

The Anticipated Effects of EU Enlargement: Exchange Rate Volatility, Institutions and Conditional Convergence

Leonardo Becchetti · Iftekhar Hasan · Paul Wachtel

Received: 17 June 2008 / Accepted: 28 June 2008 / Published online: 21 October 2008
© Springer-Verlag 2008

Abstract Improvement of economic policies and institutions and reduced exchange rate volatility are two expected effects arising when candidates develop prerequisites needed to qualify for EU membership. In this paper, we evaluate whether these two effects occurred in the Eastern European accession countries by inspecting exchange rate volatility and the evolution of different indicators of the quality of institutions before and after the start of the negotiation period. We then evaluate the impact of both effects on growth of real per capita GDP. By comparing the effects on accession countries to a group of control countries, including transition non candidates, we find that the prospect of accession has a significant effect on output growth, which starts materializing much before accession and even before the beginning of the negotiations with the EU.

Keywords EU enlargement · Exchange rates · Convergence

JEL Classification O43 · O47 · P3

Electronic supplementary material The online version of this article (doi:[10.1007/s11300-008-0022-5](https://doi.org/10.1007/s11300-008-0022-5)) contains supplementary material, which is available to authorized users.

L. Becchetti (✉)
Faculty of Economics, Tor Vergata University, Rome, Italy
e-mail: becchetti@economia.uniroma2.it

I. Hasan
Rensselaer Polytechnic Institute and Bank of Finland, Troy, NY, USA
e-mail: hasan@rpi.edu

P. Wachtel
Stern School of Business, New York University, New York, NY, USA
e-mail: pwachtel@stern.nyu.edu

Introduction

The 2004 enlargement of the EU was much anticipated and the run-up to accession affected the new member states far in advance. In this paper, we analyze the anticipated impact of EU accession on the new member states. We examine how the prerequisites for consideration for accession and the negotiation process itself led to changes in two important aspects of accession: exchange rate volatility and the quality of economic institutions policies. We focus on these phenomena for two reasons: they are explicit accession criteria and the literature on economic growth indicates that they can have a significant effect on both the level and conditional convergence of per capita GDP.

The prospect of EU negotiations that arose early in the transition era might have been a strong impetus for reform. Our evidence is that economic reforms began earlier and were stronger in the accession countries than in other transition countries. We then show that these reforms are important determinants of economic growth. As a result, the prospect of EU membership and the ensuing negotiations were a strong impetus to growth in these countries. Moreover, further expansion of the EU may already be having an impact on reform and growth in countries like Turkey and the Ukraine. Our results indicate that the pull of EU membership sets these countries apart from others that are otherwise similar.

In the next section of the paper, we provide an institutional background illustrating the two-way causality nexus between accession and preparations for negotiation and improvements in economic policies and institutional quality of candidate countries. We then describe our measures of institutional quality and improved policy and show how they impact on growth. In the subsequent section, we provide evidence on the dynamics of exchange rate volatility and of various indicators of quality of institutions and macroeconomic policies for a subgroup of transition candidates¹ before and after the start of the negotiating process. Finally, we test econometrically for the impact of these enlargement criteria on levels and growth of real per capita GDP. We find that enlargement candidates have a higher performance in terms of reduction of exchange rate volatility and improvement in institutional quality from the period in which they started to prepare for admission. Since in our estimates these two variables are shown to affect growth of per capita GDP significantly, we conclude that the enlargement process had a significant effect on their economic development.

¹ The transition candidates are the former communist countries that were included in the first accession group: Czech Republic, Estonia, Latvia, Lithuania, Slovak Rep., Slovenia, Poland, Hungary. Our sample of transition non candidates consists of Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, Georgia, Kazakhstan, Kyrgyzstan, Macedonia, Moldova, Romania, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

Institutional Background

The Accession Process

The process toward EU accession starts with a formal application to the European Council. After receiving an opinion from the European Commission, the Council decides whether or not accession negotiations should be opened. In the case of the transition countries, the Luxembourg meeting of the European Council in December 1997 decided to admit transition countries to negotiations based on their potential to fulfill the economic and political conditions known as the “Copenhagen criteria” in the medium term. These criteria indicate that a prospective member must: (1) be a stable democracy, respecting human rights, the rule of law, and the protection of minorities; (2) have a functioning market economy; (3) adopt the common rules, standards and policies that make up the body of EU law.²

Accession negotiations started on 31 March 1998 with Hungary, Poland, Estonia, the Czech Republic, Slovenia and Cyprus and 13 October 1999 with Romania, the Slovak Republic, Latvia, Lithuania, Bulgaria and Malta. On 9 October 2002, the Commission recommended that negotiations with the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia (and also with the non-transition countries, Cyprus and Malta) be concluded. Negotiations with these ten countries effectively concluded by the end of 2002 and these “acceding countries” joined the EU on 1 May 2004. Two additional transition countries, Bulgaria and Romania entered the EU on 1 January 2007.

