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COUNTRY-SPECIFIC CONVERGENCE BEHAVIOR IN AN ENLARGED EUROPE[1]

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ABSTRACT

European Union is the main interest of this paper on account of the long-established integration from 1950's. This paper examines the process of convergence in relative GDP per capita across European Union countries and candidate countries. As we found cross-section dependence, we present second generation panel cointegration tests of the theory for the European Union countries and candidate countries for the period 1990-2011. This paper also shows country-specific conditional and unconditional convergence at the long-run model by way of using Common Correlated Effect Model. This contribution gives crucial information about the European Union countries and candidate countries.

Keywords: *Economic Integration, Enlargement Process, Convergence, Common Correlated Effect Model*

GENİŞLEYEN BİR AVRUPA'DA ÜLKE SPESİFİK YAKINSAMA DAVRANIŞI

ÖZ

Avrupa Birliği 1950'den beri köklü bir entegrasyon olması nedeniyle bu çalışmanın asıl inceleme konusudur. Bu çalışma nispi kişi başına GSYH yakınsama sürecini Avrupa Birliği ülkeleri ve aday ülkeler açısından incelemektedir. Teoriyi yatay kesit bağımlılığı bulduğumuz için Avrupa Birliği ülkeleri ve aday ülkeler için ikinci kuşak panel koentegrasyon testleri ile 1990-2011 dönemi için ortaya koyduk. Bu çalışma ayrıca ülke spesifik koşullu ve koşulsuz yakınsama sonuçlarını uzun dönem modelinde Ortak İlişkili Etkiler Modeli kullanılarak vermektedir. Bu katı AB ülkeleri ve aday ülkeler için çok önemli bilgiler sağlamaktadır.

Anahtar Sözcükler: *Ekonomik Entegrasyon, Genişleme Süreci, Yakınsama, Ortak İlişkili Etki Modeli*

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INTRODUCTION

From the 1950s up until the mid-1980s, the literature concerned with long run growth was dominated by the Neoclassical Growth Model- a la Solow (Solow, 1956). According to this theory, the economy converges towards a steady state conditioned upon the behavioral and technological parameters in the model. After the mid-1980s, the Endogenous Growth Theory [EGT] seeks to explain the causes of technical progress as a driver of economic growth. However, early versions of EGT did not predict the conditional convergence that characterizes the Neoclassical Growth Model. For example, Barro and Sala-i-Martin (1997) extend the EGT model and added the diffusion of technology and human capital to account for economic growth. The diffusion models can predict conditional convergence when imitation may be cheaper than innovation. This framework combines the long-run growth properties of EGT with the convergence behavior of the Neoclassical Growth Model (Barro, 1997).

The effects of technological diffusion on economic growth have been analyzed by Grossman and Helpman (1991) and Rivera-Batiz and Romer (1991). Also, Bernard and Jones (1996) suggest that differences in technologies across countries can have implications for convergence.

In this paper, we analyze the convergence of per capita GDP across existing European Union (EU) countries and candidate countries. We specifically test the extent to which convergence is derived from human capital investment, nature of economic activity, trade openness which partially capture the process of technology diffusion. These conditioning variables have been selected because they reflect openness to technical progress.

We apply panel data tests of convergence with annual data available from 1990 to 2011. We have expanded the EU data set to include candidate countries' data and the results have some important policy implications both for EU and candidate countries. The rest of the paper is organised as follows: Section 2 contains the literature review, and section 3 discusses the theoretical model of convergence. Section 4 explains the empirical specifications, data set and results for unconditional and conditional convergence. Section 5 concludes.

BACKGROUND LITERATURE

In recent years, several studies have considered the convergence between EU countries and candidate countries. For example, Saracoglu and Dogan (2005) analyze the convergence hypothesis for EU countries

and candidate countries. Using panel unit root tests, they find that candidate countries converged to the EU during 1985-2004. Altin *et al.* (2010) analyze the convergence hypothesis for the period 1970- 2004 and find that enlargement positively affects convergence. Dogan and Saracoglu (2007) used panel unit root tests to investigate income convergence for the EU and candidate countries. Using quarterly data for the period 1990- 2004, they found that there is no income convergence among established EU countries but that evidence of convergence exist for an expanded group that includes candidate countries. Some candidate countries appear to be converging on the EU average. Yigit and Kutan (2007) construct an EGT to investigate the consequences of economic integration for convergence and productivity growth. Their empirical results suggest that accession to the EU is a potential, though not guaranteed, opportunity for faster growth and convergence. Willem te Velde (2011) examined how regional integration leads to convergence and growth among 100 developing countries for the period 1970-2004. He couldn't find robust growth effect of regional integration.

