CONVERGENCE REVISITED: CASE OF EU AND EASTERN EUROPE

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Abstract

This paper aims to analyze the convergence pattern of the Central and Eastern European (CEE) and South Eastern European (SEE) to the developed older member countries of European Union. In this context, by performing panel data analysis to 33 countries and each subgroup between 1993 and 2012, results reveal that there is a strong tendency on convergence for the new entrants of European Union after 2004 and for the candidate countries in terms of both convergence types which confirm the findings of neoclassical paradigm states that poorer countries will grow faster than richer ones. The speed of β convergence varies between 1.3 % to 4.2 for each group and the findings suggest that private domestic investment is the most leading determinant of growth and convergence process of Eastern European countries.

Keywords: β Convergence, σ Convergence, Eastern Europe

JEL classification: O11, O47, O52

1. Introduction

By the end of Cold War and the fall of Eastern Bloc, new political and economic environment formed in Eastern Europe. Increasing tendency of globalization caused rapid transformation of economic systems in Eastern European countries. By the commencement of new millennium, integration process of Eastern European countries to European Union (EU) is brought to agenda of EU. In this context, the greatest enlargement of EU was experienced in 2004, by including ten countries from Central and Eastern Europe. The enlargement process has been continued by including Romania and Bulgaria in 2007 and Croatia in 2013. On the other hand, status of pending candidates and potential candidates are still vital that will shape the near agenda of EU.

Besides integration issues in terms of politics, main drawback of enlargement strategy for EU is dispersion or income gap with those new entrants of EU from Eastern Europe. According to European Statistical Office (EUROSTAT), as of 2011, income gap between the richest member state (Luxembourg) and the poorest member state (Bulgaria) is almost sixteen fold in real per capita terms. In contrast to this dramatic dispersion in income level, new member states perform better in terms of economic growth. According to United Nations Conference on Trade and Development (UNCTAD), the period of 1992-2010 for which covers the transition and integration process of Eastern European countries, Estonia experienced the most rapid growth rate by 5.9 % followed by Lithuania with 5.4 %. On the other hand, during this period, the most rapid growing member state within EU-15 which consists of older and richer member states is Ireland with 4.6 % while the richest member state Luxembourg grew by 2.8 %.

The aim of this paper is to analyze the convergence aspect of CEE, candidate and potential candidate countries of EU with EU-15. Neoclassical Growth Models (NGM) pioneered by Solow (1956) indicate that initially poorer countries will grow faster than richer countries and finally countries will converge to the same steady state income level independent of their initial conditions if they display the same structural characteristics (same technology, saving behavior, etc.). This refers to absolute β convergence in the literature. However, if the countries have different structural characteristics and if initially poorer countries grow faster than richer ones, then conditional β convergence occurs. On the other hand, in the convergence literature, Sala-i Martin (1996a, 1996b) proposes "classical approach" to convergence analysis derived by NGM. The classical approach classifies the convergence as β and σ convergence and the latter is related with the dispersion in standard

deviation of income over time span. If the standard deviation of income series diminishes within time, then income series display σ convergence. In this context, the layout of the paper is organized as follows. In the next section, I will introduce a brief literature of convergence especially based on the studies of European case. In the section three, the methodology and brief information about the variables and the data will be presented. In section four, econometric results and findings will be displayed while in the final section I will present concluding remarks.

2. Literature Review

The issue of convergence has a key and deep convention in the literature of economic growth. Advocates of NGM such as Ramsey (1928), Solow (1956) Cass (1965), and Koopmans (1965) indicates the existence of convergence among the homogenous economic entities such as regions, countries, etc. Because of diminishing marginal productivity of capital, initially low capital intensive economies will grow faster than high capital intensive countries and finally will converge to their income levels. On the other hand, sources of economic growth in NGM are exogenous factors such as technology, population growth, etc. Endogenous Growth Models (EGM), rise up by the works of Romer (1986), Lucas (1988) and Romer (1990) rejects the assumption of diminishing marginal productivity of capital. Besides this, EGM consider the sources of growth as endogenous such as human capital, R&D, diffusion of technology, etc. By taking into consideration of those assumptions, findings of EGM stress that richer countries are endowed with the factors related with knowledge and innovation in production means that growth of richer countries will never end up and the income gap with poorer countries will not narrow. Unlike NGM, EGM proposes that there is divergence among economies. Ability for poorer countries to catch-up those richer countries depend on their capability in transferring technology, generating innovations or imitating those innovations which is less costly then generating.