As part of the ‘Copenhagen criteria,’ applicants were expected to accept the “*acquis*,” corresponding to laws and rules adopted on the basis of the EU’s founding treaties. The negotiating process required each applicant country to draw up its position on each of the 31 chapters of the EU *acquis*. The pace of each negotiation depended on the speed of each country in converging toward the EU *acquis* in each of field.

The subjects covered by the *acquis* are far reaching but several chapters are particularly relevant to our interests. To begin, Chapter 11 deals with the EMU and, even though it states that “*countries cannot adopt the euro upon accession because the Treaty requires that an assessment of the sustainability of the government’s financial position be performed before accession*,” it establishes measures of convergence in exchange rates and economic policy which should lead to exchange rate stability and increase the likelihood of future accession to the EMU. Specifically, prior to the date of accession, legislation must be enacted that: (1) prohibits direct financing of the public sector; (2) prohibits privileged access of the public sector to financial institutions; and (3) makes the Central Bank independent. Other elements are only required from the date of accession, importantly, exchange rate and economic policies that are coordinated with the policies of the member states (i.e. policy and procedures that are consistent with the provisions of the Stability and Growth Pact). Next, other chapters (e.g. chapter 4 on free capital

² More detailed information on the criteria may be obtained at: <http://europa.eu.int/comm/enlargement/enlargement.htm>.

movement, chapter 5 on company law and chapter 25 on the common trade policy) relate to the institutional improvements that we will also investigate.

Interest in accession by the transition countries started almost before transition itself. Table 1 shows that trade and cooperation agreements with the EU (which granted most favored nation status) date back as early as 1988 (for Hungary) and that formal demands for admission were presented between 1994 and 1996. The press dates the intention to apply for EU membership to 5 September 1991 when Poland, Hungary and the former Czechoslovakia were formally asked to participate in the meetings of EU foreign ministers. On 22 June 1993, the European Council confirmed that all transition countries can be EU members although their ability at that time to satisfy the Copenhagen criteria seemed very far off.

This brief overview indicates that improvements in the quality of institutions and economic policies have been both a prerequisite for admission to negotiations and for their successful conclusion. We therefore expect that the effects of the EU enlargement process to start well before accession and even before the beginning of the negotiation process. This is because access to negotiations has been conditional on the evaluation of the capacity to fulfill the “Copenhagen criteria” and this capacity was determined on the basis of the progress already achieved (Henderson 2000).

As noted earlier, we will examine two aspects that are particularly significant determinants of economic growth. Reduced exchange rate volatility is a good indicator of improved economic policies (Razin and Collins 1997; Cottani et al. 1990; Dollar 1992; Ghura and Grennes 1993; Darby et al. 1999) and is also a specific “Copenhagen criteria” goal. Second, the overall quality of economic institutions (Mauro 1995; Sala-i-Martin 2002) is clearly one of the criteria and has received a great deal of emphasis in recent growth literature. The literature analyzing the role of the quality of institutions and economic policies on growth is

Table 1 Main steps toward closer economic integration and accession to EU for transition countries

Country	Trade and cooperation agreement signed	Europe agreement signed	Formal demand for admission
Bulgaria	8-mag-90	8-mar-93	14 December 1995
Czech Republic	–	4-ott-93	17 January 1996
Estonia	11-mag-92	12-giu-95	24 November 1995
Hungary	26-set-88	16-dic-91	31 March 1994
Latvia	11-mag-92	12-giu-95	13 October 1995
Lithuania	11-mag-92	12-giu-95	8 December 1995
Poland	19-set-89	16-dic-91	5 April 1994
Romania	22-ott-90	1-feb-93	22 June 1995
Slovak Republic	–	4-ott-93	27 June 1995
Slovenia	5-apr-93	10-giu-96	10 June 1996

Notes Trade and cooperation agreement establishes most favoured nation status; Europe agreement provides preferential treatment of exports and formal commitment for closer economic and political integration

Source: Temprano-Arroyo and Feldman (1999)

so vast that we just make reference to a few seminal contributions. Rodrik (2000) considers that the success of market based economies crucially hinges on the presence of good institutions. The most important of them are institutions that defend *property rights, fight corruption, support macroeconomic stabilization and promote social cohesion*.

Measuring Volatility and Institutional Quality

In this section, we present our measures of exchange rate volatility and of the quality of institutions and economic policies for transition candidates and a control group including also transition non-candidates.