Many researchers believe that increasing economic integration among the countries will increase the long term growth rates. According to Romer (1993), the growth rate increases if economic integration in EGT provides two economies with the opportunity of benefiting from increasing scale economies. According to this model, integration ensures trade of goods, flow of ideas or both. Baldwin (1989) argues that trade deficiency, removal of non-tariff barriers and the enlargement of market increases the net profits. If more countries become a member of the union, higher growth rates are achieved. Dollar (1992) finds positive correlation between outward orientation and per capita GDP growth. Frankel and Romer (1996) finds that trade has significant positive effect on income. Baldwin and Seghezza (1996) put emphasis on the effect of the European integration on the growth. They developed two models, the first one being the per capita GDP growth model. This model includes the population growth rate, human capital investments, human capital at the beginning level and the ratio of investments to GDP. In the second model, investment equality is estimated by adding the investment rate to the similar variables found in the growth model and domestic and foreign trade barriers. It was found out that domestic and foreign trade barriers tend to reduce the investments and consequently have a negative impact on the growth. They said trade barriers are sharply reduced in the European integration**.** Wacziarg (2001)'s results suggest that trade openness has a positive impact on growth.

A THEORETICAL MODEL OF CONVERGENCE

A theoretical model of convergence in per capita output can be developed from the neo-classical model of growth, as developed by Solow (1956). Following Barro and Sala-i-Martin (1995), the production function can be rewritten as:

$$\hat{y} = f(\hat{k}) \Rightarrow f'(k) > 0, f''(\hat{k}) < 0 \quad (1)$$

where Y is the total output while A is an efficiency parameter. And $\hat{y} = Y/L$; $\hat{k} = K/L$, where K is capital and L is units of effective labor.

There are two exogenous sources of growth in effective labor units: the rate of technical progress, x, and the rate of growth of working population, n. Hence, we have

$$L = Ne^{xt} = N_0 e^{(n+x)t} \quad (2)$$

where N_0 is initial population.

With a closed economy, the rate of investment is equal to the rate of saving which is *Y-C*, where *Y* is income and *C* is consumption. Thus,

$$\dot{K} + \delta K = Y - C \quad (3)$$

where $\dot{K}$ is change in capital stock while δ is depreciation. The capital accumulation growth path then is

$$\dot{\hat{k}} = f(\hat{k}) - \hat{c} - (\delta + n + x)\hat{k} \quad (4)$$

where $\hat{c} = C/L$. The representative household maximizes utility by

$$U=u(c),\ u'(c)>0,\ u'' (c) <0 \quad (5)$$

where *c=C/N*.

Instantaneous social utility is defined as the product of the population size and the utility-from-consumption of the representative consumer. The social objective function to be maximized is the discounted future time path of social utility, discounting representing time preference.

$$u = N_0 \int_0^{\infty} u(c)^{-(\rho - n)t} dt \quad (6)$$

The optimal growth path, therefore, maximizes the above objective, subject to the capital accumulation constraints. The current value Hamiltonian is

$$H = u(c) + m[f(\hat{k}) - \hat{c} - (\delta + n + x)\hat{k}] \quad (7)$$

The maximum principle requires

$$\frac{\partial H}{\partial c} = u'(c) - m = 0 \quad (8)$$

$$\frac{\partial H}{\partial m} = f(\hat{k}) - \hat{c} - (\delta + n + x)\hat{k} = \dot{\hat{k}} \quad (9)$$

$$\frac{\partial H}{\partial k} = m[f'(\hat{k}) - (\delta + n + x)] - (\rho - n)m = -\dot{m} \quad (10)$$

Differentiate equation (8) with respect to time

$$u''(c)\dot{c} = \dot{m} \quad (11)$$

Use equations (6) and (9) to eliminate m and $\dot{m}$ in equation (10).

$$\dot{c} = \frac{u'(x)}{u''(x)}[f'(\hat{k}) - (\delta + x + \rho)] \quad (12)$$

$$\dot{\hat{k}} = f(\hat{k}) - \hat{c} - (\delta + n + x)\hat{k} \quad (13)$$

The above equation can be linearised using the Taylor expansion theorem. But the characteristic roots cannot be compared unless special functional forms are assumed for *u(c)* and *f(k)*.

