Taner M. Yigit, Ali M. Kutan

European Integration, Productivity Growth and Real Convergence
European Integration, Productivity Growth 
and Real Convergence

Taner M. Yigit\textsuperscript{a}

Bilkent University

and

Ali M. Kutan\textsuperscript{b}

Southern Illinois University, Edwardsville; ZEI, Bonn; and WDI, Michigan.

\textsuperscript{a}Corresponding author: Department of Economics, Bilkent University, Bilkent, 06800 Ankara-Turkey. Tel: +90 (312) 2901898, Fax: +90 (312) 2665140, E-mail: tyigit@bilkent.edu.tr

\textsuperscript{b}Economics and Finance Department, School of Business, Southern Illinois University Edwardsville, IL 62026-1102, The Center for European Integration Studies (ZEI), Bonn, and The William Davidson Institute (WDI), Michigan. E-mail: akutan@siue.edu

We thank Jesus Crespo-Cuaresma, Kostas Drakos, Balázs Egert, Lucjan T. Orlowski, Erinc Yeldan, the participants of the 7th International ERC, and the participants of the 49\textsuperscript{th} East Jour Fixe, where earlier versions of this paper was presented, for their valuable comments.
European Integration, Productivity Growth 
and Real Convergence

Abstract

This paper derives a stochastic endogenous growth model that investigates the impact of European Union integration on convergence and productivity growth. We deviate from the general strand of literature by not only deriving a theoretical model for the effects of integration on the rate of economic growth, but also by using more appropriate estimation techniques. The outcome of a series of panel and structural break tests examining the accession process of five recent members to the Union generally show improved rates of productivity growth and convergence to EU standards. We then draw from the experience of these recent members to derive implications for the first-round EU candidate countries. Subsequent tests on the first-round candidate countries find a high level of heterogeneity in growth rates, and a fast-paced convergence to EU standards.
1. Introduction

In an age where many former communist countries strive to become a member of the European Union (EU) and policy circles discuss how best to synchronize the policies so that the existing members “all” benefit, it is natural to ask whether the EU membership pays off and eliminates the divergence of EU’s incumbents over time. To answer this question, we formulate and test a stochastic endogenous growth model that investigates the impact of EU integration on convergence and productivity growth. We achieve this by combining the ideas in Rivera-Batiz & Romer (hereafter, RB-R, 1991) and Lee, Pesaran & Smith (LPS, 1997), complemented later on by a battery of structural break and panel data tests.

This paper contributes to the literature in significant ways. First, we extend the stochastic neoclassical growth model of LPS by implementing the ‘integration parameter’ of RB-R to analyze the effects of accession into the Union. We assume that integration to a wider body of knowledge that comes with (prospective) membership into the EU leads to higher returns to scale by enhancing the effectiveness of capital, hence speeding up the convergence process. Second, we test the findings of our theoretical model by utilizing the methodology by LPS, which provides a sound framework regarding the variables that should be included in the estimation\(^1\). The use of this technique especially fits our analysis since it corrects for the false inference in convergence when technological progress or sufficient heterogeneity are not adequately accounted for. Third, we complement the LPS tests with a series of structural break tests to validate the implications of the theoretical model regarding changes in the parameters of the growth process. Finally, we apply our modified theoretical model to the case of real convergence of the candidate transition economies to gain insight on the prospects of their integration to the EU by drawing from the experience of recent EU members during pre- and post-membership periods. To our best knowledge, our work is the first research that

\(^1\) Earlier studies use rather ad hoc specifications with many control variables to test for convergence, developing models that have very little reliance on growth theory.
brings theory and empirics together to analyze the impact of integration on convergence and productivity growth.

There are some related studies that complement ours. Henrekson, Thorstensson & Thorstensson (1997) examine the role of trade and institutional integration on economic growth, using a purely empirical approach on European Community (EC) and European Free Trade Area (EFTA) countries along with a sample of OECD countries. Using a cross-sectional and pooled OLS study, their study finds that joining the EU or EFTA enhances growth. Crespo-Cuaresma, Ritzberger-Grünwald, and Silgoner (2002) examine the impact of European integration on economic growth of current EU members, using a panel regression. They find that the length of EU membership has a significant and positive effect on growth, and it is higher for poorer countries, suggesting an asymmetric impact of EU membership. These studies solely focus on a regression analysis of the relation between membership and growth without providing an underlying theoretical framework or projections for the candidate economies. Martin and Velázquez (2001), Wagner and Hlouskova (2002) and Boldrin and Canova (2003) provide a descriptive analysis of how different experiences of convergence of the recent EU members affected economic growth after joining the EU and derive lessons from these countries’ experience for the candidate countries. Employing different growth scenarios, they examine the beneficial effects of the EU membership and how long it would take for the candidate countries to fully complete the convergence process. They emphasize the importance of national policies to achieve a sustained period of significant growth above EU averages and hence real convergence towards the EU standards.

Our paper extends the analysis in these papers by providing not only an in depth theoretical foundation on the effects of integration, but also empirically testing for its implications on the specific aspects of growth, namely productivity and convergence. We also contribute to the literature by using a variety of estimation techniques that have less room for
false inference due to impositions of homogeneity or neglecting of productivity growth. In addition, like in Martin and Velázquez (2001), Wagner and Hlouskova (2002) and Boldrin and Canova (2003), we provide lessons for the candidate economies by focusing the empirical evidence from the recent EU members. In this sense, we merge the two related but distinct literatures on integration and enlargement.

This paper is organized as follows. Section 2 sets up our theoretical model. We describe our estimation technique and data in Section 3, while Section 4 reports the empirical results. Section 5 discusses the importance of real convergence for the candidate countries and provides some preliminary estimates of convergence and productivity developments for these economies. The last section provides a summary of the key findings of the paper, along with its policy implications.

2. Theoretical framework

With developments in the econometrics field, 1990s have witnessed an abundance of studies on neoclassical growth theory and its implication of convergence. These empirical analyses of convergence fall into two categories. The first class of tests studies the cross-sectional correlation between initial per capita output levels \( y_{i,0} \) and the subsequent speed of growth \( (y_{i,t} - y_{i,0}) \).

\[
T^{-1}(y_{i,t} - y_{i,0}) = \alpha + \beta y_{i,0} + \epsilon_{i,t} \tag{1}
\]

A negative correlation (or \( \beta < 0 \)) is interpreted as convergence since it implies that countries with lower per capita output will grow faster (Dowrick & Nguyen, 1989; Barro, 1991; Barro and Sala-i-Martin, 1992). The second set of tests utilizes time series analysis to examine the long-run behavior of output per capita differences across countries (Quah, 1992; Bernard and Durlauf, 1995).
\[ y_{i,j} - y_{j,i} = \kappa_{i,j} + \sum_{r=0}^{\infty} \pi_{i,j,r} e_{i,j,t-r} \] (2)

A zero mean-stationary difference in output levels of country \( i \) and \( j \) implies that long term forecasts of output differences between the two countries converge to zero. A later study by Bernard & Durlauf (1996) cautions the practitioners by showing that cross sectional tests could exhibit negative correlation even without the existence of convergence, while time series tests could give misleading results when applied to countries in transition, still far away from their long-run equilibrium.

Recent adoption of panel-data estimation techniques combines the dynamics in time series with cross sectional variation in analyses of convergence. One group of authors utilizes panel unit root techniques to check for the existence of a common stochastic trend as evidence of convergence across a panel of countries (e.g., Evans and Karras, 1996; Evans, 1998, Fleissig and Strauss, 2001). Recent applications of this technique (e.g., Koèenda, 2001) assume homogeneity in growth rates across panel countries studied. Kutan and Yigit (2004), however, show Koèenda’s evidence for convergence is sensitive to the assumption of homogeneity in growth rates, and that further investigation, especially allowing for heterogeneity, is necessary. That is why we choose to employ dynamic panel data estimation techniques with the assumption of unobservable country-specific heterogeneity (Islam, 1995; Lee, Pesaran & Smith, 1997; Nerlove, 2000).

We choose to follow the methodology employed in LPS because it stands out from the rest of the studies by including an explicit link, rather than an ad hoc stochastic specification, between economic theory and their econometric model. Their work also allows for the maximum amount of heterogeneity in growth rates across the panel. We expand their model to incorporate an endogenous growth suggestion by RB-R to analyze the impact of European Union membership on the per capita GDP of recent entrants. The next section elaborates on this model.
2.1 Derivation of testable implications

Combination of the LPS suggested Cobb-Douglas production function with the integration parameter of RB-R yields

\[ Y_t = K_t^\alpha \left( A_t L_t Z_t \right)^{1-\alpha} \text{ where } 0 < \alpha < 1 \]  

(3)

where \( A \) is the labor (L) augmenting technology and Z, our contribution, is the capital (K) enhancing invention\(^2\) that comes with improved dissemination of ideas and technologies through trade and foreign direct investment (FDI).

Assuming

\[ K_t = I_{t-1} + (1-\delta) K_{t-1} \]
\[ I_t = s_t Y_t \]  

(4)

the traditional evolution of capital formula gives us

\[ \Delta \log \left( k_t \right) = -\Delta \log \left( A_t L_t Z_t \right) + \log \left( s_t k_t^{(-1-\alpha)} \right) + 1-\delta \]  

(5)

where \( s_t \) and \( \bar{\alpha} \) are the savings and depreciation rates, respectively, and \( k_t = K_t / A_t L_t Z_t \) (since capital enhancing inventions, Z, increases effectiveness of labor). Rather than following the normal deterministic path of solution to this growth problem, we follow the stochastic method by LPS with the assumptions

\[ \log \left( A_t \right) = a_t + g_t + u_{ait} \]  

(6)

\[ u_{ait} = \rho_{ait} u_{ait-1} + \epsilon_{ait} \text{ where } |\rho_{ait}| \leq 1 \]  

(7)

\[ \log \left( L_t \right) = l_t + n_t + u_{btt} \]  

(8)

and

\[ u_{btt} = \rho_{btt} u_{btt-1} + \epsilon_{btt} \text{ where } |\rho_{btt}| \leq 1 \]  

(9)

\(^2\) Derivation of this equation comes from the assumption that \( K = \int_0^K x(i)^\alpha \, di \) where \( i \) is the index of the most recently invented good.
where the technology shock, $u_{ait}$, summarizes factors that might shift total factor productivity (other than technological growth rate $g_i$), and the employment shock, $u_{bit}$, represents labor demand and supply effects other than population growth, $n_i$. We add the stochastic process for $Z_{it}$

$$\log(Z_{it}) = z_{it} + \zeta \cdot t + u_{it} \tag{10}$$

and assume the same autocorrelation as in the case of technological process only for notational simplicity.