Our measure of exchange rate volatility is based on a portfolio approach to trade relationships. Consider a country that has a portfolio of assets represented by its relationships with trade partners. Hence, the variance of the portfolio $\sigma_{p,i}^2$ of assets for the i -th country having trade relationships with j ($j = 1, \dots, N$) partners, may be written as:

$$\sigma_{p,i}^2 = \sum_j x_j^2 \sigma_j^2 + 2 \sum_{h < k} x_h x_k \sigma_{hk} \quad (1)$$

with σ_j^2 being the variance of the return of the j -th asset, or the rate of return of the bilateral exchange rate with the j -th partner, x_j the share of export to the j -th partner out of the i -th country total export, σ_{hk} the covariance between bilateral exchange rate returns of the i -th country with partners h and k . Following Bagella et al. 2004, we note that contributions to exchange rate volatility of small trading partners tend to be negligible. Thus, trading partners are not included: (1) once the number of included trading partners reaches seven, (2) once the cumulative export share reaches 60 percent, (3) if an individual partner share is smaller than 2 percent.³

Exchange rate volatility (ERV) from 1981 to the end of 2001 for both the Eurozone and the transition accession countries is shown in Figure 1; in each case, the data shown are the average for all countries in the group.⁴ In the transition countries, there is a period of extreme volatility from 1988 to 1996 where ERV is off the chart, followed by a reduction in volatility. Similar results are found by Desai (1998) in an analysis of the mid 1990s period of high real effective exchange rate volatility for transition countries. He identifies the root of these turbulences in the disequilibrium between undervalued nominal exchange rates and their PPP measures. Furthermore, Drabek and Brada (1998) find a strong correlation between real effective exchange rate volatility and changes in trade policies in transition countries. They show that real appreciations are associated with trade restrictions and vice-versa.

³ Since we are interested in the effects of the historically realized volatility on growth and not in the investigation of its law of variation, we prefer this method to ARCH or GARCH measures of volatility.

⁴ Exchange rates are official rates with one exception. From the end of 1990 until May 1995 for transition countries trading with Russia (Czech Republic, Estonia, Lithuania and Latvia) the mean monthly weighted exchange rate is calculated with the black market rate instead of the official exchange rate. The black market exchange rate is published by the Italian Exchange Office (<http://www.uic.it>).

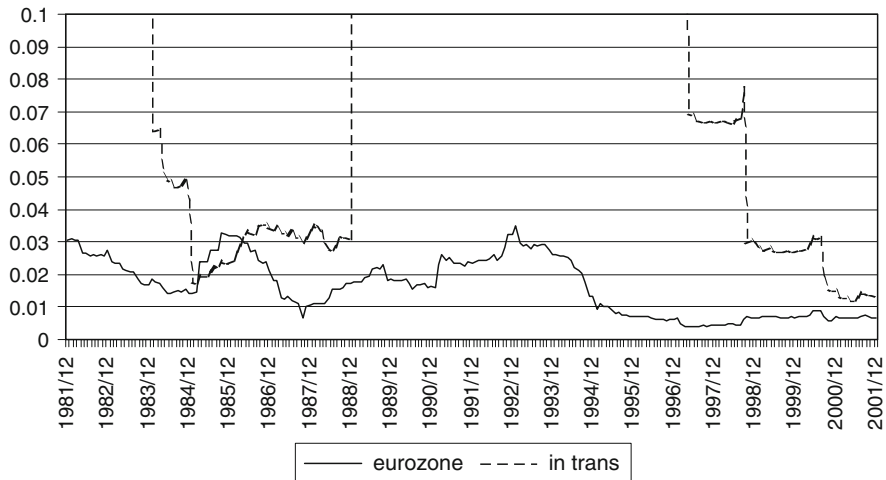


Fig. 1 Exchange rate volatility for Eurozone and transition accession candidates. The transition accession countries (in trans) are: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia

Recall that the EU *aquis* asks calls for convergence in exchange rates and economic policy that should lead to higher exchange rate stability. Moreover, countries were expected to take steps towards the *aquis* before starting negotiations. The chart indicates that volatility began to fall before the start of accession negotiations on 31 March 1998 with six countries—Hungary, Poland, Estonia, the Czech Republic, Slovenia and Cyprus.

The prerequisites needed to start negotiations and the milestones for a successful negotiation culminating in accession to the EU clearly imply a complex two-way relationship between exchange rate volatility and the quality of institutions and economic policies that lead to accession. That is, only countries that do relatively well can start the process and, at the same time, the process itself leads to an improvement in observed performance. The two-way relationship includes an impact of the desire to participate and an impact of participation in the process on improvement of the quality of institutions and economic policies and on the reduction of the exchange rate volatility.

To measure the quality of institutions and economic policies, we use the country aggregates and individual components of the index published in the *Economic Freedom of the World: 2000 Annual Report* issued by the Frazer Institute. The index is a weighted average of the different indicators designed to identify the quality of institutional arrangements and policies in major areas.⁵ Table 2 shows a summary of changes in the Index of Freedom and component categories between 1990 and 2000 for the accession countries and other country groups. There is substantial improvement in the index levels as well as large reductions of within group

⁵ The details of EFW criteria are omitted for reasons of space and available on the website <http://www.freetheworld.com>.