Following Barro and Sala-i-Martin (1995), we assume that the utility function takes the form

$$u(c) = \frac{c^{1-\theta} - 1}{1 - \theta} \quad (14)$$

Since $u'(c) = c^{-\theta}$ and $u''(c) = -\theta c$, equations (14) and (13) become

$$\dot{c} = \frac{c}{\theta}[f'(k) - (\delta + x + r)] \quad (15)$$

Equations (13) and (15) provide steady state growth paths for k and c. In the steady state y, k, and c grow at the rate of x. To show the stability of the model, we can linearise in the zone of steady state equilibrium ($\bar{c}, \bar{k}$). This yields

$$\begin{bmatrix} \dot{k} \\ \dot{c} \end{bmatrix} = \begin{bmatrix} \psi & -1 \\ \frac{c}{\theta} f'(k) & 0 \end{bmatrix} \begin{bmatrix} k & -\bar{k} \\ c & -\bar{c} \end{bmatrix} \qquad (16)$$

where $\psi = \rho - n - (1-\theta)x$ which is regarded as positive and in the steady state, $f'(k) = \delta + \rho + (1+\theta)x$

Thus the last term in the 2x2 matrix is zero. The system shows saddle path stability because the trace and determinants of A are positive and negative respectively, i.e.

$$Tr(A) = \Psi \rangle 0$$
$$Det(A) = -(c/\theta) f'(k) \langle 0 \qquad (17)$$

The stable root, β, is given by

$$\beta = -Tr(A) + \{Tr(A)^2 - 4Det(A)^2 - 4Det(A)\}^{1/2}$$

given a Cobb-Douglas production function (CDPF), i.e.

$$\hat{y} = f(\hat{k}) = A\hat{k}^{\alpha}$$

This yields

$$\beta = \frac{1}{2}\{\psi^2 + 4(\frac{1-\alpha}{\theta})(\rho+\delta+\theta x)[\frac{\rho+\delta+\theta x}{\alpha} - (n+\delta+x)]\}^{1/2} - \frac{\psi}{2} \qquad (18)$$

Note with CDPF, the dynamic time paths of y and k are identical. Hence, in discrete time, the solution for $\log[\hat{y}(t)]$ is

$$\log[y(t)] = \log[y(0)]e^{-\beta t} + \log(\bar{y})(1-e^{-\beta t}) \qquad (19)$$

The greater the value of ·, the greater the responsiveness of the average growth rate to the gap between $\log(\bar{y})$, long run equilibrium level, and the initial level of income, i.e. log[y(0)]. The model implies conditional convergence in that for given values of *y(0)* and $\bar{y}$. The growth rate is higher the lower is log [y(0)]. This is the standard β convergence process (see Barro and Sala-i-Martin, 1995).

For empirical estimation, we follow

$$\log(\frac{y_{it_0+T}}{y_{it_0}}) = \theta - (1-e^{-\beta t})\log(y_{it_0}) + u_{i,t_0,t_{0+T}} \qquad (20)$$

where $\theta = x + [(1-e^{-\beta t})][\log(\bar{y}) + xt_0]$, $u_{i,t0,t0+T}$ is the error term and i indices of the countries. Eq (21) is $Y_{i,t0+T} - Y_{i,t0} = a + b_0 Y_{i,t0} + v_{it}$, in which the coefficient on $\log(y_{it0})$ - i.e. on $Y_{i,t0}$, is constant.

EMPRICAL SPECIFICATIONS AND RESULTS

To test our convergence hypotheses, we use the specifications derived from the previous section. Equation (21) implies the test for unconditional convergence while equation (22) specifies conditional convergence. In equation (22) some additional variables included to control for the differences in preferences and technology and in steady states.

