presence of cross-sectional heteroscedasticity and correlation.[13] In order to be consistent in the sense of accounting for the possibility of asymmetric shocks to the labor markets (i.e. contemporaneous correlation), we, nevertheless, also apply SUR in the other 50% of our regression analysis. This procedure leads to similar conclusion, however. Due to space limits, not all results can be added to this paper, but are available on request (Belke, 2002).

The structure for presenting the estimation results is the same for both tables, with the exact specifications of the pooled estimation equations being described in the tables themselves. Half of the specifications include a lagged endogenous labor-market variable. All specifications contain contemporaneous real GDP growth with or without its lagged value as cyclical control, different measures of exchange rate variability, and the estimates of the country-specific constants.[14] The number of lags of the relevant variables were determined by the estimation itself. Like in his previous studies, the author limited possible lags to a number from 0 to 2 (annual data) and then tested down.

4. Summary of Results

Let us first turn to our basic regressions in Table 1. It is remarkable that the estimated coefficients measuring the impact of exchange rate volatility on the unemployment rate are mostly significant, and always display the expected sign. As our studies for other regions suggest, the economic impact of exchange rate volatility seems to be *small but non-negligible*. The results are generally weaker for DM/euro exchange rate volatility than for effective volatility. However, there is no significant difference between the coefficients for nominal and real volatility. This is not surprising, in view of the well-known fact that in the very short run changes in nominal and real exchange rates are highly correlated. If at all, the DM/euro volatility is significant in the static specifications. The estimated fixed effects exactly mirror the differences in the natural rate of unemployment, with Poland and the Slovak Republic clearly staying ahead. A commonly accepted prior, the significance of contemporaneous GDP growth in determining the unemployment rate, is corroborated by all specifications. The available test statistics point towards correct specifications. All in all, it seems, that the 10 CEECs are a group too heterogeneous to be characterized by a similarly strong impact of DM/euro exchange rate volatility.

Table 1. Impact of Exchange Rate Variability on the Change in the Unemployment Rate—SUR Estimates for 10 CEECs (Fixed Effects)

Regressors	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
Instrument for the change in unemployment rate (–1)	—	–0.28***	—	–0.20***				–0.02		–0.01
Real GDP growth rate	–0.29***	–0.18***	–0.27***	–0.15***	–0.27***	–0.21***	–0.25***	–0.25***	–0.26	–0.25***
Measures of exchange rate volatility:										
Effective volatility of nominal exchange rate	—	—	0.08***	0.04***		0.14***	—	—	—	—
Effective volatility of real exchange rate	0.08***	0.03**	—	—	0.10***		—	—	—	—
Volatility of national currency *vis-à-vis* euro (DM) (nominal exchange rate)							—	—	0.07	–0.02
Volatility of national currency *vis-à-vis* euro (DM) (real exchange rate)							0.10***	–0.03	—	—
AR-error assumed										
Fixed effects:										
–BG	–0.41	3.41	0.08	2.62	–1.14	–0.69	0.24	0.51	0.26	0.51
–CZ	0.61	1.82	0.76	1.50	0.75	0.91	1.04	1.26	1.14	1.24
–EE	0.90	1.85	1.51	1.81	0.84	1.76	1.46	2.02	1.61	2.01
–HU	0.34	3.06	0.66	2.28	–0.08	–0.07	0.64	0.19	0.74	0.17
–LV	0.08	2.33	0.86	2.03	–0.09	0.95	0.84	1.34	0.96	1.32
–LT	0.14	2.93	1.38	2.92	0.18	2.21	1.32	2.17	1.45	2.14
–PL	1.47	4.64	1.70	3.58	1.06	1.02	1.57	1.71	1.76	1.68
–RO	–0.19	2.39	0.21	1.78	–0.63	–0.57	0.11	0.22	0.32	0.18
–SK	1.30	5.11	1.62	3.42	0.88	1.01	1.57	1.84	1.70	1.82
–SL	0.84	4.26	0.95	3.11	0.64	0.41	0.81	0.90	1.01	0.88
Unweighted Statistics:										
R^2	0.44	0.48	0.47	0.34	0.23	0.21	0.49	0.33	0.47	
Durbin–Watson	1.63	2.00	1.74	1.87	1.81	2.29	1.57	1.90	1.53	
Total panel observations	97	90	101	91	87	86	96	81	97	81
Sample	1991–2001	1992–2001	1991–2001	1992–2001	1991–2001	1991–2001	1991–2001	1993–2001	1991–2001	1993–2001

Note: The term $(y_{i,t-1} - y_{i,t-2})$ is instrumented by the change of the unemployment rate lagged two periods; (***), (**), (*) denotes significance at the 1, 5 and 10% level, respectively.