Using the fact that expected change in capital is zero in the steady state and omitting the subscript $i$, we obtain

$$n + g + \zeta = E \left[ \log \left( sk_{-1}^{-1-\alpha} + 1 - \delta \right) \right] \tag{11}$$

Utilizing Jensen’s inequality, this term equals

$$n + g + \zeta = \log \left( se^{-1-\alpha}\log(k_{-1}) + 1 - \delta \right) + h \tag{12}$$

Approximation of the nonlinear term in this equation around $E \left[ \log(k_{-1}) \right]$ yields

$$\log \left( sk_{-1}^{-1-\alpha} + 1 - \delta \right) = \gamma - (1-\lambda) \log k_{-1} + \xi \tag{13}$$

where $\xi$ is the error of approximation and

$$1 - \lambda = \frac{s(1-\alpha)e^{-1-\alpha}E[\log(k_{-1})]}{se^{-1-\alpha}E[\log(k_{-1})] + 1 - \delta} > 0 \tag{14}$$

and

$$\gamma = \log \left( se^{-1-\alpha}\log(k_{-1}) + 1 - \delta \right) + (1-\lambda) E \left[ \log(k_{-1}) \right] \tag{15}$$

For small values of $n$, $g$, $\zeta$, $\delta$, and $h$, they simplify to

$$1 - \lambda = (1-\alpha)(n + g + \delta + \zeta - h) \tag{16}$$

and

$$\gamma = (n + g + \zeta - h) + (n + g + \zeta + \delta - h) \left[ \log s - \log (n + g + \zeta + \delta - h) \right] \tag{17}$$
In the deterministic version the linearization is done around the steady state $k$ and $u$’s are assumed to be zero. For $h$ equaling zero, the term $(1 - \lambda)$ is the measure of beta convergence.

Defining output per capita as

$$\frac{Y}{L} = x_t = a_t + z_t + \alpha \log (k_t)$$

(18)

where $a$ is log($A$) and $z$ is log($Z$) and $k_t = \frac{K_t}{A_t L_t Z_t}$, it is easy to see that

$$\Delta x = \Delta a_t + \Delta z_t + \alpha \left[ -(n + g + \xi) - \Delta u_t + \gamma (1 - \lambda) \frac{x_{t-1} - a_0 - z_0 - (g + \xi)(t-1) - u_{a_t} - u_{z_t}}{\alpha} \right]$$

(19)

Using equations from (6) to (10), we can rewrite this as

$$x_t = \mu + (1 - \lambda) (g + \xi) t + \lambda x_{t-1} + e_t$$

(20)

where

$$\mu = \lambda (g + \xi) - \alpha (n + g + \xi) + \alpha \gamma (1 - \lambda) (a_0 + z_0)$$

(21)

and

$$e_t = \Delta u_{at} + \Delta u_{zt} - \alpha \Delta u_t + (1 - \lambda) (u_{at} + u_{zt})$$

$$\Delta u_t = \Delta u_{at} + \Delta u_{zt} + \Delta u_d$$

(22)

In the context of the Solow growth model ($0 < \alpha < 1$), output will have a unit root only if $e_t$ has a unit root. LPS show that the unit root in $e$ only depends on the unit root in the technology error, $u_a$. Therefore, assuming $\rho_s = 1$ (and $\rho_u = \rho$), as they do, and eliminating the autocorrelation in $u_a$, we get

$$x_t = [(1 - \rho) \mu + (1 - \lambda) (g + \xi) \rho] + (1 - \lambda) (1 - \rho) (g + \xi) t + (\lambda + \rho) x_{t-1} - \lambda \rho x_{t-1} + (1 - \psi L) e_t$$

(23)

where $e_t$ is a composite error term from equations (7) and (9) and $\psi$ is a nonlinear function of variances/covariances of technology, employment, innovations, and the other parameters of the model.
The important implications of this model mentioned in LPS are the different speed of convergence due to the existence of \( h \), and the difficulty of using Augmented Dickey-Fuller (ADF) type estimation techniques to evaluate convergence. This is because the autoregressive coefficient tested is the product of many variables like \( \rho, \alpha, g, n, \delta, h, \) and \( \zeta \) with our addition, and that the unit root in output not necessarily being evidence against the neoclassical model, but also being caused by a unit root in the technology process (\( \rho = 1 \)).

What we illustrate with our contribution in this paper is that there is a positive impact of integration on a) the rate of growth via increasing the steady state value, the first term on the right hand side of Equation (23), b) the previously mentioned convergence rate in Equation (16), and c) the productivity growth, the coefficient of the deterministic trend again in Equation (23).

As in the LPS methodology, our estimation part is based on the assumptions that the convergence rate and the autocorrelation in technology approximately equal the moving average coefficient \( 1 - \lambda \cdots 1 - \rho \cdots 1 - \psi \), which transforms the system into

\[
x_t = \mu + (1 - \lambda) (g + \zeta) t + \lambda x_{t-1} + \epsilon_t
\]  

where

\[
\mu = \lambda (g + \zeta) - \alpha h + (1 - \lambda) \left\{ a_0 + \frac{\alpha}{1 - \alpha} \left[ \log s - \log (n + g + \zeta + \delta - h) \right] \right\}
\]  

This system is a modified version of the typically adopted method of convergence testing with the addition of increases in the steady state term and the productivity growth. For estimation of \( \lambda \) and \( (g + \zeta) \) separately, LPS suggests rewriting the equation

\[
x_{it} = c_i + (g_i + \zeta_i) t + u_{it}
\]

\[
u_{it} = \lambda_i u_{it-1} + \eta_{it}
\]
Separating $\lambda$ and $(g + \zeta)$ prevents any false inferences about convergence that could have resulted from a unit root in productivity growth. After the estimation of these equations, one could use these estimates to derive $\mu_i$ by noting that

$$\mu_i = (1 - \lambda_i) c_i + \lambda_i \left( g_i + \zeta_i \right) \quad (27)$$

It is apparent that one cannot identify both $g$ and $\zeta$ from these estimations, but a sudden change in the integration process could generate a structural shift in the GDP per capita. Results for the tests for these structural breaks are reported in Section 5.

Prior to estimation of the system in Equation (26), LPS suggests demeaning (across $i$) to remove the cross-correlation between countries caused by the common time component. Therefore, the estimated system becomes

$$x_i - \bar{x}_i = (c_i - \bar{c}) + \left( g_i + \zeta_i - \bar{g} - \bar{\zeta} \right) t + (u_{it} - \bar{u}_t)$$

$$\left( u_{it} - \bar{u}_t \right) = \lambda_i \left( u_{i,t-1} - \bar{u}_{t-1} \right) + (\eta_t - \bar{\eta}_t) \quad (28)$$

where the common component coefficients are obtained from a similar regression

$$\bar{x}_i = \bar{c} + \left( \bar{g} + \bar{\zeta} \right) t + \bar{u}$$

$$\bar{u}_t = \lambda \bar{u}_{t-1} + \bar{\eta}_t \quad (29)$$

Finally, coefficient values in Equation (26) are obtained by adding the estimates of Equation (28) to those of Equation (29).

There are important differences in our modified LPS model from all of studies that test for conditional convergence. The first one is that we have an explicit constant term $i_i$, representing differences in steady states rather than arbitrarily attaching a set of variables to control for differences in steady states. Despite the benefits of control variables in general, unnecessarily increasing the number of explanatory variables in dynamic panel studies is likely to increase the cross-correlation between sample countries, leading to size problems in the final estimation. The second difference is the fact that we allow for heterogeneity in technological growth rates across panel countries. LPS show that failure to account for this
possible variation will bias the convergence rates, resulting in slower convergence findings. Third and more importantly, we apply the same methodology to a different idea to illustrate that exposure to a wider knowledge base results in increased rates of productivity growth and convergence as shown in equations (16) and (24). We do this by measuring the most recent members’ convergence rates and productivity growth before and after joining the EU. We complement the outcome of these tests with the results from a series of structural break tests to find that integration does generally create the intended difference. Finally we expand our results to comment on an important question: are the first-group EU candidate countries following a similar path as the recent members, and will they and the EU benefit from a union?

3. Data and empirical methodology

3.1. Data

Our data set consists of quarterly GDP per capita from 13 countries; the earlier five members\(^3\), for the first stage estimations, and eight EU candidates\(^4\) for the latter stage of the estimations. The sample period for the member countries is from 1980 to 2002, while the candidate country data range is chosen to be between 1993 and 2002.\(^5\) We exclude Slovenia and Cyprus in the estimations due to data limitations. We construct real GDP per capita data based on purchasing power parity (PPP) values. Finally, since the classical definition of convergence refers to the log of real GDP per capita, we take the natural logarithm of all the series.

3.2 An overview of the estimation technique

We test Equation (26) for pre- and post-membership periods of the 5 recent members using Least Squares with Dummy Variables (LSDV) methodology. We choose this method over more complicated techniques such as the Exact Maximum Likelihood used in the LPS

\(^3\) Spain, Portugal, Austria, Finland, and Sweden

\(^4\) The Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, and the Slovak Republic

\(^5\) Pre-93 period is highly unstable, reflecting the shock effects of the early 1990 reforms.
(1997) paper, as well as GMM or 3SLS, due to small number of cross sectional units and a much larger quantity of time series observations. The fact that our sample countries are not randomly drawn from a large population and arguments by Baltagi (1995) lead us to the choice of fixed effects estimation over random effects.

We demean each series with French GDP/capita as the proxy for convergence to EU standards. Then, using the reduced form coefficients from Equation (28) and the French coefficients from Equation (29), we obtain the structural parameters of Equation (26). Utilizing these coefficients, we next check the assumption of heterogeneity versus common efficiency growth (g), common convergence rate (1-ε), and finally common g and common (1-ε). Likelihood ratio tests are used to establish the best fitting model among the four options. When the LR tests are not sufficient in providing a model of choice, we refer to the Akaike criterion to make a final determination. Results for Spain and Portugal (members since 1986) are displayed in Table 1 while the results for Austria, Finland, and Sweden (members since 1995) can be found in Table 2.

Next, not being able to identify the shift parameter, ζ, caused by the integration process in Equation (26), we resort to two structural break tests, to examine the validity of our theory. Structural break tests are important for our paper not only because the theory section can't separate the impact of integration from the previous values of the parameters, namely the identification problem, but also the break tests are the direct tests of our theory displayed in Equation (26). The first test we use is the stochastic multiple-break test developed by Bai & Perron (1998) and the other one is a single break test by Banerjee et al. (1992) (later extended

---

6 The bias associated with dynamic panel datasets is going to be negligible with such a high T and a low N (Judson and Owen, 1999; Nickell, 1981).
7 Unit root is rejected using Im-Pesaran-Shin (2003) test for each panel, which enables us to refer to (1-ε) as the convergence rate. Also convergence can also be verified from the opposite signs on the intercept and slope parameters of the trend model in Tables 1-7. Tomljanovic & Vogelsang (2002) indicate that a converging country with an initial per-capita income lower than the French average must exhibit a positive growth trend.
8 We use OLS to derive the estimates for these coefficients.
by Sen, 2003). We apply these tests on the recent five EU member countries to examine the impact of integration on the growth and convergence processes. We abstain from any PPP adjustment in this section to measure structural changes more accurately\(^9\).