The empirical models for the estimation at a given time are thus

$$Y_{i,t} - Y_{i,t0} = a + b_0 Y_{i,t0} + v_{it} \qquad (21)$$

and

$$Y_{i,t} - Y_{i,t0} = a + b_0 Y_{i,t0} + b_1 TRADE_{it} + b_2 AGRI_{it} + b_3 GC_{it} + v_{it} \qquad (22)$$

where T= number of years in the period from 1990 to 2011 and i = 1, 2, ..., and 24 European Union countries and candidate countries Turkey and Macedonia. Here, $Y_{i,t}$ is the natural logarithm of real GDP per capita in country *i* at time *t.* $Y_{i,t0}$ is the natural logarithm of real initial GDP per capita. Our panel data set is a balanced one, so the other countries couldn't be existed in the analysis due to the lacking data. *a* and b_0, b_1, b_2 and b_3 are the parameters to be estimated. These variables are demeaned before estimation for the purpose of removing some of the correlations that may exist across the error terms (see Lee *et al.* 1997). $b_0 < 0$ is a necessary although as Bernard and Durlauf (1991) showed. But this is not a sufficient condition for convergence.

The investigation of unconditional convergence requires a restrictive assumption that there is no difference in preference, technology and steady state across countries. Therefore, the model considers four other explanatory variables, which are expected to control for the effects of technology diffusion: an open trade policy, change in economic activities, and government consumption expenditures. It is now generally acknowledged that a relatively liberal trade regime along with structural economic changes is the main vehicles of technology diffusion.

Thus, equation (22) tries to show how income per capita depends on trade, structural change and government consumption expenditures and it shows the effectiveness of government policies. We assume that trade could be the engine of economic growth; although some argue that causality could be bi-directional (Ghatak and Wheatley-Price, 1996). Trade is also important, because a higher degree of integration with the

world market means higher level of technology. TRADE is the export of goods and services (% of GDP). TRADE is included under the assumption that there is a correlation between higher degrees of integration with the world market and higher levels of technology. Countries with more exports are likely to have used their resources more efficiently.

We use AGRI as the percentage of GDP that is produced by the agricultural sector to capture the impact of structural change. AGRI is included to allow for the differing composition of economic activities within European Union countries and candidate countries. Economic development literature has long assumed that different components of economic activity have different levels of technology (Ghatak and Li, 2006). Thus, countries with a higher percentage of GDP in agriculture are expected to have lower level of technology.

Our last explanatory variable is general government final consumption expenditures (% of GDP). GC is included on the basis that government consumption expenditures effect economic growth negatively[2], and it is important for seeing the effectiveness of government policy decisions. We collected the data from World Bank Development Indicators, and we used Gauss codes for econometric tests.

At the empirical application, first step is heterogeneity test. Pesaran and Yamagata (2008) developed Delta test to examine the heterogeneity between cross section units. Under the assumption of fixed effect and heterogeneous slopes Pesaran and Yamagata (2008):

$$y_{it} = \alpha_i \tau_T + X_i \beta_i + \varepsilon_{1,i}, \qquad \forall i = 1,2,...,N \quad (23)$$

where τ_T indicates $T \times 1$ vector of ones, β_i is $k \times 1$ vector of unknown slope coefficient, $y_i = (y_{i1},...,y_{iT})'$, $x_i = (x_{i1},..., x_{iT})'$, and $\varepsilon_{1,i} = (\varepsilon_{1,i1},...,\varepsilon_{1,iT})'$. According to the Delta test, null and alternative hypotheses are as follows:

$$\begin{aligned} H_0 &: \beta_i = \beta \\ H_1 &: \beta_i \neq \beta_j \end{aligned} \quad (24)$$

If null hypothesis is failed to reject, then series are homogeneous. Otherwise, at least one series is different from the others and hence the series are heterogeneous. Our Delta test results are shown in table 1

[2] Baldwin (1989); Edwards (1992); Dolar (1992); Levine and Renelt(1992); Frankel and Romer (1996); Baldwin and Seghezza (1996); Henrekson et al.(1997); Wacziarg (2001); Vamvakidis (1998); Bhagwati and Srinivasan (2002); Nguyen and Ezaki (2005) and Borata and Kutan (2008).

below.