Alongside those theoretical developments in the convergence studies, based on cross-country and cross-regional empirical studies emerged by the middle of 1980s. In this context, Baumol (1986), Barro (1991), Barro and Sala-i Martin (1992), Mankiw, et al. (1992), Islam (1995), Sala-i Martin (1996a, 1996b) are the proponents of empirical convergence studies. Besides their classification attempts on convergence types, most of them found that economies with similar characteristics display tendency of convergence and the speed of convergence is found to be about 2 % per year. Those findings in favor of convergence are even more evident within the regions, prefectures and states of countries. Initially empirical convergence studies for Europe are based on regional context, especially for analyzing regional income disparities or regional cohesion for founding member states of European Community (EC). In this respect, one of the earlier attempts belongs to Barro and Sala-i Martin (1991). For 73 regions of selected 7 EC countries, they analyze the convergence tendency for the period of 1950-1988. Their findings indicate that regions of selected EC countries display β and σ convergence and the speed of convergence per year was found to be 2 % which indicates as similar pattern as the states of United States (US). Button and Pentecost (1995) as distinct from Barro and Sala-i Martin (1991) analyze the convergence in regional context by adding Greece, Ireland and Luxembourg for the period of 1975-1988. 51 selected NUTS-1[1] regions of those EC countries displayed both absolute and conditional β convergence and σ convergence as well. Their finding for the speed of convergence is 3 % indicates higher speed of convergence compared to Barro and Sala-i Martin (1991). Neven and Gouyette (1995) analyze regional convergence for 108 NUTS-2 regions of the selected EC countries for the period of 1975-1990. Their findings yield that β convergence exists in absolute and conditional sense while σ convergence exists too. They find that the speed of convergence is above 2 % which reflects similarity with Button and Pentecost's (1995) finding. Sala-i Martin (1996a, 1996b) by referring to Barro and Sala-i Martin (1991) analyze the existence of convergence for 90 selected regions of 6 EC countries which are the founder and oldest developed member states of EU currently, for the period of 1950-1990. By

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[1] NUTS: Nomenclature Units for Territorial Statistics.

performing cross-section and panel data analysis, absolute and conditional β convergence exist together while the speed of convergence for cross-sectional analysis found to be 1.5 %, for panel data analysis found to be 1.8 % per year. In both studies, data set display σ convergence as well.

Recent attempts on empirical convergence analysis mainly deal with cross-country analysis within EU, considering the status after Maastricht Treaty (1992) which is the founding Treaty of today's EU and enlargement process in the new millennium. In this context, Yin, et al. (2003) investigates convergence pattern for EU-15 countries for the period of 1960-1995. Except for 1980-1985, both absolute and conditional β convergence observed for all 5-year sub periods and joint sub periods too. They find that the speed of absolute β convergence is 1.5 % while conditional β convergence is 2.5 %. They also suggest that private domestic investment expenditures are the main leading factor in ensuring growth and conditional β convergence. Cuaresma, et al. (2008) investigates the relationship between duration of EU membership and convergence between 1960 and 1998. They claim the existence of both type of β convergence and the speed of absolute β convergence is 3 % and for conditional β convergence is between 4 and 6 % which indicates higher rate when it is compared to previous empirical studies for EU case. They propose that growth enhancing effect of EU membership emanates via financial supports of EU (structural funds, etc.) and openness which causes diffusion of technology throughout EU countries as the duration of EU membership lasts long. The most striking finding of their work is that Greece, Spain, and Portugal are the most benefiting countries for EU membership during the decades.

Cavenaile and Dubois (2011) consider the greatest enlargement period of EU in 2004 and analyze convergence tendency of EU-27 between 1990 and 2007. They confirm strong tendency in favor of conditional β convergence by suggesting exports and domestic savings are the key determinants while government expenditures have no growth enhancing effect. On the other hand, Matkowski and Prochniak (2007) consider the case for CEE countries which became member of EU in 2004 except for Malta and Cyprus. They analyze convergence pattern of 8 CEE countries with EU-15 for 1993-2004. Their findings indicate that both country groups display absolute and conditional β convergence within and between each other. The speed of absolute convergence is found to be 2.3 % per year and free trade, increasing inflow of foreign direct investments (FDI), maintaining coordination and cohesion of common EU policies strongly are the key factors in facilitating growth and conditional β convergence. Vojinovic, et al. (2010) investigates the existence of convergence among CEE-10 countries join EU in 2004 for the period between 1992 and 2006. After the second half of 1990s, both types of β convergence observed as well as σ convergence which is based on the fall in income dispersion over time. The speed of absolute convergence is found 4.2 % while for conditional β convergence ranges between 2.9 % and 6.5 % over the sample period. Their findings reveal that gross fixed capital formation and exports as portion of GDP are the main factors that facilitate growth and conditional β convergence.