The Bai-Perron (henceforth BP) methodology considers the following multiple structural break model, with \(m\) breaks \((m+1\) regimes)

\[
y_t = x_t' \beta + z_t' \delta_j + u_t
\]

for \(t = T_{j-1} + 1, \ldots, T_j\) and \(j = 1, \ldots, m + 1\). \(y_t\) is the observed dependent variable at time \(t\); \(x_t\) \((p \times 1)\) and \(z_t\) \((q \times 1)\) are the vector of covariates, \(\beta\) and \(\delta_j\) are the corresponding vectors of coefficients, and \(u_t\) is the disturbance term at time \(t\). The break points \((T)\) are treated as unknown, and are estimated together with the unknown coefficients when \(T\) observations are available. In the terminology of BP, this is a partial structural change model, in the sense that \(\beta\) does not change, and is effectively estimated over the entire sample. If \(p = 0\), this becomes a pure structural change model where all coefficients are subject to change.

The procedure for detecting structural breaks, suggested by Bai and Perron, is the following. First, calculate the UDMAX and WDMAX\(^{10}\) statistics. These are double maximum tests, where the null hypothesis of no structural breaks is tested against the alternative of an unknown number of breaks. These tests are used to determine if at least one structural break is present. In addition, the \(\text{SupF}(0|l)\) is a series of Wald tests for the hypothesis of 0 breaks vs. \(l\) breaks. In this paper, the maximum number of breaks \((l)\) is chosen to be 3. If these tests show evidence of at least one structural break, then the number of breaks can be determined by the sequential \(\text{SupF}(l+1|l)\). If this test is significant at the 5 percent level, then \(l+1\) breaks are chosen. Finally, we choose the number of breaks by the Bayesian Information Criteria (BIC).

---

\(^9\) GDP per capita in real terms is used in the estimations.
\(^{10}\) UDMAX stands for equally weighted double maximum test while WDMAX refers to the weighted version.
Unfortunately, detecting multiple structural changes in the existence of trending terms or possible unit roots, as in our model specification, is quite difficult. For instance, the restrictions that BP mention on the application of their methodology are that a) one should not allow for a unit root, and that b) when a lagged dependent variable is used, autocorrelation in the error term cannot be allowed. Despite their claim of being able to include trending terms in the regression, estimating a pure structural break model, in which all the coefficients could change, generated non-convergence in our estimations (especially for the trend variable). Therefore, it is almost impossible to simultaneously derive structural breaks in the mean, AR parameter, and the trend term using the BP methodology. We tried to bypass this problem by estimating two versions of the system: first, a de-trended version to measure the breaks in the convergence rate (under the assumption of constant trend), and the second on the differenced version where the constant term represents the trend coefficient (and the mean break is undetectable). Results for these tests are displayed in Tables 3 and 4.

We also apply another strand of the literature that allows for only a ‘single break’, but permits for unit roots in the existence of trend and mean breaks, namely an extension of Banerjee et al. (1992) by Sen (2003). We utilize the sequential F-test to test for three types of model originally suggested by Perron (1989): the crash model allowing for a break in the intercept, the changing growth model allowing for a break in the trend, and finally the mixed model that allows for breaks in both the intercept and the slope (AR parameter is assumed as constant). The general model we use is

\[
y_i = \mu_0 + \mu_1 DU_i(T_b^c) + \mu_2 DT_i(T_b^c) + \mu_1 t + \alpha y_{i-1} + \sum_{j=1}^{k} c_j y_{i-j} + e_i
\]  

where \( DU_i(T_b^c) \) is the indicator function that equals 1 after the break date \( T_b^c \), \( DT_i(T_b^c) \) equals \((t - T_b^c)\) if \( t > T_b^c \). Also in Equation (31), \( \mu_0 \) and \( \mu_2 \) are the mean and trend before possible

\[11\] There are working papers at early draft stages addressing this problem of the methodology.
breaks, and \( \hat{d} \) is the autoregression parameter. We add \( k \) additional regressors, \( \sum_{j=1}^{k} c_j y_{t-j} \), to the model for possible serial correlation in the disturbance term. Lag length is chosen using the methodology suggested by Ng & Perron (1995).

Sequential maximum F-test statistics presented in Sen (2003) is:

\[
F_j(T_n) = \left( R \theta(T_n) - r \right) \left[ R \left( \sum_{i=1}^{r} X_i(T_n) X_i(T_n)^\prime \right) R' \right]^{-1} \left( R \theta(T_n) - r \right) / \sigma^2(T_n)
\]

(32)

where

\[
X_i(T_n) = (1, DU_i(T_n), t, DT_i(T_n), y_{t-1}, \Delta y_{t-1}, ..., \Delta y_{t-q})',
\]

\( r \) is the restriction matrix, \( q \) is the number of restrictions, \( \sigma^2(T_n) \) equals \( (T - 5 - k)^{-1} \sum_{i=1}^{r} \left( y_{t} - x_i(T_n) \theta(T_n) \right)^2 \), and \( \theta(T_n) \) is the OLS estimator of \( \theta = (\mu_0, \mu_1, \mu_2, \mu_3, \alpha, c_1, ..., c_k)' \) in Equation (31). For instance, if we want to allow for a unit root in case of trend and mean break, i.e. test for \( H_0: \alpha = 1, \mu_1 = 0, \mu_3 = 0 \), we use the restriction matrix \( r = (0, 0, 1)' \) with the appropriate \( R \).

The results for Sen (2003) test are reported in Table 5. Please note that in our study, we restrict our tests to cases where trend does not coexist with a unit root since there is no economic rationale for that to happen in the case of real GDP/capita data.

Finally, we apply the LPS methodology to 8 first-group candidate countries. We run two versions of this test first after demeaning with French GDP/capita as above, and then using the group mean to test for conditional convergence “within” these specific groups to examine their economic integration and strength of their ties. We again use LR-tests and AIC criterion to pick the level of heterogeneity allowed. The results are displayed in Tables 6 and 7.
4. Empirical evidence

4.1. Convergence

The critical question we try to answer is whether membership to the EU leads to faster convergence and higher productivity rates. The answer to this question is not only important for EU policymakers, but also the candidate countries planning to join soon. Higher level of convergence and productivity would indicate less adjustment, smaller fiscal costs and hence less stabilization funds. To shed some light on these issues, we focus on the experience of the recent EU members by studying their performances before and after the membership, initially using the LPS methodology described above. Results for the LSDV tests are reported in Table 1 for Spain and Portugal (members since 1986) and for Austria, Finland, and Sweden (members since 1995) in Table 2. These are followed by the results of the structural change tests in Tables 3 to 5.

Findings in Tables 1 and 2 provide an interesting picture of the effects of integration to the Union. Our theoretical model’s implication was that all of the parameters in the equation, $\mu, g + \zeta$, and $\lambda$, should increase with membership into the Union. The most recent EU members comply more with the theoretical implications than the older ones. This finding suggests that the older members already enjoyed the benefits of economic and trade liberalization within the region before they formally became EU members and the benefits of integration hence occur within a few years after joining, so it is a relatively fast process. This finding is consistent with evidence in Ben-David (1996) who shows that the prospect of an EU membership exerts a positive impact on potential entrants’ economic performance prior to their entry. This finding is encouraging for the candidate economies because it suggests that they would acquire the benefits of EU membership relatively quickly once they join in.

Before interpreting the results in Tables 1 to 2 (also 6 and 7 later on) further, the reader should note that different blocks in the rows of these tables display differing levels of
heterogeneity in the parameters of the model, \( g, \hat{i}, \) and \( 1-\hat{\epsilon} \), representing productivity growth rate, the steady state level, and the convergence rate, respectively. Prior to commenting, we first pick the specification that likelihood-ratio tests reveal and then move on to the interpretation of those results. For instance, looking at the results for Spain and Portugal in Table 1, we note that the model of choice is common convergence rate option before becoming a member, and common productivity growth and convergence (by Akaike criterion) after membership. In these specifications, the only increase occurs in the estimates of the steady states. This switch in the model specification shows an increase in homogeneity after joining the EU indicating a strong integration into the common standards.

In Table 2, there also is a switch in the specification, though not very strong. The preferred model (by AIC) in pre-membership is the common productivity growth, switching to common convergence rate afterwards. In these options, we see not only the implications of the theory section (increase in all coefficients) generally holding with a few exceptions, but also a higher degree of harmonization, namely in the convergence rate. Finland stands out from the rest of the group by having experienced a significant benefit in their productivity after membership. There also is a very healthy increase in the convergence rate of the group compared to the EU standards.

### 4.2 Structural change tests

Next, we apply the stochastic structural break tests by Bai & Perron (1998) and Sen (2003) on individual country real GDP per capita data to investigate whether integration leads to any changes in the coefficients of Equation (26). For the Bai & Perron test, we use two modifications on the original data, namely the de-trended and the differenced versions. The difficulty of analyzing pure structural break models in the existence of time trends and possible nonstationarity compel us to de-trend the data to focus on the convergence rate and difference it to examine the productivity growth (trend coefficient). We interpret the results,
as mentioned above, by first looking at the results of the double maximum tests to determine
whether there is ‘any break’, and then focusing on the sequential test for the consecutive
breaks. Along with reporting these statistics and their significance levels, the tables also report
the dates and the direction of the structural changes in the parameters of interest after the
breaks.

The results of beak tests, especially the BP multiple break test can be affected by several
factors, e.g., the degree of international technology spillovers, given by the amount of FDI
and imports, developments in the Exchange Rate Mechanism (ERM), and business cycles.
The differences in macroeconomic policies pursued as well as progress in structural reforms
and institutional developments can also cause structural breaks in data. Given significant
diversity across countries with respect to above factors, it is difficult to identify the exact
factors that might cause every structural break. For our purposes, however, the critical point is
whether there is a significant break around the time of EU accession.

The results of Table 3, which report the breaks in the convergence rates, confirm
increased convergence rates in Austria, Spain and Sweden coinciding with their membership
dates (within the confidence interval of the reported dates). Austria shows another break at
around 1988, most likely due to one of the above factors. Finland’s break in the end of 1990
could be the result of a finding of the ERM recovery since post-1992 is in the confidence
interval of this break. Finally Sweden shows two other breaks; first one in early 1980s, and
the other one coinciding with the ERM recovery, while Portugal does not have any structural
break in its convergence rate.