Table 2 Proportional changes in indicators of institutional quality, averages for country groups

	EU	Non EU OECD	Accession	Other transition
(Value of index in 2000 less 1990 index value)/value in 2000				
Index of freedom	0.084	0.077	0.494	0.334
Legal structure	0.137	0.312	0.022	-0.125
Sound money	0.110	0.266	0.334	0.235
Freedom of exchange	0.100	0.047	0.451	0.488
Regulation	0.188	0.112	0.825	0.758
(Standard deviation in 2000 less standard deviation in 1990)/SD in 2000				
Index of freedom	-0.277	-0.164	-0.553	0.236
Legal structure	-0.115	-0.288	-0.617	-0.224
Sound money	-0.554	-0.455	-0.543	-0.146
Freedom of exchange	-0.544	-0.433	-0.013	Na
Regulation	0.214	0.449	-0.362	0.246

Other transition countries: Albania, Armenia, Azerbaijan, Bosnia, Bulgaria, Croatia, Macedonia, Moldova, Romania, Russian Federation, Tajikistan, Ukraine, Uzbekistan, Yugoslavia

Accession countries: Czech R., Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia

See Appendix table for components of each index category

heterogeneity for the transition accession countries relative to other transition, EU and OECD non-EU countries.

The proportional growth in all index components is larger for the accession countries than the other transition countries. For the overall index, there is a 49 percent improvement for accession countries and 33 percent for the other transition countries. The increased homogeneity effect is even stronger. There is a reduction of 55 percent in the standard deviation of the overall index of institutional quality for accession countries against an increase of 23 percent for other transition countries.⁶ The large improvements in the candidate countries indicate a convergence towards EU levels. While the level effect may be subject to reverse causation (it is *ex ante* higher institutional quality of candidates with respect to non candidates which causes admission and not vice versa), the rate of change is a “difference in difference” effect which provides clear evidence of direct causation. That is, after the “admission race” started, candidates improved their institutional quality more than non candidates.⁷

Inspection to components of the aggregate index shows that improvement in the quality of institutions and economic policies generally anticipates the beginning of the negotiating process.

⁶ Data are available for all the accession countries but not for some of the other transition countries. Since data availability is generally positively related with good performance, the differences are likely to be downward biased.

⁷ Recall that all the transition countries were under pressure from the international financial institutions to make institutional reforms. Hence, our comparisons measure the effects of the marginal pressure exerted by the enlargement process in addition to that of international financial institutions.

In the next section, we use a familiar growth model for an econometric explanation of the role of exchange rate volatility and institutional and policy changes.

Accession Effects in an Empirical Growth Model

Model Structure

The theoretical benchmark for evaluating the effects of negotiations for EU accession is a standard Mankiw et al. 1992, hereinafter MRW, model with decreasing returns to scale in physical and human capital where country output (Y) is modeled as:

$$Y_t = F(K, H, AL) = K_t^\alpha H_t^\beta (A_t L_t)^{1-\alpha-\beta} \quad \text{with} \quad \alpha + \beta < 1 \quad (2)$$

with L and K being the standard labour and physical capital inputs, H the stock of human capital, while A is a variable capturing all other factors affecting labour productivity. Our hypothesis is that exchange rate volatility (EV) and the quality of institutions and policies (QI), the two variables affected by accession negotiations, are among the determinants of labour augmenting technological progress:

$$\begin{aligned} A_{(t)} &= A_{\text{KP}(t)} A_{\text{V(QI, EV, ...)}(t)} \quad \text{with} \quad A_{\text{V(QI, EV, ...)}(t)} = A_{\text{V}(0)} e^{g_{\text{V}}(t)} \quad \text{and} \\ A_{\text{KP}(t)} &= A_{\text{KP}(0)} e^{g_{\text{KP}}(t)} \end{aligned} \quad (3)$$

$A_{\text{KP}(t)}$ is the traditional contribution to technological progress of innovation, which grows at g_{KP} . A_{V} therefore includes other factors that enhance labour productivity; among them are the quality of governance and of macroeconomic policies (QI) and exchange rate volatility (EV). Finally, g_{V} is the rate of growth of A_{V} .