Hence, we *generalized* the specifications chosen above by estimating a *separate coefficient* of exchange rate volatility for each of the 10 CEECs, in order to allow for heterogeneity with respect to the impact of volatility. According to our model, this heterogeneity might stem from different degrees of labor market rigidities and/or from different levels of volatility experienced in the past. Allowing for *different volatility coefficients* for each CEEC, we might be able to identify those countries which drive our results. The results from the SUR procedure are presented in Table 2.

For effective volatilities, it turns out that unemployment rates in the Czech Republic, Latvia, and the Slovak Republic, and in case of the static specification also in Bulgaria, are significantly influenced by effective real exchange rate variability. If one turns to effective nominal exchange rate volatility, the pattern changes, insofar, as now the coefficient of volatility is additionally significant for Hungary and Romania, in both the static and the dynamic specification. Estonia, Poland, and Slovenia, are identified as those CEECs that are also affected by effective nominal exchange rate variability, according to one specification. However, the results do not seem to be driven by the degree of exchange rate volatility experienced by a CEEC, since the countries that display persistently higher effective volatility (such as Poland, Romania, Latvia, and Lithuania), do not display a bulk of significant coefficients of volatility, with the exception of Latvia. Hence, the often stressed heterogeneity among the candidate countries becomes obvious, too, with respect to the impact of exchange rate volatility.

The pattern becomes more significant and consistent, when the bilateral DM/euro volatilities of the CEEC currencies are implemented. If one correlates these results with our considerations with regard to openness, *vis-à-vis* the euro area, it becomes obvious that the Czech Republic, Hungary, and Poland, as the economies which are most open to trade with the euro area, are among the best performing countries with respect to the main hypothesis of this paper. These countries are joined by Romania and the Slovak Republic with four entries as well. Bulgaria as the outlier in terms of volatility and, hence, a candidate for euroization, and Latvia have two entries each. Lithuania, Slovenia, and, somewhat surprisingly, Estonia display one significant coefficient of exchange rate volatility. With the exception of "non-performing" Slovenia, these results closely correspond to our expectations, based on the country-specific degrees of openness described in section 2. However, Slovenia reveals one of the lowest degrees of exchange rate volatility. This makes plausible why Slovenia's high degrees of openness towards the euro area and of labor market rigidities, do not lead to more significant entries in Table 2.[15]

5. Conclusion

The results of this paper suggest quite important policy conclusions. The data from the past suggest that exchange rate variability had a statistically significant negative impact on the unemployment rate in a number of CEEC candidate countries. This paper has argued that this result is due to the fact that all employment decisions have some degree of irreversibility. It has investigated both effective and bilateral DM/euro exchange rate variability because the interest was mainly in the costs of exchange rate variability in general (effective volatilities), and in evaluating one partial benefit of early euroization—the elimination of large parts of the exchange rate risk—in particular (bilateral volatilities, *vis-à-vis* the DM/euro). In general, our results are rather strong since we find in many cases that exchange rate variability has a significant impact on the unemployment rate. Moreover, the data confirm the expectation that economies with relatively close ties with the euro zone, such as the Czech Republic, show a

Table 2. Estimations Based on Cross-Section Specific Coefficients of Effective Exchange Rate Volatility (SUR, Fixed Effects)