In Table 4, the results are mixed. Despite the confirmatory increases of productivity in
Austria and Portugal coincident with their membership, Spain and Sweden show dates
possibly due to the other factors mentioned above. We again notice the same structural breaks
in Austria (1986Q2) and Finland (at the beginning of 1990), later followed by a decrease in
the productivity after the ERM crisis. Combining the outcome of both tables indicates the positive impact of the membership into the Union, either through an increase in productivity or the convergence rate or both, like in Austria.

Next, we examine the results of the Sen (2003) test that searches for the single “big” change either in the trend (productivity) and/or the mean (steady state). The results of this test are more easily interpretable since the test concentrates on the largest break. Table 5 reports the sequential F-max statistics, the dates and directions of the structural changes. The first line for each country represents the break test only in the trend (same as Banerjee et al., 1992), while the second line adds a break test for the mean as well (Sen, 2003). We obtain critical values for both tests since the original studies assume \textit{iid} errors and exclude serial correlation. First observation is that there is a significant break in each test, though mostly at differing dates between the two versions of the test. Allowing for mean changes brings forth recessions as the choice of break points (Austria, Finland, Spain, and Sweden). Increased rates of productivity in Finland, Portugal and Spain around their membership dates, however, clearly support the implications of our theory. Portugal stands out by showing increased productivity in both versions of the test.

Correct inferences from the structural break tests are quite difficult, especially with complicated dynamics as our model. Different methods may produce different results, which is a natural outcome of the issues related to the structural change literature. The results can be sensitive to assuming a single break or multiple breaks; or whether the break is in the trend, the mean or whether it is a nonlinear system (regime switching). Despite such concerns, the reported results are encouraging because they generally suggest positive changes in the productivity growth and are significantly stronger compared to the panel data tests; convergence or the steady states are never negative at the time of accession, which is supportive of our theory.
5. Are candidate countries converging?

Raising the candidate countries’ per capita income to the EU level serves as the most tangible proof of the success of integration. Within these countries, significant progress toward per capita income convergence is seen as key in securing the political assent of the population to both transition and membership in the EU. For the EU countries, such income growth is important if excessive population movements from the new members to the old are to be avoided and if the EU’s budget is not to be strained by transfers to lagging economies.

Besides above considerations, evidence on real convergence of the candidate economies towards the EU standards and productivity developments also has important implications for the design of an optimal policy towards the euro zone. First, according to the Balassa-Samuelson effect, higher labor productivity leads to higher - structural - inflation that, through positive inflation differential, provokes a real appreciation of the currency. At the same time, increasing per capita income also increases domestic demand that puts some pressure on domestic prices, hence the real appreciation. (Égert, 2002 and Égert et. al, 2004). An optimal monetary policy therefore requires a good understanding of the real convergence process. Second, achieving some real convergence in the early stages of the integration process would make it easier for the candidate countries to satisfy the Maastricht criteria on nominal convergence such as low inflation and stable exchange rates. The supreme goal of integration is economic growth and thus real convergence and nominal convergence, with nominal stability, underpins real convergence. Finally, once admitted into the EMU, policymakers in accession countries will not be able to use monetary policy any longer to achieve further real convergence.
Despite its significance, this issue has not received much attention in the literature. Only a few studies examine real convergence prospects for candidate economies. Koëenda (2001) studies the convergence of macroeconomic fundamentals in several groups of transition economies. Utilizing a commonly employed panel unit root technique and a sample period from January 1991 to December 1998, he finds considerable real convergence. Kutan and Yigit (2004) report a lower level of real economic convergence than those reported by Koëenda when a more recent panel estimation approach developed by Im, Pesaran, and Shin (2003), which allows for more heterogeneity in the convergence rates, is utilized. Brada et al. (2003) find clear evidence of increasing real sector convergence between some of the first-round candidate countries and EU.

In all the above studies, industrial output is utilized as a proxy for real convergence. Estrin et al. (2001) examine the convergence of candidate countries' per capita income to that of the EU average. They find that, for the period 1970-1998, none of the transition-economy candidate countries exhibited convergence with the EU countries. Because the greater part of the sample period reflects the candidate countries' performance under communism, and because it also incorporates the output decline of the early years of the transition, this finding is not surprising, nor may it be entirely germane to the issue of convergence in the context of EU accession.

These limited studies do not use a theoretical framework, nor take into account of the role played by the integration parameter. The EU candidate economies have received significant amount of FDI from the EU and also increased their trade with them in the last decade. Such “imported” technological spillovers based on a less costly way of imitation of foreign innovations through both FDI and imports of goods are expected to help spur economic growth in the candidate countries. Our theoretical model is therefore also applicable to the

---

EU candidate economies. The presence of sufficient stock of human capital endowment in these economies, which affects their ability to imitate technical progress, also complements the positive effects of new technologies created through FDI and trade (Lucas, 1988 and Nelson and Phelps, 1966). Thus, opening up to trade and FDI inflows in the framework of integration process raises productivity and hence stimulates real convergence.

Our theoretical model emphasizes the importance of including the capital enhancing invention variable, $Z$, in the endogenous growth models to capture the effects of international technology spillovers on productivity and convergence. It is therefore important to provide some preliminary estimates of real convergence for the candidate countries as well, indicating their progress so far. These preliminary results are useful to evaluate their further progress following their EU accession. Tables 6 and 7 report the results.

Table 6 analyzes convergence of the candidate economies to the EU standards, using French per capita GDP as a proxy, by applying the LSDV methodology. Relying on the results of LR tests and AIC criterion, we observe heterogeneity in each parameter estimate reported in Table 6. All likelihood ratio tests reject common growth rates and steady states at a minimum of 95% significance level indicating that all of these countries have distinct paces of progress toward the EU standards. Focusing on the first block, we also note a fairly fast convergence rate of some these countries like the Czech Republic, Hungary and Slovakia to the French GDP/capita since traditional estimates of non-OECD and oil importing countries average around 0.27. This finding is encouraging for these candidate countries because it indicates speedy convergence to EU income levels and a higher standard of living in the future.

We can’t help but observe that the results also validate the LPS claim that increased heterogeneity raises the convergence speed. Comparing the first two sections of the table shows that convergence rates fall significantly when we constrain the productivity growth
rates to be the same throughout the sample. Finally, we note the high productivity gains in Poland and Hungary, and the lack of convergence of Malta to the Union, reflecting the differences in the amount of trade with the EU and FDI inflows from the EU. Of course, macroeconomic policies pursued by countries have also been an important factor for the convergence to EU standards.

Results of Table 7 point to the common convergence rate option as the model of choice. The high convergence rate to the group average indicates a fast pace of integration within the group to common standards. Such a finding is consistent with earlier studies that find significant real convergence among the candidate transition economies (e.g., Brada et. al (2003), Koëenda, 2001 and Kutan and Yigit, 2003). This result indicates that despite the differences in their progress toward the EU standards, the candidate countries do not have significant outliers in the process of within group harmonization. This result is important for EU policymakers because it signals that the candidate countries would be integrated by the time they join the EU, and there may not be a need to admit countries one by one based on their level of integration with the EU. The last notable outcome is the negativity of some productivity gains, in this and most other parts of the table, due to the outstanding performance of Poland and Hungary.

7. Concluding observations and policy implications

We examine the impact of EU integration on productivity growth and convergence for recent EU entrants and use their experience to draw lessons for the candidate economies. We deviate from the general strand of literature by deriving an explicit formulation of theoretical

---

13 Available empirical evidence supports this finding. In analyzing the impacts of FDI on labor productivity levels on manufacturing sectors Hungary, Poland and the Czech Republic, Barrell and Holland (2000) report significant productivity improvements in most sectors, while Schoors and van der Tol (2002) find that the presence of foreign firms creates positive spillover effects on productivity of local firms in Hungary.

14 Kaminski and Riboud (2000) emphasize the importance of the stability of macroeconomic policies pursued in Hungary.
effects of integration by introducing a new variable that captures the effects of international technology spillovers. We also provide empirical evidence on the theoretical implications of the model, using panel data estimation techniques and a battery of structural break tests.

The results regarding recent EU members reveal three interesting observations. First, downward bias in the convergence rate is confirmed when heterogeneity in productivity rates is not allowed. Comparison of the first two sections of all the tables shows slower convergence rates resulting from the imposition of a common productivity assumption. Second, almost all coefficient estimates are positively affected with membership to the EU. This result is supported by structural change tests of Bai and Perron (1998) and Sen (2003). Third, there is an increasing amount of harmonization, especially in convergence rates.

Regarding the candidate countries, in addition to the above observations, there is also a significant level of variation towards their progress to the EU standards of living. Some countries like the Czech Republic, Hungary, Slovakia, and Poland stand out in terms of productivity growth or convergence rates, while others seem to do poorly. An important policy implication of the heterogeneity result is that the candidate economies would exhibit different productivity and convergence levels, following their entry. At this stage, regional and structural funds, similar to those provided to the recent EU members, may be useful to help the poorer candidate countries catch up. However, evidence indicates that such funds are not able to generate long-run growth effects (Boldrin and Canova, 2003).

The candidate countries’ economic conditions today look similar to those of Spain and Portugal at the time of their entry (Boldrin and Canova, 2003). Therefore, the costs and gains from joining the EU will likely to be similar to those experienced by these entrants. This observation, along with the harmonization experience these countries’ growth rates display, signals that the differences in productivity and convergence levels are expected to fade out
over time, a finding that is also supported by the increasing homogeneity within the candidate countries.