3. The Methodology and Data

As indicated introduction part, I will follow Sala-i Martin's (1996a, 1996b) "classical approach" and the analysis will cover SEE-8, CEE-10 and 33 countries with the combination of EU-15. In this respect, the analysis will start with σ convergence which occurs when cross-sectional income dispersion or differentiation among economies decreases over time. To measure σ convergence or cross-sectional income dispersion following expression which is the sample variance of income per capita series needed:

$$\sigma_t^2 = (1/n)\sum_{i=1}^{N}\left[\log(y_{it}) - \mu_t\right]^2 \tag{1}$$

where $\log(y_{it})$ indicates log of income per capita while μ_t indicates sample mean of $\log(y_{it})$. If σ_t^2 decreases over time, then income series display σ convergence and income dispersion among economies fall as well.

The analysis will continue by the estimation of absolute β convergence which indicates initially poorer countries will grow faster than richer countries and approach to the common steady state income level in neoclassical sense. In this context, the following equation will be estimated.

$$\frac{1}{T}\ln\left[\frac{y_{it}}{y_{i0}}\right] = \beta_0 + \beta_1 \ln(y_{i0}) + u_{it} \qquad (2)$$

In this equation i=1,…,N represents the cross-sectional units, u_{it} represents disturbance term and left hand side of the equation is average growth rate. Absolute β convergence indicates the negative relationship between growth rate and initial level of income per capita. If $\beta_1 < 0$, negative relationship between growth rate and initial level of income is satisfied which indicates the presence of absolute β convergence holds among economies.

Finally, the analysis will end up by estimating conditional β convergence. As indicated by Sala-i Martin (1996b), when a cross-sectional regression of growth is performed on initial income, holding constant a number of additional control variables, if resulting coefficient on initial income is negative, then the date set display conditional β convergence. For conditional β convergence the following equation will be estimated.

$$\frac{1}{T}\ln\left[\frac{y_{it}}{y_{i0}}\right] = \beta_0 + \beta_1 \ln(y_{i0}) + \sum_{k=1}^{n}\beta_k X_{kt} + u_{it} \qquad (3)$$

Different from equation 2, in this equation we have vector of control variables is captured by X_{kt} which is needed to control the steady state level of income per capita. Here convergence occurs, if $\beta_1 < 0$ holds which indicates growth is negatively affected by initial income. On the other hand, as indicated by Barro and Sala-i Martin (1992), Sala-i Martin (1996a, 1996b) and Yin, et al. (2003) two measures of convergence, namely β and σ convergence are closely related. According to Sala-i Martin (1996b) if β convergence holds, then variance of income series approaches its steady state value monotonically. The key point, however, is that variance of income series can increase or decrease towards steady state depending on whether the initial value of variance is above or below the steady state. But even if β convergence holds, variance could be rising along the transition sometimes. In summary, β convergence is a necessary, but not sufficient condition for σ convergence. On the other hand, the speed of convergence, the rate at which an economy's ability to catch up steady state level of income per capita is calculated by the following equation.

$$\beta = -\ln(1 + \beta_1 T)/T \qquad (4)$$

T is the length of period and as indicated by Vojinovic, et al. (2010), the length of period in panel data studies accepted as one (T=1).

In this paper, data set covers 33 countries which consists of EU-28, candidate and potential candidate countries from South Eastern Europe. The analysis will be conducted by panel data estimation methods for the period of 1993-2012 includes the transition period of CEE countries and enlargement period of EU aftermath of 2000. By constructing panel data, Islam's (1995) methodology will be used. Islam (1995) suggests that to abstain from the negative effects of short-run business cycles, sample period should be divided into the several sub periods which also makes possible to shift from cross-section to panel data. Islam (1995) also suggests that 5 year sub periods are more proper interval than shorter intervals such as 1 or 3 year intervals and short-run disturbances may loom large in such situation. That's why he prefers 5 year intervals and in this respect panel data constructed by taking the 5 year averages of each variables.