Table 1. Delta Test Results for Unconditional Convergence Model

Test	Test Statistics	Probability
$\tilde{\Delta}$	0.370	0.356
$\tilde{\Delta}_{adj}$	0.397	0.346

H_0 is not rejected, so slope coefficients in the cointegration equation are homogeneous. Then we estimated Delta test for conditional convergence model. The results are shown below in table 2.

Table 2. Delta Test Results for Conditional Convergence Model

Test	Test Statistics	Probability
$\tilde{\Delta}$	1.612*	0.053
$\tilde{\Delta}_{adj}$	1.823*	0.034

As H_0 is rejected, slope coefficients in the cointegration equation are heterogeneous. It is important to determine the Cross-section dependence (CD) before implementing unit root tests. To this end, we used CD test of Pesaran (2004). Standard panel data model Pesaran (2004):

$$y_{it} = \alpha_i + \beta_i' x_{it} + \varepsilon_{2,it}, \quad \text{for } i = 1,2,...,N \text{ and } t = 1,2,...,T \quad (25)$$

where i indicates the cross section dimension, t indicates time series dimension, x_{it} is $k \times 1$ vector of observed time-varying regressors, α_i are individual intercepts, β_i are slope coefficients.

To test cross section dependence, test statistics is computed as follows Pesaran (2004):

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \right) \quad (26)$$

CD statistic of Pesaran has mean zero for fixed values of T and N, where N indicates cross section dimension, T is time

dimension of panel, $\hat{\rho}_{ij}$ represents the sample estimate of the cross sectional correlations among residuals. The hypothesis for the computed test statistics are:

$$H_0 : \rho_{ij} = \rho_{ji} = cor(\varepsilon_{2,it}, \varepsilon_{2,jt}) = 0$$
$$H_1 : \rho_{ij} = \rho_{ji} \neq 0 \quad (27)$$

The *CD* test results are shown in table 3 below.

Table 3. Cross Section Dependence Test

Variable	Test Statistics
$Y_{i,t0}$	15.682**
AGRI	7.536**
TRADE	7.871**
GC	5.344**

Test statistics show that there is cross section dependence for all series. Hence, one needs to take into consideration the cross section dependence while undertaking unit root tests. Otherwise, the results would be biased. The appropriate unit root test in that case is Cross-Sectionally Augmented *Dickey-Fuller (CADF)* test of Pesaran (2007). Pesaran's asymptotic results are related with the individual CADF statistics and their averages, which are called Cross-Sectionally Augmented Im, Peseran, Shin (CIPS) Test. The null and alternative hypotheses of the CADF test are shown below:

$$H_0 : \beta_j = 0$$
$$H_1 : \beta_j < 0 \quad j = 1,2,..,N_1; \;\; \beta_j = 0, \;\; j = N_1 + 1, \;\; N_1 + 2,...,N \quad (28)$$

where N indicates number of cross sections. CADF regression is shown below Pesaran (2007):

$$\Delta y_{it} = a_i + b_i y_{i,t-1} + c_i \bar{y}_{t-1} + d_i \Delta \bar{y}_t + e_{1,it} \quad (29)$$

where $\Delta y_{it} = y_{it} - y_{i,t-1}$; $y_{i,t-1}$ is the first lag of y_{it} ; $\Delta \bar{y}_t$ is cross-section mean of Δy_t and $e_{1,it}$ is residuals. CIPS test is based on Pesaran (2007):

$$CIPS(N,T) = N^{-1} \sum_{i=1}^{N} t_i(N,T) \quad (30)$$

where $t_i(N,T)$ is the CADF statistics for i[th] cross-section unit defined by (29). CIPS test gives only one value. CIPS test results are shown in table 4 below.

Table 4. CIPS Test Results

Variable	Test Statistics
$Y_{i,t0}$	-2.3351**
AGRI	-2.6738**
TRADE	-2.8907**
GC	-1.5974**

According to Table 4, null hypothesis of non-stationary is not rejected at 1per cent or 5 per cent level of significance for all series. That is, there is unit root problem.