A larger and richer EU market with no exchange rate risk, which the recent entrants were not able to enjoy, will further facilitate the convergence process for the candidate economies. National policies encouraging further trade and FDI flows with the EU, as well as free labor and capital mobility, along with supply side and fiscal reforms, will therefore play a much more important role to achieve growth rates higher than EU averages and hence real convergence. The evidence of positive impact of integration on growth rates and productivity reported in this paper suggests that gained benefits over time will be more than outweigh the expected short-run consequences of the accession process, thereby making Europe a more prosperous place for all the parties involved.
References


### Table 1: Growth in Spain and Portugal before and after joining the EU (demean with France)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All heterogeneous</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$g$</td>
<td>0.18***</td>
<td>0.07*</td>
<td>0.10***</td>
<td>0.07***</td>
</tr>
<tr>
<td>$i$</td>
<td>3.02</td>
<td>3.84</td>
<td>0.65</td>
<td>0.70</td>
</tr>
<tr>
<td>$1-\bar{c}$</td>
<td>0.59**</td>
<td>0.58***</td>
<td>0.09***</td>
<td>0.09***</td>
</tr>
<tr>
<td>$LR = 7.16$</td>
<td>Common productivity growth</td>
<td>0.07***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$i$</td>
<td>-0.13</td>
<td>3.86</td>
<td>0.47</td>
<td>0.73</td>
</tr>
<tr>
<td>$1-\bar{c}$</td>
<td>0.01</td>
<td>0.58***</td>
<td>0.06***</td>
<td>0.10***</td>
</tr>
<tr>
<td>$LR = 0.001$</td>
<td>Common convergence rate</td>
<td>0.07***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$g$</td>
<td>0.18***</td>
<td>0.07***</td>
<td>0.10***</td>
<td>0.07***</td>
</tr>
<tr>
<td>$i$</td>
<td>2.99</td>
<td>3.87</td>
<td>0.65</td>
<td>0.70</td>
</tr>
<tr>
<td>$1-\bar{c}$</td>
<td>0.58***</td>
<td>0.09***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$LR = 12.96$</td>
<td>Common productivity and convergence rate</td>
<td>0.17*</td>
<td>0.07**</td>
<td>0.53</td>
</tr>
<tr>
<td>$g$</td>
<td>0.67</td>
<td>0.77</td>
<td>0.51</td>
<td>0.53</td>
</tr>
<tr>
<td>$i$</td>
<td>0.10***</td>
<td>0.09***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: $g$ represents technological/productivity growth, $i$ is a mixed variable that shows different steady states, and $1-\bar{c}$ is the convergence rate. Growth rates are annualized values. Values for $i$ rather than $c$ are reported in these tables due to the implications of the theoretical section about this parameter. Significance values are not reported for $i$ since it is composed of the product of three parameters. Critical values used for LR tests are 3.84 (2.71) for $\chi^2$ (first two tests) and 5.99 (4.61) for $\chi^2$ (last test). *** indicates significance at 99% while ** and * correspond to significance at 95% and 90%, respectively. ¤ indicates choice by AIC criterion.

### Table 2: Growth in Austria-Finland-Sweden before and after joining the EU (demean with France)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All heterogeneous</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$g$</td>
<td>0.05*</td>
<td>0.045</td>
<td>0.045</td>
<td>0.045</td>
<td>0.045</td>
<td></td>
</tr>
<tr>
<td>$i$</td>
<td>1.56</td>
<td>0.52</td>
<td>1.25</td>
<td>2.57</td>
<td>2.46</td>
<td>4.40</td>
</tr>
<tr>
<td>$1-\bar{c}$</td>
<td>0.20***</td>
<td>0.06***</td>
<td>0.15***</td>
<td>0.32***</td>
<td>0.33***</td>
<td>0.56***</td>
</tr>
<tr>
<td>$LR = 2.09$</td>
<td>Common productivity growth</td>
<td>0.07*</td>
<td>0.08***</td>
<td>0.045</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$i$</td>
<td>1.63</td>
<td>0.42</td>
<td>1.25</td>
<td>2.56</td>
<td>0.15</td>
<td>4.20</td>
</tr>
<tr>
<td>$1-\bar{c}$</td>
<td>0.20***</td>
<td>0.05***</td>
<td>0.15***</td>
<td>0.32***</td>
<td>0.01***</td>
<td>0.53***</td>
</tr>
<tr>
<td>$LR = 3.27$</td>
<td>Common convergence rate</td>
<td>0.07**</td>
<td>0.08</td>
<td>0.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$g$</td>
<td>0.06</td>
<td>0.045</td>
<td>0.045</td>
<td>0.045</td>
<td>0.045</td>
<td></td>
</tr>
<tr>
<td>$i$</td>
<td>0.88</td>
<td>0.90</td>
<td>0.89</td>
<td>2.96</td>
<td>2.75</td>
<td>3.00</td>
</tr>
<tr>
<td>$1-\bar{c}$</td>
<td>0.11***</td>
<td>0.11***</td>
<td>0.37***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$LR = 7.38$</td>
<td>Common productivity and convergence rate</td>
<td>0.045</td>
<td>0.37***</td>
<td>0.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$g$</td>
<td>0.91</td>
<td>0.92</td>
<td>0.92</td>
<td>0.97</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>$i$</td>
<td>0.11***</td>
<td>0.12***</td>
<td>0.11***</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Insignificance for $g$ indicates replacement with the productivity rate and steady state coefficient estimates for France, namely 0.045. Significance values are not reported for $i$ since it is composed of the product of three parameters. Critical values used for LR tests are 9.49 (7.78) for $\chi^2$ and 5.99 (4.61) for $\chi^2$.
Table 5: BP Structural Break Test Results in Autoregressive Coefficient (Convergence Rate)

| Country | UDmax  | WDmax  | Sequential (2|1) | Sequential (3|2) | BIC choice | Break dates      |
|---------|--------|--------|-------------|-------------|------------|-----------------|
| Austria | 18.80*** | 47.06*** | 14.79**    | 0.06        | 0          | 1987Q4          |
|         |         |        |             |             |            | 1996Q3         |
| Finland | 28.33*** | 62.17*** | 4.77        | 0.05        | 2          | 1990Q3          |
| Portugal | 5.60 | 7.13 | 11.85** | 12.50** | 2          |                 |
| Spain   | 32.17*** | 80.54*** | 0.04        | 0.0004      | 0          | 1984Q3          |
| Sweden  | 289.44*** | 724.48*** | 0.01        | 28.23***    | 0          | 1982Q4          |
|         |         |        |             |             |            | 1993Q3          |

Notes: A maximum of three breaks are allowed due to sample size. UDMAX and WDMAX results are for the double maximum tests of Bai & Perron (1998). The sequential tests examine the likelihood of having i+1 breaks given that i breaks exist. BIC choice column refers to the number of breaks according to the Bayesian Information Criterion. The confidence intervals for the break dates are not reported to save space. Break dates are reported when the double maximum tests point to the existence of at least one break.

Table 6: BP Structural Break Test Results in the Trend Coefficient (Productivity Growth)

| Country | UDmax  | WDmax  | Sequential (2|1) | Sequential (3|2) | BIC choice | Break dates      |
|---------|--------|--------|-------------|-------------|------------|-----------------|
| Austria | 11.88*** | 19.21*** | 8.66**     | 5.56        | 0          | 1986Q2          |
|         |         |        |             |             |            | 1994Q2         |
| Finland | 30.27*** | 46.12*** | 12.33***    | 2.09        | 2          | 1992Q3          |
| Portugal | 7.92*  | 17.63*** | 3.63        | 4.29        | 0          | 1984Q3          |
| Spain   | 9171.7*** | 22857.0*** | 4.57 | 1.22        | 0          | 1997Q3          |
| Sweden  | 11.74 | 18.98 | 2.11        | 4.29        | 0          | 1984Q3          |

Notes: The autoregressive coefficient is held constant to capture the gradual breaks in the trend as opposed to sudden ones.

Table 7: Single break test (Sen, 2003) results for trend and mean breaks

<table>
<thead>
<tr>
<th>Country</th>
<th>F-max</th>
<th>Date</th>
<th>ΔM</th>
<th>ΔT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td></td>
<td></td>
<td>ΔM</td>
<td>ΔT</td>
</tr>
<tr>
<td>Trend alone</td>
<td>63.12**</td>
<td>1987Q2</td>
<td>( + )</td>
<td></td>
</tr>
<tr>
<td>Trend + Mean</td>
<td>11.40**</td>
<td>1992Q4</td>
<td>( − ) ** ( + )</td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td></td>
<td></td>
<td>ΔM</td>
<td>ΔT</td>
</tr>
<tr>
<td>Trend alone</td>
<td>14.96**</td>
<td>1984Q1</td>
<td>( + )</td>
<td></td>
</tr>
<tr>
<td>Trend + Mean</td>
<td>32.40**</td>
<td>1985Q4</td>
<td>( + ) ** ( + )</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td></td>
<td>ΔM</td>
<td>ΔT</td>
</tr>
<tr>
<td>Trend alone</td>
<td>14.96**</td>
<td>1984Q1</td>
<td>( + )</td>
<td></td>
</tr>
<tr>
<td>Trend + Mean</td>
<td>36.10**</td>
<td>1993Q2</td>
<td>( − ) ** ( + )</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Critical values derived in Monte Carlo simulations for sequential F-max test are 7.93, and 9.17 for stationary break models at 90%, and 95%, respectively. ΔM represents a change in the mean, while ΔT is the change in trend.
<table>
<thead>
<tr>
<th>Country/Coeff.</th>
<th>g</th>
<th>i</th>
<th>l-ë</th>
</tr>
</thead>
<tbody>
<tr>
<td>Czech Rep.</td>
<td>0.10**</td>
<td>-0.56</td>
<td>0.31***</td>
</tr>
<tr>
<td>Estonia</td>
<td>0.04</td>
<td>-0.13</td>
<td>0.09***</td>
</tr>
<tr>
<td>Hungary</td>
<td>0.23***</td>
<td>-0.99</td>
<td>0.42***</td>
</tr>
<tr>
<td>Latvia</td>
<td>0.14**</td>
<td>-0.37</td>
<td>0.15***</td>
</tr>
<tr>
<td>Lithuania</td>
<td>0.18***</td>
<td>-0.64</td>
<td>0.23***</td>
</tr>
<tr>
<td>Malta</td>
<td>0.06***</td>
<td>-1.37</td>
<td>-0.11</td>
</tr>
<tr>
<td>Poland</td>
<td>0.29***</td>
<td>-0.52</td>
<td>0.20***</td>
</tr>
<tr>
<td>Slovakia</td>
<td>0.12***</td>
<td>-0.74</td>
<td>0.32***</td>
</tr>
</tbody>
</table>

### All heterogeneous

<table>
<thead>
<tr>
<th>Country/Coeff.</th>
<th>g</th>
<th>i</th>
<th>l-ë</th>
</tr>
</thead>
<tbody>
<tr>
<td>Czech Rep.</td>
<td>-0.28</td>
<td>0.18***</td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td>-0.15</td>
<td>0.10***</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>-0.02</td>
<td>0.03***</td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td>0.06***</td>
<td>-0.20</td>
<td>0.10***</td>
</tr>
<tr>
<td>Lithuania</td>
<td>-0.34</td>
<td>0.17***</td>
<td></td>
</tr>
<tr>
<td>Malta</td>
<td>-1.38</td>
<td>-0.11</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>-0.02</td>
<td>0.04***</td>
<td></td>
</tr>
<tr>
<td>Slovakia</td>
<td>-0.17</td>
<td>0.09***</td>
<td></td>
</tr>
</tbody>
</table>