Since annual GDP growth rates are influenced by the fluctuations of aggregate demand, demand-side macroeconomic variables in conditional convergence equation is included by

following Vojinovic, et al. (2010). Data set for all variables obtained from UNCTAD's UNCTADSTAT database. As dependent variable, annual average real GDP per capita growth rate is taken which is then transformed by taking 5 year averages. As initial income, GDP per capita in US Dollars at constant prices (2005) and constant exchange rates of the base year (annual period average) is constructed by UNCTADSTAT which is then transformed by taking 5 year averages. The same procedure is applied for the rest of variables which are the components of GDP by expenditure approach, namely final consumption expenditures (percentage of real GDP), general government final consumption expenditures (percentage of real GDP), gross fixed capital formation (percentage of real GDP) and exports of goods and services (percentage of real GDP).

4. Econometric Results

In this section, econometric results regarding with the estimation of convergence models provided in the previous section will be displayed by each group of countries, SEE-8[2], CEE-10[3] and 33 countries by including EU-15 together. First, results for σ convergence, then results for absolute and conditional β convergence will be presented with theoretical discussions responsibly.
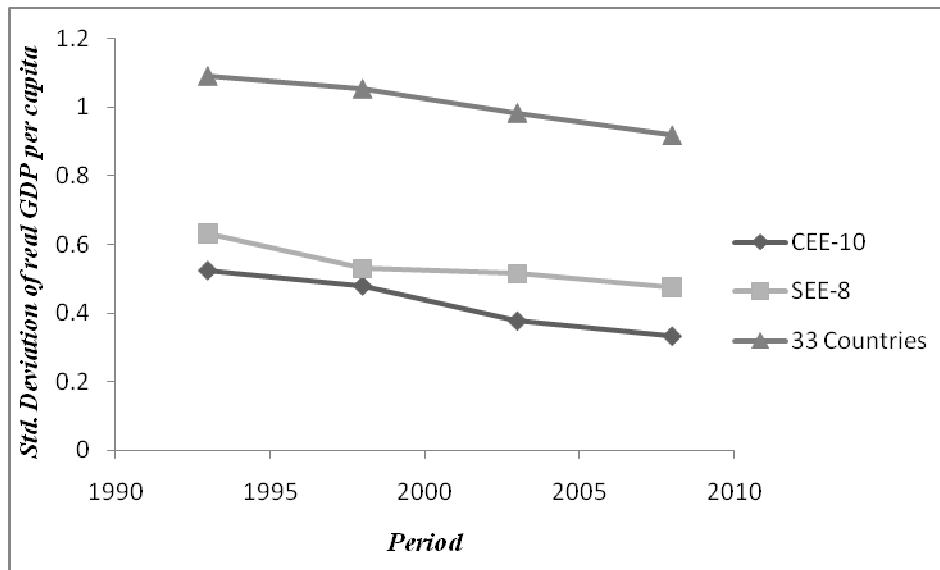
4.1. Sigma Convergence

Based on the cross-sectional standard deviations of income per capita, Figure 1 represents the dispersion of real GDP per capita for all country groups. As seen in Figure 1, dispersion of real GDP per capita represented by the standard deviation of real GDP per capita series declines over time for all country groups. It reveals that over the sample period, 1993-2012 σ convergence exists for all selected countries within EU-15, CEE-10 and SEE-8. Because of the large income gap between EU-15 and Eastern European countries, for whole sample (33 countries) value of standard deviation is above compared to homogenous groups such as CEE-10 and SEE-8. According to Figure 1, as the income gap narrows and structural characteristics display similarities or countries become more homogenous, then value of standard deviation becomes smaller which is the case for CEE-10 and SEE-8. As indicated by Sapir (1988), Lloyd (1992) and Yin, et al. (2003) this declining trend in standard deviation for all country groups is the sign for the close accomplishment of integration process for CEE-10 and SEE-8 that also bears some current EU member countries. During the transition period in 1990s, as those countries liberalized their economies and become as open economies, they receive foreign direct investments and deal with foreign trade. Geographical closeness to EU market increased their export and import share with EU countries, which in turn caused rapid growth for those countries. This declining trend in σ seems to be sluggish because of the experienced financial turmoil and debt crisis of some EU countries after 2008. The new member states and candidate countries also negatively affected by the slowdown observed in developed economies of EU which are the main trading partners and have significant share in trade for those countries as well. On the other hand, measures and bail out plans against these crises are still not enough as the recovery process gets longer which in turn shrinks the economies of new members and current candidates of EU.

The findings in favor of σ convergence, supports the findings of previous studies concerning with EU such as Barro and Sala-i Martin (1991), Neven and Gouyette (1995), Button and Pentecost (1995), and Sala-i Martin (1996a, 1996b). The existence of σ convergence especially for CEE and SEE countries supports the findings of previous studies concerning with the new member states from Central and Eastern Europe such as Matkowski and Prochniak (2007) and Vojinovic, et al. (2010).