Given the cross section dependence of our series, we employ second generation panel cointegration tests. Westerlund (2008) proposed the Durbin–H panel and group cointegration test, which gives more powerful results than any other panel cointegration test if there exists cross section dependence. The following equation is proposed by Westerlund (2007):

$$\Delta y_{it} = \delta_i^{'} d_t + \alpha_i (y_{it-1} - \beta_i^{'} x_{it-1}) + \sum_{j=1}^{pt} \alpha_{ij} \Delta y_{it-j} + e_{2,it} \qquad (31)$$

where α_i is error correction term, d_t shows deterministic trend, $e_{2,it}$ is residuals. Durbin-H group and Durbin-H panel statistics are computed as follows Westerlund (2008):

$$DH_g = \hat{S}_i (\tilde{\phi}_i + \hat{\phi}_i)^2 \sum_{t=2}^{T} \hat{e}_{it-1}^2 \qquad (32)$$

$$DH_p = \hat{S}_n (\tilde{\phi} + \hat{\phi})^2 \sum_{i=1}^{n} \sum_{t=2}^{T} \hat{e}_{it-1}^2 \qquad (33)$$

$\hat{S}_i$ and $\hat{S}_n$ are the variance ratios, and $\hat{e}_{it-1}$ is the consistent estimate of e_{it-1}. Panel statistics, DH_p, is summing the n individual terms. Group mean statistics, DH_g, is constructed by multiplying the

terms and then summing them up. The null and alternative hypotheses of Durbin–H panel and group cointegration tests are as follows:

$$H_0 : \phi_i = 1 \quad for \ \ all \ \ i = 1,...,n$$
$$H_1^p : \phi_i = \phi \ \ and \ \ \phi < 1 \quad for \ \ all \ \ i \qquad (34)$$
$$H_1^g : \phi_i < 1 \quad for \ \ at \ \ least \ \ some \ \ i$$

The Durbin-H panel cointegration results are compared with the critical value, 1.645. Our results indicate that there is cointegration for EU and candidate countries. Table 5 represents Durbin-H panel and group cointegration test results.

Table 5. Durbin-H (2008) Cointegration Tests Results

	Test Statistics	Probability
Durbin-H group	3.309**	0.0000
Durbin-H panel	12.052**	0.0000

Our test results support the long run cointegration relationship. It means that deviations from equilibrium value of the variable in the short run will be corrected in the long run.

Next, we estimate the long-run model for each country. Given that there is cross-sectional dependence in our series, we use Common Correlated Effects Mean Group (CCE-MG) estimators developed by Pesaran (2006). For the i^{th} cross section unit at time t for $i = 1,...,N$ and $t = 1,...,T$, the linear heterogeneous panel data model is shown below Pesaran (2006):

$$y_{it} = \alpha_i^{'} d_t + \beta_i^{'} x_{it} + e_{3,it} \qquad (35)$$

In equation (30), d_t is a $n \times 1$ vector of observed common effects which includes deterministic components. x_{it} is a $k \times 1$ vector of individual-specific regressors (Kapetanios and Pesaran, 2005), and errors $e_{3,it}$ are:

$$e_{3,it} = \gamma_i^{'} f_t + \varepsilon_{3,it} \quad (36)$$

In equation (36), f_t is the vector of common effects, $\varepsilon_{3,it}$ are the individual-specific errors. Below, we present CCE-MG estimates.

Table 6. CCE Mean Group Estimates for Unconditional Convergence Model

	Coefficient	t-statistics	Implied λ	half-life
$Y_{i,t0}$	-0.33418	-13.5791	0.019368	35.78757

Table 6 shows CCE-MG estimation results of unconditional convergence model. There is an absolute unconditional convergence observed because the coefficient of the initial level of real GDP per capita is negative and statistically significant. Countries with lower initial levels of relative GDP per capita tend to grow 0.33 per cent faster than rich ones.

The half life condition is given by $e^{\lambda t} = 1/2 \Rightarrow t = \ln(2)/\lambda$. It shows that how an economy fills the gap between others. Table 6 shows that countries with lower initial levels of relative GDP per capita will move halfway in 35 years. Implied λ is 0.019. It implies that 1.9 percent of the gap of initial levels of real relative GDP per capita between the rich and the poor vanishes in a year if their steady states are identical. The methodology also allows us to identify individual effects of independent variables on the dependent variable as well. Table 7 shows the country-specific convergence behavior.