Regressors	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Instrument for the change in unemployment rate (–1)		–0.28***		–0.30***		–0.36***		–0.3***
Real GDP growth rate	–0.31***	–0.19***	–0.18***	–0.13***	–0.23***	–0.11***	–0.17***	–0.15***
Measures of exchange rate volatility:								
Effective volatility of nominal exchange rate			X	X				
Effective volatility of real exchange rate	X	X						
Volatility of national currency *vis-à-vis* euro (DM) (nominal exchange rate)							X	X
Volatility of national currency *vis-à-vis* euro (DM) (real exchange rate)					X	X		
Country-specific coefficient of exchange rate volatility X:								
–BG	0.09**	0.02	0.09***	–0.01	0.08***	–0.01	0.12***	–0.08
–CZ	0.19***	0.23***	0.73***	0.74***	0.66***	0.82***	0.73***	0.82***
–EE	0.06	–0.03	–0.36	–0.39**	0.24	0.13	–0.83***	–0.09
–HU	0.10	0.05	0.99***	0.52*	0.42	0.54*	1.93***	1.12***
–LV	0.13***	0.13***	0.35**	0.54***	–0.78***	–0.86**	–0.19	–0.62
–LT	0.08	–0.02	0.04	0.06	0.97	1.12**	0.28	0.54
–PL	0.02	–0.07	0.46**	0.12	0.69***	0.40**	0.73***	0.35*
–RO	–0.05	–0.03	0.45***	0.30***	0.33***	0.31***	0.42***	0.28***
–SK	0.18***	0.17**	1.08***	0.98***	1.67***	1.73***	1.46***	1.36***
–SL	0.03	0.04	0.57***	0.12	–0.01	–0.12	0.40**	–0.10
Unweighted statistics:								
R^2	0.46	0.54	0.52	0.60	0.55	0.62	0.58	0.60
Durbin–Watson	1.70	2.14	1.64	2.11	1.60	2.07	1.80	2.18
Total panel observations	97	90	96	89	97	89	96	89
Sample	1991–2001	1992–2001	1991–2001	1992–2001	1991–2001	1992–2001	1991–2001	1992–2001

Note: The term $(y_{i,t-1} - y_{i,t-2})$ is instrumented by the change of the unemployment rate lagged two periods. X denotes volatility for which country-specific coefficient is estimated; (***), (**), (*) denotes significance at the 1, 5 and 10% level, respectively.

stronger impact of euro exchange rate variability. The estimated impact coefficients were in most of the cases smaller if all of the ten CEECs were pooled. This systematic correlation between openness and the strength of the impact of exchange rate volatility on trade, corresponds to the general finding of the literature, that for emerging markets this channel is more important.

A common argument against reducing exchange rate variability, is the position that economies need some safety valve somewhere. In other words, would the suggested gains from suppressing exchange rate variability be lost, if the volatility reappeared elsewhere, for example in higher interest rate variability? I would argue that it is not possible at present to say whether the volatilities of other variables will increase or decrease with efforts to limit CEEC exchange rate fluctuations. But recent research by Rose (1999) and others indicates that official action can reduce exchange rate variability, simply by holding the variability of fundamentals, such as interest rates and money constant. If these findings are corroborated by further studies, one might conclude that, for some of the CEECs, monetary integration with the Euro area would be the optimal monetary policy strategy. However, labor market reform could be argued to be an equally worthy strategy, backed up by central bank independence, and the adoption of an anti-inflation monetary policy rule.

Appendix

Sources: Oesterreichische Nationalbank (2002a), Oesterreichische Nationalbank (2002b), Vienna Institute for International Economic Studies (2002), Estonia, Latvia, Lithuania: Eurostat and national sources.

CPI: Index of consumer prices.
GDP: Gross domestic product, real growth rate, %.
TRADE WEIGHTS: average trade weight of CEEC *X* with country *Y* (Sum of countries *Y* = “world” = Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, UK, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia, Croatia, Belarus, Russia, Ukraine, Switzerland, US, Turkey) over the period 1990–2001, and calculated as 100*(exports to country *y* plus imports from country *Y*)/(total exports to the “world” plus total imports from the “world”); Euroland substitutes the euro area countries from 1999 on. The source for exports and imports is UNO (UN SITC 3, dimension 1000 US$).
UNEMP: Unemployment rate in %, end of period (registered unemployment in proportion to active population).
WAGE: Average gross monthly wages, real growth rate, %.
XR: specified national currency [n.c.] units) per US dollar, monthly average, nominal, bilateral exchange rates *vis-à-vis* other countries than the US calculated via cross rates.
XRR: specified national currency [n.c.] units) per US dollar, monthly average, real (deflated with CPI), bilateral exchange rates *vis-à-vis* other countries than the US calculated via cross rates.
VOLXREFF: effective volatility of nominal exchange rates (30 bilateral volatilities calculated for each CEEC, effective volatilities were generated by multiplying each of the 30 bilateral volatilities with the respective trade weight).

VOLXRREFF: effective volatility of real exchange rates (30 bilateral volatilities calculated for each CEEC, effective volatilities were generated by multiplying each of the 30 bilateral volatilities with the respective trade weight).