An empirically estimable form of the model is derived in Bagella et al. 2004. Steady state values for physical and human capital are substituted in the production function and the growth of the labour input is exogenous.⁸ The resulting equation for output is:

$$\begin{aligned} \ln\left(\frac{Y_t}{L_t}\right) &= c + \gamma_1 [\ln(A_{\text{V}}) + g_{\text{V}} t] + \frac{\alpha}{1-\alpha-\beta} \ln(s_k) + \frac{\beta}{1-\alpha-\beta} \ln(s_h) \\ &\quad + \frac{\alpha + \beta}{1-\alpha-\beta} \ln(n + g + \delta) \end{aligned} \quad (4)$$

where $c = \ln(A_{\text{KP}(0)}) + g_{\text{KP}} t$ is the quasi-public good component of knowledge products and is therefore assumed constant across countries. As in Bagella et al. 2004, the quality of institutional rules and macroeconomic policies and exchange

⁸ The exogeneity of labour force growth is a restrictive assumption which can be accepted considering that changes in per capita income on fertility affect labour force with lags which go beyond the time interval considered in our estimate (especially panel estimates). Moreover, we may also assume that with migration and, albeit imperfect, international mobility of labour the effect of domestic fertility on the labour force is limited.

rate volatility may be seen as two specific components of the country specific factor $[\ln(A_V) + g_V t]$ that augments the effects of labour input on levels and growth of real per capita GDP.

With standard assumptions about adjustments to a balanced growth path, an empirically estimable equation for growth can be derived:

$$\ln\left(\frac{Y}{L}\right)_t - \ln\left(\frac{Y}{L}\right)_0 = c' + \gamma_1 [\ln(A_V) + g_V t] + c_1 \ln(s_k) + c_2 \ln(s_h) + c_3 \ln(n + g + \delta) - c_4 \ln\left(\frac{Y}{L}\right)_0 \quad (5)$$

Interpretation of estimates of (5) may be affected by observational equivalence. Originally, the MRW estimation framework was adopted by the authors to test the (human capital augmented) Solow exogenous growth model, but Bernanke and Gurkaynak (2001) show that such estimation framework is consistent with any growth model that admits a balanced growth path and therefore is compatible also with suitable endogenous growth models.

The exogenous/endogenous growth issue has special interest when we interpret the results of our growth equation, given that the interpretation under the two perspectives is quite different. Consider, however, that the distinction blurs once we introduce quality of institutions and macroeconomic policies as a factor of exogenous growth in our augmented Solow model. In that case our framework clearly suggests that policy matters for growth independently from the question whether what we measured corresponds to traditional exogenous or endogenous growth models.

By arguing that exchange rate volatility and the quality of institutions and economic policies proxy important components of the labour augmenting factor and are uniquely responsible of further growth from the equilibrium point, we implicitly introduce the importance of institutions and policies also in the exogenous growth framework (Bagella et al. 2004).⁹

Econometric Specification

Data are obtained from several sources: the World Bank development indicators, the Penn World Tables, the indicators of institutional quality collected by the Frazer institute and UNESCO data on school enrollment and quality adjusted schooling years of the working population. The dependent variable Y/L is real gross domestic product per working-age person (population aged between 15 and 64). s_k is gross domestic investment over GDP and is calculated using values taken from Penn World Tables¹⁰ or, alternatively, World Bank data. s_k is our proxy for human capital investment. Commonly used proxies for this variable such as enrollment rates or

⁹ Dowrick and Rogers (2002) implicitly share this view by arguing that “the Solow-Swann steady state is a moving target which grows at different rates in each country” and by adding that such growth depends on technical progress, which “may well reflect unobserved policy and institutional differences”.

¹⁰ The Penn World Tables provide consistent cross-country information based on price surveys of identical sets of good and services in different countries. See Heston and Summers (1988, 1996) for a discussion of the methodological advantages of the data.

average years of schooling are very crude. Enrollment rates are reflective of current human capital investments and not the existing stock, while years of schooling do not take into account quality differences. We use instead Hanushek and Kimko's (2000) educational quality index, normalized by Wozzmann (2003) for each country relative to the measure for the United States.

Another problem to consider in level and growth estimates on a sample which joins transition countries and the rest of the world is the need to take into account the possibility of structural breaks in productivity of labour and physical capital during and after the communist period. The literature on transition economies identifies several sources of structural differences between ex communist countries and the rest of market economies, before and after the fall of the Berlin wall. Easterly and Fischer (1995) document the presence of low productivity rates in the communist period for the low elasticity of substitution between factors of production, considering that, in the communist era, the plan generated restrictions to capital mobility and services were considered unproductive. Campos and Coricelli (2002) highlight that significant differences in factors productivities might have been generated by widespread labour hoarding which was deemed necessary to cope with uncertainty in the delivery of inputs (fulfill plan targets) and to maximize subsidies for the enterprise. Other authors emphasize how low factor productivity may persist also in the transition period. A problem of mismatch may arise since human capital accumulated under the communist regime was highly specialized and not easily transferable (Boeri 2000) with "too many rocket scientists, too few marketing experts" (Campos and Dabuniskas 2001).

Consider also that, after the communist period, decline in participation rates and slight decline in gross school enrolment ratios may have affected GDP as well. For these reasons, we tested for structural differences between transition countries and the rest of the sample before and after the communist era. Results on structural breaks tests are not significant and are omitted for reasons of space and available from the authors upon request.