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[2] SEE-8 countries are Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Romania, Serbia, The Former Yugoslav Republic of Macedonia, and Turkey.

[3] CEE-10 countries are Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia.

Figure. 1. Sigma Convergence for SEE-8 Countries

4.2. Beta Convergence

The analysis of β convergence will be conducted through the models described in section 3. In this context, this section first will be devoted to the estimation results of absolute β convergence and then conditional β convergence. Estimation of absolute and conditional β convergence is performed by panel data methods namely pooled OLS, fixed effects models (FEM), and random effects model (REM). Selection of appropriate panel data method is done by performing F-Test, LM-Test and Hausman Test proposed by Hausman (1978). For appropriateness of Pooled OLS over FEM F-Test, while for appropriateness of REM over pooled OLS and FEM, LM-Test and Hausman Test performed respectively. For F-Test, as a null hypothesis of "no individual effects" ($H_0 : \mu_i = 0$) tested, for LM-Test "variances of individual effects are zero" or ($H_0 : \sigma_\mu^2 = 0$) and finally for Hausman Test "no correlation between random individual effects and explanatory variables" or ($H_0 : Cor(\mu_i, X_{it}) = 0$) tested. Results for appropriate panel data method selection are given in Table 1. Based on these considerations for SEE-8 and whole sample (33 countries) regressions for conditional β convergence will be estimated by FEM while for CEE-10 group will be estimated by REM. On the other hand, regressions based on absolute β convergence will be estimated by Pooled OLS for SEE-8 and whole sample, while for CEE-10 will be estimated by REM.

Table 1: Model Selection

Model Name/Number	Country Group	F-Test F-Stat. (p-value)	LM-Test χ^2 Stat. (p-value)	Hausman Test χ^2 Stat. (p-value)	Model Selection Result
Abs. β Conv.	SEE-8	1.96 (0.1059)	0.18 (0.3373)		Pooled OLS
Cond. β Conv.					
1	SEE-8	6.97*** (0.0003)		33.23*** (0.0000)	FEM
2	SEE-8	6.61*** (0.0004)		45.76*** (0.0000)	FEM
3	SEE-8	7.15*** (0.0002)		45.13*** (0.0000)	FEM
4	SEE-8	4.97*** (0.0017)		24.15*** (0.0000)	FEM
Abs. β Conv.	CEE-10	0.21 (0.9900)	4.14** (0.0418)		REM
Cond. β Conv.					
1	CEE-10	0.28 (0.9750)	4.08** (0.0433)		REM
2	CEE-10	0.40 (0.9216)	3.11* (0.0776)		REM
3	CEE-10	0.42 (0.9119)	3.59* (0.0580)		REM
4	CEE-10	0.86 (0.5732)	1.57 (0.2107)		Pooled OLS
Abs. β Conv.	33 countries	1.08 (0.3722)	0.51 (0.4743)		Pooled OLS
Cond. β Conv.					
1	33 countries	2.04*** (0.0043)		40.83*** (0.0000)	FEM
2	33 countries	1.91*** (0.0086)		33.16*** (0.0000)	FEM
3	33 countries	1.90*** (0.0089)		32.18*** (0.0000)	FEM
4	33 countries	1.74** (0.0205)		27.30*** (0.0000)	FEM

Notes: Asterisks *, ** and *** denote statistical significance at the 10 percent, 5 percent and 1 percent level, respectively. **Source:** Author's Calculations.

Based on these appropriate panel data model selection results, analysis of β convergence is devoted to absolute and conditional β convergence respectively and discussion of results are given in following part of the study.

4.2.1. **Absolute Beta Convergence**

The analysis of absolute β convergence is done by estimating equation 2 that is described in the previous section. By performing panel data methods, estimation results are given in Table 1 for each country groups. The most crucial point in Table 2 is the existence of absolute β convergence for each country groups. The coefficient of initial level of income in natural logarithm (LY) is negative and significant in each regression for all country groups indicates that initially poorer countries in terms of per capita real GDP grow faster than those richer countries and catch-up the steady state level of income. The findings in favor of absolute β convergence, supports the idea of NGM indicated in introduction section. According to NGM, if economies are homogenous and far below steady state level of income, then they will record rapid growth performance compared the richer counterparts and eventually catch up steady state level of income. In the case of Table 2, SEE-8 countries display similar economic structure within the group and far below the income levels of CEE-10 and EU-15, display absolute β convergence and the speed of convergence indicated by implied β convergence yields higher speed compared to CEE-10 and whole sample including EU-15. As discussed for σ convergence, possible explanation could be the efforts for integration process with EU and for this purpose financial assistance in implementing the common EU policies which help those countries to catch up with the developed member states of EU, increasing capital flows after liberalization took place and increasing foreign direct investments which in turn accelerates the growth process in those countries. The findings in favor of absolute β