Exchange rate volatility "*vis-à-vis* the euro" is calculated as the volatility *vis-à-vis* the DM from 1990:01 until 1998:12 on and *vis-à-vis* the euro from 1999:01 on (except Greece: from 2001 on).

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Notes

1. For a similar model that analyzes the effect of exchange rate uncertainty on investment and not explicitly on the labor market, see Belke and Gros (2001).

2. Formally, the wage bargain leads to a wage rate maximizing the Nash product $(2w - 2\underline{w})^{\beta} \times (2p^* - 2w)^{1-\beta}$ whose solution is $w = (1 - \beta)\underline{w} + \beta p^*$, and hence the expected net return for the firm is $2p^* - 2w - c = (1 - \beta)(2p^* - 2\underline{w}) - c$.

3. Of course, such a flexible contract implies that some exchange rate risk is shared between the worker and the firm. However, the reason why they both benefit is not the risk-sharing aspect, but the fact that the flexible contract excludes continuation of unprofitable work relationships.

4. Belke and Kaas (2002) consider an alternative set-up, which allows for the *possibility of job destruction*. It turns out that in this case uncertainty does not delay job creation, but job destruction becomes more likely if uncertainty increases. Moreover, this effect is more pronounced if the worker's fallback wage is higher. Hence, the basic conclusions of the basic model remain valid.

5. I do not *a priori* restrict the sign of the barrier b. Hence one of these conditions is automatically satisfied, whereas the other is satisfied only if uncertainty is large enough.

6. Formally, this results from the fact that equation (4) is only valid whenever σ_1 exceeds b (otherwise the exchange rate could never exceed the barrier, and the firm never creates a job in period 1) and whenever $-\sigma_1$ is lower than b (otherwise the exchange rate could never fall below the barrier and the firm always creates a job in period one).

7. The other (smaller) solution to this equation is less than $|b|$, and is therefore not feasible.

8. In principle, one might employ option prices to extract implicit forward looking volatilities, but option prices are generally available only for the US dollar, and sometimes against the DM, and even then only for limited periods.

9. This test represents a direct extension of the univariate Augmented Dickey-Fuller (ADF) test setting to panel data. The results by Levin and Lin (1992) indicate that panel data is particularly useful for distinguishing between unit roots, and highly persistent stationarity in macroeconomic data, and that their unit root test for panel data is appropriate in panels of moderate size (between 10 and 250 cross-sections), as encountered in our study.

10. The results of unit root tests for the employment protection legislation index are available on request. It should be kept in mind that the artificial and constructed character of these institutional variables, can create serious problems for their correct empirical treatment. Hence, in cases of doubt about the order of integration we do not rely too much on the numerical results, but stick to economic intuition when specifying our regression equations.

11. Due to the limited availability of data for the CEECs with a maximum of 11 annual observations, country-specific regressions are not (yet) an option.

12. Dummies for different exchange rate regimes are not included throughout the regressions, since the impact of different exchange rate regimes on the labor market is exactly the focus of our study.

13. Motivated by inspections of the country-specific residuals we include an autoregressive error term in some specifications which enables us to get rid of autocorrelation problems in the time dimension. Following Greene (2000, p. 605), we prefer to impose the restriction of a common autocorrelation coefficient across countries in these cases.
14. The inclusion of a cyclical control variable can be interpreted as a first robustness test itself. Due to lack of space, the country-specific constants, while interesting for their own's are not displayed in the tables.
15. As a final step, I corroborated my analysis by extensive robustness checks. In the first step, I limited the sample to a group of rather homogenous countries with respect to labor market regulation, namely the Visegrad Economies, the Czech Republic, Hungary, Poland, and the Slovak Republic. The *magnitude* of the estimated volatility coefficients and their *significance levels increase dramatically*. A second robustness check, which includes indicators of strictness of employment protection legislation in the regressions, also performs quite well. As a third and final robustness check I implemented a measure for real wage growth, in order to check whether the result of a significant relationship between exchange rate volatility and the unemployment rate, found in this paper is driven by a missing third variable related to labor costs. Compared with the baseline estimation, the pattern of the result did not change much. I also checked for the exogeneity of the volatility and robustness variables, with respect to the change of the unemployment rate. Due to lack of space, the results are not presented here. For results see Belke (2002).