**LR = 18.25***

### Common Productivity Growth

<table>
<thead>
<tr>
<th>Country/Coeff.</th>
<th>g</th>
<th>i</th>
<th>l-ë</th>
</tr>
</thead>
<tbody>
<tr>
<td>Czech Rep.</td>
<td>0.09***</td>
<td>-0.37</td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td>0.20***</td>
<td>-0.54</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>0.22***</td>
<td>-0.47</td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td>0.18***</td>
<td>-0.59</td>
<td>0.21***</td>
</tr>
<tr>
<td>Lithuania</td>
<td>0.15***</td>
<td>-0.54</td>
<td></td>
</tr>
<tr>
<td>Malta</td>
<td>0.04</td>
<td>-0.24</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>0.29***</td>
<td>-0.57</td>
<td></td>
</tr>
<tr>
<td>Slovakia</td>
<td>0.11***</td>
<td>-0.47</td>
<td></td>
</tr>
</tbody>
</table>

**LR = 29.21***

### Common convergence rate

<table>
<thead>
<tr>
<th>Country/Coeff.</th>
<th>g</th>
<th>i</th>
<th>l-ë</th>
</tr>
</thead>
<tbody>
<tr>
<td>Czech Rep.</td>
<td>-0.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td>-0.31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>-0.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td>-0.36</td>
<td>0.15***</td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td>-0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malta</td>
<td>-0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>-0.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovakia</td>
<td>-0.32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LR = 51.17***

Notes: Cyprus and Slovenia are left out due to data unavailability. Insignificance means parameter values are not significantly different than the French values. Significance values are again not reported for i since it is composed of the product of three parameters. 95% (99%) critical values used in the LR tests are 14.07 (18.48) for \( \chi^2_2 \) (first two tests) and 23.69 (29.14) for \( \chi^2_{14} \) (for the last test).
<table>
<thead>
<tr>
<th>Country/Coeff.</th>
<th>$g$</th>
<th>$i$</th>
<th>$I^-\bar{e}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All heterogeneous</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Czech Rep.</td>
<td>-0.07***</td>
<td>0.14</td>
<td>0.25***</td>
</tr>
<tr>
<td>Estonia</td>
<td>0.01</td>
<td>-0.02</td>
<td>0.14***</td>
</tr>
<tr>
<td>Hungary</td>
<td>0.03***</td>
<td>0.04</td>
<td>0.35***</td>
</tr>
<tr>
<td>Latvia</td>
<td>0.03***</td>
<td>-0.23</td>
<td>0.36***</td>
</tr>
<tr>
<td>Lithuania</td>
<td>0.06***</td>
<td>-0.24</td>
<td>0.35***</td>
</tr>
<tr>
<td>Malta</td>
<td>-0.10***</td>
<td>0.21</td>
<td>0.19***</td>
</tr>
<tr>
<td>Poland</td>
<td>0.09***</td>
<td>-0.19</td>
<td>0.50***</td>
</tr>
<tr>
<td>Slovakia</td>
<td>-0.04</td>
<td>0.00</td>
<td>0.19***</td>
</tr>
</tbody>
</table>

| **Common Productivity Growth** | | | |
| Czech Rep. | -0.01 | 0.06*** | |
| Estonia | -0.05 | 0.17*** | |
| Hungary | 0.04 | 0.35*** | |
| Latvia | 0.04*** | -0.25 | 0.37*** |
| Lithuania | -0.18 | 0.31*** | |
| Malta | 0.01 | 0.07*** | |
| Poland | -0.04 | 0.27*** | |
| Slovakia | -0.04 | 0.09*** | |
| **LR = 16.22** | | | |

| **Common convergence rate** | | | |
| Czech Rep. | -0.07*** | 0.17 | |
| Estonia | 0.06*** | -0.12 | |
| Hungary | 0.04*** | 0.02 | |
| Latvia | 0.02* | -0.18 | 0.29*** |
| Lithuania | 0.04* | -0.17 | |
| Malta | -0.12*** | 0.36 | |
| Poland | 0.10*** | -0.12 | |
| Slovakia | -0.06*** | 0.04 | |
| **LR = 10.07** | | | |

| **Common productivity growth and convergence rate** | | | |
| Czech Rep. | 0.04 | | |
| Estonia | -0.01 | | |
| Hungary | 0.04 | | |
| Latvia | -0.01 | -0.07 | 0.15*** |
| Lithuania | -0.03 | | |
| Malta | 0.10 | | |
| Poland | 0.01 | | |
| Slovakia | -0.02 | | |
| **LR = 54.27*** | | | |

Notes: 95% (99%) critical values used in the LR tests are 14.07 (18.48) for $\chi^2$ (first two tests) and 23.69 (29.14) for $\chi^2_{14}$ (for the last test).
2008
B01-08 Euro-Diplomatie durch gemeinsame „Wirtschaftsregierung“
Martin Seidel

2007
B03-07 Löhne und Steuern im Systemwettbewerb der Mitgliedstaaten der Europäischen Union
Martin Seidel
B02-07 Konsolidierung und Reform der Europäischen Union
Martin Seidel
B01-07 The Ratification of European Treaties - Legal and Constitutional Basis of a European Referendum.
Martin Seidel

2006
B03-06 Financial Frictions, Capital Reallocation, and Aggregate Fluctuations
Jürgen von Hagen, Haiping Zhang
B02-06 Financial Openness and Macroeconomic Volatility
Jürgen von Hagen, Haiping Zhang
B01-06 A Welfare Analysis of Capital Account Liberalization
Jürgen von Hagen, Haiping Zhang

2005
B11-05 Das Kompetenz- und Entscheidungssystem des Vertrages von Rom im Wandel seiner Funktion und Verfassung
Martin Seidel
B10-05 Die Schutzklauseln der Beitrittsverträge
Martin Seidel
B09-05 Measuring Tax Burdens in Europe
Guntram B. Wolff
B08-05 Remittances as Investment in the Absence of Altruism
Gabriel González-König
B07-05 Economic Integration in a Multicone World?
Christian Volpe Martincus, Jennifer Pédussel Wu
B06-05 Banking Sector (Under?)Development in Central and Eastern Europe
Jürgen von Hagen, Valeriya Dinger
B05-05 Regulatory Standards Can Lead to Predation
Stefan Lutz
B04-05 Währungspolitik als Sozialpolitik
Martin Seidel
B03-05 Public Education in an Integrated Europe: Studying to Migrate and Teaching to Stay?
Panu Poutvaara
B02-05 Voice of the Diaspora: An Analysis of Migrant Voting Behavior
Jan Fidrmuc, Orla Doyle
B01-05 Macroeconomic Adjustment in the New EU Member States
Jürgen von Hagen, Iulia Traistaru

2004
B33-04 The Effects of Transition and Political Instability On Foreign Direct Investment Inflows: Central Europe and the Balkans
Josef C. Brada, Ali M. Kutan, Tamer M. Yigit
B32-04 The Choice of Exchange Rate Regimes in Developing Countries: A Multinominal Panal Analysis
Jürgen von Hagen, Jizhong Zhou
B31-04 Fear of Floating and Fear of Pegging: An Empirical Analysis of De Facto Exchange Rate Regimes in Developing Countries
Jürgen von Hagen, Jizhong Zhou
B30-04 Der Vollzug von Gemeinschaftsrecht über die Mitgliedstaaten und seine Rolle für die EU und den Beitrittsprozess
Martin Seidel
B29-04 Deutschlands Wirtschaft, seine Schulden und die Unzulänglichkeiten der einheitlichen Geldpolitik im Eurosystem
Dieter Spethmann, Otto Steiger
B28-04 Fiscal Crises in U.S. Cities: Structural and Non-structural Causes
Guntram B. Wolff
B27-04 Firm Performance and Privatization in Ukraine
Galyna Grygorenko, Stefan Lutz
B26-04 Analyzing Trade Opening in Ukraine: Effects of a Customs Union with the EU
Oksana Harbuzyuk, Stefan Lutz
B25-04 Exchange Rate Risk and Convergence to the Euro
Lucjan T. Orlowski
B24-04 The Endogeneity of Money and the Eurosystem
Otto Steiger
B23-04 Which Lender of Last Resort for the Eurosystem?
Otto Steiger
B22-04 Non-Discretionary Monetary Policy: The Answer for Transition Economies?
Elham-Mafi Kreft, Steven F. Kreft
B21-04 The Effectiveness of Subsidies Revisited: Accounting for Wage and Employment Effects in Business R+D
Volker Reinthaler, Guntram B. Wolff
B20-04 Money Market Pressure and the Determinants of Banking Crises
Jürgen von Hagen, Tai-kuang Ho
B19-04 Die Stellung der Europäischen Zentralbank nach dem Verfassungsvertrag
Martin Seidel
<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>B18-03</td>
<td>The Effects of Regional and Industry-Wide FDI Spillovers on Export of Ukrainian Firms</td>
<td>Stefan H. Lutz, Oleksandr Talaver, Sang-Min Park</td>
</tr>
<tr>
<td>B17-03</td>
<td>Determinants of Inter-Regional Migration in the Baltic States</td>
<td>Mihails Hazans</td>
</tr>
<tr>
<td>B16-03</td>
<td>South-East Europe: Economic Performance, Perspectives, and Policy Challenges</td>
<td>Iulia Traistaru, Jürgen von Hagen</td>
</tr>
<tr>
<td>B15-03</td>
<td>Employed and Unemployed Search: The Marginal Willingness to Pay for Attributes in Lithuania, the US and the Netherlands</td>
<td>Jos van Ommeren, Mihails Hazans</td>
</tr>
<tr>
<td>B14-03</td>
<td>FCIs and Economic Activity: Some International Evidence</td>
<td>Charles Goodhart, Boris Hofmann</td>
</tr>
<tr>
<td>B13-03</td>
<td>The IS Curve and the Transmission of Monetary Policy: Is there a Puzzle?</td>
<td>Charles Goodhart, Boris Hofmann</td>
</tr>
<tr>
<td>B12-03</td>
<td>What Makes Regions in Eastern Europe Catching Up? The Role of Foreign Investment, Human Resources, and Geography</td>
<td>Gabriele Tondl, Goran Vuksic</td>
</tr>
<tr>
<td>B11-03</td>
<td>Die Weisungs- und Herrschaftsmacht der Europäischen Zentralbank im europäischen System der Zentralbanken - eine rechtliche Analyse</td>
<td>Martin Seidel</td>
</tr>
<tr>
<td>B10-03</td>
<td>Foreign Direct Investment and Perceptions of Vulnerability to Foreign Exchange Crises: Evidence from Transition Economies</td>
<td>Josef C. Brada, Vladimír Tomšík</td>
</tr>
<tr>
<td>B09-03</td>
<td>The European Central Bank and the Eurosystem: An Analysis of the Missing Central Monetary Institution in European Monetary Union</td>
<td>Gunnar Heinsohn, Otto Steiger</td>
</tr>
<tr>
<td>B08-03</td>
<td>The Determination of Capital Controls: Which Role Do Exchange Rate Regimes Play?</td>
<td>Jürgen von Hagen, Jizhong Zhou</td>
</tr>
<tr>
<td>B07-03</td>
<td>Nach Nizza und Stockholm: Stand des Binnenmarktes und Prioritäten für die Zukunft</td>
<td>Martin Seidel</td>
</tr>
<tr>
<td>B06-03</td>
<td>Fiscal Discipline and Growth in Euroland. Experiences with the Stability and Growth Pact</td>
<td>Jürgen von Hagen</td>
</tr>
<tr>
<td>B05-03</td>
<td>Reconsidering the Evidence: Are Eurozone Business Cycles Converging?</td>
<td>Michael Massmann, James Mitchell</td>
</tr>
<tr>
<td>B04-03</td>
<td>Do Ukrainian Firms Benefit from FDI?</td>
<td>Stefan H. Lutz, Oleksandr Talaver</td>
</tr>
<tr>
<td>B03-03</td>
<td>Europäische Steuerkoordination und die Schweiz</td>
<td>Stefan H. Lutz</td>
</tr>
<tr>
<td>B02-03</td>
<td>Commuting in the Baltic States: Patterns, Determinants, and Gains</td>
<td>Mihails Hazans</td>
</tr>
<tr>
<td>B01-03</td>
<td>Die Wirtschafts- und Währungsunion im rechtlichen und politischen Gefüge der Europäischen Union</td>
<td>Martin Seidel</td>
</tr>
</tbody>
</table>