convergence in Table 2 support the findings of previous studies such as Barro and Sala-i
Martin (1991), Neven and Gouyette (1995), Button and Pentecost (1995), Sala-i Martin
(1996a, 1996b), Yin, et al. (2003), and Cuaresma, et al. (2008) in which older members or
today's EU-15 countries are analyzed. On the other hand, Matkowski and Prochniak (2007),
Vojinovic, et al. (2010), and Cavenaile and Dubois (2011) consider the case by including the
new members of EU from CEE and achieve the presence of absolute β convergence supports
the findings in Table 2 in terms of countries from SEE and CEE.

Table 2. Absolute Beta Convergence

Dependent Variable: GR	SEE-8	CEE-10	33 Countries
Constant	0.3289 [0.1271]**	0.2055 [0.0552]***	0.1463 [0.0471]***
LY	-0.0355 [0.0155]**	-0.0187 [0.0059]***	-0.0126 [0.0047]***
R^2 (within)	-	0.003	-
R^2 (between)	-	0.67	-
R^2 (overall)	0.148	0.083	0.136
Observations	32	40	132
F Stat. (p-value)	5.23 (0.0294)	-	7.01 (0.0091)
Wald χ^2 (p-value)	-	9.89 (0.0017)	-
Implied β	0.0362**	0.0189***	0.0127***

Notes: Dependent variable for each regression is annual average growth rate of real GDP (GR). For
SEE-8 and 33 countries, estimation is done by pooled OLS while for CEE-10 REM is performed.
Robust standard errors are given in square brackets. Asterisks *, ** and *** denote statistical
significance at the 10 percent, 5 percent and 1 percent level, respectively. **Source:** Author's
Calculations.

4.2.2. Conditional Beta Convergence

The analysis of conditional β convergence will be done separately for each country group,
through equation 3 described in the previous section. As indicated in the previous section,
components of GDP by expenditure method will be used as control variables in explaining
growth and convergence process in estimation procedure. In this context, estimation results of
conditional β convergence are provided in Table 3. In all regressions, the negative
relationship between initial level of income (LY) and growth (GR) is satisfied which indicates
the existence of conditional β convergence in line with the arguments of NGM in Table 3.
However, the most striking point in Table 3 is that the speed of conditional β convergence
(implied β) calculated by equation 4 corresponds to higher rates and ranges between 18 % and
22 %. Alongside adding more control variables which result higher speed of convergence, as
depicted in appendix part, according to model selection results regressions for conditional β
convergence is estimated by Fixed Effects Model (FEM) causes higher speed of convergence
as well. Following Islam (1995), Canova and Mercet (1995) use panel data regional data
while Caselli, et al. (1996) use panel data for a cross-section of countries. Their findings
reveal that one of the advantages of using panel data over cross-sections one doesn't
necessary to hold constant steady state because it can be implicitly estimated using fixed
effects. By estimating with panel data with fixed effects, the speed of convergence could
exceed 2 % per annum which is much larger than the speed by estimating cross-sections or
other panel data models such as random effects or pooled OLS. As discussed for the analysis
of absolute β convergence, economic rationale behind this finding or possible explanation
could be SEE-8 countries are the most disadvantageous and laggard countries compared to
counterparts from EU-15 and CEE-10 in terms of income and structure of economy. On the
other hand, as it is analyzed in terms of the determinants of growth, private domestic
expenditures (LINV) are the most leading factor which positively affects growth and
convergence process as in line with the expectations. This finding also confirms Mankiw et al.
(1992), Islam (1995), Barro (1997), Yin, et al. (2003) and Vojinovic, et al. (2010). Private
consumption expenditures (LC) don't have any affect on growth, while on the contrary to
expectations, export share in GDP (LX) doesn't have any affect on growth. Unlike most of
the studies above, in the second and third regressions government expenditures (LGOV)

which is expected to crowd out private domestic investments, positively affect growth. This result shows that even government expenditures are expected to be far from efficiency, it accompanies with private sector in growth process for those disadvantageous countries.