For estimation of underlying long run growth relationships, we use panel data for 99 countries for 1970–2000 where each observation is a 5-year average. Thus, there is a maximum of six observations for each country. Descriptive statistics for all of the regressors in the model are shown in Table 3. The investment to GDP ratio from World Bank data ranges from 6 to 53 percent, while the dispersion of the Summers-Heston investment to GDP measure (where raw measures are adjusted for quality and imperfect competition effects) is as high as expected. The highest percentile of secondary school gross enrolment ratios exceeds unity since it divides secondary school population (which includes pupils above the respective age class) to the secondary school age class. The median value of gross secondary school enrolment ratios is 48 percent.

Econometric Findings

The econometric estimation of (5) starts with a baseline growth model with 593 panel observations (six 5-year averages for 99 countries with some missing data). Each equation includes country-fixed effects, which are not shown in the tables. The

Table 3 Distribution of the regressors used in the econometric analysis

Centile	<i>Ngd</i>	<i>Gcapform</i>	<i>Schoolsegro</i>	<i>Schoolqua</i>	<i>QI</i>	<i>Moneyacc</i>	<i>Credlabus</i>	<i>Freedomex</i>	<i>ERV</i>
5	0.054	0.062	0.050	0.533	3.440	1.271	3.091	2.099	0.000005
10	0.057	0.070	0.100	0.591	3.770	3.292	3.848	3.314	0.000009
20	0.062	0.103	0.173	0.791	4.040	4.862	4.484	3.948	0.000028
30	0.067	0.117	0.230	0.796	4.500	5.310	4.845	4.480	0.000059
40	0.070	0.139	0.351	0.834	4.880	5.740	5.160	5.110	0.000076
50	0.074	0.160	0.486	0.873	5.050	6.060	5.285	5.430	0.000108
60	0.076	0.187	0.612	0.933	5.300	6.266	5.536	5.800	0.000156
70	0.078	0.204	0.755	1.040	5.500	6.738	5.700	6.600	0.000219
80	0.082	0.245	0.872	1.165	6.020	7.560	6.180	6.930	0.000292
90	0.086	0.316	0.940	1.270	6.730	8.550	6.641	8.074	0.000665
95	0.093	0.420	1.002	1.377	7.145	9.185	6.908	8.447	0.000889
99	0.145	0.532	1.217	1.541	8.400	9.538	7.250	9.350	0.007441

ngd sum of the rate of growth of population, stock of capital depreciation and technological progress, *Gcapform* gross capital formation over GDP (WB data), *Schoolsegro* Gross secondary school enrolment ratio, *Schoolqua* average schooling of the working population corrected for quality, *QI* Index of quality of institutional rules and of macroeconomic policies (see Appendix for index components), *Moneyacc* Index of access to sound money, *Credlabus* Index of regulation of credit, labor, and business, *ERV* effective exchange rate volatility (calculated as one year variance of effective exchange rate volatility monthly returns (see Eq. 1 in text))

Table 4 Growth equations: institutions, exchange rate volatility and enlargement in conditional convergence (Cross country panel of five year averages, 1970–2000)

	MRW Baseline model	Baseline model with enlargement dummy	Baseline with enlargement dummy and		
			Exchange rate volatility, ERV	Regulation index	Freedom index, QI
ln ($Y/L_{(t)}$)	-0.152 -7.84	-0.155 -8.02	-0.186 -5.72	-0.220 -8.19	-0.160 -5.20
ln (s_k)	0.108 5.18	0.112 5.40	0.067 2.37	0.084 3.35	0.065 2.37
ln (s_h)	-0.026 0.02	-0.025 -1.25	0.060 1.59	0.036 1.33	0.027 0.70
ln ($n + g + d$)	-0.252 -5.11	-0.262 -5.33	-0.195 -2.75	-0.213 -3.66	-0.174 -2.86
Ln (ERV)			-0.005 -1.75		
Ln (credlabus)				0.246 5.53	
Ln (QI)					0.063 1.66
Denlarg		0.158 2.65	0.160 2.80	0.021 0.23	0.103 1.47
Constant	0.919 4.49	0.920 4.53	1.135 3.80	1.094 4.46	0.961 3.86
H_0 , Joint insignificance of fixed effects	3.80 (0.00)	3.91 (0.00)	2.31 (0.00)	2.76 (0.00)	2.40 (0.00)
F test	31.66 (0.00)	27.05 (0.00)	7.54 (0.00)	16.29 (0.00)	5.64 (0.00)
R^2 within	0.20	0.13	0.21	0.22	0.09
H_0 , Test on model restriction	1.53 (0.21)	1.49 (0.22)	2.85 (0.10)	1.88 (0.17)	1.20 (0.27)
Countries	99	99	81	91	91
Obs.	593	593	378	451	440