Table 7 shows country-specific unconditional convergence behavior. From the table we see that all coefficients are significant and show unconditional convergence except Macedonia. Sweden has fastest unconditional convergence, and United Kingdom has lowest. The other countries with low unconditional convergence are Malta, Spain, Lithuania and Bulgaria, also France, Germany, Slovenia and Belgium have high unconditional convergence speed. Although, in line with the theory, we expect relatively lower convergences for Germany and France, their growth patterns have seemed parallel since the World War II (Amable and Juillard, 2000: 10), and regional differences in these countries have caused a tendency towards unconditional convergence (Juessen, 2009; Firgo and Huber, 2013). It is also possible to mention that relatively less fragility against shocks and sustainable growth rates in Germany and France helped those results. Therefore, our high unconditional convergence speeds for Germany and France are understandable and justifiable in this sense.

Table 7. CCE Estimation Results for Each Country (Unconditional Convergence Model)

ID	$Y_{i,t0}$	Implied λ	Half-life
Austria	-0.38**	0.022764	30.44979
Belgium	-0.453**	0.028729	24.12719
Bulgaria	-0.246**	0.013446	51.551
Cyprus	-0.408**	0.024964	27.76562
Czech Republic	-0.378*	0.02261	30.65633
Denmark	-0.294**	0.016578	41.81102
Finland	-0.253**	0.01389	49.90259
France	-0.487**	0.031785	21.80755
Germany	-0.496**	0.032628	21.24422
Hungary	-0.433**	0.027019	25.6542
Italy	-0.317**	0.018155	38.17887
Latvia	-0.385**	0.023149	29.94261
Lithuania	-0.229**	0.012384	55.97056
Luxembourg	-0.305**	0.017326	40.00647
Netherlands	-0.288**	0.016175	42.8527
Poland	-0.257**	0.014146	49.00063
Portugal	-0.261**	0.014403	48.12609
Slovak Republic	-0.342**	0.019931	34.7774
Slovenia	-0.484**	0.031507	21.99973
Spain	-0.215**	0.011527	60.13135
Sweden	-0.633**	0.047733	14.52133
United Kingdom	-0.168*	0.008758	79.14238
Croatia	-0.327**	0.018858	36.75688
Malta	-0.213**	0.011406	60.77014
Turkey	-0.408**	0.024964	27.76562
Macedonia, FYR	-0.03	0.00145	477.888

Table 8. CCE Mean Group Estimates for Conditional Convergence Model

	Coefficient	t-statistics
$Y_{i,t0}$	-0.49109	-7.64881
TRADE	-0.00053	-1.90897
AGRI	0.00308	0.789317
GC	-0.00483	-4.56452

CCE-MG estimates show that there is a strong relationship. An absolute conditional convergence is observed because the coefficient on the initial level of real GDP per capita is negative and statistically significant. Countries with lower initial levels of relative GDP per capita tend to grow 0.49 percent faster than rich ones. And the other explanatory variables have expected signs except openness. We expect that openness effects economic growth positively, government consumption effects negatively, and agriculture effects positively as theory points out. On the contrary to the theory openness has negative coefficient. This means that some of the EU and candidate countries are affected from openness negatively; these countries are Austria, Latvia, United Kingdom and Turkey. When we look at to the table 8, the coefficients on the percentage of activity in agriculture (because of the declining role of the agricultural sectors in these economies) are statistically insignificant. On the other hand, the methodology also allows us identifying individual effects of independent variables on the dependent variable as well. Table 9 shows that the coefficients of agriculture are statistically significant at 1per cent and 5 per cent for 17 countries.

According to the half-life formula of conditional convergence model, countries with lower initial levels of relative GDP per capita will halfway in 18 years. And implied λ is 0.037. It implies that 3.7 percent of the gap of initial levels of real relative GDP per capita between the rich and the poor vanishes in a year if their steady states are identical. This is faster than the unconditional convergence model. It means that the explanatory variables at the conditional convergence model have good explanatory power for GDP per capita convergence.