Table 3. Conditional Beta Convergence: SEE-8

Dependent Variable: GR	Regression Number			
	1	2	3	4
Constant	0.9148 [0.2175]***	0.4484 [0.1735]**	0.4959 [0.2085]**	-0.2741 [0.9537]
LY	-0.1695 [0.0377]***	-0.1953 [0.0253]***	-0.2077 [0.0288]***	-0.1966 [0.0394]***
LINV	0.1678 [0.0349]***	0.2174 [0.0249]***	0.2061 [0.0300]***	0.2105 [0.0250]***
LGOV		0.1863 [0.0488]***	0.1761 [0.0543]**	0.1254 [0.0757]
LX			0.0341 [0.0376]	0.0383 [0.0404]
LC				0.1760 [0.1903]
R^2 (within)	0.655	0.746	0.753	0.771
R^2 (between)	0.393	0.378	0.324	0.393
R^2 (overall)	0.308	0.293	0.264	0.286
Observations	32	32	32	32
F Stat. (p-value)	11.61 (0.0060)	25.63 (0.0004)	24.30 (0.0003)	191.95 (0.0000)
Wald χ^2 (p-value)				
Implied β	0.1858***	0.2173***	0.2329***	0.2190***

Notes: Dependent variable for each regression is annual average growth rate of real GDP (GR). Robust standard errors are given in square brackets. All independent variables except for constant are transformed into the natural logarithm and shown by capital l (L). Asterisks *, ** and *** denote statistical significance at the 10 percent, 5 percent and 1 percent level, respectively. **Source:** Authors' Calculations.

The picture differs in terms of convergence speed for CEE-10 countries which have almost same duration in candidacy and membership process. In this context, estimation results of conditional β convergence for CEE-10 countries are shown in Table 4. In all regressions, negative relationship between annual average growth rate and initial level of income (LY) is satisfied which indicates the presence of conditional β convergence and confirms the findings of NGM in the context of CEE-10 as well. Here the speed of convergence represented by implied β is substantially slower than the speed for SEE-8. Even private domestic investments (LINV) are the most substantial factor and positively affect growth, inefficient government expenditures (LGOV) enter regressions with other control variables causes productivity loses and partially crowd out private domestic investments compared to case of SEE-8. As a result, the speed of conditional β convergence and growth process is negatively affected by the inclusion of government expenditures into the regressions. Presence of conditional β convergence for CEE-10 confirms the findings of Matkowski and Prochniak (2007) and Vojinovic, et al. (2010) for CEE countries. On the other hand, findings in favor of positive effect of private domestic investments on growth and convergence confirm the findings in this line with the indicated studies above. Many authors such as Barro (1991, 1997), Barro and Lee (1993) indicates the negative effect of government expenditures which is supported by the findings in Table 4 while Yin, et al. (2003) and Vojinovic, et al. (2010) couldn't find any significant effect on growth. As in the case of SEE-8, exports (LX) do not have any significant effect on growth while consumption expenditures (LC) enter in only one regression and do positively affect average growth rate.

Table 4. Conditional Beta Convergence: CEE-10

Dependent Variable: GR	Regression Number			
	1	2	3	4
Constant	-0.0824 [0.1197]	0.3652 [0.1367]***	0.3285 [0.1460]**	-0.2855 [0.4305]
LY	-0.0147 [0.0020]***	-0.0260 [0.0041]***	-0.0224 [0.0055]***	-0.0182 [0.0082]**
LINV	0.0803 [0.0242]***	0.0819 [0.0202]***	0.0855 [0.0230]***	0.1068 [0.0258]***
LGOV		-0.1169 [0.0272]***	-0.1049 [0.0294]***	-0.1002 [0.0324]***
LX			-0.0106 [0.0107]	-0.0075 [0.0092]
LC				0.1104 [0.0630]*
R^2 (within)		0.371	0.390	0.386
R^2 (between)		0.821	0.780	0.836
R^2 (overall)		0.402	0.411	0.434
R^2	0.293			
Observations	40	40	40	40
F Stat. (p-value)	7.70 (0.0016)			
Wald χ^2 (p-value)		80.24 (0.0000)	105.96 (0.0000)	64.74 (0.0000)
Implied β	0.0148***	0.0263***	0.0226***	0.0183**

Notes: Dependent variable for each regression is annual average growth rate of real GDP (GR). Robust standard errors are given in square brackets. All independent variables except for constant are transformed into the natural logarithm and shown by capital l (L). Asterisks *, ** and *** denote statistical significance at the 10 percent, 5 percent and 1 percent level, respectively. **Source:** Author's Calculations.