Gcapform gross capital formation over GDP, *Schoolqua* average schooling of the working population corrected for quality, *ngd* sum of the rate of growth of population, stock of capital depreciation and technological progress, *QI* Quality of institutional rules and of macroeconomic policies (see Appendix), *Credlabus* Regulation of Credit, Labor, and Business (see Appendix), *ERV* effective exchange rate volatility (calculated as one year variance of monthly returns of the real effective exchange rate). For the definition of effective exchange rate volatility see Eq. 1). *Denlarg* dummy taking value of one for transition candidates in the last five year interval of the sample

t statistics are shown below regression coefficients. Significance levels are in parentheses after hypothesis test F values

baseline equation is the first column of Table 4. The additional equations in the table test for the importance of the variables relevant to accession: exchange rate volatility and the quality of institutions. The second equation adds an enlargement dummy that has a value of one for accession countries for the last 5-year interval of

Table 5 Growth equations: institutions, exchange rate volatility and enlargement in conditional convergence (Panel of EU plus transition countries, five year average 1970–2000)

	Baseline model	Baseline model with enlargement dummy	Baseline model with enlargement dummy and		
			Exch. Rate volatility ERV	Regulation index	Freedom index, QI
ln ($Y/L_{(t)}$)	-0.293	-0.309	-0.233	-0.281	-0.295
	-4.89	-5.3	-3.46	-5.36	-4.20
ln (s_k)	-0.073	-0.047	-0.084	0.011	-0.068
	-1.36	-0.89	-1.22	0.21	-1.17
ln (s_h)	0.176	0.197	0.286	0.317	0.364
	1.80	2.07	2.41	4.11	3.91
ln ($n + g + d$)	-0.073	-0.109	0.013	0.053	0.010
	-0.90	-1.36	0.14	0.66	0.10
Ln (ERV)			-0.029		
			-3.57	0.258	
Ln (credlabus)				4.10	
					0.082
Ln (QI)					0.93
Denlarg		0.133	0.047	-0.044	0.037
		2.77	1.08	-0.69	0.69
Constant	2.390	2.437	1.510	2.051	2.160
	4.35	4.57	2.28	4.20	3.54
H_0 : Joint insignificance of fixed effects	5.74 (0.00)	5.73 (0.00)	3.39 (0.00)	2.93 (0.00)	5.53 (0.00)
F test	5.74 (0.00)	8.72 (0.00)	7.78 (0.00)	10.36 (0.00)	5.53 (0.00)
R^2 within	0.24	0.30	0.44	0.43	0.30
H_0 , Test on model restriction	0.04 (0.84)	0.18 (0.67)	1.18 (0.28)	7.84 (0.00)	3.69 (0.05)
Countries	28	28	24	26	25
Obs.	136	136	97	112	109

See notes to Table 4

the estimate. The following equations add our measures of exchange rate volatility and alternative measures of institutional quality.

The baseline estimates are consistent with our expectations. Joint significance of the fixed effects is never rejected. The hypothesis test on the restriction implied by the model¹¹ is not rejected. There is a negative and significant convergence effect, that is; the coefficient on the lagged level of per capita GDP is negative. Physical capital investment is highly significant while investment in human capital is not. Similar results with panel growth equations are found in Islam (1995). Although the human capital variable is not significant, the result is understandable. Since panel

¹¹ The coefficients of human and physical capital and the sum of population growth, depreciation and technical progress coincide in level and growth estimates. From (4) and (5) the standard implied restriction of conditional convergence estimates is $c_2 + c_3 = -c_4$.

data mainly measure the within country effects of changes in regressors on the dependent variable, changes in human capital which occur very slowly may have a small influence on growth. The effects of human capital found in cross-section results are captured by the panel fixed effects in these estimates.

The enlargement dummy is significant, except when we introduce the indexes of institutional development. The measure of exchange rate volatility is not quite twice as big as its standard error. Exchange rate volatility and institutional quality are not entered simultaneously because they are strongly correlated (0.54). If we look at the economic magnitude of the transition effect we find that accession candidates have an overall 15 percent bonus to the rate of growth in each of the two-five years periods where preparation for accession affected their performance. This amount to a premium of a growth rate that is more than 2.5 percent per year higher.

Overall, the panel estimates in Table 4 provide supportive evidence for the role of volatility and institutional quality on growth. Since the particular hypotheses of interest concern the effects of EU accession on growth, we also show estimates of the model with just the EU and accession countries included in the sample. The data set is much smaller with no more than 28 countries in the panel. Estimates of the same set of equations are shown in Table 5.

With the smaller data set, the baseline model estimates are not as strong. In particular, the coefficients on physical capital is insignificant, which could be due to the fact that formerly planned economies had lots of poorly allocated physical capital investment. The enlargement dummy is large and significant in the smaller sample, but it disappears completely when either exchange rate volatility or a measure of institutional quality is included in the equation. This lends credence to the underlying argument of the paper that accession has an important influence on growth through the two channels suggested.