Table 9 shows country-specific conditional convergence behavior. According as the table, countries with low unconditional convergence are Slovak Republic, Poland and Portugal; also Denmark, Finland, Lithuania and Belgium have high unconditional convergence speed. There is an interesting result exist here. In comparison with unconditional convergence model, here Lithuania has high conditional convergence speed. It was in the list of low unconditional convergence speed countries. It means that these additional explanatory variables in Table 9 have substantial effect on Lithuania economy.

Table 9. CCE Estimation Results for Each Country (Conditional Convergence Model)

ID	$Y_{i,t0}$	*TRADE*	*AGRI*	*GC*	Implied λ	Half-life
Austria	-0.333*	-0.006**	0.016**	-0.012**	0.022498	30.80919
Belgium	-0.827**	0.001**	0.03**	-0.001	0.09747	7.111375
Bulgaria	0.058	0.000	0.002**	0.004**	-	-
Cyprus	-1.312**	0.003**	-0.006	-0.003**	-	-
Czech Republic	-0.5*	-0.002	0.01**	-0.001	0.038508	18.00
Denmark	-0.812**	-0.001	0.01**	-0.013**	0.092851	7.465177
Finland	-0.742**	-0.001	-0.006**	-0.005**	0.075266	9.209248
France	-0.805**	0.002**	-0.021**	-0.012**	0.09082	7.632118
Germany	-0.196	0.002**	0.032*	-0.008	0.01212	57.19141
Hungary	-0.328**	-0.001	-0.01**	-0.005**	0.022083	31.38804
Italy	-0.264*	-0.001	0.047*	0.001	0.017029	40.70351
Latvia	-0.47*	-0.002**	-0.002	-0.003**	0.035271	19.65203
Lithuania	-0.757**	0.000	0.004	-0.004	0.078594	8.819328
Luxembourg	-0.446**	0.000	-0.04**	-0.009**	0.032811	21.12572
Netherlands	-0.32	0.001**	0.026**	-0.005**	0.021426	32.35121
Poland	-0.149**	0.000	0.009**	-0.011**	0.008964	77.3299
Portugal	-0.177	0.000	-0.004	-0.002	0.010822	64.04881
Slovak Republic	-0.019	0.001**	0.024**	0.005**	0.001066	650.4075
Slovenia	-0.946**	0.001**	-0.017**	-0.012**	0.162154	4.274624
Spain	-0.656**	0.000	0.001	-0.008**	0.059284	11.69196
Sweden	-0.853**	-0.004	-0.004	-0.014**	0.106518	6.507329
United Kingdom	-0.473**	-0.002**	0.003	-0.001*	0.035586	19.47788
Croatia	-0.593**	-0.001	0.001	-0.002**	0.049941	13.87926
Malta	-0.314**	0.000	-0.038**	-0.006**	0.020938	33.1053
Turkey	-0.476**	-0.003**	0.014**	0.004	0.035904	19.30582
Macedonia, FYR	-0.058	0.000	0.000	-0.003**	0.003319	208.8142

CONCLUSIONS

This paper examines the tendency towards convergence in relative GDP per capita across EU and candidate countries, and investigates the effects of openness, economic activity and government consumption in the growth process for the period 1990-2011.

Our estimates of speed of convergence in accord with many other researchers' are high. We can justify it in the light of very sluggish EU growth rates of recent times. Besides, this speed is faster in conditional convergence model than the unconditional convergence model. It means that the explanatory variables at the conditional convergence model have good explanatory power for GDP per capita convergence for EU and candidate countries.

This paper gives country-specific conditional and unconditional convergence results at the long-run model via using Common Correlated Effect Model. This contribution provides crucial information about the European Union countries and candidate countries. These tests enable to see which countries have high, and which countries have low unconditional and conditional convergence.

From the conditional convergence model, we can also see the country-specific effects of explanatory variables. We see that the coefficient of agriculture is small since the role of agriculture has decreased over the years. Being the EU member bring some advantages to the member countries on account of the scale economies. On the contrary of our expectations openness variable has negative coefficient for Austria, Latvia, United Kingdom and Turkey. These countries were affected trade openness negatively at this period of time. As we expected government consumption variable has negative coefficient, it affects economic growth negatively.

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