2002

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>B30-02</td>
<td>An Adverse Selection Model of Optimal Unemployment Assurance</td>
<td>Marcus Hagedorn, Ashok Kaul, Tim Mennel</td>
</tr>
<tr>
<td>B29B-02</td>
<td>Trade Agreements as Self-protection</td>
<td>Jennifer Pédussel Wu</td>
</tr>
<tr>
<td>B29A-02</td>
<td>Growth and Business Cycles with Imperfect Credit Markets</td>
<td>Debajyoti Chakrabarty</td>
</tr>
<tr>
<td>B28-02</td>
<td>Inequality, Politics and Economic Growth</td>
<td>Debajyoti Chakrabarty</td>
</tr>
<tr>
<td>B27-02</td>
<td>Poverty Traps and Growth in a Model of Endogenous Time Preference</td>
<td>Debajyoti Chakrabarty</td>
</tr>
<tr>
<td>B26-02</td>
<td>Monetary Convergence and Risk Premiums in the EU Candidate Countries</td>
<td>Lucjan T. Orłowski</td>
</tr>
<tr>
<td>B24-02</td>
<td>The Effects of Quotas on Vertical Intra-industry Trade</td>
<td>Stefan Lutz</td>
</tr>
<tr>
<td>B23-02</td>
<td>Legal Aspects of European Economic and Monetary Union</td>
<td>Martin Seidel</td>
</tr>
<tr>
<td>B22-02</td>
<td>Der Staat als Lender of Last Resort - oder: Die Achillesverse des Eurosystems</td>
<td>Otto Steiger</td>
</tr>
<tr>
<td>B21-02</td>
<td>Nominal and Real Stochastic Convergence Within the Transition Economies and to the European Union: Evidence from Panel Data</td>
<td>Ali M. Kutan, Taner M. Yigit</td>
</tr>
</tbody>
</table>
B19-02 East Germany: Transition with Unification, Experiments and Experiences
Jürgen von Hagen, Rolf R. Strauch, Guntram B. Wolff

B18-02 Regional Specialization and Employment Dynamics in Transition Countries
Iulia Traistaru, Guntram B. Wolff

B17-02 Specialization and Growth Patterns in Border Regions of Accession Countries
Laura Resmini

B16-02 Regional Specialization and Concentration of Industrial Activity in Accession Countries
Iulia Traistaru, Peter Nijkamp, Simonetta Longhi

B15-02 Does Broad Money Matter for Interest Rate Policy?
Matthias Brückner, Andreas Schaber

B14-02 The Long and Short of It: Global Liberalization, Poverty and Inequality
Christian E. Weller, Adam Hersch

B13-02 De Facto and Official Exchange Rate Regimes in Transition Economies
Jürgen von Hagen, Jizhong Zhou

B12-02 Argentina: The Anatomy of A Crisis
Jiri Jonas

B11-02 The Eurosystem and the Art of Central Banking
Gunnar Heinsohn, Otto Steiger

Martin Seidel

B09-02 Monetary Policy in the Euro Area - Lessons from the First Years
Volker Clausen, Bernd Hayo

B08-02 Has the Link Between the Spot and Forward Exchange Rates Broken Down? Evidence From Rolling Cointegration Tests
Ali M. Kutan, Su Zhou

B07-02 Perspektiven der Erweiterung der Europäischen Union
Martin Seidel

B06-02 Is There Asymmetry in Forward Exchange Rate Bias? Multi-Country Evidence
Su Zhou, Ali M. Kutan

B05-02 Real and Monetary Convergence Within the European Union and Between the European Union and Candidate Countries: A Rolling Cointegration Approach
Josef C. Brada, Ali M. Kutan, Su Zhou

B04-02 Asymmetric Monetary Policy Effects in EMU
Volker Clausen, Bernd Hayo

B03-02 The Choice of Exchange Rate Regimes: An Empirical Analysis for Transition Economies
Jürgen von Hagen, Jizhong Zhou

B02-02 The Euro System and the Federal Reserve System Compared: Facts and Challenges
Karlheinz Ruckriegel, Franz Seitz

B01-02 Does Inflation Targeting Matter?
Manfred J. M. Neumann, Jürgen von Hagen

2001
B29-01 Is Kazakhstan Vulnerable to the Dutch Disease?
Karlygash Kuralbayeva, Ali M. Kutan, Michael L. Wyzan

B28-01 Political Economy of the Nice Treaty: Rebalancing the EU Council. The Future of European Agricultural Policies
Deutsch-Französisches Wirtschaftspolitisches Forum

B27-01 Investor Panic, IMF Actions, and Emerging Stock Market Returns and Volatility: A Panel Investigation
Bernd Hayo, Ali M. Kutan

B26-01 Regional Effects of Terrorism on Tourism: Evidence from Three Mediterranean Countries
Konstantinos Drakos, Ali M. Kutan

B25-01 Monetary Convergence of the EU Candidates to the Euro: A Theoretical Framework and Policy Implications
Lucjan T. Orlowski

B24-01 Disintegration and Trade
Jarko and Jan Fidrmuc

B23-01 Migration and Adjustment to Shocks in Transition Economies
Jan Fidrmuc

B22-01 Strategic Delegation and International Capital Taxation
Matthias Brückner

B21-01 Balkan and Mediterranean Candidates for European Union Membership: The Convergence of Their Monetary Policy With That of the Europan Central Bank
Josef C. Brada, Ali M. Kutan

B20-01 An Empirical Inquiry of the Efficiency of Intergovernmental Transfers for Water Projects Based on the WRDA Data
Anna Rubinchik-Pessach

B19-01 Detrending and the Money-Output Link: International Evidence
R.W. Hafer, Ali M. Kutan
B18-01 Monetary Policy in Unknown Territory. The European Central Bank in the Early Years
Jürgen von Hagen, Matthias Brückner

B17-01 Executive Authority, the Personal Vote, and Budget Discipline in Latin American and Carribean Countries
Mark Hallerberg, Patrick Marier

B16-01 Sources of Inflation and Output Fluctuations in Poland and Hungary: Implications for Full Membership in the European Union
Selahattin Dibooglu, Ali M. Kutan

B15-01 Programs Without Alternative: Public Pensions in the OECD
Christian E. Weller

B14-01 Formal Fiscal Restraints and Budget Processes As Solutions to a Deficit and Spending Bias in Public Finances - U.S. Experience and Possible Lessons for EMU
Rolf R. Strauch, Jürgen von Hagen

B13-01 German Public Finances: Recent Experiences and Future Challenges
Jürgen von Hagen, Rolf R. Strauch

B12-01 The Impact of Eastern Enlargement On EU-Labour Markets. Pensions Reform Between Economic and Political Problems
Deutsch-Französisches Wirtschaftspolitisches Forum

B11-01 Inflationary Performance in a Monetary Union With Large Wage Setters
Lilia Cavallar

B10-01 Integration of the Baltic States into the EU and Institutions of Fiscal Convergence: A Critical Evaluation of Key Issues and Empirical Evidence
Ali M. Kutan, Niina Pautola-Mol

B09-01 Democracy in Transition Economies: Grease or Sand in the Wheels of Growth?
Jan Fidrmuc

B08-01 The Functioning of Economic Policy Coordination
Jürgen von Hagen, Susanne Mundschenk

B07-01 The Convergence of Monetary Policy Between Candidate Countries and the European Union
Josef C. Brada, Ali M. Kutan

B06-01 Opposites Attract: The Case of Greek and Turkish Financial Markets
Konstantinos Drakos, Ali M. Kutan

B05-01 Trade Rules and Global Governance: A Long Term Agenda. The Future of Banking.
Deutsch-Französisches Wirtschaftspolitisches Forum

B04-01 The Determination of Unemployment Benefits
Rafael di Tella, Robert J. McCulloch

B03-01 Preferences Over Inflation and Unemployment: Evidence from Surveys of Happiness
Rafael di Tella, Robert J. McCulloch, Andrew J. Oswald

B02-01 The Konstanz Seminar on Monetary Theory and Policy at Thirty
Michele Fratianni, Jürgen von Hagen

B01-01 Divided Boards: Partisanship Through Delegated Monetary Policy
Etienne Farvaque, Gael Lagadc

2000

B20-00 Breakin-up a Nation, From the Inside
Etienne Farvaque

B19-00 Income Dynamics and Stability in the Transition Process, general Reflections applied to the Czech Republic
Jens Hölscher

B18-00 Budget Processes: Theory and Experimental Evidence
Karl-Martin Ehrhart, Roy Gardner, Jürgen von Hagen, Claudia Keser Martin Seidel

B17-00 Rückführung der Landwirtschaftspolitik in die Verantwortung der Mitgliedsstaaten? - Rechts- und Verfassungsfragen des Gemeinschaftsrechts
Christa Randzio-Plath, Tomasso Padoa-Schioppa

B16-00 The European Central Bank: Independence and Accountability
Jürgen von Hagen, Ralf Hepp