Conclusions

A typical argument that policymakers and academicians quote in favour of EU economic integration or convergence toward monetary unions is that these processes reduce the impact of financial crises on real economy of participants or candidates. This intuition is difficult to test empirically since we cannot compare the historical course of events with the counterfactual hypothesis (e.g. the impact of a crisis in the absence of participation or candidacy to EU economic integration or monetary union).

In this paper, we provide an alternative path, which may help to evaluate these effects. We show that effective promotion of a country's candidacy to EU enlargement requires an improvement in institutional quality and the reduction of real effective exchange rate volatility. Even in this specific case a problem of reverse causation arises given that transition non-candidates were not admitted to negotiations because of their *ex ante* inferior institutional quality and macroeconomic performance. Reverse causation is much less likely to occur if we adopt a difference in difference approach and look at rates of change. Successful participation to the admission race has in fact improved institutional quality and

the quality of macroeconomic policies more for the accession countries than for other transition countries. If this occurs, and if these variables positively affect level and growth of GDP, we are more likely to conclude that enlargement had an impact on them.

Our empirical findings confirm these hypotheses. We find that transition countries that were candidates to the enlargement had good performance in terms of institutional change and real effective exchange rate volatility (relatively better than transition non candidates) in the period from the time in which we may reasonably consider they started to prepare for negotiations with the EU until the accession. Since the institutional quality variable has strong and significant effects on growth of real per capita GDP we are led to conclude that the institutional path chosen in order to pursue EU membership has positively affected growth of the accession countries.

References

- Bagella M, Becchetti L, Hasan I (2004) The anticipated and concurring effects of a currency union: real effective exchange rate, convergence and growth for the Euro zone countries. *J Int Money Finance* 23(7–8):1053–1080
- Bernanke BS, Gurkaynak RS (2001) Is growth exogenous? Taking Mankiw Romer and Weil seriously. NBER Working Paper no. 8365
- Boeri T (2000) Structural change, welfare systems, and labour reallocation: lessons from the transition of formerly planned economies. Oxford University Press, Oxford
- Campos F, Coricelli F (2002) Growth in transition: what we know, what we don't, and what we should. *J Econ Lit* XL(3):793–836
- Campos F, Dabuniskas A (2001) So many rocket scientist, so few marketing clerks: Determinants of occupational change during the Estonian transition, CERGE-EI discussion paper 59
- Cottani J, Cavallo Domingo F, Shahbaz Khan M (1990) Real exchange rate behavior and economic performance in LDCs. *Econ Dev Cult Change* 39:61–76
- Darby J et al (1999) The impact of exchange rate uncertainty on the level of investment. *Econ J* 109:C55–C67
- Desai P (1998) Macroeconomic fragility and exchange rate vulnerability: a cautionary record of transition economies. *J Comp Econ* 26(4):621–641
- Dollar D (1992) Outward-oriented developing economies really do grow more rapidly: evidence from 95 LDCs, 1976–85. *Econ Dev Cult Change* 40:523–544
- Drabek Z, Brada JC (1998) Exchange rate regimes and the stability of trade policy in transition economies. *J Comp Econ* 26:642–668
- Easterly W, Fischer S (1995) The Soviet economic decline. *World Bank Econ Rev* 9(3):341–371
- Ghura D, Grennes (1993) The real exchange rate and macroeconomic performance in sub-Saharan Africa. *J Dev Econ* 42:155–174
- Hanushek EA, Kimko DD (2000) Schooling, labor-force quality, and the growth of nations. *Am Econ Rev* 90(5):1184–1208
- Henderson K (2000) The challenges of EU eastward enlargement. *Int Polit* 3(7):1–17
- Heston A, Summers R (1988) A new set of international comparisons of real product and price levels estimates for 130 countries, 1950–1985. *Rev Income Wealth* 34(1):1–25
- Heston A, Summers R (1996) International price and quantity comparisons: potentials and pitfalls. *Am Econ Rev* 86(2), May
- Islam N (1995) Growth empirics: a panel data approach. *Q J Econ* CX:1127–1170
- Mankiw NG, Romer D, Weil D (1992) A contribution to the empirics of economic growth. *Q J Econ* 407–437
- Mauro P (1995) Corruption and growth. *Q J Econ* 110(3):681–712

- Razin O, Collins SM (1997) Exchange rate misalignment and growth. National Bureau of Economic Research Working Paper 6174
- Rodrik D (2000) Institutions for high-quality growth: what they are and how to acquire them. Discussion Paper No. 2370, CEPR
- Sala-i-Martin X (2002) 15 years of new growth economics: what have we learnt? Working Paper No. 172, Central Bank of Chile
- Temprano-Arroyo H, Feldman RA (1999) Selected transition and Mediterranean countries: an institutional primer on EMU and EU accession. *Economics of Transition* 7(3):741–806
- Wozzmann L (2003) Specifying human capital. *J Econ Surv* 17(3):239–270