Table 5 provides the results by bringing whole sample including EU-15. In all regressions, negative relationship between initial level of income and average growth rate is satisfied and yields the presence of convergence in conditional form. The results in Table 5 also supports the arguments of NGM which indicates that poorer countries will catch-up richer counterparts and retain the same steady income level after controlling steady state income level by control variables. After model selection test results, regressions in Table 5 decided to be estimated by FEM which yields higher speed of convergence ranges between 7.8 % and 8.7 %. This striking finding supports the findings by Canova and Mercet (1995) and Caselli, et al. (1996) whom address much larger than 2 % speed of convergence by estimating with FEM. On the other hand, private domestic investments (LINV) positively affect growth and stand out as the most leading factor in growth and convergence in accordance with expectations through above indicated studies in the literature. Unlike in the case of CEE-10, crowding out effect of inefficient or lower productive government expenditures (LGOV) reflected only in fourth regression in Table 5 while consumption expenditures (LC) have positive effect on growth in the same regression. Finally, even export share in GDP (LX) bears positive sign in third and fourth regressions; statistically it is insignificant yielding to have not any effect on growth and convergence.

Table 5. Conditional Beta Convergence: 33 Countries

Dependent Variable: GR	Regression Number			
	1	2	3	4
Constant	0.3961 [0.2466]	0.6504 [0.3003]**	0.6678 [0.3219]**	-0.988 [0.5123]
LY	-0.0757 [0.0308]**	-0.0755 [0.0292]**	-0.0841 [0.0468]*	-0.0800 [0.0453]*
LINV	0.1148 [0.0254]***	0.1021 [0.0261]***	0.1038 [0.0289]***	0.1117 [0.0260]***
LGOV		-0.0736 [0.0503]	-0.0739 [0.0505]	-0.1116 [0.0450]**
LX			0.0160 [0.0396]	0.0262 [0.0366]
LC				0.1773 [0.0726]**
R^2 (within)	0.351	0.375	0.379	0.401
R^2 (between)	0.447	0.424	0.437	0.442
R^2 (overall)	0.206	0.199	0.199	0.196
R^2				
Observations	132	132	132	132
F Stat. (p-value)	10.61 (0.0003)	7.55 (0.0006)	6.73 (0.0005)	8.59 (0.0000)
Wald χ^2 (p-value)				
Implied β	0.0788**	0.0785**	0.0878*	0.0834*

Notes: Dependent variable for each regression is annual average growth rate of real GDP (GR). Robust standard errors are given in square brackets. All independent variables except for constant are transformed into the natural logarithm and shown by capital l (L). Asterisks *, ** and *** denote statistical significance at the 10 percent, 5 percent and 1 percent level, respectively. **Source:** Author's Calculations.

5. Concluding Remarks

This paper aims to examine the convergence process of Eastern European countries including candidate and potential candidates of EU with EU's old and developed states. In this context, two well known measures of convergence, namely σ and β (absolute and conditional) convergence employed for the period 1993-2012 which covers the transition period of Eastern Bloc and their integration to EU as well. In terms of σ convergence which is measured by the fall or rise in standard deviation of income series reveals that income dispersion among each group decreases indicates the presence of σ convergence. On the other hand, by performing panel data, presence of both types of β convergence examine and the results yield the existence of both types of convergence for each group of countries confirming the findings of NGM in which poorer countries by growing faster than their richer counterparts and eventually will retain the common steady state level of income. The most striking result of the convergence analysis observed in terms of the speed of convergence especially for SEE-8 group which consist mainly by candidate and potential candidates of EU from South Eastern Europe and EU's latest entrants aftermath of 2007. The speed of absolute β convergence is 3.6 % while the speed of conditional β convergence ranges between 18 % and 23 % which is uncommon in conventional convergence literature.

These findings are worth emphasizing the future prospects of EU enlargement. Even the analysis of convergence in this paper is limited to components of GDP by expenditure method as determinants of growth and excluding the other important determinants which is highlighted by the many conventional convergence studies, it is important that there is a tendency for catch-up. Even observed recession in Europe overall and financial turmoil and solvency crisis experienced by some major member states and its ongoing negative impact not only for those states but also as their main trading partners for the new members and candidates, successful coordination and adoption of common EU policies, financial assistance of EU (structural funds, etc.) for member states and candidate states, flow of foreign direct investments and financial capital movements could be effective mechanisms to record such a convergence tendency. Also the findings in favor of convergence could reject the idea of

"enlargement will create a burden for EU in the future". In this context, EU's enlargement process should be maintained despite ongoing debates against this fact.

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