B15-00 Regional Risk Sharing and Redistribution in the German Federation
Selahattin Dibooglu, Ali M. Kutan

B14-00 Sources of Real Exchange Rate Fluctuations in Transition Economies: The Case of Poland and Hungary
Nauro F. Campos

B13-00 Back to the Future: The Growth Prospects of Transition Economies Reconsidered
<table>
<thead>
<tr>
<th>Title</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rechtsetzung und Rechtsangleichung als Folge der Einheitlichen</td>
<td>Martin Seidel</td>
</tr>
<tr>
<td>Europäischen Währung</td>
<td></td>
</tr>
<tr>
<td>A Dynamic Approach to Inflation Targeting in Transition Economies</td>
<td>Lucjan T. Orlowski</td>
</tr>
<tr>
<td>The Importance of Domestic Political Institutions: Why and How</td>
<td>Marc Hallerberg</td>
</tr>
<tr>
<td>Belgium Qualified for EMU</td>
<td></td>
</tr>
<tr>
<td>Rational Institutions Yield Hysteresis</td>
<td>Rafael Di Tella, Robert Mac-</td>
</tr>
<tr>
<td>Culloch</td>
<td>Kenneth Kletzer</td>
</tr>
<tr>
<td>The Effectiveness of Self-Protection Policies for Safeguarding</td>
<td></td>
</tr>
<tr>
<td>Emerging Market Economies from Crises</td>
<td>Deutsch-Französisches Wirtschaftspolitisches Forum</td>
</tr>
<tr>
<td>Financial Supervision and Policy Coordination in The EMU</td>
<td>Bernd Hayo</td>
</tr>
<tr>
<td>The Demand for Money in Austria</td>
<td>Jan Fidrmuc</td>
</tr>
<tr>
<td>Liberalization, Democracy and Economic Performance during</td>
<td>Christa Randzio-Plath</td>
</tr>
<tr>
<td>Transition</td>
<td></td>
</tr>
<tr>
<td>A New Political Culture in The EU - Democratic Accountability</td>
<td></td>
</tr>
<tr>
<td>of the ECB</td>
<td>Jarko Fidrmuc, Jan Fidrmuc</td>
</tr>
<tr>
<td>Integration, Disintegration and Trade in Europe: Evolution of</td>
<td></td>
</tr>
<tr>
<td>Trade Relations during the 1990's</td>
<td></td>
</tr>
<tr>
<td>Inflation Bias and Productivity Shocks in Transition Economies:</td>
<td>Josef C. Barda, Arthur E. King,</td>
</tr>
<tr>
<td>The Case of the Czech Republic</td>
<td>Ali M. Kutan</td>
</tr>
<tr>
<td>Monetary Union and Fiscal Federalism</td>
<td>Kenneth Kletzer, Jürgen von Hagen</td>
</tr>
<tr>
<td>Skills, Labour Costs, and Vertically Differentiated Industries:</td>
<td>Stefan Lutz, Alessandro Turrini</td>
</tr>
<tr>
<td>A General Equilibrium Analysis</td>
<td>Bernd Hayo</td>
</tr>
<tr>
<td>Micro and Macro Determinants of Public Support for Market Reform</td>
<td>Robert MacCulloch</td>
</tr>
<tr>
<td>in Eastern Europe</td>
<td>Rafael Di Tella, Robert Mac-</td>
</tr>
<tr>
<td>Culuioch</td>
<td>Rafael Di Tella, Robert Mac-</td>
</tr>
<tr>
<td>What Makes a Revolution?</td>
<td></td>
</tr>
<tr>
<td>Informal Family Insurance and the Design of the Welfare State</td>
<td></td>
</tr>
<tr>
<td>Partisan Social Happiness</td>
<td></td>
</tr>
<tr>
<td>The End of Moderate Inflation in Three Transition Economies?</td>
<td>Josef C. Brada, Ali M. Kutan</td>
</tr>
<tr>
<td>Subnational Government Bailouts in Germany</td>
<td>Helmut Seitz</td>
</tr>
<tr>
<td>The Evolution of Monetary Policy in Transition Economies</td>
<td>Ali M. Kutan, Josef C. Brada</td>
</tr>
<tr>
<td>Why are Eastern Europe’s Banks not failing when everybody else’s</td>
<td>Christian E. Weller, Bernard Mor-</td>
</tr>
<tr>
<td>are?</td>
<td>zuch</td>
</tr>
<tr>
<td>Stability of Monetary Unions: Lessons from the Break-Up of</td>
<td>Jan Fidrmuc, Julius Horvath and</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>Jarko Fidrmuc</td>
</tr>
<tr>
<td>Multinational Banks and Development Finance</td>
<td></td>
</tr>
<tr>
<td>Financial Crises after Financial Liberalization: Exceptional</td>
<td></td>
</tr>
<tr>
<td>Circumstances or Structural Weakness?</td>
<td></td>
</tr>
<tr>
<td>Industry Effects of Monetary Policy in Germany</td>
<td>Bernd Hayo and Birgit Uhlenbrock</td>
</tr>
<tr>
<td>Financial Fragility or What Went Right and What Could Go</td>
<td>Christian E. Weller and Jürgen</td>
</tr>
<tr>
<td>Wrong in Central European Banking?</td>
<td>von Hagen</td>
</tr>
<tr>
<td>Size Distortions of Tests of the Null Hypothesis of Stationarity:</td>
<td>Mehmet Caner and Lutz Kilian</td>
</tr>
<tr>
<td>Evidence and Implications for Applied Work</td>
<td></td>
</tr>
<tr>
<td>Financial Supervision and Policy Coordination in the EMU</td>
<td>Deutsch-Französisches Wirtschaftspolitisches Forum</td>
</tr>
<tr>
<td>Financial Liberalization, Multinational Banks and Credit Supply:</td>
<td>Christian Weller</td>
</tr>
<tr>
<td>The Case of Poland</td>
<td></td>
</tr>
<tr>
<td>Monetary Policy, Parameter Uncertainty and Optimal Learning</td>
<td>Volker Wieland</td>
</tr>
<tr>
<td>The Connection between more Multinational Banks and less Real</td>
<td></td>
</tr>
<tr>
<td>Credit in Transition Economies</td>
<td></td>
</tr>
</tbody>
</table>

1999

B25-99 Micro and Macro Determinants of Public Support for Market Reforms in Eastern Europe
B24-99 What Makes a Revolution?
B23-99 Informal Family Insurance and the Design of the Welfare State
B22-99 Partisan Social Happiness
B21-99 The End of Moderate Inflation in Three Transition Economies?
B20-99 Subnational Government Bailouts in Germany
B19-99 The Evolution of Monetary Policy in Transition Economies
B18-99 Why are Eastern Europe’s Banks not failing when everybody else’s are?
B17-99 Stability of Monetary Unions: Lessons from the Break-Up of Czechoslovakia
B16-99 Multinational Banks and Development Finance
B15-99 Financial Crises after Financial Liberalization: Exceptional Circumstances or Structural Weakness?
B14-99 Industry Effects of Monetary Policy in Germany
B13-99 Financial Fragility or What Went Right and What Could Go Wrong in Central European Banking?
B12-99 Size Distortions of Tests of the Null Hypothesis of Stationarity: Evidence and Implications for Applied Work
B11-99 Financial Supervision and Policy Coordination in the EMU
B10-99 Financial Liberalization, Multinational Banks and Credit Supply: The Case of Poland
B09-99 Monetary Policy, Parameter Uncertainty and Optimal Learning
B08-99 The Connection between more Multinational Banks and less Real Credit in Transition Economies
Comovement and Catch-up in Productivity across Sectors: Evidence from the OECD

Christopher M. Cornwell and Jens-Uwe Wächter

Productivity Convergence and Economic Growth: A Frontier Production Function Approach

Christopher M. Cornwell and Jens-Uwe Wächter

Tumbling Giant: Germany's Experience with the Maastricht Fiscal Criteria

Jürgen von Hagen and Rolf Strauch

The Finance-Investment Link in a Transition Economy: Evidence for Poland from Panel Data

Christian Weller

The Macroeconomics of Happiness

Rafael Di Tella, Robert MacCulloch and Andrew J. Oswald

The Consequences of Labour Market Flexibility: Panel Evidence Based on Survey Data

Rafael Di Tella and Robert MacCulloch

The Excess Volatility of Foreign Exchange Rates: Statistical Puzzle or Theoretical Artifact?

Robert B.H. Hauswald

1998

Labour Market + Tax Policy in the EMU

Deutsch-Französisches Wirtschaftspolitisches Forum

Can Taxing Foreign Competition Harm the Domestic Industry?

Stefan Lutz

Free Trade and Arms Races: Some Thoughts Regarding EU-Russian Trade

Rafael Reuveny and John Maxwell

Fiscal Policy and Intrainational Risk-Sharing

Jürgen von Hagen

Price Stability and Monetary Policy Effectiveness when Nominal Interest Rates are Bounded at Zero

Athanasios Orphanides and Volker Wieland

Die Bewertung der "dauerhaft tragbaren öffentlichen Finanzlage" der EU Mitgliedstaaten beim Übergang zur dritten Stufe der EWWU

Rolf Strauch

Exchange Rate Regimes in the Transition Economies: Case Study of the Czech Republic: 1990-1997

Julius Horvath and Jiri Jonas

Der Wettbewerb der Rechts- und politischen Systeme in der Europäischen Union

Martin Seidel

U.S. Monetary Policy and Monetary Policy and the ESCB

Robert L. Hetzel

Money-Output Granger Causality Revisited: An Empirical Analysis of EU Countries (überarbeitete Version zum Herunterladen)

Bernd Hayo

Designing Voluntary Environmental Agreements in Europe: Some Lessons from the U.S. EPA’s 33/50 Program

John W. Maxwell

Monetary Union, Asymmetric Productivity Shocks and Fiscal Insurance: an Analytical Discussion of Welfare Issues

Kenneth Kletzer

Estimating a European Demand for Money (überarbeitete Version zum Herunterladen)

Bernd Hayo

The EMU’s Exchange Rate Policy

Deutsch-Französisches Wirtschaftspolitisches Forum

Central Bank Policy in a More Perfect Financial System

Jürgen von Hagen / Ingo Fender

Trade with Low-Wage Countries and Wage Inequality

Jaleel Ahmad

Budgeting Institutions for Aggregate Fiscal Discipline

Jürgen von Hagen

1997

Macroeconomic Stabilization with a Common Currency: Does European Monetary Unification Create a Need for Fiscal Insurance or Federalism?

Kenneth Kletzer


Tom Lyon / John Mayo

Employment and EMU

Deutsch-Französisches Wirtschaftspolitisches Forum

A Stability Pact for Europe

(a Forum organized by ZEI)